

2026



# Mechanical Engineering BSc

STUDY PROGRAM

**UNIVERSITY OF DUNAÚJVÁROS**

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**DESCRIPTION OF THE DEGREE STUDY PROGRAM**

<b>Mechanical Engineering BSc</b>	
(Mechanical Engineering)	
The higher educational institution responsible for the study program:	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
<b>Responsible persons for the study program</b>	
Responsible institute:	Institute of Engineering Sciences
Director of institute:	Dr. habil. Róbert Sánta, PhD
Responsible person for the study program:	Dr. Szabó Attila, PhD, college associate professor
<b>Specializations (majors) and responsible persons:</b>	
Machine Maintenance and Technical Diagnostic	Dr. Szabó Attila, PhD, college associate professor
Green Transformation	Dr. Kovács-Bokor Éva, PhD, college associate professor
Nuclear Energy	Dr. Pázmán Judit, PhD, college associate professor
<b>Main aspects of the study program:</b>	
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
Credit points to be acquired:	210
The objectives of the training and the professional competencies to be acquired	The aim of the training is to train mechanical engineers who are capable of operate machinery and mechanical equipment and and maintenance of machinery and equipment, the introduction of engineering technologies, and the organisation and management of work, the technical and technical the tasks of technical development, research and design of average complexity the requirements of the labour market; and

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	a sufficient depth of theoretical knowledge for the second stage of training a second cycle of training.
Criteria for choosing a specialisation	Completion of 90 credits
	In the semester specified in the curriculum, at least one specialization is started, which most students choose. Starting more than one specialization is only possible if at least 15 people have chosen it.
Prerequisite(s) for starting the internship	<p>The student may enroll in the course after having completed at least 120 credits and after the specialization has been selected.</p> <p>The prerequisite for commencing the professional internship is the registration for and completion of the Professional Internship course. Within the framework of this course, the student selects a placement in consultation with the course instructor and submits the officially signed declaration of acceptance by the host company to the instructor by the end of the study period. The submission of this document is also a condition for completing the course.</p>
Internship	<p>The professional internship is a practice organized within the framework of the Professional Internship course at an approved training placement for a minimum duration of six weeks.</p> <p>The internship should take place after the 6th semester (according to the curriculum, typically during the summer period), although deviations are permitted provided that the required conditions are fulfilled.</p>
The earliest time and conditions for the recognition of the professional internship through prior work experience.	<p>The recognition of the professional internship on the basis of prior work experience may be requested if the student can verify that their previous or current employment is professionally aligned with the learning outcomes and competence requirements of the program. The request for recognition may be initiated with the course instructor after the student has registered for the Professional Internship course.</p> <p>Work experience may be accepted as fulfilling the professional internship requirement if the following conditions are met: the duration of employment in full-time position reaches at least two years; the position held is professionally relevant and substantially connected to the training and outcome requirements of the program; the student has applied the competencies expected in the program during their work (such as professional design, analysis, development, operation, organizational, or economic tasks); and the work performed did not consist exclusively of administrative or routine activities.</p>

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	<p>Required documents include an employer's certificate containing the duration of employment (start and end dates), the number of working hours per week, the job title, a job description, and the official signature and contact details of the company. In addition, the student must submit a professional report of at least four pages, including a brief presentation of the organization, a professional description of the activities performed, an overview of the applied methods, tools, and technologies, and a presentation of the competencies acquired.</p>
Final certificate (absolutorium)	<p>The university leaving certificate certifies the successful completion of the exam requirements in accordance with the curriculum and the completion of the other study requirements (e.g. physical education) and the collection of the required number of credit points defined in the study and output requirements. This certificate is a proof without qualification and evaluation that the student has fulfilled all the study and exam requirements defined in the curriculum.</p>
Prerequisite(s) for thesis writing	<p>The prerequisite for registering for the Thesis course is the completion of the final examination subjects, the Professional Internship course, and at least 170 credits.</p> <p>The student may begin writing the thesis after providing proof of completion of the professional internship and once the thesis topic proposal has been approved by the head of the institute/ department /program.</p>
Thesis	<p>The thesis is the solution of a specific mechanical engineering problem or the elaboration of a research task within a defined professional field. Based on the knowledge acquired during their studies, supplemented by relevant literature and under the guidance of both academic and industrial supervisors, the student must complete the thesis within one semester. Through the thesis, the candidate demonstrates sufficient proficiency in the practical application of acquired knowledge, the ability to perform mechanical engineering tasks independently, and familiarity with additional professional literature beyond the curriculum, applied in a value-creating manner. Formal requirements: in accordance with the currently valid Thesis Preparation Guidelines. The length of the thesis must be between 50 and 70 pages.</p>
Condition for passing the final examination	<p>The prerequisites of the final exam are the receipt of the university leaving certificate and the thesis accepted for evaluation.</p>
Final exam	<p>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 has to prove that he is able to apply the acquired knowledge in</p>

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	practice. The final exam includes defending the thesis and an oral exam of the subjects appointed in the curriculum. (FE1 and FE2).
Nuclear Energy specialisation final examination subjects	ZV1: Machinery DUEN (L)-MUG-151; Basic of energetics DUEN(L)-MGT-211; Basic of Nuclear energetics DUEN(L)-MGT-118.  ZV2: Basics of nuclear safety DUEN(L)-MGT-117; Equipments of Nuclear Power Plants DUEN(L)-MGT-152; Ensuring the integrity of equipment DUEN(L)-MGT-119;
Machine Maintenance and Technical Diagnostic specialisation final examination subjects	ZV1: Maintenance strategy DUEN(L)-MGT-254, Maintenance technologies 2. DUEN(L)-MGT-253 Tribology DUEN(L)-MUG-118  ZV2: Machinery DUEN (L)-MUG-151; Technical Diagnostics 1. DUEN(L)-MUG-157 Technical Diagnostics 2. DUEN(L)-MUG-219
Green Transformation specialisation final examination subjects	ZV1: Machinery DUEN (L)-MUG-151; Basic of energetics DUEN(L)-MGT-211; Basics of energy saving and conservation DUEN(L)-MGT-153  ZV2: Energy management DUEN(L)-MGT-114; Renewable energy DUEN(L)-MGT-115 Novel techniques of environmental protection DUEN(L)-MGT-216
Average of the certificate	The average of the certificate should be calculated in the following way: $(FE1 + FE2 + D + SA)/4$ : (FE1) the mark for the first final exam subject, (FE2) the mark for the second final exam subject, (D) is the mark awarded for the thesis by the final exam committee, which is structured as follows: - Mark received for the evaluation 1/3 - Presentation 1/3 - Debating skills, answers to questions 1/3 (SA) is the cumulative average of the study marks weighted with the credits points obtained by the student.
Qualification of the certificate	excellent 4.51 – 5.00; good 3.51 – 4.50; average 2.51 – 3.50; acceptable 2.00 – 2.50

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Conditions for the award of the certificate	The precondition of the issue of certificate to prove the completion of higher educational studies is the successful final exam.
Language education	English
Sport	Over 4 semesters, 2 hours per week (full-time only)
Mobility window	During the course of the program, students ideally take advantage of the mobility window in the 4th semester. Since mobility depends both on the hosting institution's capacity and the student's ability to travel, this window is integrated flexibly into the curriculum in accordance with the principles laid down in §45 of the Academic and Examination Regulations of the Student Requirements System. A designated staff member of the Directorate for International Relations provides assistance in selecting the host institution
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.

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CURRICULUM TABLES

Full time		Mechanical Engineering BSc																				Prerequisite				
Subject code	Subject name	Credit	Requirement	Semester - Classes per week																						
				1			2			3			4			5			6				7			
T	P	L	T	P	L	T	P	L	T	P	L	T	P	L	T	P	L	T	P	L	T	P	L			
DUEN-TKK-915	Introduction to the use of artificial intelligence	0	MM	5*	5*	0																			-	
DUEN-IMA-100	Tutorial mathematics	5	S	0	2	0																				-
DUEN-IMA-152	Engineering Mathematics 1.	5	E	0	3	0																				-
DUEN-ISF-010	Infomatics	5	M	0	0	3																				-
DUEN-MGT-111	Engineering representation	5	M	1	2	0																				-
DUEN-MUG-152	Mechanics 1.	5	E	1	2	0																				-
DUEN-MUG-212	CAD	5	M	0	0	3																				-
DUEN-MUT-151	Engineering Physics	5	E	1	1	1																				-
DUEN-TKK-915	Introduction to the use of artificial intelligence	0	MM	1	1	0																				-
DUEN-IMA-212	Engineering Mathematics 2.	5	M				0	0	3																	DUEN-IMA-152
DUEN-MST-210	Industrial materials	5	M				1	0	2																	-
DUEN-MUG-222	Basics of machine design	5	M				2	1	0																	DUEN-MUG-212, DUEN-MUG-152, DUEN-MGT-111
DUEN-MUG-257	Mechanics 2.	5	E				1	2	0																	DUEN-MUG-152
DUEN-MUT-250	Heat and Fluid Dynamics	5	E				1	1	1																	DUEN-MUT-151
-	Optional course	5	-				-	-	-																	-
DUEN-IMA-110	Mathematics 3.	5	M							0	3	0														DUEN-IMA-152
DUEN-MGT-112	Engineering construction	5	M							1	2	0														DUEN-MGT-111
DUEN-MUA-116	Technology of Structural Materials	5	M							1	0	2														-
DUEN-MUG-153	Mechanics 3.	5	E							1	2	0														DUEN-MUG-152
DUEN-TVV-111	Human Resource Management	5	M							1	2	0														-
DUEN-TVV-114	Management	5	M							1	2	0														-
-	Optional course	5	-										-	-	-											-
DUEN-MGT-211	Basics of energetics	5	M										2	0	1											-
DUEN-MUG-151	Machinery	5	M										2	0	1											DUEN-MUT-250
DUEN-MGT-251	Industrial drive technology	5	E										2	1	0											DUEN-MUG-152, DUEN-MUG-222
DUEN-MGT-252	Industrial automatics	5	E										1	2	0											DUEN-IMA-152
DUEN-MUG-252	Production Technology	5	E										2	1	0											DUEN-MUG-152
-	Specialisation	20	-																							-
DUEN-TVV-122	Entrepreneurship	5	M																		1	2	0			-
DUEN-MUA-210	Welding	5	E																		2	1	0			DUEN-MST-210
-	Specialisation	20	-																							-
-	Optional course	5	-																							-
DUEN-MUG-213	Metrology	5	M																				2	0	1	DUEN-MUG-257, DUEN-MUG-222
-	Optional course	5	-																							-
-	Specialisation	15	-																							-
DUEN-MUG-117	Quality Management	5	M																				2	1	0	-
DUEN-MUT-110	Environmental protection and energy management	5	M																				2	0	1	-
-	Sport	0	A																							-
	Number of Theoretical/Practice/Lab classes per week			3	10	7	6	6	6	5	11	2	9	4	2	2	1	0	2	0	1	4	1	1		
	Total number of classes per week			22			18			18			15			3			3			6				
	Total credit points			215																						
MACHINE MAINTENANCE AND TECHNICAL DIAGNOSTICS																3	0	6	3	0	6	0	9	0		
				22	18	18	15	15	14	9																
GREEN TRANSFORMATION																3	0	6	3	0	6	0	9	0		
				22	18	18	15	15	15	9																
NUCLEAR ENERGY																3	0	6	2	0	7	0	9	0		
				22	18	18	15	15	15	9																



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Part time	Mechanical Engineering BSc																			Prerequisite				
	Subject code	Subject name	Credit	Requirement	Semester - Classes per week																			
					1			2			3			4			5				6			7
T	P	L	T	P	L	T	P	L	T	P	L	T	P	L	T	P	L	T	P	L				
DUEL-TKK-915	Introduction to the use of artificial intelligence	0	MM	5*	5*	0															-			
DUEL-IMA-100	Tutorial mathematics	0	S	0	10	0															-			
DUEL-IMA-152	Engineering Mathematics 1.	5	E	0	15	0															-			
DUEL-ISF-010	Informatics	5	M	0	0	15															-			
DUEL-MGT-111	Engineering representation	5	M	5	10	0															-			
DUEL-MUG-152	Mechanics 1.	5	E	5	10	0															-			
DUEL-MUG-212	CAD	5	M	0	0	15															-			
DUEL-MUT-151	Engineering Physics	5	E	5	5	5															-			
DUEL-TKK-915	Introduction to the use of artificial intelligence	0	MM	5	5	0															-			
DUEL-IMA-212	Engineering Mathematics 2.	5	M			0	0	15													DUEL-IMA-152			
DUEL-MST-210	Industrial materials	5	M			5	0	10													-			
DUEL-MUG-222	Basics of machine design	5	M			10	5	0													DUEL-MUG-212, DUEL-MUG-152, DUEL-MGT-111			
DUEL-MUG-257	Mechanics 2.	5	E			5	10	0													DUEL-MUG-152			
DUEL-MUT-250	Heat and Fluid Dynamics	5	E			5	5	5													DUEL-MUT-151			
-	Optional course	5	-			-	-	-													-			
DUEL-IMA-110	Mathematics 3.	5	M					0	15	0											DUEL-IMA-152			
DUEL-MGT-112	Engineering construction	5	M					5	10	0											DUEL-MGT-111			
DUEL-MUA-116	Technology of Structural Materials	5	M					5	0	10											-			
DUEL-MUG-153	Mechanics 3.	5	E					5	10	0											DUEL-MUG-152			
DUEL-TVV-111	Human Resource Managment	5	M					5	10	0											-			
DUEL-TVV-114	Management	5	M					5	10	0											-			
-	Optional course	5	-							-	-	-									-			
DUEL-MGT-211	Basics of energetics	5	M						10	0	5										-			
DUEL-MUG-151	Machinery	5	M						10	0	5										DUEL-MUT-250			
DUEL-MGT-251	Industrial drive technology	5	E						10	5	0										DUEL-MUG-152, DUEL-MUG-222			
DUEL-MGT-252	Industrial automatics	5	E						5	10	0										DUEL-IMA-152			
DUEL-MUG-252	Production Technology	5	E						10	5	0										DUEL-MUG-152			
-	Specialisation	20	-																		-			
DUEL-TVV-122	Entrepreneurship	5	M							5	10	0									-			
DUEL-MUA-210	Welding	5	E							10	5	0									DUEL-MGT-212			
-	Optional course	5	-																		-			
-	Specialisation	20	-																		-			
DUEL-MUG-213	Metrology	5	M													10	0	5			DUEL-MUG-257, DUEL-MUG-222			
-	Specialisation	15	-																		-			
-	Optional course	5	-																		-			
DUEL-MUG-117	Quality Management	5	M																10	5	0	-		
DUEL-MUT-110	Environmental protection and energy management	5	M																10	0	5	-		
	<b>Number of Theoretical/Practice/Lab classes per week</b>			20	55	35	30	30	30	25	55	10	45	20	10	10	5	0	10	0	5	20	5	5
	<b>Total number of classes per week</b>			110			90			90			75			15			15			30		
	<b>Total credit points</b>			210																				
	<b>MACHINE MAINTENANCE AND TECHNICAL DIAGNOSTICS</b>															3	0	6	3	0	6	0	45	0
																9			9				45	
				22			18			18			15			15			14			45		
	<b>GREEN TRANSFORMATION</b>															3	0	6	3	0	6	0	45	0
																9			9				45	
				22			18			18			15			15			15			45		
	<b>NUCLEAR ENERGY</b>															3	0	6	2	0	7	0	45	0
																9			9				45	
				22			18			18			15			15			15			45		

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MACHINE MAINTENANCE AND TECHNICAL DIAGNOSTICS																											
Subject code	Subject name	Credit	Requirement	Semester - Classes per week														Prerequisite									
				1		2		3		4		5		6		7											
				T	P	L	T	P	L	T	P	L	T	P	L	T	P		L	T	P	L					
DUEL-MGT-113	Maintenance technologies 1.	5	M															10	5	0	DUEL-MUG-222						
DUEL-MUG-111	Production planning, CAM	5	M															10	0	5	DUEL-MUG-252						
DUEL-MUG-118	Tribology	5	M															10	5	0	DUEL-MUG-222						
DUEL-MUG-157	Technical Diagnostics 1.	5	E															10	5	0	DUEL-MUG-153, DUEL-IMA-110						
DUEL-MGT-253	Maintenance technologies 2.	5	E															10	5	0	DUEL-MGT-113						
DUEL-MGT-254	Maintenance strategy	5	E															10	5	0	DUEL-MGT-113						
DUEL-MUG-216	Complex Machine Designing	5	M															0	0	15	-						
DUEL-MUG-219	Technical Diagnostics 2.	5	M															10	0	5	DUEL-MUG-157						
DUEL-MUG-093	Professional Practice	0	S															0	0	0	-						
DUEL-MUG-091	This is project	15	S																0	45	0	finishing all subject of the 1-6 semester					
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	15	5	30	10	20	0	45	0	
	Total number of classes per week			0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60	45							
	Total credit points			55																							
GREEN TRANSFORMATION																											
Subject code	Subject name	Credit	Requirement	Semester - Classes per week														Prerequisite									
				1		2		3		4		5		6		7											
				T	P	L	T	P	L	T	P	L	T	P	L	T	P		L	T	P	L					
DUEL-MGT-114	Energy management	5	M															10	5	0	-						
DUEL-MGT-115	Renewable energy	5	M															10	5	0	DUEL-MUT-250						
DUEL-MGT-153	Basics of energy saving and conservation	5	E															10	5	0	-						
DUEL-TGT-252	Sustainable Finance and Bigtech Companies in Finance	5	E															10	5	0	-						
DUEL-MGT-215	Practical application of renewable energy sources	5	E															0	0	15	-						
DUEL-MGT-216	Novel techniques of environmental protection	5	E															10	0	5	-						
DUEL-MGT-257	Basic Principles of Hydrogen Technology	5	E															10	5	0	-						
DUEL-MGT-258	Basics of the circular economy	5	E															10	5	0	-						
DUEL-MUG-093	Professional Practice	0	S															0	0	0	-						
DUEL-MUG-091	This is project	15	S																0	45	0	finishing all subject of the 1-6 semester					
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	20	0	30	10	20	0	45	0	
	Total number of classes per week			0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60	45							
	Total credit points			55																							
NUCLEAR ENERGY																											
Subject code	Subject name	Credit	Requirement	Semester - Classes per week														Prerequisite									
				1		2		3		4		5		6		7											
				T	P	L	T	P	L	T	P	L	T	P	L	T	P		L	T	P	L					
DUEL-MGT-117	Basics of nuclear safety	5	M															10	0	5	-						
DUEL-MGT-118	Basics of Atomenergetics	5	M															10	5	0	-						
DUEL-MGT-119	Ensuring the integrity of equipment	5	M															10	5	0	-						
DUEL-MGT-152	Equipments of Nuclear Power Plants	5	E															10	5	0	-						
DUEL-MGT-213	Industrial knowledge	5	M															10	0	5	-						
DUEL-MGT-214	Operation and maintenance practice	5	M															0	0	15	-						
DUEL-MGT-255	Radiation protection and environmental policy	5	E															10	5	0	-						
DUEL-MGT-256	NPP measurements and NDT	5	E															10	5	0	-						
DUEL-MUG-093	Professional Practice	0	S															0	0	0	-						
DUEL-MUG-091	This is project	15	S																0	45	0	finishing all subject of the 1-6 semester					
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	15	5	30	10	20	0	45	0	
	Total number of classes per week			0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60	45							
	Total credit points			55																							

## SUBJECT DESCRIPTIONS

### Tutorial mathematics

Subject name		In Hungarian	Matematika felzárkóztató				Level	BSc		
		In English	Tutorialmathematics				Code	DUEN(L)-IMA-100		
2025/2026 II.										
Responsible educational unit			Institute of Informatics							
Compulsory prerequisite subject:			-							
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/26	Per week	0	Per week	2	Per week	0	S	0	english
Part time	150/10	Per semester	0	Per semester	10	Per semester	0			
Person responsible for the subject:			name		Gordana Stankov, PhD			position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)			<b>Short-term objective</b> This course is recommended, based on a preliminary assessment of prior knowledge, for students enrolled in the Bachelor's programmes in Business Administration and Management, Materials Engineering, Mechanical Engineering, Business Informatics, Computer Engineering, and Technical Management, as well as in higher-level vocational programmes in technical and business-related fields. The primary objective of the course is to provide students with the fundamental mathematical knowledge required for higher education studies. It aims to strengthen and systematize students' mathematical knowledge, skills, and competencies in order to establish an appropriate foundation for successfully completing university-level mathematics courses. The course builds on the mathematical knowledge acquired in secondary education.							
			<b>Objectives and development goals</b> -							
			Typical delivery methods							
		Lecture	-							
		Seminar	Classroom exercises, structured student contribution, presentation, case study analysis.							
		Lab	-							
		Other	-							
Requirements (in learning outcomes)			<b>Knowledge</b> The student has knowledge of the methods and procedures necessary for solving mathematical problems related to their field of study. They possess the fundamental mathematical background required for their discipline, including knowledge of functions and linear algebra.							
			<b>Ability</b> The student is able to apply the acquired mathematical knowledge and related activities in practice. They apply the learned problem-solving methods and procedures in solving mathematical tasks. They are able to develop their own solution strategies and defend them in discussions by using appropriate mathematical reasoning and argumentation. They are capable of organizing their own learning process effectively and of identifying and using various learning resources (printed and electronic).							
			<b>Attitude</b> The student is open to understanding and adopting developments and innovations in mathematics and applied mathematics related to their qualification and field of study. They show interest in new methods and tools relevant to their discipline. Their attitude towards solving technical problems is strengthened and further developed.							
			<b>Autonomy and responsibility</b> Students take responsibility for their own work.							

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Short description of subject content	The course covers the content of the intermediate-level mathematics matriculation exam. Operations with complex numbers. Set theory concepts and the notion of functions. Number sequences, exponentiation, root extraction, and order of operations. Logarithms, solutions of linear and quadratic equations. Solving word problems.
Types of student activity	Guided problem-solving: 60% Independent problem-solving: 40%
Required reading and resources	<ul style="list-style-type: none"> <li>• OpenStax. (2021). Precalculus 2e. Houston, TX: OpenStax. ISBN 978-1-951693-40-4.</li> <li>• Abramson, J. (Ed.). (2021). Algebra and Trigonometry 2e. Houston, TX: OpenStax. ISBN 978-1-951693-40-4.</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• OpenStax. (2021). College Algebra (2e). Houston, TX: OpenStax. ISBN 978 1 951693 41 1.</li> <li>• OpenStax. (2022). Contemporary Mathematics. Houston, TX: OpenStax. ISBN 978-1-951693-56-5.</li> </ul>
Assignments	-
Description and schedule of exams	During the semester, full-time and part-time students will take one midterm test in week 13. Students who achieve at least 50% on the midterm will receive a graded signature.
Framework and rules for the use of artificial intelligence	Artificial intelligence may be used during classwork; however, it is not permitted for solving tests.

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**Engineering Mathematics 1.**

Subject name		In Hungarian		Mérnöki matematika 1				Level	BSc	
		In English		Engineering mathematics 1				Code	DUEN(L)-IMA-152	
2025/2026 II.										
Responsible educational unit				Institute of Informatics						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	0	Per week	3	Per week	0	E	5	english
Part time	150/15	Per semester	0	Per semester	15	Per semester	0			
Person responsible for the subject:				name		Antal Joós, PhD			position	associate professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Acquiring the mathematical foundations necessary for further studies.						
				<b>Objectives and development goals</b> Training background: knowledge and skills acquired in public education. Related subjects: Engineering Mathematics 2, Mathematics 3, Operations Research and Decision Theory. Related objectives: learning the concepts and relationships of linear algebra, probability theory, and statistics that are essential for working in the field.						
Typical delivery methods				Lecture		-				
				Seminar		Classroom practice, student-written posts, presentations, case study analysis				
				Lab		-				
				Other		-				
Requirements (in learning outcomes)				<b>Knowledge</b> Knows the methods and procedures necessary for solving mathematical problems in their field of expertise. Possesses the knowledge and skills in mathematics, function theory, and linear algebra necessary for their field of expertise.						
				<b>Ability</b> Is able to apply the mathematical knowledge and skills they have learned. Applies the problem-solving methods and procedures learned. Is able to prepare their own solution plan and defend it in discussions (argumentative debate skills) in relation to the mathematical concepts learned. Is able to organize their own learning process effectively, find and use various learning resources (printed, electronic).						
				<b>Attitude</b> Is open to learning about and accepting mathematics-based, applied mathematical developments and innovations related to their qualification and field of expertise. Is interested in new methods and tools related to their field of expertise.						
				<b>Autonomy and responsibility</b> Responsibility for their own work and that of their colleagues.						
Short description of subject content				Linear equation systems. Matrices, operations with matrices. Matrix determinant, inverse, rank. Vectors, operations with vectors. Basis transformation. Space elements, metric tasks. Eigenvalues, eigenvectors. Operations with complex numbers. Set theory, the concept of a function. Limits of sequences, convergence criteria. Basic properties of single-variable real functions, limits, continuity. Interpretation of the differential quotient of single-variable real functions, the relationship between differentiability and continuity, the derivative function, the differential of a differentiable function. General differentiation rules, differentiation of elementary functions. Mean value theorems of differential calculus, higher-order derivatives, L'Hospital's rule, function discussion. The concept of the Riemann integral, conditions for integrability, properties of definite integrals, mean value theorem of integral calculus, Newton-Leibniz formula. Primitive functions, indefinite integrals and some of their properties, basic integrals. Integration methods. Improper integrals. Basic properties of real functions of several variables, differential calculus, calculation of extreme values. Tasks related to nuclear energy and green energy.						
Types of student activity				Learning theoretical material with guidance and independently.						

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	<p>Solving tasks with guidance and independently.  Learning theoretical material with guidance: 10%  Learning theoretical material independently: 30%  Solving tasks with guidance: 30%  Solving tasks independently: 30%</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Lay, D. C.: Linear Algebra and its applications, 4th edition, Addison-Wesley, 2012.</li> <li>• Stewart, J.: Complex Numbers, Additional Topic to Essential Calculus, 2nd edition, 2013, pp. 1-11.</li> <li>• Smith, R. T., Minton, R. B.: Calculus: Early transcendental functions, 4th edition, McGraw Hill, New York, 2012.</li> </ul>
Recommended reading and resources	-
Assignments	As stated in the first lesson.
Description and schedule of exams	As stated in the first lesson.
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted. Artificial intelligence is permitted for checking homework assignments, accelerating the learning process, and generating sample examples to facilitate understanding of concepts, but its use is prohibited in closed-book exams.

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**Informatics**

Subject name		In Hungarian		Informatika				Level	BSc	
		In English		Informatics				Code	DUEN-ISF-010 DUEL-ISF-010	
2025/2026 II.										
Responsible educational unit				Institute of Information Technology, Department of Software Development and Application						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/45	Per week	0	Per week	0	Per week	3	M	5	english
Part time	150/15	Per semester	0	Per semester	0	Per semester	15			
Person responsible for the subject:				name		Mariann Váraljai, PhD			position	associate professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> In addition to the necessary basic IT knowledge, students should acquire a higher level of knowledge in the given areas that will enable individuals to develop the knowledge and skills necessary for the efficient, effective and professional use of the most common computer applications in the workplace.						
				<b>Objectives and development goals</b> Be able to confidently manage a graphical operating system. Be able to browse the Internet, search for relevant information and conduct electronic correspondence. Learn about scientific search services and the general rules of etiquette for Internet communication (NETiquette) Be able to create any complex, multi-page text document with a word processing program, and be able to create professional digital text. Be able to create tables, manage data with a spreadsheet program, and be able to implement data visualization. Be able to create presentations and apply advanced presentation techniques. Be able to use artificial intelligence (AI) responsibly and safely, with particular attention to critical thinking when making decisions involving AI technology. Be able to develop an appropriate ethical attitude towards AI and data protection. Be able to independently creatively use any innovative IT tools and applications.						
Typical delivery methods				Lecture		-				
				Seminar		-				
				Lab		In classrooms with the use of projector and computer, students solve individual tasks on the computers, using programs, with teacher assistance. Computer based exercises, individual tasks.				
				Other		-				
Requirements (in learning outcomes)				<b>Knowledge</b> Students familiar with the general and specific mathematics, informatics principles, rules, relationships and procedures of the user programs in the field of information technology. They have adequate expertise in the IT field specialist knowledge of specific tools for selecting tools and to carry out its tasks.						
				<b>Ability</b> Students are able to perform partial activities independently during solving more complex system problems. They apply their studied problem-solving methods and procedures efficiently in expertly tasks. Throughout the course, participants will learn to handle AI technology with critical thinking and make responsible decisions in source management.						
				<b>Attitude</b> Students are interested in new methods and tools related to IT section. Students consider their own professional competences and activities on reflective way. Open to understand and accommodate professional, technological development and innovation area. They apply technology in an ethical manner and in accordance with moral guidelines.						
				<b>Autonomy and responsibility</b> Students strive for efficient and quality work. The responsible for the technical operations carried out independently.						
Short description of subject content				Confident use of operating system: managing files and folders.						

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	<p>Goal-oriented use of the Internet, knowledge of NETiquette. Targeted search on the Internet. Use of email programs.</p> <p>Word processing with MS Word word processor program: Basic text editing operations, creating tables, applying styles, creating a table of contents and other lists, and creating mail merges.</p> <p>Spreadsheet management with MS Excel spreadsheet program: Creating, uploading and formatting tables, using cell references, formulas, functions, charts as data visualization, applying simple database operations, managing and visualizing data.</p> <p>Making a presentation with MS PowerPoint or Prezi: basic slide editing and formatting operations, using the slide master, slide templates, applying styles, slideshow settings and presentation techniques.</p> <p>They make independent, creative use of innovative information technology (e.g. AI) and tools.</p>
Types of student activity	<p>Heard information processing by creating notes, Systematization of information has led by tasks (40%) Self-processing (individual) tasks (60%)</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• WORD 2010 All-In-One for Dummies by Doug Lowe with Ryan Williams, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet)</li> <li>• EXCEL 2010 All-In-One for Dummies by Greg Harvey, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet)</li> <li>• ACCESS 2010 All-In-One for Dummies by Margaret Levine Young, Alison Barrows, and Joseph C. Stockman, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet)</li> <li>• POWER POINT 2010 All-In-One for Dummies by Doug Lowe, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet)</li> <li>• The Internet for Dummies 12th edition by John R. Levine – Margaret Levine Young, Wiley Publishing Inc, Indiana (free pdf on Internet)</li> <li>• OFFICE 2010 All-in-one for Dummies by Peter Weverka, Wiley Publishing, Inc. Indiana (free pdf on Internet)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Electronic literature and learning materials in Moodle or in Neptun.</li> <li>• MS Office Tutorial and examples (Internet).</li> </ul>
Assignments	<p>Compulsory assignment:</p> <ul style="list-style-type: none"> <li>• Create an own individual presentation using MS Power Point or Prezi program based on the conditions set by the instructors.</li> <li>• Deadline: until Week 10! (Upload to the Moodle system!)</li> </ul> <p>Not mandatory, but for extra (bonus) points:</p> <ul style="list-style-type: none"> <li>• The student has the opportunity to solve a Word and Excel tasks on a topic of his or her own choice that match and are consistent with the learning materials of the semester. The extra point will be included in the final grade. It is necessary to discuss the undertaken tasks with the teacher in advance. The tasks are to create a document, table, database that meet real needs with the help of Microsoft Office programs.</li> </ul>
Description and schedule of exams	<p>At the end of each topic, students write closed papers, typically:</p> <ul style="list-style-type: none"> <li>• Week 5: Word processing computer-based test</li> <li>• Week 11: Spreadsheet management computer-based test</li> </ul> <p>In case of any computer-based tests, the opportunity for improving grades is available in the last week of the school period (typically in Week 13) and during the exam period.</p>
Framework and rules for the use of artificial intelligence	<p>Partial authorization of artificial intelligence: For classwork and individual assignments.</p> <p>Prohibition of artificial intelligence: For the two midterm exams and the make-up midterm exams.</p>

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### Engineering representation

Subject name		In Hungarian		Műszaki ábrázolás				Level	BSc	
		In English		Engineering representation				Code	DUEN-MGT-111 DUEL-MGT-111	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	1	Per week	2	Per week	0	M	5	english
Part time	150/15	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:				name		Gábor Vizi, PhD			position	college associate professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> To impart the knowledge of descriptive geometry and mechanical drawing necessary for performing mechanical engineering work.						
				<b>Objectives and development goals</b> The student should be able to perform any variation of the basic constructions occurring in representational geometry. Recognize the elementary constructions necessary for solving various complex tasks, be able to determine their appropriate sequence. Be able to select the optimal solution for the given situation from among the possible solution methods. The student should know the theory and practice of creating technical drawing projections and sections. The student should be able to edit technical drawings of machine parts with traditional tools and read technical drawings. The student should be able to build a dimensional network of machine parts.						
Typical delivery methods				Lecture	Transferring theoretical knowledge through presentation					
				Seminar	Solving typical tasks with teacher guidance					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> He/She knows the conceptual system, the most important relationships and theories related to his/her field of expertise. He/She has a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field of expertise. He/She has a basic knowledge of machine design principles and methods, machine manufacturing technology, control engineering procedures and operating processes. He/She has a comprehensive knowledge of the operating principles and structural units of applied work and power machines, mechanical equipment and devices. He/She can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and relationship of the applied system elements.						
				<b>Ability</b> Performs a job that is appropriate to his/her professional qualifications. Able to plan, organize and carry out independent learning. Able to identify routine professional problems, explore, formulate and solve (through the practical application of standard operations) the theoretical and practical background necessary for their solution.						
				<b>Attitude</b> Open to learning about and embracing machine design developments related to their qualifications and field of expertise. Interested in new methods and tools related to their field of expertise.						
				<b>Autonomy and responsibility</b> Taking responsibility for one's own work and the work of others.						
Short description of subject content				Image plane, coordinate system, projection. Representation of a point, real and point image of a line. Projection and the law of change of view. Mutual positions of spatial elements. Projections depending on their straight positions, diverging and intersecting lines. Transversals, notable lines of a plane. True size of a plane figure, constructions with rotation. Intersection line of two planes, angles of inclination, distances. Solving problems with basic constructions.						

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	Basic standards of technical drawing design. Theoretical overview of projection systems in technical practice. Application of views, view orders. Application of sections and sections. Dimensioning on technical drawings. Dimension grids.
Types of student activity	Processing theoretical material with guidance 20% Independent processing of theoretical material 20% Solving tasks with guidance 20% Independent processing of tasks 40% Laboratory measurements with guidance Preparation of laboratory reports
Required reading and resources	<ul style="list-style-type: none"> <li>• Tamás Zahola: Descriptive Geometry – Elementary constructions</li> <li>• Tamás Zahola: Introduction to Engineering Drawings</li> </ul>
Recommended reading and resources	-
Assignments	<ul style="list-style-type: none"> <li>• Standard characters</li> <li>• Creation of a new view</li> <li>• Diverting and intersecting lines</li> <li>• Plane notable lines</li> <li>• Interaction of plane shapes</li> <li>• Constructions</li> <li>• Projections</li> <li>• Sections</li> </ul>
Description and schedule of exams	Week 7: Complex Representational Geometric Editing Week 13: Mechanical Engineering Review Questions
Framework and rules for the use of artificial intelligence	Partial authorization of artificial intelligence: For classwork and individual assignments. Prohibition of artificial intelligence: For the two midterm exams and the make-up midterm exams.

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**Mechanics 1.**

Subject name		In Hungarian		Mechanika 1.				Level	BSc	
		In English		Mechanics 1.				Code	DUEN-MUG-152 DUEL-MUG-152	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	1	Per week	2	Per week	0	E	5	english
Part time	150/20	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:				name		András Nagy, PhD		position	associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> By applying the concepts and relationships presented in the lectures in the exercises and during home preparation, the student will master the mechanical foundations of the design of simple engineering structures. He will become familiar with the conceptual system of statics and strength theory and the relationships applied in practice.						
				<b>Objectives and development goals</b> -						
Typical delivery methods				Lecture	Presentation with whiteboard and projector					
				Seminar	Blackboard practice, partly with independent student problem solving					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> By applying the concepts and relationships presented in lectures in exercises and during home preparation, the student will master the mechanical foundations of the design of simple engineering structures. He will become familiar with the conceptual system of statics and strength theory and the relationships applied in practice.						
				<b>Ability</b> The student will be able to design and construct mechanical components, machines, devices, equipment, and structures in terms of statics and strength.						
				<b>Attitude</b> Mastering the design and strength theory approach to machine elements, machines, devices, equipment						
				<b>Autonomy and responsibility</b> Learning and applying the responsibilities and regulations of engineering design. Mastering the rules of group cooperation.						
Short description of subject content				<p>Statics of a material point: concept of vector, operations with vectors. Force, force system, equilibrium. Statics of rigid bodies: concept of rigid body. Concept of moment. Equivalence and reduction of force systems. Resultant concept. Equilibrium of a rigid body. Ideal constraints. Definition of support systems in the case of spatial and planar force systems. Statics of supports: concept of support elements, supports and constraints, internal forces and stresses and the principle of their definition, relationships between stresses. Fundamentals of strength theory: basic concepts, division, methods of strength theory, purpose of strength tests, requirements imposed on structural elements, the rupture diagram and the mechanical characteristics that can be determined from it. Determination of mechanical stresses in the case of simple stresses. Concept and definition of stress state. Evaluation of stress state, principal stresses, principal stress directions. Elements of deformation state: specific strains and angular distortions. Evaluation of deformation state. Relationship between elements of deformation and stress state. Concept and theories of equivalent stress.</p> <p>Image plane, coordinate system, projection. Representation of a point, real and point image of a line. Projection and the law of change of view. Mutual positions of spatial elements. Projections depending on their straight positions, diverging and intersecting lines. Transversals, notable lines of a plane. True size of a plane</p>						

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	figure, constructions with rotation. Intersection line of two planes, angles of inclination, distances. Solving problems with basic constructions. Basic standards of technical drawing design. Theoretical overview of projection systems in technical practice. Application of views, view orders. Application of sections and sections. Dimensioning on technical drawings. Dimension grids.
Types of student activity	Processing theoretical material with guidance/independently: 15/35% Solving problems with guidance/independently: 15/35%
Required reading and resources	<ul style="list-style-type: none"> <li>• Ladányi Gábor: Mechanika 1., Elektronikus jegyzet, Dunaújvárosi Egyetem, 2020</li> <li>• Dr. Vigh Sándor- Szilárd BÉláné- Dr. Izsák Gyula: Műszaki mechanika I. Példatár: 1. rész. Dunaújváros, DF Kiadói Hivatal, 2000.</li> <li>• Dr Vigh S. szerk. Műszaki mechanika II. Példatár II/A, főiskolai jegyzet. DF Kiadó, Dunaújváros, 2000.</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Dr. M. Csizmadia Béla-Dr. Nándori Ernő-: Mechanika mérnököknek. Statika. Budapest, Nemzeti Tankönyvkiadó, 1998. 510 p.</li> <li>• Dr. M. Csizmadia Béla-Dr. Nándori Ernő-: Mechanika mérnököknek. Szilárdságtan Nemzeti Tankönyvkiadó, 1998. 510 p.</li> <li>• Dr Vigh S. Műszaki mechanika IV. Keresztmetszeti jellemzők. Főiskolai jegyzet. DF Kiadó, Dunaújváros, 1998.</li> </ul>
Assignments	<p>Compulsory homework:</p> <ul style="list-style-type: none"> <li>• 3rd week Resultant of a spatial force system</li> <li>• 6th week Support forces of a two-support beam</li> <li>• 8th week Stresses of a two-support, cantilever beam</li> <li>• 11th week Strength design of a beam subjected to straight bending</li> </ul> <p>Optional homework:</p> <ul style="list-style-type: none"> <li>• 2nd week Operations with vectors</li> <li>• 4th week Resultant of a plane force system</li> <li>• 7th week Construction of a dough bridge</li> <li>• 10th week Determination of the support forces of a statically indeterminate suspended beam</li> <li>• 13th week Strength check of a beam subjected to oblique bending</li> </ul>
Description and schedule of exams	-
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence tools is partially permitted during the acquisition of the subject:</p> <ul style="list-style-type: none"> <li>• the use of artificial intelligence tools is permitted during the development of homework assignments. The student is responsible for the content and form of the solution of the assignments and if it does not meet the expectations, the homework is invalid.</li> <li>• the use of artificial intelligence tools in any form during the verification of the student's knowledge (exam papers, exams) is not permitted.</li> </ul>

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**CAD**

Subject name		In Hungarian		CAD			Level	BSc		
		In English		CAD			Code	DUEN-MUG-212 DUEL-MUG-212		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/60	Per week	0	Per week	0	Per week	3	M	5	english
Part time	150/15	Per semester	0	Per semester	0	Per semester	15			
Person responsible for the subject:				name			Tamás Zahola		position	master instructor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Acquire the basic knowledge of computer-aided mechanical design.						
				<b>Objectives and development goals</b> The student should be familiar with the practice of computer geometric modelling. Be able to build parametric geometric models of components that "survive" construction changes and contain the designer's intention. Be able to select the optimal modelling sequence and method for the given task from among several possible ones. Be able to build an assembly from the created components. Be able to have technical drawings of components and assemblies produced that best comply with the requirements of the valid drawing standards.						
Typical delivery methods				Lecture		-				
				Seminar		-				
				Lab		Computer lab practice				
				Other		-				
Requirements (in learning outcomes)				<b>Knowledge</b> Can apply the related calculation and modelling principles and methods of mechanical product, process and technological design.						
				<b>Ability</b> Able to plan, organize and conduct independent learning. Able to create basic models of technical systems and processes.						
				<b>Attitude</b> Open to learning about and embracing developments related to their qualifications and field of expertise. Interested in new methods and tools related to their field of expertise.						
				<b>Autonomy and responsibility</b> Taking responsibility for one's own work and the work of others.						
Short description of subject content				In computer laboratory sessions, the student will learn the practice of computer geometric modelling through the application of a modern, parametric modeling system (SolidWorks). He will master the use of the commands necessary for the creation of machine parts. He will learn how to build assemblies. He will be prepared to create technical drawing documentation that best complies with the current standards in his engineering work based on the previously built part and assembly models.						
Types of student activity				Processing theoretical material with guidance 20% Independent processing of theoretical material 20% Solving tasks with guidance 20% Independent processing of tasks 40%						
Required reading and resources				<ul style="list-style-type: none"> <li>Tamás Zahola: CAD – Workbook</li> <li>SolidWorks Online Help</li> </ul>						
Recommended reading and resources				<ul style="list-style-type: none"> <li>Descriptions and documentation related to the SolidWorks program system</li> </ul>						
Description and schedule of exams				Week 6: Part Modelling Week 9: Assembly Creation Week 13: Technical Drawing Creation						
Framework and rules for the use of artificial intelligence				The use of artificial intelligence is permitted in all situations during the learning process of the subject. It is the student's responsibility to verify the correctness of the results obtained.						

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### Engineering Physics

Subject name		In Hungarian		Mérnöki fizika				Level	BSc	
		In English		Engineering physics				Code	DUEN-MUT-151 DUEL-MUT-151	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	1	Per week	1	Per week	1	E	5	english
Part time	150/15	Per semester	5	Per semester	5	Per semester	5			
Person responsible for the subject:				name		Miklós Horváth, PhD			position	college professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The goal of the course is to learn the basics of the mechanics of a particle, mechanical systems, electricity, statics and dynamics of liquids and gases, thermodynamics, and geometric and physical optics, and to prepare for the specialized subjects following the module.						
				<b>Objectives and development goals</b> The subject is a basic subject, and accordingly it is included in the first semester of the first year in the curriculum. The subject background is the core material of the secondary school physics. The goal of the subject is to understand and learn the fundamental laws of classical physics at a higher level than in the secondary school, using the differential and integral calculus at the level of description and definitions. The aim is to learn and understand physical laws and phenomena during the lectures, and to solve physics problems during the problem solving exercises. The additional goal is to learn how to measure basic physical quantities and measurement methods, to learn about the measuring instruments belonging to them, and to master their use. Upon successful completion of the subject, students will increase their scientific literacy, develop their problem-solving and manual skills. The knowledge of the subject prepares them for the understanding and learn of later professional subjects.						
Typical delivery methods				Lecture	Projector					
				Seminar	Projector and board					
				Lab	Laboratory exercises in the physics laboratory					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Possesses theoretical and practical knowledge related to the subject area. Recognizes and understands the physical basics of problems in technical practice, is able to use basic physical measuring instruments.						
				<b>Ability</b> Able to perform tasks related to the subject area. Has high-level problem-solving skills.						
				<b>Attitude</b> The attitude of solving technical problems develops.						
				<b>Autonomy and responsibility</b> Taking responsibility for the work.						
Short description of subject content				Mechanics: basic kinematics, rectilinear uniform, and accelerating motion, uniform and accelerating circular motion. Dynamics: basic equation of dynamics, uniform accelerating motion, dynamics of circular motion, oscillatory motion. Linear momentum of a particle and mechanical system, theorem of linear momentum, work energy, power. Mechanics of fluids and gases. Hydrostatics, Archimedes' law, Pascal's law Thermodynamics: 1st and 2nd laws of thermodynamics, , cycles, phase changing, linear and volume heat expansion. Electricity: electrostatics, direct current, direct current network analysis Magnetism and induction, alternating current Optics: geometric optics, physical optics, photometry						
Types of student activity				Understand and processing the heard presentation by taking notes 50%						

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	Problem-guided systematization of information 30% Independent processing of problems 20%
Required reading and resources	<ul style="list-style-type: none"> <li>• Dr. Kiss Endre: Textual material based on the Engineering Physics textbook in the Moodle system</li> <li>• Department working group; edited by Dr. Horváth Miklós: Elaborated tasks based on the Physics example library in the Moodle system</li> <li>• Syllabuses of Engineering Physics laboratory exercises in the Moodle system</li> <li>• Literature: Alvin Halpern: Beginning Physics I-II (SHAUM OUTLINE SERIES McGraw- Hill, ISBN 0-07-025653-5)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Daniel Oman- Robert Oman: Physics for the Utterly Confused (McGraw- Hill Companies, ISBN: 0-07-048262-4)</li> <li>• Daniel Oman- Robert Oman: How to solve Physics Problems (McGraw- Hill Companies, ISBN: 0-07-0481660)</li> </ul>
Assignments	Explained in the 1st lecture
Description and schedule of exams	Explained in the 1st lecture
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted for preparing for a paper or exam. In case of working from home, (preparing assignments to be submitted), the use of artificial intelligence-based tools is permitted for language and form correction, information collection, and systematization, provided that the student indicates the use and checks the results. In these cases, the responsibility for the submitted work is the student's responsibility. The use of artificial intelligence in all activities during assessments (written and oral assessments) is prohibited: In the first lesson the teacher must provide a detailed information about these rules.

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**Engineering Mathematics 2.**

Subject name		In Hungarian	Mérnöki matematika 2					Level	BSc	
		In English	Engineering mathematics 2					Code	DUEN-IMA-212 DUEL-IMA-212	
2025/2026 II.										
Responsible educational unit			Institute of Informatics							
Compulsory prerequisite subject:			DUEN(L)-IMA-152 Engineering mathematics 1							
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture	Seminar		Lab					
Full time	150/39	Per week	1	Per week	2	Per week	0	M	5	english
Part time	150/15	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:			name			László Bognár, PhD		position	college professor	
Course objectives and justification (content, learning outcomes, place in curriculum)			<b>Short-term objective</b> The purpose of the course is to make the students familiar with analysing data using statistical methods and tools. Having covered this course students understand the objective of probability and statistics, they know the different ways of gathering data, analysing datasets with statistical software and they can make inferences for real world situations based on samples of data.							
			<b>Objectives and development goals</b> -							
Typical delivery methods			Lecture	These formal lectures mostly aim at transferring information. Students are expected to take personal notes in addition to the course text, slides or transparencies.						
			Seminar	Students are expected to be actively involved. Whether it is about exercises, feedback on an assignment or practicing statistical data analysis with software package personal input will always be expected.						
			Lab	-						
			Other	-						
Requirements (in learning outcomes)			<b>Knowledge</b> Students will have a solid foundation of analysing processes or phenomena described by quantitative data.							
			<b>Ability</b> Students will demonstrate their ability to apply statistics in other fields at an appropriate level and demonstrate their ability to apply knowledge acquired from their major to real world models. Students will demonstrate mastery of data analysis and statistical concepts by communicating critically reasoned analysis through written and oral presentations.							
			<b>Attitude</b> Students will acquire up-to-date skills and/or applications of computer use related to future career choices. Students will be able to read, interpret, and critically analyse journal articles in the related field.							
			<b>Autonomy and responsibility</b> Responsibility for their own work and that of their colleagues.							
Short description of subject content			During the course students will be engaged in the following topics: introduction, descriptive statistics, probability, random variable, method of estimation, test of hypotheses, simple linear regression.							
Types of student activity			Frontal work 30% Individual or group work 50% Testing 20%							
Required reading and resources			<ul style="list-style-type: none"> <li>James T. McClave, P. George Benson, Terry Sincich : Statistics for Business and Economics. Ed 12th. Pearson Education, Inc. 2014.</li> <li>Douglas C. Montgomery George C. Runger : Applied Statistics and Probability for Engineers. Ed 5th. John Wiley &amp; Sons Inc. 2011.</li> </ul>							
Recommended reading and resources			<ul style="list-style-type: none"> <li><a href="http://onlinestatbook.com/2/index.html">http://onlinestatbook.com/2/index.html</a></li> <li>STATISTICS FOR BUSINESS AND ECONOMICS, TWELFTH EDITION, James T. McClave, Info Tech, Inc., University of Florida</li> </ul>							

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	<ul style="list-style-type: none"> <li>• P. George Benson, College of Charleston, Terry Sincich, University of South Florida, Copyright © 2014, 2011, 2008 Pearson Education, Inc. Publishing as Pearson, 75 Arlington Street, Boston, MA 02116.</li> <li>• STUDENT'S SOLUTIONS MANUAL, Nancy S. Boudreau, Bowling Green State University, Copyright © 2014, 2011, 2008 Pearson Education, Inc. Publishing as Pearson, 75 Arlington Street, Boston, MA 02116.</li> </ul>
Assignments	-
Description and schedule of exams	Continuous evaluation in the form of midterm tests.
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted. Artificial intelligence is permitted for checking homework assignments, accelerating the learning process, and generating sample examples to facilitate understanding of concepts, but its use is prohibited in closed-book exams.

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### Industrial materials

Subject name		In Hungarian		Műszaki anyagismeret				Level	BSc	
		In English		Industrial materials				Code	DUEN-MST-210 DUEL-MST-210	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Structural Integrity						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	1	Per week	0	Per week	2	M	5	english
Part time	150/20	Per semester	5	Per semester	0	Per semester	10			
Person responsible for the subject:				name		Dr. Imre Kovács		position	associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is for students to acquire basic chemical knowledge, through which they will become familiar with the structure of materials, the electron shell structure that determines material properties, the types of chemical bonds that determine macroscopic characteristics, and the microscopic structure and testing methods of individual types of materials (metals, ceramics, polymers). Students will learn about the relationships between the structure and properties of materials, and based on this, in simpler cases they will be able to select the materials that best suit the intended use.						
				<b>Objectives and development goals</b> The subject builds on the students' basic knowledge of chemistry, which lays the foundation for understanding the structure of materials, the electron shell structure and various chemical bonds. Its development goal is to provide students with an understanding of the relationships between the microscopic structure and macroscopic properties of metals, ceramics and polymers, as well as to familiarize them with the basic methods of testing them. The course contributes to students' ability to independently select the appropriate materials for simpler engineering tasks, in accordance with the requirements of use.						
Typical delivery methods				Lecture	PowerPoint slide, using powder ejector					
				Seminar	-					
				Lab	Individual and group work in university laboratories					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> He/She has a comprehensive knowledge of the basic facts, directions and boundaries of the subject area of the technical field. He/She knows the general and specific mathematical, natural and social science principles, rules, relationships and procedures necessary for the cultivation of the technical field. He/She has a thorough knowledge of the structural materials used in the mechanical engineering field, the methods of their production and the conditions of their application.						
				<b>Ability</b> The student is able to apply basic and systemic knowledge of technical materials to interpret the structure, properties and behavior of materials. He/she is able to compare the characteristics of material groups (metals, ceramics, polymers) and to professionally apply the procedures related to the application and production of materials in simple engineering tasks. Based on the acquired knowledge, he/she is able to select the most suitable material for the given technical requirements and to justify material selection decisions.						
				<b>Attitude</b> The student is able to apply basic and systemic knowledge of technical materials to interpret the structure, properties and behavior of materials. He is able to compare the characteristics of material groups (metals, ceramics, polymers) and to professionally apply the procedures related to the application and production of materials in simple engineering tasks. Based on the acquired knowledge, he is able to select the most suitable material for the given technical requirements and to justify material selection decisions.						
				<b>Autonomy and responsibility</b>						

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	She makes her decisions carefully, in consultation with representatives of other fields, and independently, for which she takes responsibility.
Short description of subject content	Atomic structure. Structure of the periodic table. Electron configuration. Types and characteristics of chemical bonds. Electron affinity, electronegativity, oxidation number. Strong bonds. Weak bonds. General characterization of metals, reactivity. Basic knowledge of organic chemistry. Grouping of carbon compounds, nomenclature. Isomerism. The most important reactions of organic materials. Connection possibilities of macromolecules as the basis for polymer production. Basic knowledge of silicate chemistry. Basic knowledge of colloidal chemistry. State change in solid-phase processes. Polymorphic transformation. Types of technical materials. Interaction of structure - processing - properties. Crystal structure, crystal systems. Crystal, crystallite. Defects of the crystal lattice. Movement of atoms in the material, diffusion. Phases and fabric elements of metallic materials. Significance and definition of equilibrium phase diagrams. Rules for reading two- and three-component equilibrium phase diagrams. Basic types of two-component equilibrium phase diagrams.
Types of student activity	Attending lectures and taking handwritten notes, independent preparation for the zh papers using ppt slides 50% Acquiring practical knowledge by participating in laboratory exercises 30% Independent preparation of assignments and reports 20%.
Required reading and resources	<ul style="list-style-type: none"> <li>• Balázs Verő, Éva Dénes, Zsolt Csepeli: Introduction to Technical Materials Science, College Publishing House, Dunaújváros</li> <li>• Éva Dénes, Péter Farkas, Zsoltné Fülöp, Zoltán Szabó: Metal Technology, College Publishing House, Dunaújváros</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Dr. Tamás Tóth: Mechanical properties of materials and methods of their testing. College Publishing House, Dunaújváros</li> </ul>
Assignments	As mentioned in the first lesson, prepare measurement reports throughout the semester
Description and schedule of exams	As stated in the first lesson
Framework and rules for the use of artificial intelligence	The use of artificial intelligence within the framework of this course is partially permitted: it may be applied for the preparation of in-class assignments (e.g., organizing concepts related to material structure, reviewing material-related correlations), as well as for developing the structure or improving the linguistic quality of submitted reports and written assignments. Students are required to ensure that all submitted professional content—particularly the interpretation of relationships between material structure, microstructural features, and material properties—reflects their own, verifiable work. During midterm tests and examinations, the use of artificial intelligence in any form is strictly prohibited.

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**Basics of machine design**

Subject name		In Hungarian		Géptervezés alapjai				Level		BSc	
		In English		Basics of machine design				Code		DUEN-MUG-222 DUEL-MUG-222	
2025/2026 II.											
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic							
Compulsory prerequisite subject:				DUEN(L)-MUG-212 CAD DUEN(L)-MUG-152 Mechanics 1. DUEN(L)-MGT-111 Engineering representation							
Type		Number of lessons						Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	150/60	Per week	2	Per week	1	Per week	0	M	5	english	
Part time	150/15	Per semester	10	Per semester	5	Per semester	0				
Person responsible for the subject:				name		Tamás Zahola		position		master instructor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Introducing the basic principles and methods of mechanical design.							
				<b>Objectives and development goals</b> The student should know the structure and operation of typical machine parts, machine elements, assemblies, and subassemblies encountered in mechanical engineering practice. Be able to select standard parts of such units, determine the main dimensions, and construct related parts. Be able to prepare drawing documentation of units using traditional and computer tools. The student should be able to apply what he/she has learned in the subjects Mechanical Engineering I, CAD, and Mechanics I to construct simple constructions and subassemblies.							
Typical delivery methods				Lecture		Transferring theoretical knowledge through presentation					
				Seminar		Problem solving with teacher guidance, homework consultation					
				Lab		-					
				Other		-					
Requirements (in learning outcomes)				<b>Knowledge</b> Has a comprehensive knowledge of the basic facts, directions and boundaries of the subject area of the technical field. Has a knowledge of the conceptual system, the most important relationships and theories related to his/her field. Has a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field. Has a basic knowledge of the principles and methods of machine design, mechanical engineering and control engineering procedures and operating processes. Has a comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices. Has a thorough knowledge of the learning, knowledge acquisition and data collection methods of the mechanical engineering field, 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 relationship of the applied system elements. Can apply the related calculation and modelling principles and methods of mechanical product, process and technological design.							
				<b>Ability</b> Performs a job that is appropriate to his/her qualifications. Able to plan, organize and carry out independent learning. Able to identify routine professional problems, explore, formulate and solve them (through the practical application of standard operations) the theoretical and practical background necessary for their solution. Able to create basic models of technical systems and processes. Identifies routine professional problems, explores and formulates the theoretical and practical background necessary for their solution, and solves them through the practical application of standard operations.							
				<b>Attitude</b> Open to learning and absorbing knowledge related to mechanical engineering related to his/her qualification and field of expertise. Interested in new methods and tools related to the field.							
				<b>Autonomy and responsibility</b> Taking responsibility for one's own work and the work of others.							

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Short description of subject content	Parts or units of mechanical equipment that are used repeatedly, perform the same task, and have a similar structural design - machine elements. Conceptual definition, grouping, description, representation, strength dimensioning, correct structural design, operation and maintenance of machine elements. The main machine elements or groups to be discussed in detail are: drive and connecting screws, shafts, shaft joints, couplings, bearings, belt drives, gears. During the discussion of the subject areas, the emphasis is placed on the representation and overview of the parts/units.
Types of student activity	Processing theoretical material with guidance 20% Independent processing of theoretical material 20% Solving tasks with guidance 20% Independent processing of tasks 40%
Required reading and resources	<ul style="list-style-type: none"> <li>• Tamás Zahola: Machine structures II. - Workbook</li> </ul>
Recommended reading and resources	-
Assignments	Design task to be completed in group work
Description and schedule of exams	Week 7: Representation of threaded parts, basic principles of strength design Week 13: Machine elements of rotary motion
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted when solving the design task, and it is the student's responsibility to verify the correctness of the solution. No external assistance may be used during closed-door assignments.

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**Mechanics 2.**

Subject name		In Hungarian		Mechanika 2.				Level	BSc	
		In English		Mechanics 2.				Code	DUEN-MUG-257 DUEL-MUG-257	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUG-152 Mechanics 1.						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	1	Per week	2	Per week	0	E	5	english
Part time	150/20	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:				name		András Nagy, PhD			position	associate professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> By applying the concepts and relationships presented in the lectures in the exercises and during home preparation, the student will master the mechanical foundations of the design of complex structures. He will become familiar with the statics of structures, the issues of serviceable limit states, and the basics of the finite element method.						
				<b>Objectives and development goals</b> Expanding the elementary statics and strength knowledge that forms the content of the Mechanics I subject to analyze the types of structures and failure modes that occur in mechanical engineering practice.						
Typical delivery methods				Lecture	Presentation with whiteboard and projector					
				Seminar	Blackboard practice, partly with independent student problem solving					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> By applying the concepts and relationships presented in the lectures in the exercises and during home preparation, the student will master the mechanical foundations of the design of simple engineering structures. He will become familiar with the conceptual system of statics and strength theory and the relationships applied in practice.						
				<b>Ability</b> The student is able to perform static and structural design of machine elements, machines, devices, equipment, and structures, and analyze failure modes.						
				<b>Attitude</b> Mastering the construction, strength and safety engineering approach to machine elements, machines, devices, equipment.						
				<b>Autonomy and responsibility</b> Learn about the responsibilities and regulations of engineering design, apply safety regulations, and master the rules of group cooperation.						
Short description of subject content				<p>Statics of structures: classification of supporting structures. Pinned multi-support support, three-hinged frame, truss structures and other supporting structures, determination of support forces and stresses. Rope structures. Friction, frictional connections and their application in mechanical engineering. Applied solidity: working principles of solidity. Their application to determining the displacements of bar structures. Approximate methods for determining displacements. Basic concepts of the finite element method. Solving statically indeterminate structures using the force method. Stability problems of flexible bodies: plane and spatial bar deflection, denting. Elastic-plastic deformations, dimensioning of bar structures using plastic principles. Phenomenon of fatigue, control. Phenomenon of brittle fracture, control.</p> <p>Image plane, coordinate system, projection. Representation of a point, real and point image of a line. Projection and the law of change of view. Mutual positions of spatial elements. Projections depending on their straight positions, diverging and intersecting lines. Transversals, notable lines of a plane. True size of a plane figure, constructions with rotation. Intersection line of two planes, angles of inclination, distances. Solving problems with basic constructions.</p>						

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	Basic standards of technical drawing design. Theoretical overview of projection systems in technical practice. Application of views, view orders. Application of sections and sections. Dimensioning on technical drawings. Dimension grids.
Types of student activity	Processing of theoretical material with guidance/independently: 20/30% Solving problems with guidance/independently: 10/20% Solving laboratory problems with guidance: 20%
Required reading and resources	<ul style="list-style-type: none"> <li>Ladányi Gábor: Mechanika 2., elektronikus jegyzet, Dunaújvárosi Egyetem, 2020</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>Szönyiné Passa Erzsébet - Dr. Koppány Imre: Mechanika - Tartószerkezetek I/A, Budapest, Nemzeti Tankönyvkiadó 1998.</li> <li>Dr. Vigh S. szerk.: Műszaki mechanika II/B főiskolai jegyzet, Dunaújváros, DF Kiadó, Dunaújváros, 2003.</li> <li>Tanszéki munkaközösség: Műszaki mechanika I. Elemi Statika, Munkafüzet, Dunaújváros, ME DFK Kiadói Hivatal, 1994.</li> <li>Tanszéki munkaközösség: Műszaki mechanika II/2. Alkalmazott szilárdságtan, Munkafüzet. DF Kiadó, Dunaújváros, 2002.</li> <li>Dr. Vigh Sándor - Szilávik Béláné - Dr. Izsák Gyula: Műszaki mechanika I. Példatár 2. rész, Dunaújváros, DF Kiadói Hivatal, 2000.</li> <li>Dr. Vigh S. szerk.: Műszaki mechanika II. Példatár II/B, főiskolai jegyzet. DF Kiadó, Dunaújváros, 1998</li> </ul>
Assignments	<p>Required homework:</p> <ul style="list-style-type: none"> <li>Week 2 Support forces and stress diagrams of a broken beam</li> <li>Week 7 Determination of the bar forces of a truss beam</li> <li>Week 10 Three-way strain measurement</li> <li>Week 13 Solution of an indeterminate beam</li> </ul> <p>Diligence homework:</p> <ul style="list-style-type: none"> <li>Week 3 Support forces and stress diagrams of a curved beam</li> <li>Week 5 Support forces and stress diagrams of a hinged multi-support beam</li> <li>Week 9 Determination of the characteristics of a composite cross-section</li> <li>4. Week 11 Verification of a centrally compressed slender beam</li> </ul>
Description and schedule of exams	As stated in the first lesson
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence tools is partially permitted during the acquisition of the subject:</p> <ul style="list-style-type: none"> <li>the use of artificial intelligence tools is permitted during the development of homework assignments. The student is responsible for the content and form of the solution of the assignments and if it does not meet the expectations, the homework is invalid.</li> <li>the use of artificial intelligence tools in any form during the verification of the student's knowledge (exam papers, exams) is not permitted.</li> </ul>

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### Heat and Fluid Dynamics

Subject name		In Hungarian		Hő- és áramlástan				Level	BSc		
		In English		Heat and Fluid Dynamics				Code	DUEN-MUT-250 DUEL-MUT-250		
2025/2026 II.											
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic							
Compulsory prerequisite subject:				DUEN(L)-MUT-151 Engineering Physics							
Type		Number of lessons						Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	150/60	Per week	1	Per week	1	Per week	1	E	5	english	
Part time	150/20	Per semester	5	Per semester	5	Per semester	5				
Person responsible for the subject:				name				Endre Kiss, PhD		position	college Professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The study of the practical problems solutions in heat and fluid dynamics.							
				<b>Objectives and development goals</b> Heat and Fluid Dynamics based on Mathematics and Engineering Physics is founding the professional knowledge bases of those subjects which are using fluid dynamic and thermal knowledge. The subject Heat and Fluid Dynamics is deepening the knowledge of students in Fluid Dynamics and Thermodynamics. The subject is providing information and knowledge for the engineering subject in the field dealing with by using presentations, problem solving lessons and laboratory practices, all are turning the activities to practical applications.							
Typical delivery methods				Lecture	For all students, using a large lecture hall, a board presentation, a projector or an overhead projector						
				Seminar	For every student, problem solving in small groups						
				Lab	Measurements in pair						
				Other	-						
Requirements (in learning outcomes)				<b>Knowledge</b> Have a comprehensive knowledge of the basic facts, directions and limits of the subject area of engineering. Knowledge of the general and specific rules, contexts and procedures for the operation of the technical field. You know the terminology, key concepts and theories related to your field. Comprehensive knowledge of the main theories in the field of knowledge acquisition and problem solving your methods. He/she knows the measuring procedures used in mechanical engineering, their instruments, instruments and measuring equipment. Understand, characterise and model the structure and operation of the structural units and elements of mechanical systems, the design and interrelationship of the system components used.							
				<b>Ability</b> The ability to analyse at a basic level the disciplines that make up the knowledge base of the technical field, to synthesise relationships and to make appropriate evaluations. Ability to apply the most important terminology, theories and procedures of the technical field in the performance of related tasks. Ability to plan, organise and carry out independent learning. Ability to identify routine professional problems, and the principles and techniques needed to solve them to explore, formulate and (standard operations in practice). Ability to understand and use literature, computer and library resources specific to their field. The acquired IT knowledge can be used to perform tasks in the field of apply it in your solution. Ability to build basic models of technical systems and processes. Ability to communicate in their mother tongue in a professionally appropriate manner, orally and in writing, according to their field of specialisation.							
				<b>Attitude</b> It assumes and authentically represents the social role of its profession and its fundamental relationship with the world. It is open to learning about, embracing and authentically communicating professional, technological development and innovation in engineering. It tries to solve problems in cooperation with others, where possible. Sufficient stamina and tolerance of monotony to carry out practical activities has. Using his/her technical knowledge, he/she strives to understand the observable phenomena as thoroughly as possible, to describe and explain their laws.							

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	<p><b>Autonomy and responsibility</b> In unexpected decision situations, he/she independently thinks through and develops comprehensive, substantiating professional questions on the basis of given sources. In carrying out his/her professional duties, he/she will also cooperate with qualified professionals in other fields (primarily technical, economic and legal). He shares his experience with his colleagues, helping them to develop. It takes responsibility for the consequences of its technical analyses, its proposals and its decisions.</p>
Short description of subject content	The basics of fluid dynamics and thermodynamics. Euler and Bernoulli equations, Haagen-Poiseuille equations, viscosity, laminar and turbulent flow, pressure drag in turbulent flow. Pressure drops in fittings. Impulse theorem. Similarity. Solid body in viscous substance. Intensive and extensive quantities. Universal and unified gas law. The mechanical work and the heat, and the first law of thermodynamics. Isochoric, isobaric, isotherm and adiabatic processes. The polytropic 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.
Types of student activity	Lecture: Written text processing with note-taking 40%, theoretical material self-processing 20%, task solution 40%. Labor: Heard text processing with note-taking 10%, home preparation for measurement 20%, measurement 40%, minutes preparation 30%.
Required reading and resources	<ul style="list-style-type: none"> <li>• Kiss E. Heat and Fluid Dynamics Electronic notes (Moodle)</li> <li>• Kiss E. Heat and Fluid Dynamics Problem solving Electronic notes (Moodle)</li> <li>• Kiss E. Laboratory syllabuses Electronic notes (Moodle)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Dr Gruber, Dr Blahó: Mechanics of Fluids, Tankönyvkiadó, Budapest, 1973</li> <li>• Grósz Gy. Thermodynamics, BME 1996</li> </ul>
Assignments	Full time: 5 measurement reports Part time: 3 measurement reports
Description and schedule of exams	According to semester plan There are two tests during the semester. The first is in the 6th, and the second in the 13th week. The test consists of 10 free choice questions (max. 30 points), two assay questions (max 20 points), and two problems to solve for 50 points. If the res
Framework and rules for the use of artificial intelligence	It is not allowed to apply artificial intelligence

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## Entrepreneurship

Subject name		In Hungarian	Vállalkozástan				Level	BSc		
		In English	Entrepreneurship				Code	DUEN-TVV-122 DUEL-TVV-122		
2025/2026 II.										
Responsible educational unit			Institute for Social Sciences Department of Management and Enterprise Sciences							
Compulsory prerequisite subject:			-							
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture	Seminar		Lab					
Full time	150/39	Per week	1	Per week	2	Per week	0	M	5	english
Part time	150/15	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:			name		Dr. Andrea Keszi-Szeremlei		position	college teacher		
Course objectives and justification (content, learning outcomes, place in curriculum)			<b>Short-term objective</b> The curriculum provides a comprehensive knowledge of entrepreneurship, including the creation, operation, transformation, liquidation, financial management and the management of assets and liabilities. The student will be familiar with the means of preventing corruption. The student will be able to review the essence and the conduct of corporate management and to understand and apply corporate (business) law and regulations. They will be familiar with the economic, financial, human, material and property characteristics and components of companies, the risks inherent in the activities of companies and their types, the characteristics of international and domestic corporate cooperation and will be able to apply these at a skill level. In addition to theoretical knowledge, practical features will also be explored.							
			<b>Objectives and development goals</b> -							
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						
			Lab	-						
			Other	-						
Requirements (in learning outcomes)			<b>Knowledge</b> Understands the conceptual framework of business management. Is familiar with the mechanisms of corporate operations. Is familiar with the legal background and internal and external environment of companies. Is familiar with the management systems, objectives, and strategies of companies.							
			<b>Ability</b> Able to use the concepts of the field professionally. Able to identify and define the resources of companies. Able to implement the basics of corporate management. Able to understand corporate goals and strategic steps. Able to understand and use relevant literature.							
			<b>Attitude</b> Open to actively interpreting changing communication communities and social situations. Sensitive to solving problems arising from the functioning of relationships. Receptive to exploiting opportunities for development.							
			<b>Autonomy and responsibility</b> Takes responsibility for their own development. Cooperates with others and seeks solutions to problems. Feels responsible for the development of their work environment.							
			The formation of companies, their concept, and the legal background of their operation. The macro and micro, external and internal environment of companies. Anti-corruption in business practice (forms of corruption, means of prevention). Companies as economic systems, characteristics of economic systems, basic concepts of their operation. Company goals, goal systems, strategy. Economic decisions of companies. Description of corporate resources and activity systems. Company assets and resources, company financing. Organization and management							
Short description of subject content										

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	of companies. Resource management in companies. Presentation of corporate production, services, and material processes. Internal and external logistics of companies. Human resource management in companies. Sources and role of corporate information. Corporate innovation. Corporate revenue and cost management. The concept of quality, total quality management and control (TQM). Corporate strategy, strategic principles, strategic management, strategy development, implementation, and control. Controlling. The role and presentation of business planning. Corporate ethics, responsibility, and culture in the operation of companies. Outsourcing, its development, types, and implementation possibilities.
Types of student activity	Corporate cooperation. Individual and group activities: participation in individual and small group tasks, participation in guided corporate role-playing, analysis of case studies, examination of complex corporate simulations.
Required reading and resources	<ul style="list-style-type: none"> <li>• William D. Bygrave - Andrew Zacharakis (2014): Entrepreneurship, 3rd Edition, John Wiley &amp; Sons, DUE Library</li> <li>• Dollinger, Marc J. (2008): Entrepreneurship, Marsh Publications, Letölthető: <a href="https://shorturl.at/R1ydn">https://shorturl.at/R1ydn</a> - egyes részei</li> <li>• Materials on MOODLE</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Jerome Katz, Richard Green (2014) Entrepreneurial Small Business. 4th ed. McGraw-Hill International Ed., ISBN: 978-0078029424, DUE Library</li> </ul>
Assignments	Presentation and analysis of the business activities of a company selected by the student in week 14, using the knowledge acquired so far. Short presentation on a predetermined company-related topic.
Description and schedule of exams	Midterm tests on weeks 7th and 12th. Supplementary test on week 13th
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is partially permitted:</p> <ul style="list-style-type: none"> <li>• during class work, for data collection and information gathering for assignments</li> <li>• for data collection for certain HF assignments</li> <li>• during preparation for ZH</li> </ul> <p>The use of any AI tools is prohibited during knowledge assessment and closed book exams.</p>

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**Mathematics 3.**

Subject name		In Hungarian		Matematika 3.			Level	BSc		
		In English		Mathematics 3.			Code	DUEN-IMA-110 DUEL-IMA-110		
2025/2026 II.										
Responsible educational unit				Institute of Information Technology						
Compulsory prerequisite subject:				DUEN(L)-IMA-152 Engineering Mathematics 1.						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	<b>150/39</b>	Per week	<b>0</b>	Per week	<b>3</b>	Per week	<b>0</b>	<b>M</b>	<b>5</b>	<b>english</b>
Part time	<b>15015</b>	Per semester	<b>0</b>	Per semester	<b>15</b>	Per semester	<b>0</b>			
Person responsible for the subject:				name		Zoltán Papp, PhD		position	associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b>						
				<p>The aim of the course is to acquire and deepen the mathematical and function-theoretic foundations that are essential for understanding and applying the professional subjects. Students broaden their mathematical knowledge for the independent study of the literature, and they become familiar with the key relationships and conceptual frameworks necessary for working in the field. The course also develops applied mathematical thinking.</p> <p>The course builds on the foundations of analysis and function theory: limits, continuity, differentiation, basic integration methods, as well as fundamental function types and their analysis. Students are expected to be familiar with basic mathematical notation, computational techniques, and elementary problem-solving steps.</p> <p>The aim of the course is to deepen and extend students' mathematical knowledge toward analytical and differential-equation methods needed for understanding and applying algorithms, modelling tasks, data processing, and engineering computations. It develops students' abstract thinking, modelling skills, and problem-solving abilities, with particular emphasis on the applications of multivariable functions, numerical procedures, and differential equations in computer science.</p> <p>The course supports independent learning and the development of students' analytical thinking, which are indispensable for later professional subjects.</p>						
Typical delivery methods				<b>Objectives and development goals</b>						
				-						
				Lecture		-				
				Seminar		Instruction is conducted entirely in practical sessions, involving guided problem-solving, small-group or pair-based activities, and collective solution analysis. The emphasis is placed on the application of methods, the articulation and refinement of problem-solving strategies, and the provision of immediate feedback.				
				Lab		-				
Other		-								
Requirements (in learning outcomes)				<b>Knowledge</b>						
				<p>The student possesses the theoretical foundations and methodological tools of differential and integral calculus, as well as differential equations, that are required for the mathematical modelling and analysis of engineering problems. They have a clear understanding of the essential concepts, relationships, and computational techniques associated with multivariable functions, numerical procedures, and geometrical applications.</p> <p>They command a comprehensive system of theoretical and practical knowledge related to the topics of the course, forming a solid basis for algorithmic thinking, engineering computations, and the acquisition of subsequent technical subjects. The student understands the engineering applications of the methods studied, such as numerical solution techniques, model construction, and the mathematical description of processes, and recognizes their role in problem-solving and data-processing workflows.</p>						
				<b>Ability</b>						

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	<p>The student is able to apply differential and integral calculus, as well as numerical methods, in the modelling and analysis of engineering problems. They employ techniques of multivariable analysis, numerical integration, and the solution of differential equations in algorithmic reasoning, data-processing tasks, and simulation workflows.</p> <p>They are capable of identifying and selecting the appropriate mathematical method in accordance with the nature of a given engineering problem (e.g., optimization, approximation, process modelling); they develop problem-solving strategies independently and are able to justify their choices with sound professional reasoning.</p> <p>The student is proficient in the use of mathematical and computational tools (e.g., computer algebra systems, numerical computing environments) throughout the problem-solving process, and they can compare and evaluate the efficiency and applicability conditions of different solution methods.</p> <p><b>Attitude</b></p> <p>The student is open to methodological innovations and developments in mathematics and engineering, and demonstrates a willingness to engage with modern analytical and numerical techniques.</p> <p>They strive for precise, logical, and transparent reasoning, as well as for the consistent use of formal mathematical notation. The student shows an active interest in the connections between mathematical modelling and engineering sciences.</p> <p>They maintain a positive attitude toward collaboration, joint problem-solving, and professional dialogue. Furthermore, they appreciate the role of mathematical methods in ensuring the reliability, optimisability, and efficient operation of engineering systems.</p> <p><b>Autonomy and responsibility</b></p> <p>The student selects mathematical methods and tools responsibly, in accordance with the nature of the given task. They carry out mathematical analyses, model construction, and computational work independently, interpret the obtained results, and verify their reliability.</p> <p>They assume responsibility for the accuracy of their own work, including the identification and correction of errors. The student is capable of making professionally grounded decisions and justifying them through mathematical reasoning.</p> <p>They collaborate effectively in an information-technology project environment with peers and professionals, particularly in tasks that involve developments based on mathematical analysis or modelling.</p>
Short description of subject content	<p>Special differentiation rules. Geometric applications of differential calculus. Area calculation. Volume and surface area of solids of revolution. Arc-length and centroid calculations. Multiple integrals. Numerical integration. Solution of nonlinear equations.</p> <p>Separable and reducible differential equations. First-order and second-order linear differential equations. Reduced (incomplete) second-order differential equations.</p>
Types of student activity	<p>Guided processing of theoretical material. Independent study of theoretical content. Guided problem-solving. Independent completion of problem-solving tasks. Text comprehension. Individual and group-based information processing. Articulation and discussion of differing viewpoints. Development of debating skills and argumentation techniques. Collaboration within a group.</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Frank Ayres JR., Elliott Mendelson: Theory and Problems of Differential and Integral Calculus, McGraw-Hill, 1990, ISBN: 0-07-002662-9</li> <li>• Robert C. Wrede, Murray Spiegel: Theory and Problems of Advanced Calculus, Schaum's Outline Series, McGraw-Hill, 2002</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Smith, R. T., Minton, R. B.: Calculus: Early transcendental functions, 4th edition, McGraw Hill, New York, 2012</li> </ul>
Assignments	As discussed during the first session.
Description and schedule of exams	<p>Full-time students are required to complete four in-class assessments, administered in Weeks 3, 6, 9, and 12. Each assessment carries a maximum of 25 points. The tests consist of theoretical questions and problem-solving tasks. Students must achieve at least 50% of the available points on each individual assessment, and the combined score of the two assessments must reach at least 51% of the total possible points.</p>

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	<p>Part-time students are required to complete two in-class assessments. Each assessment carries a maximum of 50 points. Students must achieve at least 50% of the available points on each individual assessment, and the combined score of the two assessments must reach at least 51% of the total possible points.</p>
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence (AI) is partially permitted in this course. Students may use AI-based tools exclusively for the purpose of understanding the course material, independently processing theoretical content, and practising problem-solving techniques. This includes requesting explanations, visualizations, supporting examples, or alternative solution approaches.</p> <p>Permitted uses of AI include:</p> <ul style="list-style-type: none"><li>• supporting the comprehension of theoretical material (explanations, supplementary examples);</li><li>• checking practice exercises and exploring possible solution approaches;</li><li>• assisting autonomous learning processes (e.g., conceptual clarification, visualization).</li></ul> <p>Prohibited uses of AI:</p> <p>AI may not be used in any context that affects the evaluation of semester performance. It is strictly forbidden to:</p> <ul style="list-style-type: none"><li>• use AI during in-class assessments, make-up tests, or retakes;</li><li>• generate or revise homework, assignments, or any work submitted for evaluation using AI;</li><li>• substitute in-class problem-solving with AI assistance;</li><li>• automatically generate solutions or solution plans using AI tools.</li></ul>

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**Engineering construction**

Subject name		In Hungarian		Gépszerkesztés				Level	BSc	
		In English		Engineering construction				Code	DUEN-MGT-112 DUEL-MGT-112	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MGT-111 Engineering representation						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	1	Per week	2	Per week	0	M	5	english
Part time	150/15	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:				name		Péter Ákos Szilassy, PhD		position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Developing mechanical design skills.						
				<b>Objectives and development goals</b> The student should be able to solve the graphical geometric problems that arise during the work of a mechanical engineer based on what has been learned in the subjects of Technical Representation and Fundamentals of Machine Design. Recognize the elementary constructions necessary for solving various complex tasks and be able to determine their appropriate sequence. Be able to select the optimal one for the given situation from among the possible solution methods. Be able to independently apply basic constructions to the division and transformation of simple three-dimensional geometric surfaces encountered in mechanical engineering practice by plane section, penetration and projective transformation. Be able to form complex shapes encountered in mechanical engineering practice, to form and edit surfaces using line movement, and to spread extensible surfaces onto a plane. The student should be proficient in the independent use of standards and drafting aids, in sketching and editing component drawings, and in editing machine units. The student should know the theoretical structure of the ISO tolerance and fit system to correctly specify permissible dimensional deviations, tolerances, and fits. Be able to specify the accuracy specifications for machine parts. Be able to know the metrics characterizing the surface quality of machine parts, be able to define them, and be able to specify them. Be able to design machine parts with a characteristic design corresponding to a given production technology. Be able to reconstruct the technical drawings of real machine parts so that the given part, or a part capable of replacing it, can be manufactured based on the completed drawing.						
Typical delivery methods				Lecture	Transfer of theoretical knowledge through presentation					
				Seminar	Problem solving with teacher guidance					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Knows the conceptual system, the most important relationships and theories related to his/her field of expertise. Has a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field of expertise. Has a basic knowledge of machine design principles and methods, machine manufacturing technology, control engineering procedures and operating processes. Has a comprehensive knowledge of the operating principles and structural units of 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 relationship of the applied system elements. Can apply the related calculation and modelling principles and methods of mechanical product, process and technological design.						
				<b>Ability</b> Performs a job that is appropriate to his/her professional qualifications. Able to plan, organize and carry out independent learning. Able to identify routine professional problems, explore, formulate and solve (through the practical application of standard operations) the theoretical and practical background necessary for their solution.						

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	<p><b>Attitude</b> Open to learning and absorbing knowledge related to mechanical engineering related to his/her qualification and field of expertise. Interested in new methods and tools related to the field.</p> <p><b>Autonomy and responsibility</b> Taking responsibility for one's own work and the work of others.</p>
Short description of subject content	Typical surfaces and bodies of mechanical engineering practice. Plane section of flat bodies. Plane section of curved bodies. Interaction of flat bodies. Interaction of curved bodies. The ISO tolerance system. Tolerances of longitudinal dimensions. Fittings. Surface quality metrics and their specification. Typical design of cast, welded and machined parts. Reconstruction of machine parts (reverse engineering).
Types of student activity	<p>Processing theoretical material with guidance 20%</p> <p>Independent processing of theoretical material 20%</p> <p>Solving tasks with guidance 20%</p> <p>Independent processing of tasks 40%</p> <p>Laboratory measurements with guidance</p> <p>Preparation of laboratory reports</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• prof. Ferenc Szlivka: Machine structures III. - Workbook</li> </ul>
Recommended reading and resources	-
Assignments	<ul style="list-style-type: none"> <li>• Plane section of flat beam surfaces</li> <li>• Plane section of bodies of revolution</li> <li>• Interaction of flat beam surfaces</li> <li>• Bolt and nut joint</li> <li>• Parallel key joint</li> <li>• Bearing installation</li> </ul>
Description and schedule of exams	<p>Week 7: Interaction of bodies of revolution</p> <p>Week 13: Tolerance calculation tasks</p>
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted in all situations during the learning process of the subject. It is the student's responsibility to verify the correctness of the results obtained.

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### Technology of Structural Materials

Subject name		In Hungarian		Szerkezeti anyagok technológiája				Level		BSc		
		In English		Technology of Structural Materials				Code		DUEN-MUA-116 DUEL-MUA-116		
2025/2026 II.												
Responsible educational unit				Institute of Engineering Sciences, Department of Structural Integrity								
Compulsory prerequisite subject:				-								
Type		Number of lessons						Requiremen	Credit	Language of education		
		Lecture		Seminar		Lab						
Full time	150/60	Per week	1	Per week	0	Per week	2	M	5	english		
Part time	150/20	Per semester	5	Per semester	0	Per semester	10					
Person responsible for the subject:				name				Andrea Szabó, PhD		position		assistant professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is to enable students to select the most appropriate structural materials and manufacturing technologies for a given engineering task. To support this, students become familiar with the production methods, properties, and application areas of metallic and nonmetallic materials, as well as the operation and applicability of property-modifying and forming technologies.								
				<b>Objectives and development goals</b> The course builds on the students' previously acquired knowledge in materials science and manufacturing technologies, which provides the foundation for the professional interpretation of the behaviour and processing characteristics of structural materials. Its developmental aim is to enable students to understand the system-level relationships between material selection and technology selection, and to evaluate the advantages, limitations, and applicability of different processes from an engineering perspective. The course supports students' technological decision-making competencies, with particular emphasis on the proper technical selection and application of property-modifying processes, forming technologies, and welding procedures.								
Typical delivery methods				Lecture		Using PPT slides and a projector						
				Seminar		-						
				Lab		Laboratory work, individual and collaborative						
				Other		-						
Requirements (in learning outcomes)				<b>Knowledge</b> The student is familiar with the fundamental production methods, properties, and typical application areas of metallic and nonmetallic structural materials. The student understands the operating principles and mechanisms of property-modifying technologies such as alloying, casting, plastic deformation, heat treatment, and surface engineering. The student is also aware of the basic principles, application conditions, and practical limitations of forming technologies and the most important fusion and pressure welding processes.								
				<b>Ability</b> The student is able to interpret the properties and behaviour of structural materials from an engineering perspective and apply this knowledge in material and technology selection tasks. The student can evaluate various property-modifying technologies (alloying, casting, plastic forming, heat treatment, surface engineering) and forming processes, comparing their applicability, advantages, and limitations. The student is capable of independently selecting and justifying the most appropriate technological procedure for a given engineering task, including the professional application of the major fusion and pressure welding methods.								
				<b>Attitude</b> The student is committed to continuously expanding their professional knowledge and remains open to new materials, technologies, and engineering solutions. The student acts responsibly and with due diligence in decision-making situations involving material and technology selection, taking into account safety, quality, and sustainability considerations.								
				<b>Autonomy and responsibility</b> The student is able to independently assess and apply the technical considerations related to structural materials and technologies, and to make responsible decisions								

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	in material and technology selection tasks. In their independent professional work, the student consistently adheres to quality, safety, and sustainability requirements, and assumes responsibility for the technical adequacy of the procedures selected.
Short description of subject content	Production of metals: ironmaking, steelmaking, continuous casting, and the electrolytic production of aluminum. Fe-Fe <sub>3</sub> C equilibrium phase diagram. Classification and characteristic properties of steel and aluminum alloys. Nucleation and growth. Isothermal and continuous cooling transformation diagrams. Formation of nonequilibrium microstructural constituents. Primary and secondary microstructures. Microstructure and mechanical properties of hotworked alloys. Forging, extrusion, hot rolling, and tubemanufacturing processes. Metallurgical phenomena associated with cold working. Microstructure and mechanical properties of coldworked alloys. Sheetforming technologies: leveling of sheet materials, material separation by thermal or shear loading, forming by bending, deep drawing, and stretch forming. Bulk heat treatments. Surface heat treatments. Operation and application fields of the most important fusion and pressure welding processes.
Types of student activity	Participation in lectures and taking handwritten notes; independent study using PPT slides for preparing for midterm tests 50% Acquisition of practical skills through participation in laboratory sessions and plant visits 30% Independent completion and processing of assigned tasks 20%
Required reading and resources	<ul style="list-style-type: none"> <li>• American Foundry Society (AFS) – Metalcasting Technology for Students (AFS Publications)</li> <li>• ASM International – Powder Metal Technologies and Applications (ASM Handbook, Vol. 7)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• John Campbell – Castings (Butterworth-Heinemann)</li> <li>• William D. Callister &amp; David Rethwisch – Materials Science and Engineering: An Introduction (Wiley)</li> </ul>
Assignments	According to the information provided during the first class, students are required to complete one assignment during the semester.
Description and schedule of exams	As communicated in the first lecture class
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: it may be applied for the preparation of in-class assignments (organizing information related to the manufacturing technologies, properties, application areas, and structure–property relationships of metallic and non-metallic structural materials), as well as for developing the structure or improving the linguistic quality of submitted reports and written assignments. Students must ensure that all submitted professional content—particularly the interpretation of material-production and processing methods, the analysis of material properties, the justification of technological decisions, and the formulation of conclusions—reflects their own, verifiable work. During midterm tests, examinations, and all forms of individual assessment, the use of artificial intelligence in any form is strictly prohibited.

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**Mechanics 3.**

Subject name		In Hungarian		Mechanika 3.				Level	BSc	
		In English		Mechanics 3.				Code	DUEN-MUG-153 DUEL-MUG-153	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUG-152 Mechanics 1.						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	1	Per week	2	Per week	0	E	5	english
Part time	150/20	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:				name		András Nagy, PhD			position	associate professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> By applying the concepts and relationships presented in the lectures in the exercises and during home preparation, the student will master the determination of the kinetic and kinematic characteristics of material points, rigid bodies and simple mechanisms. He will acquire knowledge about the classification and operation of mechanisms frequently encountered in mechanical engineering practice. He will acquire knowledge about the collision and oscillation phenomena of elastic bodies.						
				<b>Objectives and development goals</b> Expanding/generalizing the elementary statics and strength theory knowledge acquired in the course of Mechanics 1 to analyze the behavior of moving structures (gears, mechanisms) encountered in mechanical engineering practice.						
Typical delivery methods				Lecture	Presentation with whiteboard and projector					
				Seminar	Blackboard practice, partly with independent student problem solving					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> By applying the concepts and relationships presented in the lectures in the exercises and during home preparation, the student will master the basics of mechanical modeling of moving bodies and structures. He will become familiar with the conceptual system of kinematics and kinetics and the relationships applied in practice.						
				<b>Ability</b> The student will be able to analyze the motion of engineering structures that can be modeled as material points, rigid bodies, and mechanisms and determine their kinematic characteristics.						
				<b>Attitude</b> Students learn the elements of kinematic and dynamic characteristics that occur during the operation of moving machine elements, machines, devices, and equipment, and the methods for determining them.						
				<b>Autonomy and responsibility</b> They will learn about the responsibility of operating mechanical equipment, its regulations, and will be able to apply safety regulations. They will also practice mastering the rules of collective cooperation.						
Short description of subject content				Momentum, rotation, kinetic energy of a material point, work of force and torque, power. Kinetic theorems. Concept of a rigid body, types of motion, elementary motions. Velocity state of a rigid body, velocity diagram. Acceleration state of a rigid body, acceleration diagram. Momentum, rotation, kinetic energy of a rigid body. Kinetic theorems for a rigid body. Rolling of a rigid body and movement of a clamp around a stationary axis. Static and dynamic balancing. Kinetics of structures using classical and reduction methods. Summary of the theory of oscillations of a material point. Bending and torsional oscillations with one degree of freedom. Oscillating systems with multiple degrees of freedom. Collision of solid bodies. Concept, characterization and classification of mechanisms, structure, kinematic analysis. Kinematics of drives (gear, belt, friction and chain drives). Mechanisms often found in mechanical engineering.						
Types of student activity				Processing theoretical material with guidance/independently: 15/35%						

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	Problem solving with guidance/independently: 20/30%.
Required reading and resources	<ul style="list-style-type: none"> <li>• Csizmadia szerk. Mechanika III/B főiskolai jegyzet, Budapest, Tankönyvkiadó</li> <li>• Tanszéki munkaközösség: Műszaki mechanika III/1. Dinamika (alapjai) Munkafüzet, Dunaújváros, DF Kiadó Dunaújváros</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Dr. Vigh S. szerk: Műszaki mechanika III. Példatár, főiskolai jegyzet, Buda-pest, Tankönyvkiadó</li> <li>• Dr. M. Csizmadia Béla - Dr. Nádori Ernő: Mechanika mérnököknek. Mozgástan. Nemzeti Tankönyvkiadó, 1999.</li> <li>• Dr. Sályi István: Mechanizmusok; A gépek kinematikájának és dinamikájának alapjai, Buda-pest, Tankönyvkiadó, 1973.</li> </ul>
Assignments	<p>Required homework:</p> <ul style="list-style-type: none"> <li>• Week 3 Kinematics of a material point</li> <li>• Week 6 Kinetics of a material point</li> <li>• Week 8 Spatial kinematics of a rigid body</li> <li>• Week 11 Kinematics of a four-joint mechanism</li> <li>• Week 13 Kinematics and kinetics of a lifting mechanism</li> </ul> <p>Diligence homework:</p> <ul style="list-style-type: none"> <li>• Week 2 Kinematics of a material point</li> <li>• Week 4 Plane kinematics of a rigid body</li> <li>• Week 7 Construction of a dough bridge</li> <li>• Week 10 Kinematics of an eccentric piston gear</li> <li>• Week 13 Plane kinematics of a rigid body</li> </ul>
Description and schedule of exams	As stated in the first lesson
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence tools is partially permitted during the acquisition of the subject:</p> <ul style="list-style-type: none"> <li>• the use of artificial intelligence tools is permitted during the development of homework assignments. The student is responsible for the content and form of the solution of the assignments and if it does not meet the expectations, the homework is invalid.</li> <li>• the use of artificial intelligence tools in any form during the verification of the student's knowledge (exam papers, exams) is not permitted.</li> </ul>

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## Human Resource Management

Subject name		In Hungarian	Emberi erőforrás menedzsment					Level	BSc	
		In English	Human Resource Management					Code	DUEN-TVV-111 DUEL-TVV-111	
2025/2026 II.										
Responsible educational unit			Institute of Engineering							
Compulsory prerequisite subject:			-							
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/39	Per week	1	Per week	2	Per week	0	M	5	english
Part time	150/15	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:			name		Dr. habil Mónika Rajcsányi-Molnár			position	college professor	
Course objectives and justification (content, learning outcomes, place in curriculum)			<b>Short-term objective</b>							
			The goal of the course is to develop the essential skills required of employees at the workplace and to expand students' HR management skills. The course broadens the students' knowledge and gives abilities to manage the labor market institutions and policies, workplace and labor market characteristics, the system of labor relations, competence and motivation management, personnel management activities, organizational behavior, organizational communication, human resource management case studies, occupational safety and health project management.							
Typical delivery methods			<b>Objectives and development goals</b>							
			-							
			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.						
			Lab	-						
			Other	-						
Requirements (in learning outcomes)			<b>Knowledge</b>							
			The students know the basic facts, relationships, boundaries, limitations in human resource management (HRM) system of knowledge and activity. They know and understand the processes and procedures for the modalities of human activities. They familiar with the business of manufacturing and service processes, human and social relationships, their impact on human resources. Knows that a key element in the prosperity of the people working successfully.							
			<b>Ability</b>							
			The students can apply the analyzing methods and tasks (planning, organizing, and thinking in alternatives, inspection) on theoretical and practical grounds. They are able to achieve the tasks assigned to them without control and inspection. They can plan, schedule and complete the tasks within their scope of responsibility. They can make the suggestions and decisions and take measures required for successfully solving a task within their own scope of competence. They are capable of understanding the cause-result relationship and using analyzing skills in the activity chain of planning-organizing-decision preparing-decision-making They can c apply the roles connected to employment and use and utilize managerial competences. They are able to formulate an opinion of their own, deliver and defend it.							
			<b>Attitude</b>							
Good negotiators are patient, well-educated and have empathy, i.e. they can identify with the representatives of the other side and accept their opinion. Good, future-oriented bargainers respect their counterpart, are trustworthy and not aggressive. It takes into account the employment practices of legal, ethical and professional rules. Susceptible to accommodate new information, new tasks that require collaboration. Considers it important for individual career planning. It strives to lifelong learning and help the staff as well.										

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	<p><b>Autonomy and responsibility</b> 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. Ability to select its own staff, taking into account the specified criteria. Ability to independently supply the areas it controls human processes. Sense of responsibility for subordinates working fellow.</p>
Short description of subject content	Evolution of the human resource management. Environmentally determination of HRM. The HRM place in the organizational structure. The HRM's activities and tasks. Job planning, analysis, competency models. Career management, career planning alignment of individual and organizational career opportunities. The workforce training and development opportunities. Performance evaluation and feedback management. Compensation and incentive systems. Industrial relations system. Management of organizational changes. New trends in HRM practice.
Types of student activity	Pair work presentation Group work (case study analysis)
Required reading and resources	<ul style="list-style-type: none"> <li>• David Campbell &amp; Tom Craig(2011):Organisation and the Business Environment, Second edition, Routledge Publishing, USA</li> <li>• Materials on Moodle</li> <li>• Handouts from the lecturer</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• TORRINGTON, Derek – HALL, Laura – TAYLOR, Stephen (2005): Human Resource Management. Pearson Education Limited, Essex, England.810 p. ISBN 978-0-273-68713-9</li> <li>• ARMSTRONG, Michael (2009): A handbook of Human Resource Management Practice, 11th ed. London: Kogan Page 1062 p. ISBN 0-7494-4631-5</li> </ul>
Assignments	Students have to take a final test
Description and schedule of exams	Multi-choice questions
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is partially permitted:</p> <ul style="list-style-type: none"> <li>• during class work, for data collection and information gathering for assignments</li> <li>• for data collection for certain HF assignments</li> <li>• during preparation for ZH</li> </ul> <p>The use of any AI tools is prohibited during knowledge assessment and closed book exams.</p>

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## Management

Subject name		In Hungarian		Emberi erőforrás menedzsment				Level	BSc	
		In English		Human Resource Management				Code	DUEN-TVV-111 DUEL-TVV-111	
2025/2026 II.										
Responsible educational unit				Institute of Engineering						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	1	Per week	2	Per week	0	M	5	english
Part time	150/15	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:				name		Dr. habil Mónika Rajcsányi-Molnár			position	college professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b>						
				The goal of the course is to develop the essential skills required of employees at the workplace and to expand students' HR management skills. The course broadens the students' knowledge and gives abilities to manage the labor market institutions and policies, workplace and labor market characteristics, the system of labor relations, competence and motivation management, personnel management activities, organizational behavior, organizational communication, human resource management case studies, occupational safety and health project management.						
Typical delivery methods				<b>Objectives and development goals</b>						
				-						
				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.					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b>						
				The students know the basic facts, relationships, boundaries, limitations in human resource management (HRM) system of knowledge and activity. They know and understand the processes and procedures for the modalities of human activities. They familiar with the business of manufacturing and service processes, human and social relationships, their impact on human resources. Knows that a key element in the prosperity of the people working successfully.						
				<b>Ability</b>						
				The students can apply the analyzing methods and tasks (planning, organizing, and thinking in alternatives, inspection) on theoretical and practical grounds. They are able to achieve the tasks assigned to them without control and inspection. They can plan, schedule and complete the tasks within their scope of responsibility. They can make the suggestions and decisions and take measures required for successfully solving a task within their own scope of competence. They are capable of understanding the cause-result relationship and using analyzing skills in the activity chain of planning-organizing-decision preparing-decision-making They can c apply the roles connected to employment and use and utilize managerial competences. They are able to formulate an opinion of their own, deliver and defend it.						
				<b>Attitude</b>						
Good negotiators are patient, well-educated and have empathy, i.e. they can identify with the representatives of the other side and accept their opinion. Good, future-oriented bargainers respect their counterpart, are trustworthy and not aggressive. It takes into account the employment practices of legal, ethical and professional rules. Susceptible to accommodate new information, new tasks that require collaboration. Considers it important for individual career planning. It strives to lifelong learning and help the staff as well.										

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	<p><b>Autonomy and responsibility</b> 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. Ability to select its own staff, taking into account the specified criteria. Ability to independently supply the areas it controls human processes. Sense of responsibility for subordinates working fellow.</p>
Short description of subject content	Evolution of the human resource management. Environmentally determination of HRM. The HRM place in the organizational structure. The HRM's activities and tasks. Job planning, analysis, competency models. Career management, career planning alignment of individual and organizational career opportunities. The workforce training and development opportunities. Performance evaluation and feedback management. Compensation and incentive systems. Industrial relations system. Management of organizational changes. New trends in HRM practice.
Types of student activity	Pair work presentation Group work (case study analysis)
Required reading and resources	<ul style="list-style-type: none"> <li>• David Campbell &amp; Tom Craig(2011):Organisation and the Business Environment, Second edition, Routledge Publishing, USA</li> <li>• Materials on Moodle</li> <li>• Handouts from the lecturer</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• TORRINGTON, Derek – HALL, Laura – TAYLOR, Stephen (2005): Human Resource Management. Pearson Education Limited, Essex, England.810 p. ISBN 978-0-273-68713-9</li> <li>• ARMSTRONG, Michael (2009): A handbook of Human Resource Management Practice, 11th ed. London: Kogan Page 1062 p. ISBN 0-7494-4631-5</li> </ul>
Assignments	Students have to take a final test
Description and schedule of exams	Multi-choice questions
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is partially permitted:</p> <ul style="list-style-type: none"> <li>• during class work, for data collection and information gathering for assignments</li> <li>• for data collection for certain HF assignments</li> <li>• during preparation for ZH</li> </ul> <p>The use of any AI tools is prohibited during knowledge assessment and closed book exams.</p>

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### Basics of energetics

Subject name		In Hungarian		Energetika alapjai			Level	BSc		
		In English		Basics of energetics			Code	DUEN-MGT-211 DUEL-MGT-211		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name			Róbert Sánta, PhD		position	professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is to provide students with appropriate knowledge of the processes of energy production and energy management, and to familiarize them with the equipment used for energy generation.						
				<b>Objectives and development goals</b> The course builds on the introductory mathematics and physics subjects of the engineering undergraduate programme. Its aim is to establish the fundamental concepts of energy engineering and a systems-oriented approach. Students become familiar with the basics of energy production and energy conversion, and acquire the ability to interpret simple energy processes and perform basic calculations.						
Typical delivery methods				Lecture	Board-based and projector-supported lectures					
				Seminar	-					
				Lab	Laboratory tasks					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Possesses theoretical and practical knowledge related to the subject area of the course.						
				<b>Ability</b> Is able to perform tasks related to the subject area of the course.						
				<b>Attitude</b> Develops the appropriate attitude required for solving technical problems.						
				<b>Autonomy and responsibility</b> Takes responsibility for their work.						
Short description of subject content				Tasks and fields of energy engineering. Introduction to the three subsystems of energy engineering: production and generation of energy carriers; transportation, distribution, and storage; and final energy consumption. Energy indicators and energy efficiency. Energy-related aspects of sustainable development. Primary and secondary energy demand. Fossil fuels, nuclear fuels, and renewable energy sources, their utilization and environmental impacts. Introduction to pressurized water nuclear power plants, combined heat and power generation, and the utilization of renewable energy sources. Energy conversion processes in pressurized water nuclear power plants and in combined heat and power generation.						
Types of student activity				Processing of spoken material with note-taking: 50% Systematization of information through guided tasks: 30% Independent completion of tasks: 20%						
Required reading and resources				<ul style="list-style-type: none"> <li>Bihari Péter, Energetika, Edutus Főiskola, jegyzet.</li> <li><a href="https://regi.tankonyvtar.hu/hu/tartalom/tamop412A/2010-0017_33_energetika_1/index.html">https://regi.tankonyvtar.hu/hu/tartalom/tamop412A/2010-0017_33_energetika_1/index.html</a></li> </ul>						
Recommended reading and resources				<ul style="list-style-type: none"> <li>Ősz J.: Energetika jegyzet .ppt formátumban a <a href="http://www.energia.bme.hu">www.energia.bme.hu</a> honlapon.</li> <li>Büki G.: Energetika, Műegyetemi kiadó, 2000.</li> <li>Büki G.: Erőművek. Műegyetemi Kiadó, 2004. Oktatási segédanyagok: <a href="http://www.energia.bme.hu">www.energia.bme.hu</a></li> </ul>						
Assignments				As stated during the first class.						

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Description and schedule of exams	As stated during the first class.
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence tools is partially permitted in this course. Students may use AI-based tools (e.g. for literature summarization, concept development, or data interpretation) during in-class tasks, homework assignments, and project work, provided that the use of such tools is properly documented and the student provides their own professional interpretation of the results.</p> <p>The use of artificial intelligence is not permitted during assessments measuring individual performance (e.g. midterm tests, examinations, or calculation tasks), where the aim is to evaluate independent engineering thinking and calculation skills.</p> <p>In the case of project assignments, the use of AI is permitted as a design-support tool (e.g. for comparing energy alternatives or generating concepts). However, the final technical calculations and conclusions must be prepared and defended independently by the student.</p>

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### Machinery

Subject name		In Hungarian		Géptan			Level	BSc		
		In English		Machinery			Code	DUEN-MUG-151 DUEL-MUG-151		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUT-250 Heat and Fluid Dynamics						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name			Róbert Sánta, PhD		position	professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Have a comprehensive knowledge of the basic facts, directions and limits of the subject area of engineering. You know the terminology, key concepts and theories related to your field. Comprehensive knowledge of the operating principles and structural units of the machines, power tools, mechanical equipment and tools used. Understand, characterise and model the structure and operation of the structural units and elements of mechanical systems, the design and interrelationship of the system components used.						
				<b>Objectives and development goals</b> As an educational background, students have fundamental knowledge in mechanics, thermodynamics, and basic engineering sciences. The aim of the course is to provide a comprehensive understanding of the operating principles, structure, and application of working and power machines used in mechanical engineering practice. The course focuses on developing the ability to analyze, compare, and model machinery and mechanical systems, with particular emphasis on fluid-flow and thermal machines. Furthermore, it supports the development of practical engineering skills required for the operation, maintenance, modernization, and further development of existing mechanical equipment and systems.						
Typical delivery methods				Lecture	In a classroom with the use of projector, Power Point and computer in each lecture					
				Seminar	-					
				Lab	Manual editing exercise in groups of up to 30					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Students acquire comprehensive knowledge of the fundamental facts, development trends, and operational limits of fluid machinery within the broader field of mechanical engineering. They understand the role and application boundaries of fluid-flow machines in industrial and energy systems, with particular attention to vortex pumps and impeller-based machines. Students are familiar with the terminology, key concepts, and governing theories related to fluid machinery, including fluid statics and dynamics, energy transfer in turbomachinery, continuity and momentum principles, Bernoulli's equation, Euler's turbomachinery equation, similarity laws, cavitation, and efficiency characteristics. They confidently use professional vocabulary associated with vortex pumps, impellers, casings, flow patterns, head, discharge, power, and performance curves. They possess comprehensive knowledge of the main theoretical approaches and problem-solving methods applied in fluid machinery, including analytical calculations, characteristic curve evaluation, dimensional analysis, and basic modeling techniques for performance prediction and system integration. Students have thorough knowledge of the operating principles, structural units, and functional elements of vortex pumps and impeller-based machines. They understand the construction, geometry, and function of key components such as the impeller, volute casing, shaft, seals, bearings, and inlet/outlet configurations, as well as their interaction during energy conversion.						

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	<p>Furthermore, students are able to understand, characterize, and model the structure and operation of mechanical systems containing fluid machinery. They can analyze the design and interrelationship of system components, evaluate operating conditions, and interpret how hydraulic, mechanical, and structural elements influence overall system performance, reliability, and efficiency.</p> <p><b>Ability</b> 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).</p> <p><b>Attitude</b> Strives to learning about and accepting automation design developments related to his qualification and field of expertise. Interested in new methods and tools related to the field.</p> <p><b>Autonomy and responsibility</b> Responsibility for one's own work and the work of others.</p>
Short description of subject content	<p>General machine learning. Types of physical quantities used in mechanical engineering, their definition, application, conversions. Systems of measurement. Conversion between different measurement systems. Characteristics of constant speed operation of machines. Loss of energy transfer, machine efficiency, variable speed operation, starting, stopping. Hydraulics. Pumps and motors, hydraulic power cylinders. Proportional pressure limiters, pressure reducers, flow regulators. Pipes, pipe fittings, batteries, filters. Switching technology. Pneumatics Characteristics and applications of pneumatic actuators. Pneumatic components. Basic connections. Introduction and identification of elements. Operation of pneumatic elements, examples of applications.</p>
Types of student activity	<p>Processing of theoretical material with control 20% Independent processing of theoretical material 20% Problem solution with control 20% Independent processing of tasks 40%</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Attila Kovács: General Mechanical Engineering (university note) Műegyetemi Kiadó, Bp. 1999..</li> <li>• Zobory I. - Szabó A.: General Mechanical Engineering (university note) Műegyetemi Kiadó, Bp. 1998.</li> <li>• Kjell Evensen-Jul Ruud : Basics of pneumatics, MECMAN EGER Ltd. Budapest 1994,</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Imre Dolgos: Operation of machinery I.</li> <li>• National Textbook Publishing House, 1998. Budapest</li> </ul>
Assignments	-
Description and schedule of exams	Week 13: Mid-term on whole subject
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted when preparing take-home assignments, but prohibited during in-class tests. The use of artificial intelligence is not allowed in assessments that measure individual performance (such as quizzes, exams, and practical tasks), where the goal is to evaluate independent engineering thinking and computational skills.

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**Industrial drive technology**

Subject name		In Hungarian		Gépezési hajtástechnika				Level	BSc	
		In English		Industrial drive technology				Code	DUEN-MGT-251 DUEL-MGT-251	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUG-152 Mechanics 1. DUEN(L)-MUG-222 Basics of machine design						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Tamás Zahola		position	master instructor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Mastering complex mechanical engineering design methods and acquiring knowledge about mechanical drives.						
				<b>Objectives and development goals</b> The student should know the structure and operation of typical machine parts, machine elements, assemblies, and subassemblies encountered in mechanical engineering practice. Be able to design such units. Be able to prepare drawing documentation of the units primarily using computer tools. The student should be able to apply what has been learned in the subjects Basics of Machine Design and Mechanics 1-2 to create and design complex constructions.						
Typical delivery methods				Lecture		Presentation of theoretical material.				
				Seminar		Problem solving with teacher guidance				
				Lab		-				
				Other		-				
Requirements (in learning outcomes)				<b>Knowledge</b> He/She knows the conceptual system, the most important relationships and theories related to his/her field. He/She has a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field. He/She has a basic knowledge of machine design principles and methods, mechanical engineering and control engineering procedures and operating processes. He/She has a comprehensive knowledge of the operating principles and structural units of applied work and power machines, mechanical equipment and devices. He/She has a thorough knowledge of the learning, knowledge acquisition and data collection methods of the mechanical engineering field, their ethical limitations and problem-solving techniques. He/She can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and relationship of the applied system elements.						
				<b>Ability</b> Performs a job that is appropriate to his/her qualifications. Able to plan, organize and carry out independent learning. Able to identify routine professional problems, explore, formulate and solve them (through the practical application of standard operations) the theoretical and practical background necessary for their solution. Able to create basic models of technical systems and processes. Identifies routine professional problems, explores and formulates the theoretical and practical background necessary for their solution, and solves them through the practical application of standard operations.						
				<b>Attitude</b> Open to learning and absorbing knowledge related to mechanical engineering related to his/her qualification and field of expertise. Interested in new methods and tools related to the field.						
				<b>Autonomy and responsibility</b> Taking responsibility for one's own work and the work of others.						
Short description of subject content				Design of complex machine structures: strength design, correct structural design, operation and maintenance. The course curriculum focuses primarily on drive technology, in addition to other topics that are important for mechanical engineering practice and have not been previously discussed. Flexible (belt) drives, couplings, gear drives, springs, brakes, pipes and pipe fittings, seals.						

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Types of student activity	Processing theoretical material with guidance 20% Independent processing of theoretical material 20% Solving tasks with guidance 20% Independent processing of tasks 40% Laboratory measurements with guidance Preparation of laboratory reports
Required reading and resources	<ul style="list-style-type: none"> <li>• Tamás Zahola: Machine structures 4. - Workbook</li> </ul>
Recommended reading and resources	-
Assignments	Design task to be completed in group work
Description and schedule of exams	Week 6: Belt Drives Week 13: Gears
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted in all situations during the learning process of the subject. It is the student's responsibility to verify the correctness of the results obtained.

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**Industrial automatics**

Subject name		In Hungarian		Ipari Automatizálás			Level	BSc		
		In English		Industrial automatics			Code	DUEN-MGT-252 DUEL-MGT-252		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-IMA-152 Engineering Mathematics 1.						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	1	Per week	2	Per week	0	E	5	english
Part time	150/20	Per semester	5	Per semester	10	Per semester	0			
Person responsible for the subject:				name		András Nagy, PhD		position	associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Introduce students to the essential elements of control and regulation technology, the most important parts of process control, with particular emphasis on process control, manufacturing automation. Developing PLC programming skills in students.						
				<b>Objectives and development goals</b> As an educational background, students possess basic knowledge in electrical engineering, control engineering, and technical informatics. The aim of the course is to build on these fundamentals and develop a comprehensive understanding of industrial automation systems, with particular emphasis on control and regulation applications. Furthermore, the course aims to develop a practice-oriented approach and to establish the competencies required for the design and programming of PLC-based industrial systems. The subject also contributes to the development of students' independent problem-solving skills and systems-oriented thinking.						
Typical delivery methods				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					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> 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 industrial control systems and methods, manufacturing technology, control engineering procedures. Comprehensive knowledge of the operating principles and structural units of industrial control, mechanical equipment and devices. Can interpret, characterize and model the structure and operation of the structural units and elements of automated systems, the design and connection of the applied system elements						
				<b>Ability</b> 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).						
				<b>Attitude</b> Strives to learning about and accepting automation design developments related to his qualification and field of expertise. Interested in new methods and tools related to the field.						
				<b>Autonomy and responsibility</b> Responsibility for one's own work and the work of others						
				Short description of subject content				Fundamentals of control engineering, control and regulation technology basics. Characteristics, goodness, and types of control and regulation. Signals and systems, descriptive characteristics, block diagrams. Methodology of system		

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	description. Mappings, modeling, simulation. Structural and block diagrams. Deterministic test signals. Static and dynamic optimization. Fourier and Laplace transformation. Frequency response. Characteristics of fuzzy control. Basic steps of PLC programming, step and ladder programming, SCADA systems. Basics of sensors and actuators, connections. Industrial field bus systems, protocols.
Types 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%
Required reading and resources	<ul style="list-style-type: none"> <li>• Materials on MOODLE</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Conner Gareth: Scenic Automation Handbook, ISBN9781138850279, 2018</li> <li>• Fabrizio Frigeni: Industrial Robotics Control, EAN9781484289884, 2022</li> </ul>
Assignments	Project work
Description and schedule of exams	-
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted when preparing take-home assignments, but prohibited during in-class tests. The use of artificial intelligence is not allowed in assessments that measure individual performance (such as quizzes, exams, and practical tasks), where the goal is to evaluate independent engineering thinking and computational skills.

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### Production Technology

Subject name		In Hungarian		Gyártástechnológia			Level	BSc		
		In English		Production technology			Code	DUEN-MUG-252 DUEL-MUG-252		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUG-152 Mechanics 1.						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Gábor Vizi, PhD		position	college associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Acquisition of basic of production technologies.						
				<b>Objectives and development goals</b> PLASTIC FORMING PROCESSES Understanding the theoretical basis of plastic forming. Knowledge of plastic forming technologies, production equipment and tools. CUTTING - Understanding the principles and implications of machining - Knowing the basic machining processes - Calculation and selection of process data - Calculation of machine time and standard time and cost – recognition of other machining processes.						
Typical delivery methods				Lecture	For all students, in a large lecture, using a whiteboard, projector or overhead projector					
				Seminar	Small table top exercises for up to 20 people					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Basic knowledge of machine design principles and methods, machine manufacturing technology, control procedures and operating processes. Apply the related computational and modelling principles and methods of engineering product, process and technology design.						
				<b>Ability</b> Cognitive ability, ability to solve problems independently, ability to concentrate on one thing for a long period of time.						
				<b>Attitude</b> Open to learning and accepting knowledge related to manufacturing technology in their field of expertise. Interested in new methods and tools related to their field of expertise.						
				<b>Autonomy and responsibility</b> Responsibility for one's own work and the work of others						
Short description of subject content				CUTTING-FREE FORMING PROCESSES Theoretical principles of metal plastic forming. Classification of cutting-free forming processes. Forging, pressing, rolling technology, manufacturing equipment, tools. Seamless pipe manufacturing technology, manufacturing equipment. Sheet metal forming technologies. Punching and cutting technology, machines and tools. Theory, technology, machines and tools of bending. Theory, technology and tools of deep drawing. Cold welding and cold forming processes, tools and machines. Casting technology, processes, manufacturing equipment. MACHINING PROCESSES Machining methods and characteristics of machining. Turning, planing, drilling, milling, grinding. Optimal determination of allowances, feed rates and number of cycles for all types of machining. Calculation of main machine time. Selection of the appropriate machine. Calculation of standard time. Cost analysis. Non-conventional processes. Other cutting processes (drilling, sawing, gear cutting, etc.). Determination of pre-production.						
Types of student activity				Processing theoretical material with guidance 5 % Independent processing of theoretical material 40 %, Task solving with guidance 15 % , Independent processing of tasks 40 %						

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Required reading and resources	<ul style="list-style-type: none"><li>R.K. Rajput: Textbook of Manufacturing technology, LAXMI Publications (P) LTD 113, Golden House, Daryaganj, New Delhi-110002</li></ul>
Recommended reading and resources	<ul style="list-style-type: none"><li>K.C.Jain, A.K. Chitale: Textbook of Production Engineering, PHI Learning Private Limited, New Delhi-110001, 2010</li></ul>
Assignments	-
Description and schedule of exams	Week 7: machining section Week 13: plastic forming section
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is not permitted

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## Welding

Subject name		In Hungarian		Hegesztés				Level	BSc	
		In English		Welding				Code	DUEN-MUA-210 DUEL-MUA-210	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Structural Integrity						
Compulsory prerequisite subject:				DUEN(L)-MST-210 Industrial materials						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name				Béla Palotás, PhD	position	research professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Students should become familiar with the basic principles of welding and related processes, the welding parameters, their effects, and the rules for their selection. They will learn the fundamentals of preparing welding procedure specifications and welding plans, as well as the basic welding equipment and the principles of their selection. Students will also become familiar with weld defects, their effects and repair methods, as well as the basics of welding quality management, occupational safety, and environmental protection in welding.						
				<b>Objectives and development goals</b> -						
Typical delivery methods				Lecture	Lectures for all students in a lecture hall using board-based explanation and a computer projector.					
				Seminar	Example problem solving for all students in a lecture hall using a computer projector. Demonstration of practical exercises.					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Is familiar with the different types of joining technologies and is able to apply welding processes while observing the rules for producing defect-free joints. Furthermore, the student is able to design the welding technology and prepare the manufacturer's welding procedure specification.						
				<b>Ability</b> Is able to perform tasks corresponding to their professional qualification. Is able to plan, organize, and carry out independent learning. Is able to supervise and control specialized technological manufacturing processes while taking the principles of quality management into account.						
				<b>Attitude</b> Demonstrates perseverance and the ability to tolerate routine tasks when performing practical activities. Strives for the continuous improvement of applied technologies and procedures through a creative approach. Aims to apply energy- and material-efficient processes and technologies.						
				<b>Autonomy and responsibility</b> Directs the work of the assigned personnel based on the guidance of their workplace supervisor and supervises the operation of machines and equipment. Determines the properties of different products, monitors the quality of the technological work phases, and performs quality control of the related subtasks.						
Short description of subject content				Physical principles of welding. Technology of the main fusion welding processes. Technology of the main pressure welding processes. Fundamentals of weldability. Basics of quality management in welding. Welding technological documentation and its preparation. Occupational safety, fire protection, and environmental protection in welding. Economic aspects of welding and the environmentally conscious selection of welding processes and materials.						
Types of student activity				Active participation in lectures, classroom exercises, and laboratory exercises.						

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Required reading and resources	<ul style="list-style-type: none"> <li>• Downloadable lecture notes from <a href="http://www.duf.hu">www.duf.hu</a>,</li> <li>• Welding pocket book I. (Welding procedures), Cokom Mérnökiroda Kft., Budapest 2023,</li> <li>• Welding pocket book II. (Welding production technology), Cokom Mérnökiroda Kft., Budapest 2023.</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Welding Handbook, Tom 1-5. AWS, Miami, FL, The USA, 2010.</li> </ul>
Assignments	As stated in the first lesson.
Description and schedule of exams	As stated in the first lesson.
Framework and rules for the use of artificial intelligence	<p>In this course, the use of artificial intelligence tools is partially permitted for mid-year assignments, project work, papers, and presentations, primarily as a supplement to and verification of independent work, with appropriate citation and source identification. Students may employ AI-based tools (e.g. literature synthesis, concept generation, data interpretation) in the context of in-class activities, assignments, and project work, provided that the use is explicitly documented and complemented by the student's own professional analysis and critical reflection.</p> <p>The use of AI is not permitted in assessments intended to evaluate individual performance (e.g. quizzes, examinations, calculation-based tasks), where the objective is to assess independent engineering reasoning and analytical competence.</p> <p>In project-based tasks, AI may be applied as a design-support tool (e.g. comparison of energy alternatives, exploration of conceptual solutions). However, all final technical calculations, evaluations, and conclusions must be produced and defended independently by the student.</p>

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## Metrology

Subject name		In Hungarian		Gépészeti mérés technika			Level	BSc		
		In English		Metrology			Code	DUEN-MUG-213 DUEL-MUG-213		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name			Gábor Ladányi	position	master instructor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> 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 wave of tribological properties. The life time and third body must be determined generally. They have to plan and run tribological systems on the basis of properties 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.						
				<b>Objectives and development goals</b> -						
Typical delivery methods				Lecture	In a classroom with the use of projector or computer in each lecture.					
				Seminar	-					
				Lab	Laboratory measurements performed in a measurement laboratory, with report preparation					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Knows and uses the basic concepts of firing technology in practice. The students understand and uses knowledge of combustion theory in environmental protection. The student knows the processes that take place in domestic and industrial boilers. The student interprets the structure of the special steam turbine, the way of energy conversion. The student knows the structure of the reaction steam turbine, the way of energy conversion. The student understands the design of a gas turbine for energy purposes, the role of his turbine, compressor and firebox. The student is aware of the main features of the construction of a gas turbine used in aviation. The student informed about the operation of the compressor refrigerator. The student understands the structure of the compression and spark ignition engine, the processes that take place in them. The student is aware of the possibilities of increasing the performance of internal combustion engines, their advantages and disadvantages.						
				<b>Ability</b> Performs the job according to his/her qualifications. Ability to plan, organise and carry out independent learning. The ability to manage and control the production processes of specialised technology, with a view to quality assurance and quality control.						
				<b>Attitude</b> Student strives to meet and enforce quality standards. Student strives to organise and carry out their tasks in accordance with environmental, health and sustainability standards. Using student's technical knowledge, Student will seek to gain a better understanding of observable phenomena and to describe and explain their laws.						
				<b>Autonomy and responsibility</b> Takes responsibility for their work.						
				Short description of 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		

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	examinations. Processing of measuring results with statistical methods. The estimation of measuring results.
Types of student activity	Processing heard text with notes 60% Task-based organisation of information 10% Independent processing of tasks 30%.
Required reading and resources	<ul style="list-style-type: none"> <li>• Materials on MOODLE</li> <li>• GUM (Guide of Uncertainty of Measurement)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Jay L. Bucher, The Metrology Handbook Hardcover – April 1, 2004, springer, ISBN-13: 978-0873896207</li> <li>• Heather A. Wade, The ASQ Metrology Handbook, Third Edition (eBook), Published 2023, ISBN: 9781636940205, Item Number: E1596</li> </ul>
Assignments	-
Description and schedule of exams	-
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted for certain types of tasks (e.g. in-class activities, assignments), but prohibited in other cases (e.g. midterm tests).

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**Thesis project**

Subject name		In Hungarian		Szakdolgozat - GEPBSC				Level		BSc					
		In English		Thesis project				Code		DUEN-MUG-093 DUEL-MUG-093					
2025/2026 II.															
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic											
Compulsory prerequisite subject:				Completion of all courses from semesters 1–6.											
Type		Number of lessons						Requiremen	Credit	Language of education					
		Lecture		Seminar		Lab									
Full time	150/117	Per week	0	Per week	9	Per week	0	S	15	english					
Part time	150/45	Per semester	0	Per semester	45	Per semester	0								
Person responsible for the subject:				name				Zoltán Gyukity		position		master instructor			
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Work based on independent literature review and data collection, as well as individual consultation, using the information learned during the training and collected during the internship.											
				<b>Objectives and development goals</b> -											
Typical delivery methods				Lecture		-									
				Seminar		The student prepares his/her thesis independently in individual consultations in 100% of the practice.									
				Lab		-									
				Other		-									
Requirements (in learning outcomes)				<b>Knowledge</b> The student, summarising the knowledge acquired during the course and the results of the work placement, prepares a thesis on the chosen topic in the field of computer science and electronics integrated engineering as a synthesis of his/her studies. The thesis is an independent work requiring the creative use of the knowledge acquired. The thesis shall be supervised and assisted by a supervisor and shall be at least 50 pages long and no longer than 80 pages.											
				<b>Ability</b> The student should be able to solve problems in mechanical engineering design work based on what has been learned. Recognise the elementary structures required to solve various complex problems and be able to determine their correct sequence. You can choose the optimal solution for the situation from a range of possible solutions. Be able to train and represent complex shapes in engineering practice. The student should be proficient in the independent use of standards and drafting aids, sketching and editing component drawings, and drafting machine assemblies. The student should be familiar with the conceptual structure of the ISO tolerance and fitment system for the correct specification of tolerances, tolerances and fits. Be able to specify accuracy specifications for machine parts. Know, be able to define and prescribe the surface finish metrics of machine parts. Be able to design machine parts with a typical design for a given production technology. Be able to reconstruct the technical drawing of real machine parts so that the part or a substitute part can be produced from the drawing. Be able to understand and analyse problems in industrial processes (e.g. maintenance problems) and make recommendations for their improvement. Be able to present and document problems and solutions appropriately.											
				<b>Attitude</b> Open to learning and absorbing engineering knowledge related to your qualifications and area of expertise. Interested in new methods and tools related to the field. And able to incorporate them into the thesis.											
				<b>Autonomy and responsibility</b> Takes responsibility for their work.											
				Short description of subject content				The student, summarising the knowledge acquired during the course and the results of the professional practice, prepares a thesis on the chosen topic in the field of mechanical engineering integrated with computer science and electronics. The thesis is an independent work requiring the creative use of the knowledge acquired. The thesis is prepared under the regular guidance and guidance of a supervisor.							

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Types of student activity	Regular consultation with industry and academic consultants. Incorporation of suggestions into the thesis. Continuous development and documentation of the thesis at the appropriate level.
Required reading and resources	<ul style="list-style-type: none"><li>• A guide to the thesis. 2nd expanded and revised edition. University publisher</li><li>• Materials on MOODLE</li></ul>
Recommended reading and resources	-
Assignments	-
Description and schedule of exams	-
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted only with proper citation.

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**Professional Practice**

Subject name		In Hungarian		Ipari gyakorlat				Level	BSc	
		In English		Professional Practice				Code	DUEN-MUG-093 DUEL-MUG-093	
2025/2026 II.										
Responsible educational unit				Institute of Technology, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/0	Per week	0	Per week	0	Per week	0	S	0	english
Part time	150/0	Per semester	0	Per semester	0	Per semester	0			
Person responsible for the subject:				name				position	master instructor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b>						
				Based on the previously completed courses, the student has acquired comprehensive knowledge that enables them to solve an engineering task (heat treatment, plastic forming, failure analysis, materials testing). To demonstrate this competence, the student prepares a thesis, during which they integrate the knowledge gained in individual subjects into a coherent and complex body of knowledge. The student is able to understand the engineering task as a whole, solve it, and prepare a structured summary of the results.						
Typical delivery methods				<b>Objectives and development goals</b>						
				-						
Requirements (in learning outcomes)				Lecture	-					
				Seminar	Completion and support of the theoretical and practical tasks of the thesis within the framework of consultation.					
				Lab	-					
				Other	Full-time programme: 1 semester, at least 560 hours Part-time programme: 6 weeks, at least 240 hours					
Requirements (in learning outcomes)				<b>Knowledge</b>						
				Has comprehensive knowledge of the fundamental facts, directions, and boundaries of the technical field.						
				Is familiar with the conceptual framework of the specialization, as well as its most important relationships and theories.						
				Has comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of the field.						
				Has thorough knowledge of the learning, knowledge acquisition, and data collection methods of mechanical engineering, their ethical limitations, and the related problem-solving techniques.						
				<b>Ability</b>						
Is able to perform tasks corresponding to their professional qualification.										
Is able to apply the key terminology, theories, and procedures of the given technical field in the execution of related tasks.										
Is capable of planning, organizing, and carrying out independent learning.										
Is able to apply and enforce occupational safety, fire protection, and hygiene regulations and requirements during their work.										
Is able to communicate professionally and appropriately in their field of expertise, both orally and in writing, in their native language and in at least one foreign language.										
Is able to apply the technical regulations related to the operation of mechanical systems, as well as the principles of setting up and operating machines and mechanical equipment, including their economic aspects.										
Short description of subject content				<b>Attitude</b>						
				Their attitude required for solving technical problems is improved.						
				<b>Autonomy and responsibility</b>						
				Takes responsibility for their work.						
Short description of subject content				The student plans and carries out the practical tasks related to the thesis, performs the necessary tests, evaluates the obtained results, and summarizes them in a thesis of at least 20 pages.						

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Types of student activity	Consultation, laboratory practice, and tasks to be carried out in an industrial environment.
Required reading and resources	-
Recommended reading and resources	-
Assignments	-
Description and schedule of exams	-
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted in all situations in this course.

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### Quality Management

Subject name		In Hungarian		Minőségirányítás				Level		BSc		
		In English		Quality Management				Code		DUEN-MUG-117 DUEL-MUG-117		
2025/2026 II.												
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic								
Compulsory prerequisite subject:				-								
Type		Number of lessons						Requiremen	Credit	Language of education		
		Lecture		Seminar		Lab						
Full time	150/60	Per week	2	Per week	1	Per week	0	M	5	english		
Part time	150/20	Per semester	10	Per semester	5	Per semester	0					
Person responsible for the subject:				name				László Róbert Hári, PhD		position		assistant professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Acquiring the basics of quality management, learning about the application of basic quality management methods.								
				<b>Objectives and development goals</b> Getting to know the basics of ISO 9001 operation, supplemented by typical ocalysis methods, to achieve skills that can be used in general.								
Typical delivery methods				Lecture		With projector, on a whiteboard						
				Seminar		With projector, on a whiteboard						
				Lab		-						
				Other		-						
Requirements (in learning outcomes)				<b>Knowledge</b> Possess theoretical and practical knowledge of the subject matter.								
				<b>Ability</b> He/she is able to perform tasks related to the subject of the subject.								
				<b>Attitude</b> The attitude to solving technical problems is improving.								
				<b>Autonomy and responsibility</b> Takes responsibility for their work.								
Short description of subject content				The subject gives a general picture of the professional aspects of the construction and operation of a quality management system, and that the construction of management systems is process-oriented.								
Types of student activity				Processing of heard text by taking notes 50% Task-led organization of information 30% Independent processing of tasks 20%								
Required reading and resources				<ul style="list-style-type: none"> <li>ISO 9000:2015 (Fundamentals and vocabulary)</li> <li>International Organization for Standardization. (2015). Quality management systems — Fundamentals and vocabulary (ISO Standard No. ISO 9000:2015). <a href="https://www.iso.org/standard/45481.html">https://www.iso.org/standard/45481.html</a></li> </ul>								
Recommended reading and resources				<ul style="list-style-type: none"> <li>ISO 9001:2015 (Requirements)</li> <li>International Organization for Standardization. (2015). Quality management systems — Requirements (ISO Standard No. ISO 9001:2015). <a href="https://www.iso.org/standard/62085.html">https://www.iso.org/standard/62085.html</a></li> </ul>								
Assignments				Announced during the first lesson								
Description and schedule of exams				Announced during the first lesson								
Framework and rules for the use of artificial intelligence				Prohibited.								

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**Environmental protection and energy management**

Subject name		In Hungarian	Környezetvédelem és energiagazdálkodás				Level	BSc		
		In English	Environmental protection and energy management				Code	DUEN-MUT-110 DUEL-MUT-110		
2025/2026 II.										
Responsible educational unit			Institute of Engineering Sciences, Department of Mechanical and Energetic							
Compulsory prerequisite subject:			-							
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/60	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/20	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:			name		Petrovickijné, Ildikó Angerer, PhD		position	associate professor		
Course objectives and justification (content, learning outcomes, place in curriculum)			<b>Short-term objective</b> The students get acquainted with the subject and the general problems of environmental protection, the technologies of abatement, elimination of pollutants and energy management.							
			<b>Objectives and development goals</b> Developing of student's knowledge on environmental protection, the technologies of abatement, elimination of pollutants and energy management.							
Typical delivery methods			Lecture	Presentation in a lecture room for everyone using computer driven projector						
			Seminar	-						
			Lab	Measurement in laboratory in pairs (max 11 pairs)						
			Other	-						
Requirements (in learning outcomes)			<b>Knowledge</b> Knowledge of the basic facts, directions and limits of the subject area of engineering. Knowledge of the general and specific mathematical, scientific and social principles, rules, relationships and procedures necessary for the operation of the field of engineering. Knowledge of the terminology, the most important contexts and theories related to the field. Comprehensive knowledge of the methods of knowledge acquisition and problem-solving in the main theories of the field. Comprehensive knowledge of basic economic, business and legal rules and tools. Knowledge of measurement procedures at an applied level. Has an applied knowledge of the requirements and standards of health and safety at work, fire protection, safety and health at work, and environmental protection in the field of his/her specialisation. Comprehensive knowledge of the management, environmental protection and quality assurance principles, their limits and requirements, which are intrinsically linked to the field.							
			<b>Ability</b> The ability to analyse at a basic level the disciplines that make up the knowledge base of the technical field, to synthesise relationships and to make appropriate evaluations. Ability to plan, organise and conduct independent learning. Ability to identify routine professional problems, to identify, formulate and solve (using standard operations in practice) the theoretical and practical background necessary to solve them. Ability to understand and use literature, computer and library resources specific to the field. Ability to apply the acquired IT knowledge to the solution of problems in the field. Ability to apply and enforce safety, fire safety and hygiene rules and regulations. Ability to communicate orally and in writing in his/her mother tongue and in at least one foreign language in a professionally appropriate manner, in accordance with his/her field of specialisation.							
			<b>Attitude</b>							

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	<p>It is open to learning about, embracing and authentically communicating professional, technological development and innovation in engineering. It strives to make self-learning a means to achieve its professional goals. He/she takes decisions in complex and unexpected decision-making situations in full respect of legal and ethical standards. Seek to solve problems, preferably in cooperation with others. Strive to maintain self-development in the field on an ongoing basis and in line with professional goals. He/she strives to solve problems and make management decisions by listening to the opinions of his/her supervisors, preferably in cooperation. Have the stamina and tolerance of monotony required to carry out practical activities. Open to the use of IT tools. Open and receptive to the application of new, modern and innovative practices and methods related to organic farming and health awareness. In the course of his/her work, he/she observes and complies with the relevant safety, health, environmental protection, quality assurance and control requirements.</p> <p><b>Autonomy and responsibility</b> Responsibly upholds and represents the values of the engineering profession, and is open to professionally informed critical comment. In the performance of his/her professional duties, he/she will cooperate with qualified professionals from other disciplines (primarily technical, economic and legal). Identify shortcomings in the technologies used, process risks and take the initiative to mitigate them. Monitor legislative, technical, technological and administrative changes in the field. Under the direction of the line manager, manages the work of the staff assigned to him/her and supervises the operation of machinery and equipment. Assesses the efficiency, effectiveness and safety of the work of subordinates. Supervises the professional development of his/her subordinates. Sharing his/her experience with his/her colleagues in order to support their development. Takes responsibility for the consequences of his/her technical analyses, the proposals he/she makes and the decisions he/she takes. Translated with <a href="http://www.DeepL.com/Translator">www.DeepL.com/Translator</a> (free version)</p>
Short description of subject content	<p>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. Scrubbers. 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 equipment. The pollution of soil. Waste and their treatment. Noise and vibration as environmental protection. Radioactive pollution.</p>
Types of student activity	<p>Lecture: the making notes: studying the text independently, Laboratory practice: studying the information, making reports</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Kiss E.: Environmental Protection and Economical usage of Energy (on Moodle drive)</li> <li>• Environmental Science Toward a Sustainable Future Richard T. Write, Bernard J. Nebel, Prentice Hall</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• The Biosphere, Ian Bradbury, Belhaven Press</li> <li>• Air Pollution, Its Origin and Control, Kenneth Wark and Cecil F. Warner, Harper and Row</li> <li>• Hazardous Waste Management Michael D. LaGrega, McGraw Hill</li> <li>• Drinking Water Quality, N.F. Gray, Wiley</li> </ul>
Assignments	<p>Laboratory report according to schedule During the semester period a total of 2 independent project papers/case studies of your choice on topics related to Environmental protection and energy management.</p>

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<p>Description and schedule of exams</p>	<p>As stated in the first lesson. By the end of the study period, 2 mid-year assignments/projects/evening studies must be prepared and submitted in pre-specified elective topics.</p> <p>If the arithmetic average of the scores of the two mid-term assignments/case studies does not reach 51%, the grade can be obtained in a written exam during the exam period according to the score limits specified in the Study and Examination Regulations.</p> <p>The conditions for signing and registering for the exam is: Writing and submitting 2 mid-year independent assignments/theses/case studies in electronic form.</p> <p>During the semester period a total of 2 independent project papers/case studies and laboratory measurement reports.</p> <p>Essay type test at the 6th week and at the last week.</p>
<p>Framework and rules for the use of artificial intelligence</p>	<p>In this course, the use of artificial intelligence tools is partially permitted for mid-year assignments, project work, papers, and presentations, primarily as a supplement to and verification of independent work, with appropriate citation and source identification. . Students may employ AI-based tools (e.g. literature synthesis, concept generation, data interpretation) in the context of in-class activities, assignments, and project work, provided that the use is explicitly documented and complemented by the student's own professional analysis and critical reflection.</p> <p>The use of AI is not permitted in assessments intended to evaluate individual performance (e.g. quizzes, examinations, calculation-based tasks), where the objective is to assess independent engineering reasoning and analytical competence.</p> <p>In project-based tasks, AI may be applied as a design-support tool (e.g. comparison of energy alternatives, exploration of conceptual solutions). However, all final technical calculations, evaluations, and conclusions must be produced and defended independently by the student.</p>

## MACHINE MAINTENANCE AND TECHNICAL DIAGNOSTICS

### Maintenance technologies 1.

Subject name		In Hungarian	Gépüzemfenntartási technológiák 1.				Level	BSc		
		In English	Maintenance technologies 1.				Code	DUEN-MGT-113 DUEL-MGT-113		
2025/2026 II.										
Responsible educational unit			Institute of Engineering Sciences, Department of Mechanical and Energetic							
Compulsory prerequisite subject:			DUEN(L)-MUG-222 Basics of machine design							
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	<b>M</b>	<b>5</b>	<b>english</b>
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:			name		Attila Szabó, PhD			position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)			<b>Short-term objective</b> Short-term objective The aim of the course is to provide students with comprehensive knowledge of the damaging effects acting on machine components, the analysis of failures, and the factors influencing surface quality, as well as to enable them to select appropriate repair and assembly technologies.							
			<b>Objectives and development goals</b> The course is based on the fundamentals of machine elements, materials science, mechanics, and manufacturing technology. Its aim is to enable students to recognize and analyze damage processes in machine components, mitigate damaging effects, and, based on the nature of the damage, professionally select and apply appropriate repair and assembly technologies.							
Typical delivery methods			Lecture	Projector, ppt presentations						
			Seminar	Projector, ppt presentations						
			Lab	-						
			Other	-						
Requirements (in learning outcomes)			<b>Knowledge</b> Able to analytically examine the damage processes of machines and equipment, uncover causes of errors and professionally eliminate them.							
			<b>Ability</b> Performs a job corresponding to his qualifications. Able to plan, organize and carry out independent study. Able to diagnose mechanical failures, select remedial actions, solve repair technology tasks.							
			<b>Attitude</b> He is open to learning about and receiving knowledge related to machine maintenance related to his qualification and field of expertise. Interested in new methods and tools related to the field.							
			<b>Autonomy and responsibility</b> Taking responsibility for your own work and the work of your peers.							
Short description of subject content			The damaging effects occurring 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.							
Types of student activity			Processing theoretical course material with guidance: 60 % Independent processing of theoretical course material: 40 % Task solution with guidance 15 % Processing tasks independently 85%							
Required reading and resources			<ul style="list-style-type: none"> <li>• Lech Pawlowski, The Science and Engineering of Thermal Spray Coatings, John Wiley &amp; Sons, 2008</li> <li>• Machine Maintenance I. Edited by Dr. Janik József. Jan Janik J. Janik, Főiskolai Kiadó, Dunaújváros, 2001.</li> <li>• Materials on MOODLE</li> </ul>							
Recommended reading and resources			<ul style="list-style-type: none"> <li>• William A. Bowditch; Kevin E. Bowditch; Mark A. Bowditch, Welding Technology Fundamentals Goodheart-Willcox, 2009</li> </ul>							

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Assignments	Completion of 2 homework assignments during the semester
Description and schedule of exams	2 tests during the semester
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted in the preparation of the homework assignment; however, its exclusive use is not allowed. A review of relevant literature is essential and will be verified as part of the assessment. The use of AI in other cases (e.g., exams or mid-term tests) is strictly prohibited.

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**Production planning, CAM**

Subject name		In Hungarian		Gyártástervezés, CAM			Level	BSc		
		In English		Production planning, CAM			Code	DUEN-MUG-111 DUEL-MUG-111		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUG-252 Production Technology						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name		Gábor Vizi, PhD		position	college associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Learning the processes of production planning and fixture design.						
				<b>Objectives and development goals</b> Familiarisation with micro-design documentation in manufacturing technology. Familiarity with and use of the operations plan, operations instructions and accompanying documentation. Understand the technological role and design of appliances and participate in the design of a simple appliance. To learn about the construction and operation of NC-controlled machining machines, the function and application of machine components. Gain CNC programming experience. Gain CAM programming experience.						
Typical delivery methods				Lecture		For all students, in a large lecture, using a whiteboard, projector or overhead projector (66% of all lessons)				
				Seminar		-				
				Lab		For all students in class. Using computer and CNC machines (34% of all lessons).				
				Other		-				
Requirements (in learning outcomes)				<b>Knowledge</b> Has a comprehensive knowledge of the fundamental facts, directions, and boundaries of the technical field. Knows the general and specific mathematical, natural science, and social science principles, rules, relationships, and procedures necessary for working in the technical field. Knows the conceptual system, the most important relationships and theories related to the field. Has a comprehensive knowledge of the methods of acquiring knowledge and solving problems in the main theories of the field.						
				<b>Ability</b> Cognitive ability, ability to solve problems independently, ability to concentrate on one thing for a longer period of time. Able to plan, organize, and carry out independent learning. Able to identify routine professional problems, explore and formulate the theoretical and practical background necessary to solve them, and solve them (through the practical application of standard operations). Able to create basic models of technical systems and processes.						
				<b>Attitude</b> Open to learning and acquiring knowledge related to production planning and equipment design in their field of expertise. Interested in new methods and tools related to their field of expertise.						
				<b>Autonomy and responsibility</b> Taking responsibility for your own work and the work of your peers.						
Short description of subject content				Selection of prefabricated parts. Determination of allowances for prefabricated parts and calculation of final dimensions. Presentation of a numerical example. Concept of operation and preparation of the sequence of operations. Development of operating instructions. Forms of implementation of the operation plan. Presentation of an example. Preparation of technological documentation. Systematization of documentation. Bases, base selection errors, dimension chains. The process of designing devices. Static, kinematic, and dynamic calculations. Dimensioning of device components. Drilling, milling, and turning devices and their main tasks and properties.						

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	<p>Presentation of completed devices. Structure of CNC lathes and machining centers. Basics of CNC machine programming using a simulation system. Standards applicable to CNC machines. NCT control instructions. Tooling of CNC machines. Solving specific technical tasks (programming). Learning about the CNC programming process for lathes and milling machines. Learning about formal CAM processes. Developing and presenting a specific example.</p>
Types of student activity	<p>Processing theoretical material with guidance 20 %, Independent processing of theoretical material 20 %, Task solving with guidance 20 %, Independent processing of tasks 40 %</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• R.K. Rajput: Textbook of Manufacturing technology, LAXMI Publications (P) LTD 113, Golden House, Daryaganj, New Delhi-110002</li> <li>• Hiram E. Grant, Example of workpiece grippers, Technical Book Publishing, Budapest 1970,</li> <li>• Description of EdgeCAM software,</li> <li>• NCT simulator software description</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• K.C.Jain, A.K. Chitale: Textbook of Production Engineering, PHI Learning Private Limited, New Delhi-110001, 2010,</li> <li>• NCT 2000 programming manual, machine manual</li> </ul>
Assignments	<p>The task involves developing an operation plan, operating instructions, and equipment request form for a workpiece, as well as complete documentation for a piece of equipment (assembly drawing, calculations, dimensions). Solving complex milling and turning tasks</p>
Description and schedule of exams	<p>Solving complex production planning tasks. Participation in exercises at least 70%. Submission and satisfactory completion of mid-term assignments. Positive evaluation of the mid-term knowledge assessment. 1. Written midterm exam (developing a manufacturing plan for a given component) 25-50 points, at the time specified in class. 2. Midterm exam (writing an NC program, solving a complex milling and turning task using the EdgeCAM or SolidCAM system) 25-50 points Based on these, the grade is determined as follows:</p> <ul style="list-style-type: none"> <li>• 51 - 60 points: satisfactory,</li> <li>• 61 - 70 points: average,</li> <li>• 71 - 80 points: good,</li> <li>• 81 - 100 points: excellent</li> </ul>
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is prohibited in all educational situations and forms of assessment.</p>

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### Tribology

Subject name		In Hungarian		Tribológia			Level		BSc		
		In English		Tribology			Code		DUEN-MUG-118 DUEL-MUG-118		
2025/2026 II.											
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic							
Compulsory prerequisite subject:				DUEN(L)-MUG-222 Basics of machine design							
Type		Number of lessons					Requiremen	Credit	Language of education		
		Lecture		Seminar		Lab					
Full time	150/39	Per week	2	Per week	1	Per week	0	M	5	english	
Part time	150/15	Per semester	10	Per semester	5	Per semester	0				
Person responsible for the subject:				name			Attila Szabó, PhD		position		assistant professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is to provide students with comprehensive knowledge of the operation of tribological systems, friction and wear processes, and to enable them to analyze wear mechanisms, design lubrication regimes, and professionally operate tribological systems.							
				<b>Objectives and development goals</b> The course is based on the fundamentals of machine elements, materials science, mechanics, thermodynamics and fluid mechanics, as well as manufacturing technology. Students should be able to analyze tribological systems, identify the dominant wear mechanisms, and predict wear life. They should be capable of selecting appropriate lubricants and structural materials based on lubrication regimes and material properties, as well as designing and professionally operating tribological systems.							
Typical delivery methods				Lecture		Projector, ppt presentations					
				Seminar		Projector, ppt presentations					
				Lab		-					
				Other		-					
Requirements (in learning outcomes)				<b>Knowledge</b> He get to know machine design principles and methods, machine manufacturing technology procedures based on tribological aspects. He has a comprehensive knowledge of the tribological processes taking place in used work and power machines and mechanical equipment.							
				<b>Ability</b> Performs a job corresponding to his qualifications. Able to plan, organize and carry out independent study. Able to diagnose mechanical failures, select remedial actions, solve repair technology tasks.							
				<b>Attitude</b> He is open to learning about and receiving knowledge related to tribology related to his qualification and field of expertise. Interested in new methods and tools related to the field.							
				<b>Autonomy and responsibility</b> Taking responsibility for your own work and the work of your peers.							
Short description of subject content				Definition of tribology. Description of tribological systems. Friction processes. Analysis of tribological processes. Surface quality of mechanical parts. The properties 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 properties. 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.							
Types of student activity				Processing theoretical course material with guidance: 60 % Independent processing of theoretical course material: 40 % Task solution with guidance 15 % Processing tasks independently 85%							

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Required reading and resources	<ul style="list-style-type: none"> <li>• R Gohar (Imperial College London, UK) &amp; H Rahnejat (Loughborough University, UK): FUNDAMENTALS OF TRIBOLOGY</li> <li>• Machine Maintenance I. Edited by Dr. Janik József, Dunaújváros, 2001.</li> <li>• Jenő Szántó: Tribology, Budapest 1991.</li> <li>• Valasek I. Tóth I.: Machining tribology, Budapest, Tribotechnik Kft. 2003.</li> <li>• Valasek I. Auer J.: Lubricants and their viscous substances, Budapest, Tribotechnik Kft. 2003.</li> <li>• Valasek I. Budinszki J.: Lubrication of machine components, Budapest, Tribotechnik Kft. 2003</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Gwidon Stachowiak and Andrew W Batchelor : Engineering Tribology, Third Edition Prasanta Sahoo</li> </ul>
Assignments	Completion of 2 homework assignments during the semester
Description and schedule of exams	2 tests during the semester
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is permitted in the preparation of the homework assignment; however, its exclusive use is not allowed. A review of relevant literature is essential and will be verified as part of the assessment.</p> <p>The use of AI in other cases (e.g., exams or mid-term tests) is strictly prohibited.</p>

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**Technical Diagnostics 1.**

Subject name		In Hungarian		Műszaki diagnosztika 1.				Level		BSc	
		In English		Technical Diagnostics 1.				Code		DUEN-MUG-157 DUEL-MUG-157	
2025/2026 II.											
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic							
Compulsory prerequisite subject:				DUEN(L)-MUG-153 Mechanics 3. DUEN(L)-IMA-110 Mathematics 3.							
Type		Number of lessons						Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	150/60	Per week	2	Per week	1	Per week	0	E	5	english	
Part time	150/20	Per semester	10	Per semester	5	Per semester	0				
Person responsible for the subject:				name		László Róbert Hári, PhD			position		assistant professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the education is to acquire the basics of rotating machine vibration diagnostics and the theoretical and practical knowledge of vibration measurement.							
				<b>Objectives and development goals</b> Integration of mathematical and mechanical knowledge in the discipline of modern signal processing.							
Typical delivery methods				Lecture		With projector and whiteboard					
				Seminar		Whiteboard exercise					
				Lab		-					
				Other		-					
Requirements (in learning outcomes)				<b>Knowledge</b> Possess theoretical and practical knowledge of the subject matter.							
				<b>Ability</b> Able to perform tasks related to the subject of the subject.							
				<b>Attitude</b> Attitude to solving technical problems is improving.							
				<b>Autonomy and responsibility</b> He takes responsibility for his work.							
Short description of subject content				Within the framework of the course, the vibration diagnostic methods serving the preventive maintenance strategy and the necessary mathematical apparatus are described. To get acquainted with the phenomena occurring in rotary machine diagnostics.							
Types of student activity				Processing of lesson information and independent study of the curriculum and literature.							
Required reading and resources				<ul style="list-style-type: none"> <li>• Lecture notes and slides</li> </ul>							
Recommended reading and resources				<ul style="list-style-type: none"> <li>• SKF Group. (2005). Vibration Diagnostic Guide (Publication CM5003 EN). SKF Reliability Systems.</li> <li>• <a href="https://skftechnicalsupport.zendesk.com/hc/en-us/articles/360033182914-Vibration-Diagnostic-Guide">https://skftechnicalsupport.zendesk.com/hc/en-us/articles/360033182914-Vibration-Diagnostic-Guide</a></li> <li>• <a href="https://skftechnicalsupport.zendesk.com/hc/en-us/articles/360033182914-Vibration-Diagnostic-Guide">https://skftechnicalsupport.zendesk.com/hc/en-us/articles/360033182914-Vibration-Diagnostic-Guide</a></li> </ul>							
Assignments				Announced at the first lesson							
Description and schedule of exams				Announced at the first lesson							
Framework and rules for the use of artificial intelligence				Prohibited							

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**Maintenance technologies 2.**

Subject name		In Hungarian	Gépüzemfenntartási technológiák 2.				Level	BSc		
		In English	Maintenance technologies 2.				Code	DUEN-MGT-253 DUEL-MGT-253		
2025/2026 II.										
Responsible educational unit			Institute of Engineering Sciences, Department of Mechanical and Energetic							
Compulsory prerequisite subject:			DUEN(L)-MGT-113 Maintenance technologies 1.							
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:			name				Attila Szabó, PhD		position	assistant professor
Course objectives and justification (content, learning outcomes, place in curriculum)			<b>Short-term objective</b> Short-term objective The aim of the course is to provide students with comprehensive knowledge of repair technologies for machine components and the economic aspects of maintenance, and to enable them to design and select technically and economically optimal repair solutions..							
			<b>Objectives and development goals</b> The course is based on the fundamentals of machine elements, materials science, manufacturing technology, welding technology, and maintenance engineering, with particular emphasis on the technological behavior of materials, joining and coating processes, and basic economic considerations. Students should be able to design and manage various repair technologies (mechanical methods, welding, soft and hard soldering/brazing, thermal spraying, bonding and polymer application, high energy density and surface hardening processes). They should also be capable of determining repair costs, interpreting maintenance economic indicators, and selecting the most appropriate repair technology based on technical and economic criteria.							
Typical delivery methods			Lecture	Projector, ppt presentations						
			Seminar	Projector, ppt presentations						
			Lab	-						
			Other	-						
Requirements (in learning outcomes)			<b>Knowledge</b> Able to analytically examine the damage processes of machines and equipment, uncover causes of errors and professionally eliminate them.							
			<b>Ability</b> Performs a job corresponding to his qualifications. Able to plan, organize and carry out independent study. Able to diagnose mechanical failures, select remedial actions, solve repair technology tasks.							
			<b>Attitude</b> He is open to learning about and receiving knowledge related to machine maintenance related to his qualification and field of expertise. Interested in new methods and tools related to the field.							
			<b>Autonomy and responsibility</b> Taking responsibility for your own work and the work of your peers.							
Short description of subject content			The technological methods of recovery. Recovery: - with mechanical methods; - by welding; -with soft and hard soldering; - with thermal scattering; - gluing and plasticizing. High energy density technologies and surface strengthening processes modifying surface integrity. Economy and organization of machine maintenance. Indicators of the economy of machine maintenance.							
Types of student activity			Processing theoretical course material with guidance: 60 % Independent processing of theoretical course material: 40 % Task solution with guidance 15 % Processing tasks independently 85%							
Required reading and resources			<ul style="list-style-type: none"> <li>Lech Pawlowski, The Science and Engineering of Thermal Spray Coatings, John Wiley &amp; Sons, 2008</li> </ul>							

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	<ul style="list-style-type: none"> <li>• Maintenance manual - methods and tools for managing maintenance. [professional editor Zoltán Gaál]. Budapest: RAABE Tanácsadó és Kiadó Kft., 2004.</li> <li>• Materials on MOODLE</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• William A. Bowditch; Kevin E. Bowditch; Mark A. Bowditch, Welding Technology Fundamentals Goodheart-Willcox, 2009</li> </ul>
Assignments	Completion of 2 homework assignments during the semester
Description and schedule of exams	2 tests during the semester
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is permitted in the preparation of the homework assignment; however, its exclusive use is not allowed. A review of relevant literature is essential and will be verified as part of the assessment.</p> <p>The use of AI in other cases (e.g., exams or mid-term tests) is strictly prohibited.</p>

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**Maintenance strategy**

Subject name		In Hungarian		Karbantartásmenedzsment			Level	BSc		
		In English		Maintenance strategy			Code	DUEN-MGT-254 DUEL-MGT-254		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MGT-113 Maintenance technologies 1.						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name			Attila Szabó, PhD		position	assistant professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is to provide students with a modern, systems- and risk-based understanding of maintenance theory and practice, and to enable them to design and implement maintenance strategies tailored to organizational needs.						
				<b>Objectives and development goals</b> The course is based on the fundamentals of machine elements, mechanics, probability theory and reliability engineering, as well as maintenance engineering, with particular emphasis on damage processes in machine components. Students should be able to interpret maintenance in a modern context and analyze the relationship between production and maintenance at a systems level. They should understand machine life cycle models, damage and failure processes, and the interrelations between operability and reliability. They should be capable of performing weak-point analysis, fault tree analysis, and root cause analysis, applying risk assessment methods, and determining maintenance cycle times. Furthermore, they should be able to compare and apply different maintenance strategies and philosophies (FBCM, TMK/PM, PCBM, RCM, RBM/RBIM, TPM, AM) and design and implement a maintenance system tailored to organizational needs.						
Typical delivery methods				Lecture	Projector, ppt presentations					
				Seminar	Projector, ppt presentations					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Get to know and apply the most common maintenance philosophies in companies. Able to review a company's maintenance philosophy, identify gaps and modernize it.						
				<b>Ability</b> Performs a job corresponding to his qualifications. Able to plan, organize and carry out independent study. Able to design a maintenance strategy that meets the needs of companies.						
				<b>Attitude</b> He is open to learning about and receiving knowledge related to machine maintenance related to his qualification and field of expertise. Interested in new methods and tools related to the field.						
				<b>Autonomy and responsibility</b> Taking responsibility for your own work and the work of your peers.						
Short description of subject content				The modern interpretation of the definition of „maintenance“. Maintenance and terotechnology. The connection between production and maintenance. The double-circled model of the machine life-time. Effects that can damage the machine parts. Appearance forms of damages. Deterioration reserve and its wearing out. Breakdowns and operational errors. Weak-point analysis. The probabilistic examination of operational processes. The calculation method of maintenance cycle-time. Risk analysis in maintenance. The process of root-reason-analysis. Fault-tree analysis. Maintenance strategies and philosophies. The development of maintenance. Faliure Based Corective Maintenance (FBCM). Planned Preventive Maintenance. Parameter Condition Based Maintenance (PCBM). Reliability Centred Maintenance (RCM). Risk Based Maintenance (RBM); Risk Based						

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	Inspection and Maintenance (RBIM). Total Productive Maintenance (TPM). Automatic Maintenance (AM).
Types of student activity	Processing theoretical course material with guidance: 60 % Independent processing of theoretical course material: 40 % Task solution with guidance 15 % Processing tasks independently 85%
Required reading and resources	<ul style="list-style-type: none"> <li>• David J Smith: Reliability, Maintainability and Risk, Elsevier, 2013.</li> <li>• Machine Maintenance I. Edited by Dr. Janik József, Dunaújváros, 2001.</li> <li>• Maintenance manual - methods and tools for managing maintenance. [professional editor Zoltán Gaál]. Budapest: RAABE Tanácsadó és Kiadó Kft., 2004</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Machine Maintenance II. Edited by Dr. Janik József, Főiskolai Kiadó, Dunaújváros, 2001.</li> </ul>
Assignments	Completion of 2 homework assignments during the semester
Description and schedule of exams	2 tests during the semester
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted in the preparation of the homework assignment; however, its exclusive use is not allowed. A review of relevant literature is essential and will be verified as part of the assessment. The use of AI in other cases (e.g., exams or mid-term tests) is strictly prohibited.

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### Complex Machine Designing

Subject name	In Hungarian	Komplex gépészeti tervezés					Level	BSc		
	In English	Complex Machine Designing					Code	DUEN-MUG-216 DUEL-MUG-216		
2025/2026 II.										
Responsible educational unit		Institute of Engineering Sciences, Department of Mechanical and Energetic								
Compulsory prerequisite subject:		DUEN(L)-MUG-252 Production Technology DUEN(L)-MUG-111 Production planning, CAM DUEN(L)-MUG-212 CAD DUEN(L)-MUG-222 Basics of machine design								
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/39	Per week	0	Per week	0	Per week	3	M	5	english
Part time	150/15	Per semester	0	Per semester	0	Per semester	15			
Person responsible for the subject:		name		Gábor Vizi, PhD			position		college associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)		<b>Short-term objective</b> Design, dimensioning, and modeling of complex machine structures.								
		<b>Objectives and development goals</b> Students should be able to perform mechanical engineering, computer-aided design (CAD), finite element strength calculation (FEM), and computer-aided manufacturing (CAM) tasks. They should be able to explore and outline possible solutions to mechanical engineering design problems, establish selection criteria, and select and develop the optimal solution. They should be able to document the design process and present the design results.								
Typical delivery methods		Lecture		-						
		Seminar		-						
		Lab		All students in the classroom, using computers (100% of all lessons).						
		Other		-						
Requirements (in learning outcomes)		<b>Knowledge</b> Has a comprehensive knowledge of the fundamental facts, directions, and boundaries of the technical field. Knows the general and specific mathematical, natural science, and social science principles, rules, relationships, and procedures necessary for working in the technical field. Knows the conceptual system, the most important relationships and theories related to the field. Has a comprehensive knowledge of the methods of acquiring knowledge and solving problems in the main theories of the field.								
		<b>Ability</b> Cognitive ability, ability to solve problems independently, ability to concentrate on one thing for a longer period of time. Able to plan, organize, and carry out independent learning. Able to identify routine professional problems, explore and formulate the theoretical and practical background necessary to solve them, and solve them (through the practical application of standard operations). Able to create basic models of technical systems and processes.								
		<b>Attitude</b> Open to learning and acquiring knowledge related to production planning and equipment design in their field of expertise. Interested in new methods and tools related to their field of expertise.								
		<b>Autonomy and responsibility</b> Taking responsibility for your own work and the work of others.								
Short description of subject content		Practicing parametric 3D modeling and drawing on simple machine parts, then assemblies, component recording. Developing model variants. Basics of the finite element method. Structure of program systems, interpretation of INPUT/OUTPUT data. Strength of materials applications, shape optimization. Preparation of technical documentation. Development of component manufacturing technology. Selection of machining cycles. CNC program generation.								
Types of student activity		Task completion with guidance 15%, Independent task completion 85%								
Required reading and resources		<ul style="list-style-type: none"> <li>Nagy Géza: Machine Design Atlas, Gépipari tudományos egyesület, Miskolci Egyetem Gépelemek Tanszéke 1991. SolidWorks Tutorials,</li> </ul>								

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Recommended reading and resources	<ul style="list-style-type: none"> <li>• SolidWorks VEM module software description</li> </ul>
Assignments	Continuously, during the semester, create 3D models and corrected component drawings from the component and assembly drawings issued. VEM testing of a simple machine component in a specific load case.
Description and schedule of exams	<p>Participation in exercises at least 70%.</p> <p>For each student, based on measurements, create a 3D model of a specific component and prepare a component drawing in accordance with the technical drawing specifications within a specified time period.</p> <ol style="list-style-type: none"> <li>1. Monitoring progress and positive evaluation of homework assignments.</li> <li>2. Creating a 3D model of a simple workpiece and performing finite element analysis.</li> <li>3. Exploring possible solutions to a given technical problem, evaluating them based on specific selection criteria, and then selecting the viable option(s).</li> </ol>
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is not permitted.

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### Technical Diagnostics 2.

Subject name		In Hungarian		Műszaki diagnosztika 2.				Level	BSc	
		In English		Technical Diagnostics 2.				Code	DUEN-MUG-219 DUEL-MUG-219	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUG-153 Mechanics 3. DUEN(L)-IMA-110 Mathematics 3.						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/20	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name		László Róbert Hári, PhD		position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the training is to introduce further diagnostic methods in addition to the foundation of modern maintenance.						
				<b>Objectives and development goals</b> Integration of mathematical and mechanical knowledge in the discipline of modern signal processing.						
Typical delivery methods				Lecture	With projector and whiteboard					
				Seminar	-					
				Lab	Whiteboard exercise					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Possess theoretical and practical knowledge of the subject matter.						
				<b>Ability</b> Able to perform tasks related to the subject of the subject.						
				<b>Attitude</b> Attitude to solving technical problems is improving.						
				<b>Autonomy and responsibility</b> He takes responsibility for his work.						
Short description of subject content				The basics of thermography, ferrography and ultrasound diagnostic methods, as well as further mechanical diagnostic tests, will be presented in the course.						
Types of student activity				Processing of lesson information and independent study of the curriculum and literature.						
Required reading and resources				<ul style="list-style-type: none"> <li>Lecture notes and slides</li> </ul>						
Recommended reading and resources				-						
Assignments				Announced at the first lesson						
Description and schedule of exams				Announced at the first lesson						
Framework and rules for the use of artificial intelligence				Prohibited						

## GREEN TRANSFORMATION

### Energy management

Subject name		In Hungarian		Energiamenedzsment				Level	BSc	
		In English		Energy management				Code	DUEN-MGT-114 DUEL-MGT-114	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	M	5	english
Part time	15015	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Éva Kovács-Bokor, PhD		position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is to familiarise students with the specific management and economic knowledge of the energy sector.						
				<b>Objectives and development goals</b> The objective of the course is to familiarise students with the specific management and economic knowledge of the energy sector. Accordingly, students will be familiarised with the basic economic processes, management and economic evaluation principles and methods across the entire energy sector. By applying a systems approach, students will acquire a combined technical and economic optimisation methodology. In the context of sustainability and responsibility for future generations, the course will focus on basic environmental management principles, simple methods for describing and evaluating the externalities of energy on an economic basis.						
Typical delivery methods				Lecture	For all students, in a large lecture, presentation on a whiteboard, projector or on-line using MS Teams, using a computer network.					
				Seminar	Group work presentations					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> The students have comprehensive knowledge of the different forms of project management and their classification. The students have accurate knowledge of the role of those involved in the project and the possible organizational forms. Know the theoretical background and practical implementation criteria of process groups and knowledge areas. Informed in the context of designing and managing procurement contract strategies. They know the advantages and disadvantages of different financial accounting solutions, the limits of their application. It distinguishes between different forms of project scope management. They have comprehensive knowledge of project scheduling management. Know the permitting and additional phases of projects. It provides an overview of possible forms and management options for project financing. Are aware of the potential risks that can be identified and addressed.						
				<b>Ability</b> Explore the different forms of project management and their classification. Define the role of those involved in the project and the possible organizational forms. Apply the theoretical background and practical implementation criteria of process groups and knowledge areas. Prioritize the circumstances in which procurement contract strategies are developed and managed. Select the advantages and disadvantages of different financial settlement solutions, the limits of their application. Evaluate different forms of project scope management. Evaluates the possibilities of project scheduling management and the operation of the implemented solutions. Evaluate the permitting and further phases of projects as well as management options. Explore the possible forms and management possibilities of project financing. Solve the identification of potential risks and treatment options.						
				<b>Attitude</b> Constantly monitor their work, results, and conclusions. Expands your knowledge of energy management and sustainability through continuous learning. Open to the						

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	<p>use of information technology tools. It strives to get to know and routinely use the tools needed for energy management and economic problem-solving. Develops your ability to provide accurate and error-free problem solving, engineering precision, and accuracy. Applies the principles of energy efficiency, sustainability, and environmental awareness in solving energy management tasks. Monitors changes in the social, economic, and political system. They publish their results following their profession's rules. It publishes its opinions and views without offending others.</p> <p><b>Autonomy and responsibility</b> Collaborates with the instructor and fellow students to expand knowledge. Accepts well-founded professional and other critical remarks. In some situations, as part of a team, he/she works with his/her fellow students to solve tasks. With his/her knowledge, he/she makes a responsible, informed decision based on his/her analysis. He/She feels responsible for energy, energy management problems, the sustainable use of the environment, and present and future generations. He/She is committed to the principles and methods of systems thinking and problem-solving.</p>
Short description of subject content	Energy market situation. Changes in the energy mix; Energy use and the energy intensity - sectoral comparison between Hungary and EU countries. Liberalisation in the energy sector. Pro and con of liberalisation; Political, economic, social, environmental and corporate challenges of the global energy crisis. Process and resource requirements of corporate management. Concept of corporate resources, main categories; Key challenges and problem areas of corporate energy management; Investment. The main methods of calculating investment economics; Methodological specificities of evaluating energy investments; Cost and capital efficiency of resources. Cost management. Classification of costs, cost functions; Calculation of margins - the turning point of profitability and profitability.
Types of student activity	Processing heard text with notes 60% Task-based organisation of information 10% Independent processing of tasks 30%.
Required reading and resources	<ul style="list-style-type: none"> <li>• Materials on MOODLE</li> <li>• Guide to Energy Management, Eighth Edition 8th Edition by Barney L. Capehart Ph.D. CEM, Wayne C. Turner Ph.D. PE CEM, River Publishers, 2016, ISBN-13 978-1498759335</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Wayne C. Turner, Steve Doty, Energy management, handbook, sixth edition, Distributed by Taylor &amp; Francis Ltd., 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487, USA</li> <li>• Craig B. Smith, Kelly E. Parmenter, Energy Management Principles - Applications, Benefits, Savings, Published 2016 Elsevier, ISBN 978-0-12-802506-2</li> </ul>
Assignments	1 essay to be submitted on a topic of your choice
Description and schedule of exams	According to the general role of the University
Framework and rules for the use of artificial intelligence	It is prohibited to use the AI in tests and examinations, by highly suggested to prepare one of the seminar presentations with using AI, the student can select at least one presentation from the Chinese literature using AI's ability in translating Chinese text to Hungarian.

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### Renewable energy

Subject name		In Hungarian		Megújuló energiaforrások			Level	BSc		
		In English		Renewable Energy			Code	DUEN-MGT-115 DUEL-MGT-115		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				DUEN(L)-MUT-250 Heat and Fluid Dynamics						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	M	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name			Róbert Sánta, PhD		position	professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is to introduce the students to the level renewable energy utilization (passive solar, solar collector, PV, heat pump, biomass boiler), their indicators, operation and system integration to the buildings' energy systems. The aim of the course is also to describe the different system designs and the possible interconnection of different energy utilization devices.						
				<b>Objectives and development goals</b> The main aim of the course is to strengthen students' competencies in the management and design of renewable energy systems. Students gain an understanding of renewable energy sources (wind, solar, hydro, geothermal energy, and biomass) as alternatives to fossil fuels, contributing to greenhouse gas emission reduction, diversification of energy supply, and reduced dependence on volatile fossil fuel markets, particularly oil and gas. A further objective is to familiarise students with technologies that convert renewable energy into secondary energy carriers (fuels, heat, electricity), along with their application limits. During the course, students learn the requirements of renewable energy systems, modern design principles, and basic design and sizing methods. They also acquire knowledge of system control, energy performance evaluation, operation, and optimisation.						
Typical delivery methods				Lecture	For all students, in a large lecture, presentation on a whiteboard, projector or on-line using MS Teams, using a computer network.					
				Seminar	Group work presentations					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Has both theoretical and practical knowledge relevant to the subject area.						
				<b>Ability</b> Capable of carrying out tasks related to the subject area.						
				<b>Attitude</b> Demonstrates a developing attitude towards solving engineering problems.						
				<b>Autonomy and responsibility</b> Assumes responsibility for their work.						
Short description of subject content				The aim of the course is to introduce the students to the technologies utilizing renewable energy sources (solar, water, wind, biomass, geothermal) and converting them into secondary energy carriers (fuel, heat, electricity), their possibilities and application limitations. In addition to the technical solutions, the students will get acquainted with the optimal selection and design process of renewable energy supply systems, as well as their operational aspects. In addition to energy production, the issues of integration into the system and energy storage will also be emphasized.						
Types of student activity				Processing of spoken material with note-taking 50% Guided structuring of information through tasks 30% Independent completion of tasks 20%						
Required reading and resources				<ul style="list-style-type: none"> <li>• <a href="https://energy.ec.europa.eu/system/files/2020-01/hu_final_necp_main_hu_0.pdf">https://energy.ec.europa.eu/system/files/2020-01/hu_final_necp_main_hu_0.pdf</a></li> <li>• Materials on MOODLE</li> </ul>						

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	<ul style="list-style-type: none"> <li>• Planning and Installing Photovoltaic Systems: A Guide for Installers, Architects and Engineers, Deutsche Gesellschaft für Sonnenenergie, Earthscan, 2005, ISBN: 978-1-84407-442-6</li> <li>• Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects and Engineers. Deutsche Gesellschaft für Sonnenenergie, Earthscan, 2008, ISBN-13: 978-1844077601</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Duffie- Beckman: Solar Engineering of Thermal Processes, 4th edition, John Wiley and Sons Inc., New Jersey, 2013, ISBN: 978-0-470-87366-3</li> </ul>
Assignments	As explained during the first session.
Description and schedule of exams	As explained during the first session.
Framework and rules for the use of artificial intelligence	<p>In this course, the use of artificial intelligence tools is partially permitted. Students may employ AI-based tools (e.g. literature synthesis, concept generation, data interpretation) in the context of in-class activities, assignments, and project work, provided that the use is explicitly documented and complemented by the student's own professional analysis and critical reflection.</p> <p>The use of AI is not permitted in assessments intended to evaluate individual performance (e.g. quizzes, examinations, calculation-based tasks), where the objective is to assess independent engineering reasoning and analytical competence.</p> <p>In project-based tasks, AI may be applied as a design-support tool (e.g. comparison of energy alternatives, exploration of conceptual solutions). However, all final technical calculations, evaluations, and conclusions must be produced and defended independently by the student.</p>

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**Basics of energy saving and conservation**

Subject name		In Hungarian		Gazdaságos energiateljesítés alapjai			Level	BSc		
		In English		Basics of energy saving and conservation			Code	DUEN-MGT-153 DUEL-MGT-153		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name			Andre Kiss, PhD		position	college professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> To introduce students to the field of energy management and to familiarise them with the operation, use and development of the necessary high-efficiency and safe equipment.						
				<b>Objectives and development goals</b> This subject is part of Green Energy sub course based by the knowledge received by the student in Environmental Protection and Energy Usage. This discipline is one of the subjects of the Final Examination. In this course the problems dealt are very much practical, closely related to the industry.						
Typical delivery methods				Lecture	For all students in a large lecture hall with a projector presentation.					
				Seminar	Supervised and independent solution of numerical examples and case studies in the form of small-scale exercises.					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Have a comprehensive knowledge of the basic facts, directions and limits of the subject area of engineering. Knowledge of the general and specific rules, contexts and procedures necessary for the operation of the field of engineering. Knowledge of the terminology, key concepts and theories related to the field. Comprehensive knowledge of the main theories in the field of knowledge acquisition and problem-solving methods. Basic knowledge of machine design principles and methods, control procedures and operational processes. Has an applied knowledge of measurement procedures, their tools, instruments and measuring equipment used in mechanical engineering. Understand, characterise and model the structure and operation of the structural units and elements of mechanical systems, the design and interrelationship of the system components used.						
				<b>Ability</b> The ability to analyse at a basic level the disciplines that make up the knowledge base of the technical field, to synthesise relationships and to make appropriate evaluations. Ability to apply the most important terminologies, theories and procedures of the technical discipline in the performance of related tasks. Ability to plan, organise and conduct independent learning. Ability to identify routine technical problems and to apply the principles and techniques needed to solve them to identify, formulate and implement (standard operations in practice) (using standard procedures).						
				<b>Attitude</b> It assumes and authentically represents the social role of its profession and its fundamental relationship with the world. Open to learning about, accepting and authentically communicating professional and technological developments and innovations in the field of engineering. Seeks to solve problems, preferably in cooperation with others. Have the stamina and tolerance of monotony to carry out practical activities. Applies his/her acquired technical knowledge to gain a thorough understanding of observable phenomena, to describe and explain their laws. In his/her work, he/she observes and complies with the relevant safety, health, environmental, quality assurance and control requirements.						
				<b>Autonomy and responsibility</b> In unexpected decision situations, he/she independently thinks through and develops comprehensive, substantiating professional questions based on given						

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	sources. In the performance of his/her professional duties, he/she will also cooperate with qualified professionals from other disciplines (primarily technical, economic and legal). He/she will share his/her experience with his/her colleagues to support their development. Assumes responsibility for the consequences of his/her technical analyses, the resulting proposals and the decisions taken.
Short description of subject content	<p>Introduction to energy management. Areas of energy and energy management. Overview of the world energy economy, main trends and macro-relationships. Overview of national energy management in Hungary. National energy structure and energy balance. Main energy needs of each economic sector. Energy demand and energy use of the population.</p> <p>Energy carriers and sources I: Energy carriers and energy sources of our planet. Exhaustible, renewable and renewable resources. Physical and chemical properties of different energy carriers. Extraction, transport and storage of energy carriers. Fossil fuels. Coal, oil, natural gas.</p> <p>Energy carriers and resources II: Exhaustible energy sources: nuclear energy. Renewable energy sources: solar, wind, hydro and geothermal, biomass, biogas. Waste-to-energy options. Conversion processes of energy carriers: combustion, combustion products.</p> <p>Energy conversion I. Thermal energy: stove, convector, hot water boiler, steam boiler. Electricity: thermal power plants, gas engines, gas and steam turbines, steam cycles, condensing power plants, combined cycle power plants.</p> <p>Treatment, storage, disposal and use of pollutants. Remediation, maintenance. Energy transport. Storage facilities. Water, gas, hot water, steam and electricity networks. Energy use I. Meeting heat demand, heating and hot water supply.</p> <p>Energy use in industrial processes. Electricity and heat consumption. Energy requirements of agriculture, transport and services. Ways of meeting demand. Legal environment, strategic approach. Legal environment of energy supply, laws and regulations. Corporate energy management. Tasks of the energy manager.</p> <p>Strategic approach. Energy management. Systematic description of energy use. Understanding of system and system boundary. Mass and energy balances. Effectiveness and efficiency.</p> <p>Energy use II . Nature of use, performance and duration diagram. Estimation of expected consumption. Optimal control, monitoring of consumption, equipment operating in parallel. Energy storage options, storage. Energy use in residential, government, industry and agriculture. The energy mix.</p> <p>Energy use III Transport of energy carriers. Transport planning. Optimal means and routes of transport. Recovery of losses. Safety considerations. Environmental constraints, emissions of pollutants during energy use</p> <p>Energy use IV . Description of energy conversion and consumption processes. Balance equations: mass, energy and waste balance. Identification of losses.</p>
Types of student activity	<p>Processing of lectures with notes 40%</p> <p>Independent processing of theoretical material 20%,</p> <p>Preparation of a seminar presentation 40%</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Endre Kiss: The Basics of Economical Energy Use, Electronic handbook, 2023, Moodle system</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Y. Mizuta: Energy Saving Technology kézikönyv, JICA-DEED kiadásában, 2003</li> </ul>
Assignments	<p>Full-time: student seminar presentations</p> <p>Part-time: student seminar presentations</p>
Description and schedule of exams	According to the general rules of the University of Dunaújváros
Framework and rules for the use of artificial intelligence	The usage of artificial intelligence is suggested in preparing seminar presentations by the students, using the special ability of translating foreign language test, especially Chinese language materials in the field of economical use of energy.

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**Sustainable Finance and Bigtech Companies in Finance**

Subject name	In Hungarian	Fenntartható pénzügyek és a FinTech cégek				Level	BSc			
	In English	Sustainable Finance and Bigtech Companies in Finance				Code	DUEN-TGT-252 DUEL-TGT-252			
2025/2026 II.										
Responsible educational unit		Institute for Social Sciences, Department of Economics and Management								
Compulsory prerequisite subject:		-								
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time		Per week	2	Per week	1	Per week	0	E	5	english
Part time		Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:		name		Dr. Péter Novoszáth			position	college professor		
Course objectives and justification (content, learning outcomes, place in curriculum)		<b>Short-term objective</b> Through the development of financial instruments, the aim is to understand the financial instruments, opportunities, and solution methods that support ESG objectives promoting sustainable development. The course also aims to provide knowledge of financial investments and to understand the significance and development path of FinTech companies.								
		<b>Objectives and development goals</b> -								
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.							
		Lab	-							
		Other	-							
Requirements (in learning outcomes)		<b>Knowledge</b> Knows sustainable financial instruments. Is able to apply sustainable financial instruments in personal and workplace decision-making.								
		<b>Ability</b> Able to distinguish between different sustainable financial instruments. Able to make proposals and develop alternatives in personal and workplace financial decisions. Able to plan, organize, and carry out independent learning. Able to apply acquired knowledge to solving professional tasks in their field.								
		<b>Attitude</b> Open to learning about, accepting, and authentically communicating developments and innovations in the financial sector. Interested in new methods and tools related to the professional field. Strives to gain a thorough understanding of observable phenomena and to describe and explain their underlying regularities using acquired financial knowledge.								
		<b>Autonomy and responsibility</b> Cooperates with qualified professionals from other fields (primarily economics and law) in performing professional tasks. Takes responsibility for the consequences of financial analyses, proposals formulated on their basis, and the decisions made.								
		Types of financial instruments Financial aspects of sustainable development Characteristics of sustainable financial instruments in Hungary and abroad Possible future financial instruments Definition, characteristics, and operation of FinTech companies								
Types of student activity		Lecture: <ul style="list-style-type: none"> <li>• Processing heard material through note-taking: 60%</li> <li>• Independent processing of theoretical material: 30%</li> <li>• Independent research work: 10%</li> </ul> Laboratory: <ul style="list-style-type: none"> <li>• Processing heard material through note-taking: 10%</li> <li>• Independent preparation for laboratory measurement: 20%</li> <li>• Active participation in laboratory measurement: 70%</li> </ul>								

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Required reading and resources	<ul style="list-style-type: none"> <li>• Mathur, S. (2024): Sustainable Finance: Financing, Impact and Value Creation, School of business Management, Mumbai, 244 pp., Download: <a href="https://sbm.nmims.edu/docs/2024/Sustainable-Finance.pdf">https://sbm.nmims.edu/docs/2024/Sustainable-Finance.pdf</a></li> <li>• Raymond M. – et al (2025): FinTech and Sustainable Finance: Impact of Digital Finance in Promoting Green investments, ResearchGate,</li> <li>• Feyen E – Natarajan H. – Saal M.: Fintech and the Future of Finance, World Bank Group, 171 pp- egyes fejezetei</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Textbooks, journal articles specified by the instructor</li> </ul>
Assignments	<p>Homeworks related to theoretical and practical material Oral exam on accounting concepts</p>
Description and schedule of exams	<p>Three written tests during the semester.</p> <ul style="list-style-type: none"> <li>• 1st test: 30 points (practice)</li> <li>• 2nd test: 35 points (practice)</li> <li>• 3rd test 35 points (from lecture materials)</li> </ul> <p>The total number of points available in the three midterm exams is 100 points.</p>
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is partially permitted:</p> <ul style="list-style-type: none"> <li>• during class work, for data collection and information gathering for assignments</li> <li>• for data collection for certain HF assignments</li> <li>• during preparation for ZH</li> </ul> <p>The use of any AI tools is prohibited during knowledge assessment and closed book exams.</p>

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**Practical application of renewable energy sources**

Subject name	In Hungarian	Megújuló energiaforrások projektfeladat					Level	BSc		
	In English	Practical application of renewable energy sources					Code	DUEN-MGT-215 DUEL-MGT-215		
2025/2026 II.										
Responsible educational unit		Institute of Engineering Sciences, Department of Mechanical and Energetic								
Compulsory prerequisite subject:		-								
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/39	Per week	0	Per week	0	Per week	3	E	5	english
Part time	15015	Per semester	0	Per semester	0	Per semester	15			
Person responsible for the subject:		name		Éva Kovács-Bokor, PhD			position	assistant professor		
Course objectives and justification (content, learning outcomes, place in curriculum)		<b>Short-term objective</b> The objective of the course is to familiarise the student with the different types of renewable energy sources and the basic design and measurement procedures related to them.								
		<b>Objectives and development goals</b> The goal of the subject is the foundation of the final thesis connected to the Green Energy Sub course through projects of renewable energy sources. The students learn how to make literature study, presentations and preparation of final thesis.								
Typical delivery methods		Lecture	For all students in a lecture room with projector or on-line using MS Teams.							
		Seminar	-							
		Lab	Laboratory exercises with renewable energy modelling							
		Other	-							
Requirements (in learning outcomes)		<b>Knowledge</b> The student will learn about fossil and renewable energy sources; The student will understand what it means to balance needs and environmental opportunities; The student will recognise the links between natural resources and the economy-society.								
		<b>Ability</b> The student is able to consider environmental or social, economic energy choices and their consequences through examples. The student will be able to explore the systemic links between nature, his/her own life and that of his/her environment.								
		<b>Attitude</b> By the end of the course, the student will be committed to using greener energy sources, to preserving environmental values and to using energy in an environmentally responsible way. The student will take responsibility for the preservation of his/her own activities and the natural environment, and for cooperating with his/her social environment								
		<b>Autonomy and responsibility</b> Decides independently, and take responsibility								
Short description of subject content		Grouping of energy sources, Hungary's and the EU's energy strategy, presentation of energy mixes. Solar energy - solar panels, Solar energy - solar collectors. Wind energy on land and at sea. Marine and river hydropower. Use of geothermal energy. Biomass - biofuels. Biomass fuels. Nuclear and fusion energy utilisation. Hydrogen as a new fuel, fuel cells. New propulsion methods in the automotive industry. Passive house design.								
Types of student activity		Presentation: Processing of lectures with notes 40%, Independent processing of theoretical material 20%, Preparation of laboratory measurements, preparation of measurement report 40%.								
Required reading and resources		<ul style="list-style-type: none"> <li>The Renewable Energy Sources in the Service of Green Energy note, Moodle,</li> <li>Dr. Éva Kovács-Bokor : Renewable Energy Sources note, Moodle,</li> <li>Károly Reményi: Renewable Energies, Akadémiai Kiadó, Budapest, 2007</li> </ul>								
Recommended reading and resources		<ul style="list-style-type: none"> <li>Reményi Károly: Energetics, CO2 warming, - The carbon cycle is life, Akadémiai Kiadó, Budapest, 2010</li> </ul>								

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Assignments	Full-time students: there are 6 2-hour assessment exercises during the semester. Students will take a report of each measurement exercise and will be graded on the basis of the measurement results. Part time students: During the semester, there is a total
Description and schedule of exams	During the semester period, in weeks 7 and 13, a total of 2 independent project papers/ case studies on topics of your choice related to renewable energy sources, 8-15 pages in length, illustrated with diagrams, charts and photos of the material presented
Framework and rules for the use of artificial intelligence	The usage of Artificial Intelligence is allowed in making student presentations from literature, preferably from Chinese translation using the translation activity of AI.. In test written in lecture, the usage of AI is banned.

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**Novel techniques of environmental protection**

Subject name		In Hungarian		Új környezetvédelmi technikák			Level	BSc		
		In English		Novel Techniques of Environmental Protection			Code	DUEN-MGT-216 DUEL-MGT-216		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
,Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	E	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name			Endre Kiss, PhD		position	college professor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Introduce students to the latest environmental techniques and their application, e.g. For all students in a large lecture hall with a blackboard presentation. Use of projector. recycling of used lithium batteries.						
				<b>Objectives and development goals</b> The Novel Techniques of Environmental Protection is part of the Green Specialization in Course of Mechanical Engineering and deals with the knowledge above normal environmental protection. The subjects of the course are the new, modern environmental techniques. The application of those new techniques can help the student after graduation to develop own technologies for the company hiring them.						
Typical delivery methods				Lecture	For all students in a large lecture hall with a presentation using projector.					
				Seminar	-					
				Lab	Measurement in laboratory in pairs					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Knowledge of the general and specific rules, contexts and procedures for the operation of the technical field. Familiarity with the terminology, the main contexts and theories related to the field. Comprehensive knowledge of the main theories of the field in terms of knowledge acquisition and problem solving methods of problem solving. Basic knowledge of machine design principles and methods, control procedures and operational processes. Has an applied knowledge of measurement procedures, their tools, instruments and measuring equipment used in mechanical engineering. Understand, characterise and model the structure and operation of the structural units and elements of mechanical systems, the design and interrelationship of the system components used.						
				<b>Ability</b> Ability to apply the most important terminology, theories and procedures of the technical field in the performance of related tasks. Ability to plan, organise and conduct independent learning. Ability to identify routine technical problems and to apply the necessary principles and techniques to solve them to identify, formulate and implement (standard operations in practice) (using standard procedures).						
				<b>Attitude</b> It is open to learning about, embracing and authentically communicating professional, technological development and innovation in engineering. Seeks to solve problems, preferably in cooperation with others. Have the stamina and tolerance of monotony to carry out practical activities. Applies his/her acquired technical knowledge to gain a thorough understanding of observable phenomena, to describe and explain their laws. In his/her work, he/she observes and complies with the relevant safety, health, environmental, quality assurance and control requirements.						
				<b>Autonomy and responsibility</b> In carrying out his/her professional duties, he/she will also cooperate with qualified professionals in other fields (primarily technical, economic and legal). He/she shares his/her experience with his/her colleagues, thus contributing to their						

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	development. He/she is responsible for the consequences of his/her technical analyses, the proposals he/she makes and the decisions he/she takes.
Short description of subject content	The expected construction of new types of equipment in line with Chinese emission reduction plans (aimed at developing emission reduction processes and equipment that meet a tenth of the EU limit). Possibilities to improve the efficiency of conventional electrostatic precipitators in coal and other fossil-fired power plants. Electrostatic precipitators with increased efficiency, Bag filters with improved electrostatic charge. Electrostatic cyclones. Venturi high efficiency filters. Design principles for separators using a combination of the above options. Design guidelines. New trends in water treatment. Newer principles and options for biological water purification. Theory and practice of endocrine disruptor removal from water. New noise reduction techniques (interference, new types of attenuation. New methods of odour control, modern methods of odour measurement. Dioxin and PCB abatement. New radioactivity reduction techniques. Processing of red mud, extraction of rare earths and scandium.
Types of student activity	Processing of lectures with notes 40%, Independent processing of theoretical material 20%, Preparation of lab notes 40%
Required reading and resources	<ul style="list-style-type: none"> <li>• Endre Kiss: New environmental techniques, Electronic note, 2023, Moodle system</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Y. Mizuta: Energy New Environmental Technologies Technology Handbook, JICA-DEED publication, 2003</li> <li>• Proceeding Publication of the Wroclaw International World Conference on Electrostatic Discharge Elimination</li> </ul>
Assignments	Full-time: preparation of 5 measurement reports Part-time: 3 measurement reports
Description and schedule of exams	According to the general requirement of University of Dunaújváros
Framework and rules for the use of artificial intelligence	The usage of artificial intelligence is suggested in preparing seminar presentations by the students and forming new lab report of environmental technologies using the special ability of the artificial intelligence of translating foreign language text, especially Chinese language materials in the field of new environmental technologies.

### Basic Principles of Hydrogen Technology

Subject name		In Hungarian		Hidrogéntechnológia kémiai alapjai			Level	BSc		
		In English		Basic Principles of Hydrogen Technology			Code	DUEN-MGT-257 DUEL-MGT-257		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Imre Kovács, PhD		position	associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> During the course, students become familiar with the chemical and physical properties of hydrogen and its compounds, as well as the production of hydrogen under laboratory and industrial conditions, including methods for producing high-purity hydrogen. In addition, students learn about elementary adsorption processes at the solid-gas interface, diffusion through solid materials (metals) and through membranes, and electrochemical processes in materials containing active hydrogen.						
				<b>Objectives and development goals</b> The course provides fundamental chemical and physical knowledge essential for understanding the properties of hydrogen. It establishes the engineering-level foundations for the production, storage, and utilization of hydrogen gas, and introduces the basic safety principles related to the associated processes and operations.						
Typical delivery methods				Lecture	PowerPoint-supported lectures using a projector and board-based explanation.					
				Seminar	Solution of basic calculation problems related to the subject area.					
				Lab	Measurement in laboratory					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> The student possesses theoretical and practical knowledge related to the subject area of the course. The student understands the knowledge required for working with such energy storage materials. The student recognizes the relationships between the resources associated with such chemical materials and the economy and society.						
				<b>Ability</b> Is able to evaluate social, economic, and energy-related decisions and their consequences through practical examples. Is able to identify the systemic relationships between energy, economic, and environmental aspects. Is able to perform tasks related to the subject area of the course.						
				<b>Attitude</b> By the end of the course, the student becomes committed to the application of greener energy sources, including hydrogen, and to the protection of environmental values and environmentally conscious energy use. The student takes responsibility for their own activities, the protection of the natural environment, and cooperation with the social environment. The student develops the appropriate attitude required for solving technical problems.						
				<b>Autonomy and responsibility</b> Takes responsibility for their work.						
Short description of subject content				The course presents the fundamental inorganic and physicochemical principles related to hydrogen. It introduces the physical and chemical properties that are important for the production, storage, and future utilization of hydrogen.						
Types of student activity				Processing of lecture material with note-taking: 50% Guided organization of information through tasks: 20% Independent completion of tasks: 20%						

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	Teacher demonstration experiments: 10%
Required reading and resources	<ul style="list-style-type: none"> <li>• Csepeli-Kovács: Kémia és Anyagismeret jegyzet.</li> <li>• Atkins, Fizikai-kémia I.-II. -III. kötetek</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Szabó-Nyilasi: Szervetlen kémia</li> <li>• H. Erbert: Elektrokémia, MK</li> </ul>
Assignments	Full-time programme: 3 assignments must be submitted during the semester. Part-time programme: 2 assignments must be submitted during the semester.
Description and schedule of exams	As stated during the first class.
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is permitted for certain types of tasks (e.g. in-class work and assignments), but prohibited in other cases (e.g. midterm tests). Within the framework of the course, artificial intelligence may be used for preparing the theoretical part of laboratory reports and for gathering information, provided that it is consistent with the theoretical material presented during the classes.

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**Basics of the circular economy**

Subject name		In Hungarian		Körforgásos gazdaság alapjai				Level	BSc	
		In English		Basics of the circular economy				Code	DUEN-MGT-258 DUEL-MGT-258	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/20	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Petrovickijné, Ildikó Angerer, PhD		position	associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The aim of the course is to familiarize the student with the problems of environmental protection related to waste management, international and national solutions, technical and development opportunities; to learn the specific design tasks of waste recovery and disposal; to learn the methods of recycling waste (e.g. spent solar cells, batteries), by-products.						
				<b>Objectives and development goals</b> The aim of the course is to familiarize the student with the problems of environmental protection related to waste management, international and national solutions, technical and development opportunities; to learn the specific design tasks of waste recovery and disposal; to learn the methods of recycling waste (e.g. spent solar cells, batteries), by-products.						
Typical delivery methods				Lecture		For all students in a large lecture hall or on-line with MS PowerPoint presentation. Use of projector or MS Teams programme.				
				Seminar		For all students in a lecture room with projector or on-line by MS Teams programme.				
				Lab		-				
				Other		-				
Requirements (in learning outcomes)				<b>Knowledge</b> The student will learn about waste management and recycling; The student will understand what it means to balance needs and environmental opportunities; The student will recognise the links between natural resources and the economy-society.						
				<b>Ability</b> The student is able to consider environmental or social, economic energy choices and their consequences through examples; The student is able to explore the systemic relationships between nature, his/her own life and the environment.						
				<b>Attitude</b> By the end of the course, students should be committed to the preservation of environmental values and the environmentally responsible use of energy. The student will take responsibility for the preservation of his/her own activities and the natural environment, and for cooperation with the social environment.						
				<b>Autonomy and responsibility</b> The student can make independent decisions; take responsibility.						
Short description of subject content				The current state of waste management in Hungary and Europe. Basic concepts of waste management. Waste management. Legislation on waste management. Waste Management Plans. Waste collection, treatment, transport, storage. Landfills: design, processes, monitoring, recultivation Energy recovery from waste. Methods and policies for waste prevention and minimisation (IPPC, LCA) Processes and technologies for industrial composting Recycling of spent solar cells and Li-batteries. Management of nuclear industrial waste. Radioactive waste disposal processes and methods.						
Types of student activity				Processing of heard text with notes 40%, Independent processing of theoretical material 20%, Exercise: 40%						
Required reading and resources				<ul style="list-style-type: none"> <li>Endre Kiss: Environmental protection and energy management (electronic note)</li> </ul>						

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	<ul style="list-style-type: none"> <li>• Petrovickijné, Ildikó Angerer Handbook and lecture notes: Moodle system</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Maria-Beatrice Coltelli, Pierfrancesco Morganti: An Introduction to the Circular Economy; Nova Science Publishers, 2021., ISBN 9781536192339</li> </ul>
Assignments	During the semester 2 essays and 2 PowerPoint presentations to be submitted on a topic of your choice.
Description and schedule of exams	<p>As stated in the first lesson. By the end of the study period, 2 mid-year assignments/projects/evening studies must be prepared and submitted in pre-specified elective topics.</p> <p>If the arithmetic average of the scores of the two mid-term assignments/case studies does not reach 51%, the grade can be obtained in a written exam during the exam period according to the score limits specified in the Study and Examination Regulations.</p> <p>The conditions for signing and registering for the exam is: Writing and submitting 2 mid-year independent assignments/theses/case studies in electronic form.</p> <p>During the semester period a total of 2 independent project papers/case studies and 2 PowerPoint presentations of your choice on topics related to Basics of Circular Economy.</p>
Framework and rules for the use of artificial intelligence	<p>In this course, the use of artificial intelligence tools is partially permitted for mid-year assignments, project work, papers, and presentations, primarily as a supplement to and verification of independent work, with appropriate citation and source identification. . Students may employ AI-based tools (e.g. literature synthesis, concept generation, data interpretation) in the context of in-class activities, assignments, and project work, provided that the use is explicitly documented and complemented by the student's own professional analysis and critical reflection.</p> <p>The use of AI is not permitted in assessments intended to evaluate individual performance (e.g. quizzes, examinations, calculation-based tasks), where the objective is to assess independent engineering reasoning and analytical competence.</p> <p>In project-based tasks, AI may be applied as a design-support tool (e.g. comparison of energy alternatives, exploration of conceptual solutions). However, all final technical calculations, evaluations, and conclusions must be produced and defended independently by the student.</p>

## NUCLEAR ENERGY

### Basics of nuclear safety

Subject name		In Hungarian		Nukleáris biztonság alapjai			Level	BSc		
		In English		Basics of nuclear safety			Code	DUEN-MGT-117 DUEL-MGT-117		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name		Alhafadhi Dakhil Mahmood Hasan, PhD		position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The student should know the basics of nuclear safety, including the fundamental issues of safety philosophy, the international and domestic safety requirements resulting from the safety philosophy, and the technical implementation of nuclear safety. Know the system of regulatory regulation of nuclear safety. Know the safety functions of a nuclear power plant and the safety systems that implement them. Know the content of safety reports and the methods of deterministic and probabilistic safety analyses.						
				<b>Objectives and development goals</b> Based on the mechanical engineering knowledge acquired in previous semesters, the student becomes familiar with the safety regulations of special nuclear power equipment and learns the operation and guidelines of individual nuclear regulatory bodies, which the student must put into practice in order to achieve safe operation in the nuclear power plant.						
Typical delivery methods				Lecture	Power point presentation, black/whiteboard presentation					
				Seminar	-					
				Lab	Invited speakers, processing of case studies					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Has a comprehensive knowledge of the basic facts, directions and boundaries of the subject area of the technical field. Has a knowledge of the general and specific mathematical, natural and social science principles, rules, relationships and procedures necessary for the cultivation of the technical field. Has a knowledge of the conceptual system, the most important relationships and theories related to his/her field. Has a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field. Has a comprehensive knowledge of the basic economic, business and legal rules and tools. Has a thorough knowledge of the structural materials used in the field of mechanical engineering, their methods of production and the conditions of their application. Has a basic knowledge of the principles and methods of machine design, machine manufacturing technology, control engineering procedures and operational processes. Has a practical knowledge of the measuring procedures used in mechanical engineering, their tools, instruments and measuring devices. At an applied level, he/she knows the expectations and requirements of the occupational and fire protection, safety technology and occupational health areas related to his/her field of expertise, as well as the relevant environmental protection regulations. He/she has a comprehensive knowledge of the foundations of the logistics, management, environmental protection, quality assurance, information						

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	<p>technology, law and economics fields organically related to the mechanical engineering field, their limits and requirements. He/she has a thorough knowledge of the learning, knowledge acquisition and data collection methods of the mechanical engineering field, their ethical limitations and problem-solving techniques. He/she has knowledge of the methods and tools of corporate economics and cost-benefit analysis based on technical foundations.</p>
	<p><b>Ability</b> Able to perform 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. Able to apply the most important terminologies, theories and procedures of the given technical field when performing the tasks related to them. Able to plan, organize and carry out independent learning. Able to identify routine professional problems, to explore, formulate and solve them (through the practical application of standard operations) the theoretical and practical background necessary for their solution. Able to understand and use the typical literature, computer science and library resources of his/her field. Able to apply the acquired IT knowledge in solving the tasks arising in his/her field. Able to create basic models of technical systems and processes. Able to use his/her knowledge creatively and to manage the resources of his/her workplace effectively. Able to apply and comply with safety, fire protection and hygiene rules and regulations during his/her work. Able to communicate in a professionally adequate manner, orally and in writing, in accordance with his/her field of expertise, in his/her native language and in at least one foreign language. Able to apply the technical specifications related to the operation of mechanical systems, the principles of setting up and operating machines and mechanical equipment, and their economic relationships. Able to manage and control specialized technological production processes, taking into account the elements of quality assurance and quality control. Able to diagnose mechanical failures, select troubleshooting operations, and solve repair technology tasks.</p>
	<p><b>Attitude</b> Assuming and authentically represents the social role of his/her profession and its fundamental relationship to the world. To be open to learning about and accepting professional, technological development and innovation in the technical field, and authentically conveying it. Striving to make his/her self-education a means of achieving his/her professional goals. To make decisions in situations that require a complex approach or unexpected decisions, taking into full consideration the laws and ethical norms. Striving to ensure that his/her self-education in the field of mechanical engineering is continuous and consistent with his/her professional goals. Striving to solve his/her tasks and make management decisions by getting to know the opinions of his/her managed colleagues, preferably in cooperation. To have the perseverance and tolerance for monotony required to perform practical activities. To be open to using IT tools, strives to learn about and apply software belonging to the field of mechanical engineering, and knows and handles 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. By applying his acquired technical knowledge, he strives to gain a thorough understanding of observable phenomena, to describe and explain their laws. In the course of his work, he complies with and ensures compliance with the relevant safety, health, environmental, quality assurance and inspection requirements.</p>
	<p><b>Autonomy and responsibility</b> Even in unexpected decision-making situations, he/she independently considers and develops comprehensive, foundational professional questions based on given sources.</p>

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	<p>To profess responsibly and represent the values of the engineering profession, and openly accepts professionally founded critical comments.</p> <p>In the course of performing his/her professional tasks, he/she also cooperates with qualified specialists from other (primarily technical, economic and legal) fields.</p> <p>To reveal the shortcomings of the applied technologies, the risks of the processes and initiates the taking of measures to reduce them.</p> <p>To monitor closely the legal, technical, technological and administrative changes related to the field.</p> <p>To direct the work of the personnel entrusted to somebody, to supervise the operation of machines and equipment based on the instructions of the workplace manager.</p> <p>To evaluate the efficiency, effectiveness and safety of the work of subordinates.</p> <p>To pay attention to promoting the professional development of the subordinates, managing and assisting their efforts in this direction, and applying the principle of equal access.</p> <p>To share the experiences with his colleagues, thus also helping their development.</p> <p>To take responsibility for the consequences of his technical analyses, the proposals formulated based on them, and the decisions made.V</p>
Short description of subject content	<p>Development of safety philosophy.</p> <p>Fundamentals of modern safety philosophy.</p> <p>Risk and safety.</p> <p>Technical issues of safety philosophy, implementation of defence in depth.</p> <p>International safety requirements. IAEA and EU safety standards.</p> <p>Domestic regulatory requirements,</p> <p>Nuclear Safety Regulations. Safety functions.</p> <p>Safe heat removal from the reactor core.</p> <p>Safe heat removal from the spent fuel pool.</p> <p>Safety systems. Reliability and safety.</p> <p>Verification of design safety, safety reports and safety analyses.</p> <p>Safety management during the operational period, Operating Conditions and Limits.</p>
Types of student activity	<p>Processing heard text by taking notes and recording the material using your own and electronically available notes 80%</p> <p>Developing test questions 20%</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Fundamentals of Nuclear Safety (electronic note, lecturer's note)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• European Utility Requirements</li> <li>• IAEA Safety Standards (Safety Fundamentals, Safety Standards, Safety Guides)</li> </ul>
Assignments	-
Description and schedule of exams	<p>Week 7: Closed paper I</p> <p>Week 12: Closed paper II</p> <p>Week 13: Any closed paper can be substituted</p>
Framework and rules for the use of artificial intelligence	<p>Partial permission: artificial intelligence is allowed for certain types of tasks (e.g. classwork, submitted papers), but prohibited in other cases (e.g. closed-door papers).</p> <p>Within the framework of the subject, artificial intelligence can be used to collect information and to develop individual topics in preparation for the closed-door paper.</p>

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### Basics of Atomenergetics

Subject name		In Hungarian		Atomenergetikai alapismeretek				Level	BSc	
		In English		Basics of Atomenergetics				Code	DUEN-MGT-118 DUEL-MGT-118	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	2	Per week	1	Per week	0	M	5	english
Part time	150/20	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Gábor Pór, PhD		position	research professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> An introductory lecture series that provides the student with a comprehensive overview of the history of nuclear energy, the possible types of nuclear power plants currently in operation and planned for the future, the journey of uranium ore from mining to the cemetery, and trends, as well as an insight into what they will learn in more detail in each subject.						
				<b>Objectives and development goals</b> This course is essentially the foundational subject of the Nuclear Power Plant specialization. It is important that students learn to think in terms of energy needs and learn the place, role, and extent of nuclear energy in the energy mix. They learn the physical foundations of fission and fusion energy release, and the historical development of nuclear power plants. Of course, the main equipment of domestic pressurized water nuclear power plants will be introduced. We will also learn about the ideas for future nuclear power plants.						
Typical delivery methods				Lecture	Accompanied by a projector and short films					
				Seminar	Calculations, tests, drawings					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Has a comprehensive knowledge of the basic facts, directions and boundaries of the subject area of the technical field. Has a knowledge of the general and specific mathematical, natural and social science principles, rules, relationships and procedures necessary for the cultivation of the technical field. Has a knowledge of the conceptual system, the most important relationships and theories related to his/her field. Has a comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices.						
				<b>Ability</b> Able to apply the most important terminologies, theories, and procedures of the given technical field when performing related tasks. Able to identify routine professional problems, explore, formulate, and solve (through the practical application of standard operations) the theoretical and practical background necessary for their solution.						
				<b>Attitude</b> Open to learning about, accepting, and authentically conveying professional, technological development and innovation in the technical field. Strives to solve problems in collaboration with others, if possible.						
				<b>Autonomy and responsibility</b> Even in unexpected decision-making situations, he/she independently considers and develops comprehensive, foundational professional questions based on given sources. He/she responsibly professes and represents the values of the engineering profession, and is open to professionally grounded critical comments. In the course of performing his/her professional tasks, he/she also cooperates with qualified professionals from other fields (primarily technical, as well as economic and legal). He/she reveals the shortcomings of the applied technologies and the risks of the processes and initiates the taking of measures to reduce them.						

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Short description of subject content	History of nuclear reactors. The bomb 1939–1945,-47; The first nuclear pyre. Accidents Nuclear power plant generations. From uranium ore to the graveyard. Safety principles. The entire uranium life cycle Uranium ore mining. Fuel element production. Nuclear power plant use (source: npp.hu). Temporary storage. Reprocessing. Waste management. Final disposal. Reactor physics. Fundamentals of nuclear physics. Criticality (four- and six-factor formula) Pressurized water and boiling water nuclear power plants Small and Modular Reactors. Nuclear power plant generations. VVER: PaksI and PaksII. Fundamentals of fusion power plants
Types of student activity	Processing heard text by taking notes 50% Task-guided organization of information 30% Independent processing of tasks 20%
Required reading and resources	<ul style="list-style-type: none"> <li>• <a href="https://www.standards.doe.gov/standards-documents/1000/1019-bhdbk-1993-v1">https://www.standards.doe.gov/standards-documents/1000/1019-bhdbk-1993-v1</a></li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• <a href="https://world-nuclear.org/information-library/current-and-future-generation/outline-history-of-nuclear-energy">https://world-nuclear.org/information-library/current-and-future-generation/outline-history-of-nuclear-energy</a></li> </ul>
Assignments	Study done with AI
Description and schedule of exams	As stated in the first lesson
Framework and rules for the use of artificial intelligence	The use of artificial intelligence in written assignments is the same as the usual publication citation requirement. So, if the AI wrote the given part of the text, it should be put in quotation marks and referenced as a website. If only the idea comes from the AI, it should be referenced as a source without quotation marks. This also applies to the study, where the use of AI will be recommended.

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**Ensuring the integrity of equipment**

Subject name		In Hungarian		Berendezések integritásának biztosítása			Level	BSc		
		In English		Ensuring the integrity of equipment			Code	DUEN-MGT-119 DUEL-MGT-119		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name		Alhafadhi Dakhil Mahmood Hasan, PhD		position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> After mastering the subject material, the student should be able to plan, take measures, and carry out the maintenance and inspection activities necessary to optimize the operating time of the nuclear power plant or its system/equipment, taking into account the reliability of the operation and maintenance of the nuclear power plant, the economy of the production process, and other (quality, safety, environmental) aspects.						
				<b>Objectives and development goals</b> -						
Typical delivery methods				Lecture	PowerPoint presentation, black/whiteboard presentation					
				Seminar	-					
				Lab	Outside practise in Maintenance and Practise Centre in Paks					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Has a comprehensive knowledge of the basic facts, directions and boundaries of the subject area of the technical field. Has a knowledge of the conceptual system, the most important relationships and theories related to his/her field. Has a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field. Has a comprehensive knowledge of the basic economic, business and legal rules and tools. Has a thorough knowledge of the structural materials used in the field of mechanical engineering, their production methods and the conditions of their application. Has a basic knowledge of the principles and methods of machine design, machine manufacturing technology, control engineering procedures and operating processes. Has a comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices. Has a practical knowledge of the measuring procedures used in mechanical engineering, their tools, instruments and measuring devices. At an applied level, he/she knows the expectations and requirements of the fields of work and fire protection, safety technology and occupational health related to his/her field, as well as the relevant regulations of environmental protection. He/she has a comprehensive knowledge of the foundations of the fields of logistics, management, environmental protection, quality assurance, information technology, law and economics organically related to the field of mechanical engineering, their limits and requirements. He/she has a thorough knowledge of the methods of learning, knowledge acquisition and data collection of the field of mechanical engineering, their ethical limitations and problem-solving techniques. He/she can interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and relationship of the applied system elements. He/she can apply the related calculation and modeling principles and methods of mechanical product, process and technological design.						
				<b>Ability</b>						

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Able to perform 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.

Able to apply the most important terminologies, theories and procedures of the given technical field when performing the tasks related to them. Able to plan, organize and carry out independent learning.

Able to identify routine professional problems, to explore, formulate and solve them (through the practical application of standard operations) the theoretical and practical background necessary for their solution.

Able to understand and use the typical literature, computer science and library resources of his/her field.

Able to apply the acquired IT knowledge in solving tasks arising in his/her field.

Able to create basic models of technical systems and processes. Able to use his/her knowledge creatively and effectively manage the resources of his/her workplace.

Able to apply and comply with safety, fire protection and hygiene rules and regulations during his/her work. Able to communicate in a professionally adequate manner, orally and in writing, in his/her native language and in at least one foreign language, in accordance with his/her field of expertise.

Able to apply the technical specifications related to the operation of mechanical systems, the principles of setting up and operating machines and mechanical equipment, and their economic relationships.

Able to manage and control specialized technological production processes, keeping in mind the elements of quality assurance and quality control.

Able to diagnose mechanical failures, select troubleshooting operations, and solve repair technology tasks.

**Attitude**

To assume and authentically represent the social role of his/her profession and its fundamental relationship to the world.

To be open to learning about and accepting professional, technological development and innovation in the technical field, and authentically conveying it.

To strive to make his/her self-education a means of achieving his/her professional goals.

To make decisions in full consideration of legal regulations and ethical norms, even in situations requiring a complex approach or in unexpected decision-making situations.

To strive to solve problems in cooperation with others, if possible.

To strive to ensure that his/her self-education in the field of mechanical engineering is continuous and consistent with his/her professional goals.

To strive to ensure that his/her tasks and management decisions are solved by learning about the opinions of his/her managed colleagues, if possible in cooperation.

To have the necessary perseverance and tolerance for monotony to perform practical activities.

Open to the use of IT tools, strives to learn and apply software belonging to the field of mechanical engineering, knows and handles at least one such program at a proficiency level.

Open and receptive to the application of new, modern and innovative procedures and methods related to ecological farming and health awareness. Using the technical knowledge acquired, strives to learn as thoroughly as possible about observable phenomena, describe and explain their laws.

During his work, he complies with and ensures compliance with the relevant safety, health protection, environmental protection, quality assurance and inspection requirements.

**Autonomy and responsibility**

Even in unexpected decision-making situations, he/she independently considers comprehensive, foundational professional questions and develops them based on given sources.

To responsibly acknowledge and represent the values of the engineering profession, and is open to professionally founded critical comments.

In the course of performing the professional tasks, also to cooperate with qualified specialists from other (primarily technical, economic and legal) fields.

To reveal the shortcomings of the applied technologies, the risks of the processes and initiates the taking of measures to reduce t

Closely to monitor the legislative, technical, technological and administrative changes related to the field.

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	<p>To pay attention to promoting the professional development, managing and assisting such efforts, and applying the principle of equal access.</p> <p>To share experiences with his/her colleagues, thus also helping their development.</p> <p>To assume responsibility for the consequences of the technical analyses, the proposals formulated on the basis of them and the decisions made.</p>
Short description of subject content	<p>The concept of functional and structural integrity, a coherent system for ensuring them. Their role in safety and availability. Tools: maintenance, supervision, inspection and testing. Aging processes and effects, aging management. Maintenance objectives and systems. Modern maintenance strategies and techniques (condition-dependent, reliability-centered, taking into account risk aspects). Maintenance optimization.</p> <p>Objectives and systems of periodic inspection. Elements of effective periodic inspection (performance, risk aspects). The role of non-destructive testing in periodic inspection. Qualification of inspection systems</p>
Types of student activity	<p>Processing heard text by taking notes and recording the material using your own and electronically available notes 80%</p> <p>Developing test questions 20%</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Lecture notes Nuclear Power Plant Safety II. (eds.: Elter J., Gadó J., Holló E., Lux I.), ELTE Eötvös Kiadó, Budapest, 2013</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Gábor Pór: Basic knowledge of nuclear power engineering textbook, in Moodle system</li> </ul>
Assignments	-
Description and schedule of exams	<p>Week 7: Closed paper I</p> <p>Week 12: Closed paper II</p> <p>Week 13: Any closed paper can be substituted</p>
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is prohibited in closed and oral situations, but other aids are also prohibited.

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### Equipments of Nuclear Power Plants

Subject name		In Hungarian		Atomerőművek berendezései			Level	BSc		
		In English		Equipments of Nuclear Power Plants			Code	DUEN-MGT-152 DUEL-MGT-152		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	M	5	english
Part time	150/15	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Alhafadhi Dakhil Mahmood Hasan, PhD		position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Within the framework of the course, the student becomes familiar with the main types of nuclear power plants, as well as the major energy-producing, cooling, and safety devices and systems operating in a nuclear power plant. By completing the course, the student possesses the knowledge of the operating principles and material qualities of the equipment.						
				<b>Objectives and development goals</b> Based on the student's prior knowledge of structural materials, they expand their understanding of the operation of equipment used in the nuclear energy sector, the types of materials suitable for their manufacture and potential alternatives, and also learn about the complex operating principles and development history of nuclear power plants.						
Typical delivery methods				Lecture	PowerPoint presentation, black/whiteboard presentation					
				Seminar	Outside practise in Maintenance and Practise Centre in Paks					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> To have extensive theoretical and practical preparation, as well as methodological and practical knowledge for the design, establishment, modelling, operation, and management of complex energy conversion, supply, and usage systems and processes. To be familiar with the process and methodology of energy management and energy planning. To know the main units of the primary and secondary circuits, their functions, and their connection to the system.						
				<b>Ability</b> Able to apply integrated knowledge in the field of energy machines and processes, as well as energy systems and technologies. Capable of preparing, managing, and then operating complex energy systems based on a systems-oriented, process-oriented way of thinking.						
				<b>Attitude</b> To carry out the activities with a systems-oriented and process-oriented mindset in a complex approach, giving priority to sustainability and energy awareness. To strive to contribute to the development of new methods and tools related to the technical field. To be committed to enhancing the energy sector with new knowledge and scientific results. To be dedicated to safe working practices that do not endanger human health or the natural and artificial environment, as well as to health promotion.						
				<b>Autonomy and responsibility</b> Capable of independently solving engineering tasks. Takes responsibility for economy, efficiency, sustainability, human health and safety, as well as environmental awareness. In decision-making, pays attention to environmental protection, quality management, consumer protection, sustainability, the principle and application of equal access, workplace health and safety, technical, economic, and legal regulations, as well as the fundamental requirements of engineering ethics.						

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Short description of subject content	<p>Main topics of the course: I.-III. generation nuclear power plants and their structures Primary circuit main equipment: Reactor vessel and its material grades. Reactor types: pressurized water reactors (PWR), boiling water reactors (BWR), graphite-moderated reactors (RBMK), and their development directions Volume compensator Steam generator and its main material grades Secondary circuit main equipment: Low and high pressure turbines and their material grades Condenser and its material grades Role of the feed water system and its material grades Nuclear power plant cooling. Containment systems. Emergency cooling systems Electrical and instrumentation equipment Operational disturbances, protection against external effects.</p>
Types of student activity	<p>Processing heard text by taking notes and recording the material using your own and electronically available notes 80% Developing test questions 20%</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• University of Technology and Economics (Budapest): Nuclear Power Plants II. (prepared within the framework of the Paks II. Academy), 2019, electronic notes</li> <li>• Gyula Csom: Operation of Nuclear Power Plants, University Press, Budapest, 2005.</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Péter Bihari: Nuclear Power Plants, Budapest, 2002.</li> </ul>
Assignments	-
Description and schedule of exams	<p>Week 7: Closed paper I Week 12: Closed paper II Week 13: Any closed paper can be substituted</p>
Framework and rules for the use of artificial intelligence	<p>Partial permission: artificial intelligence is allowed for certain types of tasks (e.g. classwork, submitted papers), but prohibited in other cases (e.g. closed-door papers). Within the framework of the subject, artificial intelligence can be used to collect information and to develop individual topics in preparation for the closed-door paper.</p>

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**Industrial knowledge**

Subject name		In Hungarian		Üzemtani ismeretek			Level	BSc		
		In English		Industrial knowledge			Code	DUEN-MGT-213 DUEL-MGT-213		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	0	Per week	1	M	5	english
Part time	150/15	Per semester	10	Per semester	0	Per semester	5			
Person responsible for the subject:				name		Alhafadhi Dakhil Mahmood Hasan, PhD		position	assistant professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The student should understand the fundamental reactor physics and thermohydraulic processes occurring in the reactor core. They should be aware of the factors affecting reactivity. They should recognize the relationships between the behavior of technological systems and the core. They should be able to assess, in the case of a mechanical system, its role in the safety of the core. They should have an understanding of how design and safety analysis are linked through an iterative process.						
				<b>Objectives and development goals</b> Building on the mechanical engineering and materials science knowledge acquired during the BSc program, the student gains knowledge of nuclear power plants, both through understanding their structural components and the operation processes. By the end of the course, they will know and be able to use the knowledge required for operation, decide whether the given feedbacks still allow safe operation or whether intervention is necessary, and if so, at what level and where intervention is needed.						
Typical delivery methods				Lecture	PowerPoint presentation, black/whiteboard presentation					
				Seminar	-					
				Lab	Outside practise in Maintenance and Practise Centre					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> Has a comprehensive understanding of the fundamental facts, directions, and boundaries of the technical field. Knows the general and specific mathematical, natural, and social science principles, rules, relationships, and procedures necessary for practicing the technical field. Understands the terminology of their field, the most important relationships, and theories. Has a thorough knowledge of the methods of acquiring knowledge and problem-solving for the main theories in their field. Has an in-depth understanding of structural materials used in the mechanical engineering field, their production methods, and the conditions for their application. Has a basic knowledge of machine design principles and methods, manufacturing technology, control engineering procedures, and operational processes. Is familiar at an application level with measurement procedures used in mechanical engineering, as well as their tools, instruments, and measuring devices. At the user level, they are familiar with the expectations and requirements related to occupational safety, fire protection, security technology, and occupational health in their field, as well as the relevant environmental regulations. They are able to interpret, describe, and model the structure and operation of the components and elements of mechanical systems, as well as the design and interaction of the system elements used.						
				<b>Ability</b> Able to perform a basic analysis of the disciplines that make up the body of knowledge in the technical field, to formulate synthetic connections, and to carry out appropriate evaluative activities. Able to apply the most important terminologies, theories, and procedures of the given technical field when executing related tasks. Capable of planning, organizing, and conducting independent learning. Able to identify routine professional problems, explore and articulate the						

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	<p>theoretical and practical background necessary for their resolution, and solve them (using the practical application of standard operations). Able to understand and use the specific professional literature, IT, and library resources of their field. Able to apply the acquired IT knowledge to solve tasks arising in their technical field. Capable of creating basic models of technical systems and processes. Able to use their knowledge creatively to manage workplace resources efficiently.</p> <p>In his/her work, he/she is able to apply and enforce safety, fire protection, and hygiene rules and regulations.</p> <p>He/She is capable of communicating verbally and in writing, in his/her native language and at least one foreign language, in a manner that is professionally appropriate for his/her field.</p> <p>He/She can apply technical regulations related to the operation of mechanical systems, as well as the principles of setting up and operating machines and mechanical equipment and understand the economic aspects.</p> <p>He/She is able to manage and monitor specialized technological manufacturing processes, keeping in mind the elements of quality assurance and quality control.</p> <p>He/She is capable of diagnosing mechanical malfunctions, selecting corrective actions, and solving repair technology tasks.</p>
	<p><b>Attitude</b></p> <p>He/She assumes and authentically represents the social role of his/her profession, as well as its fundamental relationship to the world. He/She is open to learning about and accepting professional, technological developments and innovations in the technical field, and to conveying them authentically. He/She strives to make self-education a tool for achieving his/her professional goals. Even in complex situations requiring thorough consideration or unexpected decision-making scenarios, he/she makes decisions fully taking into account laws and ethical standards. He/She aims to solve problems cooperatively with others whenever possible. He/She strives to ensure that self-education in the field of mechanical engineering is continuous and aligns with professional goals. He/She possesses the perseverance and tolerance for monotony necessary to carry out practical activities. He/She is open to using information technology tools, seeks to learn and apply software related to the field of mechanical engineering, and is proficient in at least one such program.</p> <p>In his work, he complies with and enforces the relevant safety, health, environmental, quality assurance, and control requirements.</p>
	<p><b>Autonomy and responsibility</b></p> <p>Takes responsibility for their work.</p> <p>Independently handles comprehensive and well-founded professional issues and develops them based on given resources, even in unexpected decision-making situations.</p> <p>Responsibly adheres to and represents the values of the engineering profession and receptively accepts professionally substantiated critical feedback.</p> <p>During the execution of professional tasks, collaborates with professionals from other fields (primarily technical, as well as economic and legal).</p> <p>Identifies deficiencies in the applied technologies, assesses the risks of processes, and initiates measures to mitigate them.</p> <p>Monitors legal, technical, technological, and administrative changes related to the field.</p> <p>Under the guidance of their workplace supervisor, directs the work of the personnel entrusted to them and supervises the operation of machines and equipment.</p> <p>He shares his experiences with his colleagues, thereby helping their development.</p> <p>He takes responsibility for his technical analyses, the proposals formulated based on them, and the consequences of the decisions made.</p>
Short description of subject content	<p>Radiation attenuation, NAA. Basic concepts of reactor physics: transport equation, diffusion approximation, cross section, neutron spectrum, reactivity coefficients. Moderation. Inherent safety. Reactor physics framework parameters and their derivation. Fuel assembly design. Zone thermo-hydraulics: heat conduction from fuel to moderator, DNBR. RIA analysis procedures. Fuel behavior. Relationship between framework parameters—safety analyses—technical design. Operation: reactor control modes, rod, boric acid, steam generator, Xe process. In-core, ex-core measurements.</p>
Types of student activity	<p>Processing of heard text with note-taking and recording the material using one's own and electronically available notes 40%</p> <p>Completion of the semester assignment 40%</p> <p>Solving test tasks 20%</p>

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Required reading and resources	<ul style="list-style-type: none"> <li>• Csom Gyula: Atomerőművek üzemtana I. – A reaktorfizika és -technika alapjai (Műegyetemi Kiadó, Budapest, 1997)</li> <li>• Csom Gyula: Atomerőművek üzemtana II/1. – Az energetikai atomreaktorok üzemtana (Műegyetemi Kiadó, Budapest, 2005)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Duderstadt, J and Hamilton, L.: Nuclear Reactor Analyses (Wiley, New York, 1976)</li> <li>• Bell, G. I., and Glasstone, S.: Nuclear Reactor Theory (American Nuclear Society, 1970)</li> <li>• G. F. Knoll, Radiation Detection and Measurement, 3rd Edition. (John Wiley &amp; Sons, Inc., 2000).</li> </ul>
Assignments	<p>Semester assignment: Selection of a unit of a nuclear power plant, and providing a summary of its operational tasks, possible malfunctions, and suggested solutions. Length: maximum 10 pages, Times New Roman size 12, line spacing 1.25.</p>
Description and schedule of exams	<p>1 closed-door papers during the semester, on the topic of operational manual knowledge</p>
Framework and rules for the use of artificial intelligence	<p>Partial permission: artificial intelligence is allowed for certain types of tasks (e.g. class work, submitted papers), but prohibited in other cases (e.g. closed-door papers). Within the framework of the subject, artificial intelligence can be used to write the semester assignment and collect information. To develop individual topics when preparing for a closed-door papers.</p>

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### Operation and maintenance practice

Subject name		In Hungarian		Üzemviteli és karbantartási gyakorlat			Level		BSc	
		In English		Operation and Maintenance Practise			Code		DUEN-MGT-214 DUEL-MGT-214	
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons					Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab				
Full time	150/39	Per week	0	Per week	0	Per week	3	M	5	english
Part time	150/15	Per semester	0	Per semester	0	Per semester	15			
Person responsible for the subject:				name		Gábor Ladányi		position		master instructor
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> After completing the internship, the student will gain a deeper and practical understanding of the construction, structure, and operation of a nuclear power plant.						
				<b>Objectives and development goals</b> The student expands the nuclear power plant knowledge acquired in the previous semesters with practice-oriented knowledge, during which the student studies the main primary circuit equipment, including the reactor vessel, the steam generator and the main circulation pump, in a 1:1 ratio, as well as the secondary circuit equipment, including the turbines. By completing the course, the student acquires complex theoretical and practical knowledge about nuclear power plant equipment, its operation and possible failures.						
Typical delivery methods				Lecture		-				
				Seminar		-				
				Lab		Outside practise in Maintenance and Practise Centre				
				Other		-				
Requirements (in learning outcomes)				<b>Knowledge</b> Has a comprehensive knowledge of the basic facts, directions and boundaries of the subject area of the technical field. Has a knowledge of the general and specific mathematical, natural and social science principles, rules, relationships and procedures necessary for the cultivation of the technical field. Has a knowledge of the conceptual system related to his/her field, the most important relationships and theories. Has a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field. Has a thorough knowledge of the structural materials used in the field of mechanical engineering, the methods of their production and the conditions of their application. Has a comprehensive knowledge of the operating principles and structural units of the applied work and power machines, mechanical equipment and devices. Has a knowledge of the measuring procedures used in mechanical engineering, their tools, instruments and measuring devices at an applied level. To have a thorough knowledge of the learning, knowledge acquisition and data collection methods of the mechanical engineering field, their ethical limitations and problem-solving techniques. To interpret, characterize and model the structure and operation of the structural units and elements of mechanical systems, the design and relationship of the applied system elements. To apply the related calculation and modelling principles and methods of mechanical product, process and technology design.						
				<b>Ability</b> Able to perform 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. Able to apply the most important terminologies, theories and procedures of the given technical field when performing the tasks related to them.						

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	<p>Able to identify routine professional problems, to explore, formulate and solve them (through the practical application of standard operations) the theoretical and practical background necessary for their solution.</p> <p>Able to understand and use the literature, computer science and library resources characteristic of his/her field.</p> <p>Able to apply the acquired IT knowledge in solving the tasks arising in his/her field.</p> <p>Able to create basic models of technical systems and processes.</p> <p>Able to apply and enforce safety, fire protection and hygiene rules and regulations during his/her work.</p> <p>Able to communicate in a professionally adequate manner, orally and in writing, in his/her native language and in at least one foreign language, in accordance with his/her field of expertise.</p> <p>Able to apply technical regulations related to the operation of mechanical systems, the principles of setting up and operating machines and mechanical equipment, and their economic relationships.</p> <p>Able to manage and control specialized technological production processes, taking into account the elements of quality assurance and quality control.</p> <p>Able to diagnose mechanical failures, select troubleshooting operations, and solve repair technology tasks.</p> <p><b>Attitude</b></p> <p>To assume and authentically represent the social role of his/her profession and its fundamental relationship to the world.</p> <p>To be open to learning about and accepting professional, technological development and innovation in the technical field, and authentically conveying it.</p> <p>To strive to make his/her self-education a means of achieving his/her professional goals.</p> <p>To make decisions in full consideration of legal regulations and ethical norms, even in situations requiring a complex approach or unexpected decisions.</p> <p>To strive to solve problems in cooperation with others, if possible.</p> <p>To strive to ensure that his/her self-education in the field of mechanical engineering is continuous and consistent with his/her professional goals.</p> <p>To have the perseverance and tolerance for monotony required to perform practical activities.</p> <p>To be open to using IT tools, strives to learn about and apply software belonging to the field of mechanical engineering, and knows and handles at least one such program at a proficiency level.</p> <p>By applying the acquired technical knowledge, he strives to gain a more thorough understanding of observable phenomena, and to describe and explain their laws.</p> <p><b>Autonomy and responsibility</b></p> <p>Even in unexpected decision-making situations, he/she independently considers and develops comprehensive, foundational professional questions based on given sources.</p> <p>To profess responsibly and represent the values of the engineering profession, and is open to professionally founded critical comments.</p> <p>In the course of performing the professional tasks, to cooperate with qualified specialists from other fields (primarily technical, as well as economic and legal).</p> <p>To reveal the shortcomings of the applied technologies, the risks of the processes and initiates the taking of measures to reduce them.</p> <p>To share the experiences with the colleagues, thus also helping their development.</p> <p>To assume responsibility for the consequences of the technical analyses, the proposals formulated based on them and the decisions made.</p>
Short description of subject content	<p>Familiarization with normal operation and design basis accident processes on the full-scale simulator of the Paks Nuclear Power Plant (Paks 1).</p> <p>Familiarization and study of the main equipment of the VVER-440 type pressurized water nuclear power plant at the Paks Maintenance Training Center (Paks 1)</p> <ul style="list-style-type: none"> <li>• Reactor vessel</li> <li>• Steam generator</li> <li>• Main circulation pump</li> <li>• Rotating machines in general</li> <li>• Turbines</li> <li>• Material testing (optional)</li> </ul>
Types of student activity	Practise and Simulation tasks

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Required reading and resources	<ul style="list-style-type: none"> <li>Description of practise lessons (DUE notes)</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>Gyula Csom: Nuclear Power Plant Operation II./1. The Operation of Nuclear Power Reactors, University of Applied Sciences Publishing House, Budapest 2005.</li> </ul>
Assignments	<p>Summary of knowledge acquired in the Maintenance Practice Centre, max. 10 pages, Times New Roman 12 font size, 1.25 line spacing, justified, illustrated summary with figures.</p> <p>Submission deadline: last day of classes of the academic period, sent by email in pdf format</p>
Description and schedule of exams	<p>Week 12: I closed-class paper</p> <p>Week 13: closed-class paper can be made up</p>
Framework and rules for the use of artificial intelligence	<p>Partial permission: artificial intelligence is allowed for certain types of tasks (e.g. classwork, submitted papers), but prohibited in other cases (e.g. closed-door papers).</p> <p>Within the framework of the subject, artificial intelligence can be used to collect information and to develop individual topics in preparation for the closed-door paper.</p>

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**Radiation protection and environmental policy**

Subject name		In Hungarian		Sugárvédelem és környezetpolitika			Level	BSc		
		In English		Radiation protection and environmental policy			Code	DUEN-MGT-255 DUEL-MGT-255		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Mechanical and Energetic						
Compulsory prerequisite subject:				-						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/20	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name		Petrovickijné, Ildikó Angerer, PhD		position	associate professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> The goal of radiation protection and environmental policy is to achieve a balance between utilizing radiation for beneficial purposes, such as medical diagnosis and treatment, industrial applications, and energy generation, while minimizing its potential adverse impacts on human health, the environment, environmental management systems and environmental policy.						
				<b>Objectives and development goals</b> The aim of the course is to familiarize the student with the problems of environmental protection related to achieve a balance between utilizing radiation for beneficial purposes, such as medical diagnosis and treatment, industrial applications, and energy generation, while minimizing its potential adverse impacts on human health, the environment environmental management systems and environmental policy. A series of introductory lectures to give the student an overview of the history of nuclear energy, the types of nuclear power plants.						
Typical delivery methods				Lecture	For all students in a large lecture hall or on-line with MS PowerPoint presentation. Use of projector or MS Teams programme.					
				Seminar	For all students in a lecture room with projector or on-line by MS Teams programme.					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> The student will learn about radiation protection, environmental management systems and environmental policy. The student will understand what it means to balance needs and environmental and nuclear safety opportunities; The student will recognise the links between natural resources and the economy-society. Have a comprehensive knowledge of the basic facts, trends and limits of the subject area of engineering. Knowledge of the general and specific mathematical, scientific and social principles, rules, contexts and procedures necessary for the operation of the technical field. Students know the terminology, key concepts and theories related to your field, have a comprehensive knowledge of the main theories and problem-solving methods in your field. Comprehensive knowledge of basic economic, business and legal rules and tools. Students have a thorough knowledge of the structural materials used in the field of mechanical engineering, the methods of their manufacture and the conditions of their application. Basic knowledge of machine design principles and methods, machine manufacturing technology, control procedures and operating processes. Comprehensive knowledge of the operating principles and structural units of the machinery, power tools, mechanical equipment and tools used. Students know the measuring procedures used in mechanical engineering, their instruments, instruments and measuring equipment, the expectations and requirements of the occupational safety, fire protection, safety and occupational health areas related to his/her field of specialisation, as well as the relevant environmental protection regulations.						

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	<p>Comprehensive knowledge of the basics, limits and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics, which are integrally related to the field of engineering.</p> <p>In-depth knowledge of learning, knowledge acquisition, data collection methods, their ethical limitations and problem-solving techniques in mechanical engineering.</p> <p>Knowledge of the methods and tools of business economics and cost-benefit analysis based on technical principles.</p>
	<p><b>Ability</b></p> <p>Ability to analyse at a basic level the disciplines that make up the knowledge base of the technical field, to formulate synthetically the interrelationships and to make adequate evaluations.</p> <p>Ability to apply the most important terminology, theories and procedures of the technical field in the performance of related tasks.</p> <p>Ability to plan, organise and carry out independent learning.</p> <p>Ability to identify routine professional problems, to identify, formulate and solve them (using standard operations in practice) against a theoretical and practical background.</p> <p>Ability to understand and use literature, computer and library resources specific to their field.</p> <p>The acquired IT knowledge can be applied to the solution of tasks in the field.</p> <p>Ability to build basic models of technical systems and processes.</p> <p>The student is able to consider environmental or social, economic energy choices and their consequences through examples; The student is able to explore the systemic relationships between nature, his/her own life and the environment.</p>
	<p><b>Attitude</b></p> <p>It assumes and authentically represents the social role of its profession and its fundamental relationship with the world.</p> <p>It is open to learning about, embracing and authentically communicating professional, technological development and innovation in engineering.</p> <p>You strive to make your self-training a means to achieve your professional goals.</p> <p>Make decisions in complex or unexpected decision-making situations, taking full account of legal and ethical standards.</p> <p>It tries to solve problems in cooperation with others, where possible.</p> <p>Strive to keep their self-training in mechanical engineering continuous and in line with their professional goals.</p> <p>It strives to solve its tasks and make management decisions by listening to the opinions of the colleagues it manages, preferably in cooperation.</p> <p>You have the stamina and tolerance for monotony needed to carry out practical activities.</p> <p>You are open to the use of IT tools, you strive to learn and use software in the field of mechanical engineering, and you know and use at least one of these programs to a proficient level.</p> <p>Open and receptive to new, modern and innovative practices and methods related to organic farming and health awareness.</p> <p>Using his/her technical knowledge, he/she strives to understand the observable phenomena as thoroughly as possible, to describe and explain their laws.</p> <p>In the course of his/her work, he/she observes and complies with the relevant safety, health, environmental, quality assurance and control requirements. By the end of the course, students should be committed to the preservation of environmental values and the environmentally responsible use of energy. The student will take responsibility for the preservation of his/her own activities and the natural environment, and for cooperation with the social environment.</p>
	<p><b>Autonomy and responsibility</b></p> <p>In unexpected decision situations, he/she independently thinks through and develops comprehensive, substantiating professional questions based on given sources.</p> <p>Responsibly uphold and represent the values of the engineering profession and be open to professionally informed critical comments.</p> <p>In carrying out his/her professional duties, the student will also cooperate with qualified professionals from other fields (primarily technical, economic and legal).</p> <p>Identify the shortcomings of the technologies used, the risks of the processes and initiate measures to reduce them.</p>

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	<p>Monitor legislative, technical, technological and administrative changes in the field.</p> <p>Directs the work of the staff assigned to student, supervises the operation of machinery and equipment, based on the instructions of the workplace manager.</p> <p>Assesses the efficiency, effectiveness and safety of the work of subordinates.</p> <p>The student is attentive to promoting the professional development of his/her subordinates, to managing and supporting their efforts in this direction, and to applying the principle of equal access.</p> <p>The student shares his experience with his colleagues, helping them to develop.</p> <p>The student can make independent decisions; take responsibility.</p>
Short description of subject content	<p>History and basics of radioactivity, Radioactivity and the interaction of different materials, absorption of radiation. Reduction of radiation intensity by different walls, thin film walls. Effects of radiation on the human body, decontamination procedures the evolution of security philosophy. The basics of modern security philosophy. Risk and security. Technical aspects of security philosophy, implementing defence in depth. International security requirements. IAEA and EU security standards. Domestic regulatory requirements, Nuclear Safety Regulations. Safety functions. Safe heat removal from the reactor active zone. Safe heat removal from the spent fuel pool. Safety systems. Reliability and safety. Verification of design safety, safety reports and safety analyses. Safety management during the operating period, Operating Conditions and Limits. Management of nuclear industrial waste. Radioactive waste disposal processes and methods. Basics of the environmental protection, environmental managements systems (ISI 14001 and EMAS) and environmental policy.</p>
Types of student activity	<p>Processing of heard text with notes 40%, Independent processing of theoretical material 20%, Exercise: 40%</p>
Required reading and resources	<ul style="list-style-type: none"> <li>• Endre Kiss: Environmental protection and energy management (electronic note)</li> <li>• Sándor Bisztray-Balku, László Bozóki, László Koblinger: The Development of Radiation Protection in Hungary, Akadémiai Kiadó, 1982</li> <li>• Fundamentals of Nuclear Safety (electronic note, rapporteur's note)</li> <li>• Elter J., Gadó J., Holló E., Lux I. (eds.): Safety of Nuclear Reactors, ELTE Eötvös Kiadó, ISBN 978-963-312-180-1, Budapest, 2013</li> <li>• Petrovickijné, Ildikó Angerer Handbook and lecture notes: Moodle system</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• Martin James E: Physics for radioactivity, Wiley-VCM Verlag GMBH, 2013</li> <li>• Nikjoo Mooshang: Interaction of radiation with Matter Nuclear Safety Regulations Volumes 1-10 and Guides (OAH website)</li> <li>• IAEA Safety Standards (Safety Fundamentals, Safety Standards, Safety Guides, IAEA website)</li> </ul>
Assignments	<p>During the semester 2 essays to be submitted on a topic of your choice.</p>
Description and schedule of exams	<p>As stated in the first lesson. By the end of the study period, 2 mid-year assignments/projects/evening studies must be prepared and submitted in pre-specified elective topics.</p> <p>If the arithmetic average of the scores of the two mid-term assignments/case studies does not reach 51%, the grade can be obtained in a written exam during the exam period according to the score limits specified in the Study and Examination Regulations.</p> <p>The conditions for signing and registering for the exam is: Writing and submitting 2 mid-year independent assignments/theses/case studies in electronic form.</p> <p>During the semester period a total of 2 independent project papers/case studies and 2 PowerPoint presentations of your choice on topics related to radiation protection and environmental policy.</p>
Framework and rules for the use of artificial intelligence	<p>In this course, the use of artificial intelligence tools is partially permitted for mid-year assignments, project work, papers, and presentations, primarily as a supplement to and verification of independent work, with appropriate citation and source identification. . Students may employ AI-based tools (e.g. literature synthesis, concept generation, data interpretation) in the context of in-class activities, assignments, and project work, provided that the use is explicitly</p>

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	<p>documented and complemented by the student's own professional analysis and critical reflection.</p> <p>The use of AI is not permitted in assessments intended to evaluate individual performance (e.g. quizzes, examinations, calculation-based tasks), where the objective is to assess independent engineering reasoning and analytical competence.</p> <p>In project-based tasks, AI may be applied as a design-support tool (e.g. comparison of energy alternatives, exploration of conceptual solutions). However, all final technical calculations, evaluations, and conclusions must be produced and defended independently by the student.</p>
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**NPP measurements and NDT**

Subject name		In Hungarian		Üzemi mérések és anyagvizsgálatok			Level	BSc		
		In English		NPP measurements and NDT			Code	DUEN-MGT-256 DUEL-MGT-256		
2025/2026 II.										
Responsible educational unit				Institute of Engineering Sciences, Department of Structural Integrity						
Compulsory prerequisite subject:				DUEN(L)-MGT-118 Basics of Atomenergetics						
Type		Number of lessons						Requiremen	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/60	Per week	2	Per week	1	Per week	0	E	5	english
Part time	150/20	Per semester	10	Per semester	5	Per semester	0			
Person responsible for the subject:				name			Gábor Pór, PhD	position	research professor	
Course objectives and justification (content, learning outcomes, place in curriculum)				<b>Short-term objective</b> Familiarization with measurements in nuclear power plants.						
				<b>Objectives and development goals</b> The student acquires knowledge of the modern model-based measurement philosophy, which enables the determination of reactor parameters that cannot be measured directly. The student also becomes familiar with the most important nuclear power plant-specific measurement chains, primarily those of the primary circuit, and gains an overview of destructive and non-destructive material testing techniques used in nuclear power plants.						
Typical delivery methods				Lecture	PowerPoint lectures using a projector, including video presentations					
				Seminar	Material testing tasks.					
				Lab	-					
				Other	-					
Requirements (in learning outcomes)				<b>Knowledge</b> The student is familiar with the measurement methods used in the primary circuit of nuclear power plants and with the characteristic data acquisition and evaluation systems. The student is also familiar with the measurement instruments and methods used in the primary circuit of nuclear power plants.						
				<b>Ability</b> Is able to set up appropriate measuring instruments in a nuclear power plant environment, consider the consequences of their use, ensure their proper operation, and develop the measurement procedure and evaluation method. Is able to evaluate the effects of the nuclear power plant environment on measurement methods that are already used in other fields but require specific considerations in this environment.						
				Is able to independently learn nuclear power plant measurement procedures and prepare a study based on international literature, including risk analysis.						
				<b>Attitude</b> Develops cooperation with fellow students and the instructor in the process of expanding knowledge. Approaches measurement tasks thoughtfully rather than mechanically; considers the available options and the consequences of potential failure in a nuclear power plant environment.						
				<b>Autonomy and responsibility</b> Approaches measurement-related problems in a nuclear power plant environment responsibly, recognizing that a lack of foresight may pose serious risks. Is able to critically review and reconsider previously established methods.						
Short description of subject content				Neutron flux measurements; temperature measurements; in-core neutron detectors and DPZ transmitters (KNI chains); pressure measurements; flow measurements; vibration measurements. Reactivity coefficients and fuel element temperature; model-based measurement philosophy. Nuclear power plant data acquisition systems, including the Hungarian VERONA system. Human-machine communication. Integrated reactor physics calculations in the new VERONA system. ALPS (Advanced Loose Part System), a modern acoustic system for detecting loose parts. Destructive and non-destructive testing: the six most important non-destructive testing methods and their role in nuclear power plants.						
Types of student activity				Participation in lectures: 40% Preparation of an individual study based on literature: 50%						

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	Material testing measurements in the laboratory: 10%
Required reading and resources	<ul style="list-style-type: none"> <li>• Instrumentation of nuclear power plants based on the MÜSZ guidelines – university lecture notes (Moodle).</li> <li>• Brief description of the VERONA system (Moodle).</li> <li>• ALPS description – articles.</li> <li>• Nuclear power plant control rooms – internet sources.</li> <li>• Non-destructive testing methods – Leonardo lecture notes.</li> </ul>
Recommended reading and resources	<ul style="list-style-type: none"> <li>• IAEA (International Atomic Energy Agency): publications available online on measurement methods and systems used in nuclear power plants, as referenced during the lectures.</li> </ul>
Assignments	As stated during the first class: preparation of a presentation and study on nuclear power plant systems based on previously agreed literature. The assignment consists of one PowerPoint presentation of approximately 20 slides and an accompanying essay describing the topic.
Description and schedule of exams	As stated during the first class.
Framework and rules for the use of artificial intelligence	<p>The use of artificial intelligence is partially permitted, but only in accordance with standard scientific citation practices:</p> <ul style="list-style-type: none"> <li>• For all submitted assignments, the student must clearly indicate which AI tool was used, for what purpose, and in which part of the work.</li> <li>• If a text section is generated verbatim by AI, it must be placed in quotation marks. If AI is used only for ideas or knowledge and the text is written in the student's own words, it must still be cited according to the applicable citation and referencing rules (including the date of access to the AI tool).</li> <li>• All figures and derivations must include a source reference. If they were generated by AI, this must be explicitly indicated; only figures created without AI may be labeled as the student's own work.</li> <li>• The use of AI is not permitted during midterm tests, written examinations, or oral examinations, unless explicitly authorized by the instructor.</li> </ul>