2026

Materials Engineering BSc

STUDY PROGRAM

UNIVERSITY OF DUNAÚJVÁROS

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Description of the degree study program

Bachelor of Science in Materials Engineering (Materials Engineering)	
Institution responsible for training	University of Dunaújváros
Institutional identification number	FI60345
Address	1/A, Tancsics Mihaly street, Dunaújváros, H-2400
Responsible manager	Dr. habil István András, Rector
Managers responsible for training	
Institute of Specialists	Technical Institute
Institute Director	Dr. habil Róbert Sánta, PhD
Responsible	Dr. Judit Pázmán, PhD
Main aspects of the study program	
Precondition of student application acceptance:	General Certificate of Education or a certificate of secondary school final exam, that certificate, which is required to start a higher educational study program in the home country of the student, the level of the required English language knowledge to start bachelor studies: IELTS 5.5
Training data	
Level of educational program	undergraduate
Level of qualification	bachelor (BSc)
Description of qualification in the diploma in Hungarian	Anyagmérnök
Description of qualification in the diploma in English	Materials 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 course is to train materials engineers who are capable of understanding and managing the processes in metals, polymers and ceramics, as well as in advanced complex material systems, i.e. composites. They will also have the ability to modify material properties in different technologies, to investigate the structure and properties of materials, to manage and organise material production processes in a systems approach and to ensure the quality of materials produced by these technologies, and the theoretical knowledge to pursue the course at Master's (MSc) level.
Prerequisite(s) for starting the internship	The student can take the subject if he/she has completed at least 120 credit points. The prerequisite for starting the internship is taking the Professional Practice subject. Within the framework of the professional practice subject, the student chooses a practical location in consultation with the subject instructor and presents the duly signed acceptance statement to the instructor during the first two weeks of the academic period. This is also a prerequisite for completing the subject.
Practical training/internship	In the 7th (last) semester, at least 6 weeks of organized practice at a professional practice location
The earliest date and conditions for acceptance of internship based on work experience	The acceptance of professional practice based on work experience can be requested if the student can prove that their current employment professionally aligns with the learning outcomes and competency requirements of the program. The student may initiate the request for acceptance with the instructor after enrolling in the professional practice course. Work experience can be accepted as professional practice if: - the duration of employment reaches two years in full-time work, - the position held is professionally relevant and significantly related to the program's training and outcome requirements, - the student applied the competencies expected in the program during the work (e.g., professional planning, analysis, development, operation, organizational, or economic tasks), - the employment did not consist solely of administrative or repetitive tasks. Employer certificate, which includes: - the duration of employment (start and end date), - the number of weekly working hours, - the job title, - job description - employer certification - company signature and contact information Student internship report (minimum 4 pages), which includes: - a brief introduction of the organization, - a professional description of the performed activities, - a presentation of the applied methods, tools, and technologies, - the acquired competencies and their description.

Conditions for issuing the Final certificate (absolutorium)	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.
Prerequisite(s) for starting thesis writing	The prerequisite for taking the Thesis course is the completion of the final exam subjects, the Professional Internship subject, and a minimum of 170 credit points. The student may begin writing the thesis only if he/she can prove that he/she has completed the professional internship and the thesis outline has been approved by the director of the institute/head of department/subject manager.
Thesis	The thesis is a solution to a materials engineering problem or a research project in a specific field of study, which can be completed in one semester under the guidance of internal and industrial consultants, based on the knowledge acquired by the student during his/her studies, by studying additional literature. The candidate will demonstrate through the thesis that he/she has acquired sufficient competence in the practical application of the knowledge acquired, is able to carry out his/her tasks in materials engineering and is familiar with other literature beyond the course material and is able to apply it in a value-adding manner. Formal requirements: the thesis is 50-70 pages long.
Condition for passing the final examination	The prerequisites of the final exam are the receipt of the university leaving certificate and the thesis accepted for evaluation.
Final exam	The final exam is to check and evaluate the professional knowledge, skills and abilities, which is required to grant the degree certificate. In the final exam the student has to prove that he is able to apply the acquired knowledge in practice. The final exam includes defending the thesis and an oral exam of the subjects appointed in the curriculum. (FE1 and FE2)
Final examination subjects	ZV1: DUEN-MUA-212 Mechanical Material Testing DUEN-MGT-116 Materials Science DUEN-MST-210 Industrial materials ZV2: DUEN-MUA-150 Production technologies of nuclear power plant devices DUEN-MST-111 Production technologies of space ceramics DUEN-MST-251 Life cycle of plastics

Averatge 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 a szakdolgozat érdemjegye, 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.
Diploma qualification	Excellent 4,51 - 5,00; Good 3,51 - 4,50; Satisfactory 2,51 - 3,50; Pass 2,00 - 2,50
Conditions for the award of a diploma	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
Work schedule	Full-time course

Required engineering competences

With a bachelor's degree, materials engineers are able to, taking into account the expected specialisations:

- quality control of the work phases and quality management of sub-tasks in materials technologies, to determine the properties of different products,
- to assess and reduce the environmental burden of materials production,
- to assess and rationalise energy use in materials production,
- to solve occupational safety and health problems,
- to apply the principle of equal access.

Knowledge:

- Knowledge of the basic physico-chemical processes in material systems, their (basic) mathematical description, with particular reference to the laws of thermodynamics and kinetics.
- You will have a broad knowledge of the atomic, micro- and macro-structure of solids, the basic methods and principles of operation of the basic tools needed to study the structure and the processes that lead to the formation of structures.
- Detailed knowledge of the principles of operation of machinery and equipment in materials production,
- know the basic technologies for the production and shaping (plastic forming and casting) of metals and their alloys.
- Knowledge of the basic technologies of heat treatment, surface treatment.
- Knowledge of basic technologies for the production of ceramics (including glass and binders) and composite materials.
- You know the basic technologies for the production and processing of polymers.
- He has a systematic knowledge of the energy characteristics of the technologies in his field, energy efficiency requirements and the possibilities of providing the necessary energy.
- He/she has a basic knowledge of the expectations and requirements of the occupational safety and fire protection, safety and environmental protection related to his/her field of expertise.
- Have a basic knowledge of the fundamentals, boundaries and requirements of environmental protection, quality assurance, information technology, law and economics, which are integrally related to the field.
- Knowledge of specific learning, knowledge acquisition and data collection methods, their ethical limitations and problem-solving techniques in materials engineering.

Ability:

- Ability to apply the related computational and modelling principles and methods of product and process design.
- The ability to interpret and characterise the structure and operation of the structural units and elements of mechanical systems, the design and interrelationship of the system components used.
- Apply the technical specifications related to the operation of manufacturing systems, the principles and the economic context of setting up and operating machinery and equipment,
- manages and controls specialised technological production processes, taking into account the elements of quality assurance and quality control.
- Ability to diagnose malfunctions, select remedial actions.
- Understands and applies the environmental, occupational health and safety and security requirements of the field, and is able to modify processes to meet expectations.
- Ability to comply with legislation and economic requirements in your field.
- Understand and use the online and print literature in their field in Hungarian and foreign languages.

Attitude:

- Strive to keep their self-education in materials engineering continuous and in line with their professional goals.
- It strives to solve its tasks and make management decisions by listening to the opinions of the colleagues it manages, preferably in cooperation.
- You have the stamina and monotony tolerance to carry out practical activities.
- It takes a creative approach to continuously improve the technologies and processes used.
- It strives to use environmentally sound technologies and to protect the built and natural environment.

It strives to use energy and material-saving processes and technologies.

Autonomy and responsibility:

- Directs the work of the personnel assigned to him/her, supervises the operation of machinery and equipment, based on the instructions of the workplace manager.
- It determines the properties of the different products, checks the quality of the work phases specific to the technology and performs quality management of the sub-tasks.
- Assesses the environmental pressures associated with production and seeks to reduce them.
- Assess and rationalise energy use in material production.
- Carry out occupational safety and health duties.
- Assesses the efficiency, effectiveness and safety of the work of subordinates.
- He or she is attentive to promoting the professional development of his or her subordinates, and to managing and assisting them in their efforts in this direction.
- Helping young staff to develop and progress in their careers.

Curriculum for Materials Engineering BSc programme

Materials Engineering BSc																										
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	T	P	L	
DUEN-IMA-100	Tutorial mathematics	0	A	0	2	0																			-
DUEN-TKK-915	Introduction to the use of artificial intelligence	0	M	1	1	0																			
DUEN-IMA-152	Engineering Mathematics 1.	5	E	0	3	0																			-
DUEN-ISF-010	Informatics	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-MST-100	Tutorial chemistry	0	S				1	2	0																
DUEN-IMA-212	Engineering Mathematics 2.	5	M				0	0	3																-
DUEN-MST-210	Industrial materials	5	M				1	0	2																-
DUEN-MST-250	Thermodynamics	5	E				1	0	2																-
DUEN-MUG-222	Basics of machine design	5	M				2	1	0																DUEN-MGT-111 DUEN-MUG-212 DUEN-MUG-152
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
DUEN-IMA-110	Mathematics 3.	5	M							0	3	0													DUEN-IMA-152
DUEN-MGT-116	Materials Science	5	M							1	0	2													-
DUEN-MGT-157	Reaction kinetics	5	E							1	1	1													
DUEN-MST-150	Production technologies of nuclear power plant devices	5	E							1	0	2													-
DUEN-MUA-150	Materials Engineering	5	E							1	1	1													-
DUEN-MUA-255	Plastic physics	5	E							1	0	2													-
DUEN-MST-211	Up-to-date casting technologies	5	M										1	0	2										-
DUEN-MST-212	Instrumental analytical chemistry	5	M										1	0	2										-
DUEN-MST-251	Life cycle of plastics	5	E										1	0	2										-
DUEN-MST-252	Micro and nano structures	5	E										1	0	2										-
DUEN-MUA-212	Mechanical Material Testing	5	M										1	0	2										-
DUEN-MUA-251	Forming of Metals	5	E										1	1	1										-
DUEN-MST-253	Space ceramics	5	E													2	0	1							-
DUEN-MST-254	Coating Processes	5	E													1	0	2							-
DUEN-MUA-113	Heat Treatment	5	M													1	0	2							-
DUEN-MUA-210	Welding	5	M													1	1	1							-
DUEN-MUA-215	Non-destructive testing of materials	5	M													1	0	2							-
-	Optional course - Materials Engineering	5	-													-	-	-							-
DUEN-MUG-090	Thesis project 1.	0	S																2	0	0				-
DUEN-MUA-093	Professional Internship - ANYBSC	0	S																0	0	0				-
DUEN-MGT-210	Environmental policy and protection against radioactivity	5	M																2	0	1				-
DUEN-MST-111	Production technologies of space ceramics	5	M																2	0	1				-
-	Optional course - Materials Engineering	5	-																-	-	-				-
-	Optional course	5	-																-	-	-				-
-	Optional course	5	-																-	-	-				-
-	Optional course	5	-																-	-	-				-
DUEN-TVV-118	Product Management and Value Analysis	5	M																			2	1	0	
DUEN-MUA-091	Research Thesis - ANYBSC	15	S																			0	12	0	-
DUEN-TVV-122	Entrepreneurship	5	M																			1	2	0	-
DUEN-TVV-114	Management	5	M																			1	2	0	-
-	Sport	0	A		-			-			-			-											-
	Number of Theoretical/Practice/Lab classes per week			4	11	7	7	6	8	5	5	8	6	1	11	6	1	8	6	0	2	4	17	0	
	Total number of classes per week			**22**			**21**			**18**			**18**			**15**			**8**			**21**			
	Total credit points			**210**																					

Optional course - Materials Engineering																												
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	T	P	L			
DUEN-MGT-117	Basics of nuclear safety	5	M													2	0	1									-
DUEN-MGT-118	Basics of Atomenergetics	5	M													2	1	0									-
DUEN-MGT-119	Ensuring the integrity of equipment	5	M													2	1	0									-
DUEN-MGT-152	Equipments of Nuclear Power Plants	5	E													2	1	0									-
DUEN-MGT-257	Basic Priciples of Hydrogen Technology	5	E													2	1	0									-
DUEN-MGT-155	Hydrogenstorage technologies	5	E																2	0	1						-
DUEN-MGT-213	Industrial knowledge	5	M																2	0	1						-
DUEN-MGT-256	NPP measurements and NDT	5	E																2	1	0						-
DUEN-MUG-213	Metrology	5	M																2	0	1						DUEN-MUG-257
DUEN-MUG-252	Production Technology	5	E																2	1	0						DUEN-MUG-152
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0	0	0	0	0	0	0	0	10	4	1	10	2	3	0	0	0			
	Total number of classes per week			0			0			0			0			**15**			**15**			0					
	Total credit points			**50**																							

Notation: **E**: Exam, **M**: Mid-year grade, **L**: Lecture, **T** Tutorial, **P** Practice, **Cr** Credit, **R** Requirement

Short description of the subjects

Tutorial mathematics

Title of the subject	Hungarian			**Matematika felzárkóztató**					Level	BSc	
	English			**Tutorialmathematics**					Code	DUEN(L)-IMA-100	
Responsible Academic Unit				Institute of Informatics							
Compulsory prerequisite subject:				none							
Type		Lecture		Seminar		Lab		Requirements	Credit	Language of instruction	
Full time		Per semester	0	Per semester	2		0	A	**0**	Hungarian	
Part time		Per semester	0	Per semester	10		0				
Person responsible for the subject:				name:		Dr. Gordana Stankov			position:	Assistant Professor	
Lecturer:				name:					position:		

Course objectives and justification (content, learning outcomes, place in curriculum)	**Objectives and development goals** 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.	
Typical lesson types:	Lecture	-
	Seminar	Classroom exercises, structured student contribution, presentation, case study analysis.
	Lab	-
	Other	-
Requirements (in learning outcomes)	**Knowledge** 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.	
	Skills 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).	
	Attitude 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.	
	Autonomy and responsibility Students take responsibility for their own work.	
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.	
Forms of student activity	Guided problem-solving: 60% Independent problem-solving: 40%	
Required reading and resources	• OpenStax. (2021). *Precalculus 2e.* Houston, TX: OpenStax. ISBN 978-1-951693-40-4. • Abramson, J. (Ed.). (2021). *Algebra and Trigonometry 2e.* Houston, TX: OpenStax. ISBN 978-1-951693-40-4.	

Recommended reading and resources	• OpenStax. (2021). *College Algebra (2e).* Houston, TX: OpenStax. ISBN 978-1-951693-41-1. • OpenStax. (2022). *Contemporary Mathematics.* Houston, TX: OpenStax. ISBN 978-1-951693-56-5.
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.

Introduction to the use of artificial intelligence

Title of the subject	Hungarian		**Bevezetés a mesterséges intelligencia használatába**						Level	BSc	
	English		**Introduction to the use of artificial intelligence**						Code	DUEN(L)-TKK-915	
Responsible Academic Unit			Teacher Training Centre								
Compulsory prerequisite subject:			none								
Type	Lecture		Seminar		Lab		Requirements		Credit	Language of instruction	
Full time	Per semester	5	Per semester	5		0	F		**0**	Hungarian	
Part time	Per semester	5	Per semester	5		0					
Person responsible for the subject:			name:		Tibor Fauszt PhD				position:	associate professor	
Lecturer:			name:						position:		

Course objectives and justification (content, learning outcomes, place in curriculum)

Objectives and development goals

The rapid development of artificial intelligence and its integration into everyday life is fundamentally transforming access to knowledge, learning methods, and educational and workplace environments. As a result, there is a growing demand for targeted, short-term training courses that provide comprehensive yet practical knowledge about artificial intelligence. The primary goal of the 10-hour artificial intelligence training course is to provide participants with meaningful, systematic, and applicable knowledge, while laying the foundation for a critical and responsible approach to the technology.
The general aim of the training is to provide participants with a comprehensive overview of the basic concepts, operating principles, and key areas of application of artificial intelligence, and to enable them to use AI tools in a conscious and goal-oriented manner in their own learning or professional environment. The training does not aim to impart in-depth technical or programming knowledge but rather to develop participants' competencies based on the three pillars of understanding, applicability and reflection.
The training also aims to help students understand the basic principles of AI including the role of data and how algorithms work. The training includes a brief overview of the historical development of AI, which helps students understand the current state of technology and future possibilities.
The 10-hour time frame provides participants with the opportunity to gain practical experience in using simple, widely available AI-based tools. Within this framework the aim of the training is to teach participants the principles of effective instruction i.e. prompting and to enable them to use these tools for various purposes such as information retrieval and content creation. Another important goal is for participants to be able to critically evaluate AI-generated content, recognizing its inaccuracies, biases and limitations.
One of the main goals of artificial intelligence education is to encourage participants to adopt an open yet critical approach to AI technologies. The training helps participants become aware of the role of human decision-making, creativity and responsibility in the use of AI. A key objective is to provide a basic understanding of ethical, legal and data protection issues, with a particular focus on their application in an educational environment.

Typical lesson types:

Lecture	For all students, in a large lecture hall, blackboard presentation, projector or online using MS Teams
Seminar	By providing access to appropriate IT equipment and web-based AI tools in the computer room.
Lab	
Other	

Requirements (in learning outcomes)

Knowledge
During the lectures students will learn about artificial intelligence, its basic concepts, and theoretical frameworks. The lectures will cover the basic principles of artificial intelligence and its main areas of application. In order to apply new technologies, they will understand and comprehend the data protection, ethical, and social implications of using artificial intelligence-based systems and learn about the factors that influence the reliability of AI systems.

Skills
After completing the training, participants will be able to consciously use simple AI-based tools (e.g. text, image or presentation generators), create and apply well-formulated prompts for their purposes. They will recognize the advantages and limitations of using AI. In line with conscious application students will be able to critically evaluate AI-generated content, integrate it into learning or teaching processes, and design application scenarios in their own areas of interest and expertise.

Attitude

	The training helps participants become open to learning about and trying out AI-based solutions, while also recognizing whether a given problem is suitable for an AI solution. After completing the course students will be able to critically evaluate information obtained through AI and use AI tools responsibly and ethically. They will strive for continuous professional development and keep up with the latest AI innovations, recognizing the importance of lifelong learning in the long term.
	Autonomy and responsibility The student is able to independently select and apply AI tools when solving a given problem. They take responsibility for the accuracy, reliability and ethical use of the outputs they produce. They recognize their own limits of competence in AI-based analysis tasks.
Short description of subject content	The aim of the 10-hour artificial intelligence (AI) training course is to provide participants with a comprehensive yet practical overview of the basic concepts, operating principles and potential applications of AI. The introductory section of the course clarifies the concept of artificial intelligence and current technological trends. After that, the focus gradually shifts to practical applications. Students learn about generative AI tools (such as text, image and study material generation). An important part of the course is discussing ethical, legal and data protection issues, with a special focus on responsible AI use in education. By the end of the course participants will be able to use AI-based tools critically and reflectively, recognize their pedagogical added value and make informed decisions about their application. The 10-hour course does not provide in-depth programming knowledge, but develops digital and pedagogical competencies that lay the foundation for the informed, responsible, and effective use of AI.
Forms of student activity	Assessment of listening comprehension with note-taking – 50% Individual practical assignments – 50%
Required reading and resources	• National AI Strategy (Hungary) • AI-MI-tools: Elicit, Scite.ai, ChatGPT, Consensus, ScholarAI, Semantic Scholar, ResearchRabbit
Recommended reading and resources	• UNESCO (2023): *AI in Science and Research Ethics Guidelines* • OECD (2024): *Responsible AI for Research and Innovation* • Elsevier & Springer AI policy for authors • Peter Norvig, Stuart J. Russell: Artificial Intelligence Volume I – A Modern Approach • Malcolm Show-Enczi Zoltán: Artificial Intelligence for beginners – Learn how artificial intelligence can be your best colleague and helper! • Stuart J. Russell: Artificial Intelligence: A Modern Approach • Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson. • Alpaydin, E. (2020). *Introduction to Machine Learning* (4th ed.). MIT Press. • Mitchell, T. M. (1997). *Machine Learning.* McGraw-Hill. • Christian, B. (2020). *The Alignment Problem: Machine Learning and Human Values.* Norton & Company.
Assignments	Preparation of individual project tasks/case studies using AI-based tools in line with the number of measurement points specified in the TVR.
Description and schedule of exams	There is no midterm test.
Framework and rules for the use of artificial intelligence	Given the nature of the course content the use of artificial intelligence is permitted in all situations.

Engineering mathematics 1

Title of the subject		Hungarian		**Mérnöki matematika 1**					Level	BSc	
		English		**Engineering mathematics 1**					Code	**DUEN(L)-IMA-152**	
2026/27/1											
Responsible Educational Institute				**Informatics Institute**							
Prerequisites											
Type		Weekly contact hours						Requirement	Credits	Language	
		Lecturers		Practice sessions		Labs					
Full time	**150/39**		**0**		**3**		**0**	**Exam**	**5**	**English**	
Part time	**150/15**	Semester	**0**	Semester	**15**	Semester	**0**				
Course cordinator				Name		**Dr. Joós Antal**			Position	**Associate Professor**	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Objectives and development goals** Acquiring the mathematical foundations necessary for further studies.	
	Training background, development objectives 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 lesson types:	Lecture	
	Seminar	Classroom practice, student-written posts, presentations, case study analysis
	Lab	
	Other	
Requirements (in learning outcomes)	**Knowledge** 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.	
	Skills 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).	
	Attitude 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.	
	Autonomy and responsibility 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.	
Forms of student activity	Learning theoretical material with guidance and independently. 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%	

Compulsory literature	1] Lay, D. C.: Linear Algebra and its applications, 4th edition, Addison-Wesley, 2012. [2] Stewart, J.: Complex Numbers, Additional Topic to Essential Calculus, 2nd edition, 2013, pp. 1-11. [3] Smith, R. T., Minton, R. B.: Calculus: Early transcendental functions, 4th edition, McGraw Hill, New York, 2012.
Recommended literature	
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.

Informatics

Title of Subject		Hungarian	**Informatika**						Level	BSc	
		English	**Informatics**						Code	**DUEN(L)-ISF-010**	
Responsible Academic Unit			Institute of Information Technology, Department of Software Development and Application								
Compulsory prerequisite subject			-								
Type		Study load per week						Requirements	Credit	Language of instruction	
		Lecture		Seminar		Lab					
Full time	150/45	Per semester	0	Per semester	0	Per semester	3	F	5	English	
Part time	150/15	Per semester	0	Per semester	0	Per semester	15				
Person responsible for the subject			Name		Dr. Mariann Váraljai				position	associate professor	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Education history, development goals** 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. • 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 transfer ways	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 (expressed in educational results)	**Knowledge** 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.	
	Ability 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.	
	Attitude 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.	
	Autonomy and Responsibility 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. – Goal-oriented use of the Internet, knowledge of NETiquette. Targeted search on the Internet. Use of email programs. – 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.	

	– 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. – 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. – They make independent, creative use of innovative information technology (e.g. AI) and tools.
Forms of student activity	– Heard information processing by creating notes, – systematization of information has led by tasks (40%) – Self-processing (individual) tasks (60%)
Required reading and resources	1. WORD 2010 All-In-One for Dummies by Doug Lowe with Ryan Williams, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet) 2. EXCEL 2010 All-In-One for Dummies by Greg Harvey, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet) 3. 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) 4. POWER POINT 2010 All-In-One for Dummies by Doug Lowe, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet) 5. The Internet for Dummies 12th edition by John R. Levine – Margaret Levine Young, Wiley Publishing Inc, Indiana (free pdf on Internet) 6. OFFICE 2010 All-in-one for Dummies by Peter Weverka, Wiley Publishing, Inc. Indiana (free pdf on Internet)
Recommended reading and resources	– Electronic literature and learning materials in Moodle or in Neptun. – MS Office Tutorial and examples (Internet).
Assignments	**Compulsory assignment:** Create an own individual presentation using MS Power Point or Prezi program based on the conditions set by the instructors. Deadline: **until Week 10!** (Upload to the Moodle system!) **Not mandatory, but for extra (bonus) points:** 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.
Description and schedule of exams	At the end of each topic, students write closed papers, typically: – ***Week 5***: Word processing computer-based test – ***Week 11***: Spreadsheet management computer-based test 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.
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.

Engineering representation

Subject name		In Hungarian	**Műszaki ábrázolás**						Level	BSc	
		In English	**Engineering representation**						Code	**DUEN(L)-MGT-111**	
Responsible educational unit											
Compulsory prerequisite subject:			**Institute of Engineering**								
Type											
Type Full time		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Part time	**150/60**	Per week	**2**	Per week	**1**	Per week	**0**	**F**	**5**	**English**	
Person responsible for the subject:	**150/15**	Per semester	**10**	Per semester	**5**	Per semester	**0**				
Course objectives and justification (content, learning outcomes, place in curriculum)				name		**Dr. Gábor Vizi**			position	college associate professor	

Course objectives and justification (content, learning outcomes, place in curriculum) Typical delivery methods	**Short-term objective** To impart the knowledge of descriptive geometry and mechanical drawing necessary for performing mechanical engineering work.	
	Objectives and development goals 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
Requirements (in learning outcomes)	Seminar	Solving typical tasks with teacher guidance
	Lab	-
	Other	-
Requirements (in learning outcomes) Short description of subject content	**Knowledge** 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.	
	Ability 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.	
	Attitude 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.	
	Autonomy and responsibility Taking responsibility for one's own work and the work of others.	

Types of student activity	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. 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.
Required reading and resources	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 -
Recommended reading and resources	Tamás Zahola: Descriptive Geometry – Elementary constructions Tamás Zahola: Introduction to Engineering Drawings
Assignments	Standard writing Creating a new view Tangent and secant lines Notable lines in a plane Intersection of plane figures Edits Projections Sections
Description and schedule of exams	Standard characters Creation of a new view Diverting and intersecting lines Plane notable lines Interaction of plane shapes Constructions Projections Sections
Framework and rules for the use of artificial intelligence	Week 7: Complex Representational Geometric Editing Week 13: Mechanical Engineering Review Questions

Mechanics 1.

Subject name		In Hungarian		Mechanika 1.					Level	FOSZK, BSc	
		In English		Mechanics 1.					Code	DUEN(L)-MUG-152	
Responsible educational unit											
Compulsory prerequisite subject:				Institute of Engineering							
Type											
Type Full time		Number of lessons							Requirement	Credit	Language of education
		Lecture		Seminar		Lab					
Part time	150/60	Per week	2	Per week	2	Per week	0		V	5	English
Person responsible for the subject:	150/15	Per semester	10	Per semester	10	Per semester	0				
Course objectives and justification (content, learning outcomes, place in curriculum)				name		Gábor Ladányi			position	master teacher	
Course objectives and justification (content, learning outcomes, place in curriculum) Typical delivery methods				**Short-term objective** 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..							
				Objectives and development goals							
Typical delivery methods Requirements (in learning outcomes)				Lecture	Presentation with whiteboard and projector						
				Seminar	Blackboard practice, partly with independent student problem solving						
				Lab	-						
				Other	-						
Requirements (in learning outcomes)				**Knowledge** 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.							
				Ability The student will be able to design and construct mechanical components, machines, devices, equipment, and structures in terms of statics and strength.							
				Attitude Mastering the design and strength theory approach to machine elements, machines, devices, equipment							
				Autonomy and responsibility Learning and applying the responsibilities and regulations of engineering design. Mastering the rules of group cooperation.							
Short description of subject content				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.							

Types of student activity	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. 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.
Required reading and resources	Processing theoretical material with guidance/independently: 15/35% Solving problems with guidance/independently: 15/35%
Compulsory reading and resources	1. Ladányi Gábor: Mechanika 1., Elektronikus jegyzet, Dunaújvárosi Egyetem, 2020 **2.** Dr. Vigh Sándor- Szlávik Béláné- Dr. Izsák Gyula: Műszaki mechanika I. Példatár: 1. rész. Dunaújváros, DF Kiadói Hivatal, 2000. **3.** Dr Vigh S. szerk. Műszaki mechanika II. Példatár II/A, főiskolai jegyzet. DF Kiadó, Dunaújváros, 2000.
Recommended reading and resources	1. Dr. M. Csizmadia Béla-Dr. Nándori Ernő-: Mechanika mérnököknek. Statika. Budapest, Nemzeti Tankönyvkiadó, 1998. 510 p. 2. Dr. M. Csizmadia Béla-Dr. Nándori Ernő-: Mechanika mérnököknek. Szilárdságtan Nemzeti Tankönyvkiadó, 1998. 510 p. 3. Dr Vigh S. Műszaki mechanika IV. Keresztmetszeti jellemzők. Főiskolai jegyzet. DF Kiadó, Dunaújváros, 1998.
Assignments	Compulsory homework: 1. 3rd week Resultant of a spatial force system 2. 6th week Support forces of a two-support beam 3. 8th week Stresses of a two-support, cantilever beam 4. 11th week Strength design of a beam subjected to straight bending Optional homework: 1. 2nd week Operations with vectors 2. 4th week Resultant of a plane force system 3. 7th week Construction of a dough bridge 4. 10th week Determination of the support forces of a statically indeterminate suspended beam 5. 13th week Strength check of a beam subjected to oblique bending
Description and schedule of exams	according to what was said in the first lesson
Framework and rules for the use of artificial intelligence	The use of artificial intelligence tools is partially permitted during the acquisition of the subject: • 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. • the use of artificial intelligence tools in any form during the verification of the student's knowledge (exam papers, exams) is not permitted.
Conditions and formation of the result	Conditions for obtaining the signature (examination right): • Completing the mandatory homework assignments to an acceptable level and on time. In justified cases, the practice leader may grant a 1-week extension. • Attending 70% of lectures • Attending 80% of exercises Conditions for obtaining the offered grade: • Obtaining the signature. • Completing at least one of the homework assignments to an acceptable level and on time. Possibilities for obtaining the grade: a. The sum of the points that can be obtained from the mandatory homework assignments (max. 40 points) and the points that can be obtained from the homework assignments (max. 40 points). b. Successful participation in the exam: Assessment of the basic questions of the theoretical curriculum and the ability to solve examples from the entire curriculum in writing. Theoretical questions related to the assignments orally. The ratio of practical and theoretical questions in the exam paper is approximately 2/3 –1/3. A maximum of 80 points can be awarded for the exam paper. The grade is determined by: a. a grade offered based on points earned from homework or b. based on points earned in the exam according to the TVSZ.

CAD

Subject name		In Hungarian	**CAD**						Level	BSc	
		In English	**CAD**						Code	**DUEN(L)-MUG-212**	
2023/2024 I.											
Responsible educational unit		**Institute of Engineering**									
Compulsory prerequisite subject:		**-**									
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	**150/60**	Per week	**0**	Per week	**0**	Per week	**3**	**F**	**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)	**Short-term objective** Acquire the basic knowledge of computer-aided mechanical design	
	Objectives and development goals 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)	**Knowledge** Can apply the related calculation and modelling principles and methods of mechanical product, process and technological design.	
	Ability Able to plan, organize and conduct independent learning. Able to create basic models of te chnical systems and processes.	
	Attitude 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.	
	Autonomy and responsibility 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	Tamás Zahola: CAD – Workbook SolidWorks Online Help
Recommended reading and resources	Descriptions and documentation related to the SolidWorks program system
Assignments	-
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.

Engineering physics

Subject name		In Hungarian	**Mérnöki fizika**					Level	BSc		
		In English	**Engineering physics**					Code	**DUEN(L)-MUT-151**		
2125/26 I.											
Responsible educational unit			**Intstitute of Engineering Sciences**								
Compulsory prerequisite subject:			-								
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time		Per week	**1**	Per week	**1**	Per week	**1**	**V**	**5**	**english**	
Part time		Per semester	**5**	Per semester	**5**	Per semester	**5**				
Person responsible for the subject:				name		**dr. Horváth Miklós**		position	**associate professor**		

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The goal of the course is to learn the basics of the mechanics of a particle, mechanival 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.	
	Objectives and development goals 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 he physics laboratory
	Other	-
Requirements (in learning outcomes)	**Knowledge** 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	
	Ability Able to perform tasks related to the subject area. Has high-level problem-solving skills.	
	Attitude The attitude of solving technical problems develops	
	Autonomy and responsibility 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% Problem-guided systematization of information 30% Independent processing of problems 20%
Required reading and resources	Dr. Kiss Endre: Textual material based on the Engineering Physics textbook in the Moodle system Department working group; edited by Dr. Horváth Miklós: Elaborated tasks based on the Physics example library in the Moodle system Syllabuses of Engineering Physics laboratory exercises in the Moodle system Literature: Alvin Halpern: Beginning Physics I-II (SHAUM OUTLINE SERIES McGraw- Hill, ISBN 0-07-025653-5)
Recommended reading and resources	Daniel Oman- Robert Oman: Physics for the Utterly Confused (McGraw- Hill Companies, ISBN: 0-07-048262-4) Daniel Oman- Robert Oman: How to solve Physics Problems (McGraw- Hill Companies, ISBN: 0-07-0481660)
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.

Tutorial chemistry

Name of the subject	in Hungarian	Kémiai alapismeretek							Level	BSc	
	in English	Tutorial chemistry							Code	DUEN(L)-MST-100	
Responsible educational unit		Institute of Technology, Department of Mechanical Engineering and Energy									
Name of compulsory prior learning DUEN(L)-		-									
Type		Presentation		Practice		Laboratory		Requirement	Credit	Language of education	
Full time		per week	1	per week	2	per week	0	S	0	english	
Part time		per term	5	per term	10	per term	0				
Teacher responsible for the subject		Name				Henriette Mészáros			schedule	Master instructor	

Training objective and justification of the course (content, output, location in the curriculum)	**Goals, development objectives** The aim of the course is to help students catch up and provide a solid basis for higher-level learning. The aim is to provide basic knowledge of chemistry to familiarise students with the structure of substances (atoms, ions, molecules), the use of the periodic table, the electron shell structure that determines the properties of matter, types of chemical bonds, chemical reactions, and stoichiometric calculations.	
Typical delivery methods	Presentation	projector, ppt presentations 1 hour per week
	Practice	solving chemical exercises
	Laboratory	
	Other	
Requirements (expressed in terms of learning outcomes)	**Knowledge** Have basic knowledge of chemistry and can perform elementary chemical calculations.	
	Ability The theoretical knowledge acquired can be used successfully in later studies.	
	Attitude It aims to understand chemical phenomena and relationships, develop scientific thinking, formulate questions, analyze information, link chemistry with other disciplines, and evaluate environmental and social impacts.	
	Autonomy and responsibility Take responsibility for their work and that of their workmates.	
Short description of the subject content	Material structure: atoms, ions, molecules, use of periodic table. Chemical bonds: covalent, ionic, metallic bonds and intermolecular interactions. Stoichiometry: mass (mole), molar mass, mass and volume percentage calculations. Writing and solving reaction equations. Acid-base reactions, pH calculations. Determination of redox reactions and oxidation numbers. Grouping of organic compounds, functional groups. Simple organic reaction mechanisms.	
Types of student activities	Attend lectures and take notes. Solving test problems in practical exercises.	
Required literature and contact details	• Fundamentals of Chemical Reaction Engineering Mark E. Davis Robert J. Davis. ISBN 0-07-245007.	
Recommended literature and contact details	• CHEMICAL ENGINEERING DESIGN Principles, Practice and Economics of Plant and Process Design GAVIN TOWLER RAY SINNOTT. ISBN 13: 978-0-7506-8423-1.	
Description of tasks to be submitted/measurement reports		
Description and timetable of the workshops	A final paper in the format of a test in week 13.	
Frameworks 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.	

Engineering Mathematics 2

Subject name		**In Hungarian**		**Mérnöki Matematika 2**					Level BSc		
		In English		**Engineering Mathematics 2**							
Subject code				**DUEN(L)-IMA-212**							
Responsible educational unit				**Department of Informatics**							
Name of Mandatory Preliminary Study				Engineering Mathematics 1.							
Number of Lessons								**Requirements**	**Credits (ECTS)**	**Language of Education**	
		Lecture		**Seminar**		**Laboratory**					
Full-time	150/52	week	1	week	0	week	3	Exam (V)	5	**English**	
Correspondence	150/20	semester	**5**	semester	0	semester	15				
Teacher responsible for the course				**Name**		László Bognár, CSc.			**Position**	College Professor	

Educational goals	**Short-term objective** 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.	
Typical delivery methods	**Lecture**	Formal 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	
	Laboratory	Laboratory work: 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.
Requirements (expressed in learning outcomes/competencies to be acquired)	- Students will have a solid foundation of analysing processes or phenomena described by quantitative data. - 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. - 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.	
Brief description of the 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.	
Activity forms of students	- Frontal work 30% - Individual or group work 50% - Testing 20%	
Compulsory reading and its availability	James T. McClave, P. George Benson, Terry Sincich : Statistics for Business and Economics. Ed 12th. Pearson Education, Inc. 2014. Douglas C. Montgomery George C. Runger : Applied Statistics and Probability for Engineers. Ed 5th. John Wiley & Sons Inc. 2011.	
Recommended reading and its availability	1. http://onlinestatbook.com/2/index.html 2. STATISTICS FOR BUSINESS AND ECONOMICS TWELFTH EDITION James T. McClave Info Tech, Inc. University of Florida	

	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. 3. 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.
Hand-in Assignments/ measurement reports	-
Description of midterm tests	Continuous evaluation in the form of midterm tests.
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.

Industrial materials

Subject name		In Hungarian	**Műszaki anyagismeret**					Level	**BSC**		
		In English	**Industrial materials**					Code	**DUEN(l)-MST-210**		
2026/2027 I.											
Responsible educational unit			**Institute of Engineering**								
Compulsory prerequisite subject:			-								
Type Full time		Number of lessons						Requirement	credit	**Language of education**	
		Lecture		Seminar		Lab					
Part time	**150/60**	Per week	1	**Per week**	0	Per Week	**2**	V	5	**English**	
Person responsible for the subject:	**150/20**	Per semester	5	Per semester	**0**	Per semester	**10**				
subject teacher				**Name**		**Dr. Imre Kovács**			Position	**Associate professor**	

The training objective and justification of the course (content, outcome, place in the curriculum)	**Short-term Objective** 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.	
	Educational background, development goals 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 transfer methods	**Lecture**	**ppt slide, using powder ejector**
	Exercise	-
	Lab	**- Individual and group work in university laboratories**
	Other	-
Requirements (expressed in academic results)	**Knowledge** 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.	
	Ability 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.
	Attitude 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.
	Autonomy and responsibility She makes her decisions carefully, in consultation with representatives of other fields, and independently, for which she takes responsibility.
Brief description of the course 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.
Student activities	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 literature and its availability	Balázs Verő, Éva Dénes, Zsolt Csepeli: Introduction to Technical Materials Science, College Publishing House, Dunaújváros Éva Dénes, Péter Farkas, Zsoltné Fülöp, Zoltán Szabó: Metal Technology, College Publishing House, Dunaújváros
Recommended literature and its availability	Dr. Tamás Tóth: Mechanical properties of materials and methods of their testing. College Publishing House, Dunaújváros
Description of tasks/measurement reports to be submitted	As mentioned in the first lesson, prepare measurement reports throughout the semester.
Description and schedule of closed places	As stated in the first lesson,
Frameworks and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: artificial intelligence is permitted for certain types of tasks (class work, assistance with submitting a paper, preparing a report). Its use is prohibited for closed papers.

Thermodynamics

Subject name		In Hungarian	**Termodinamika**						Level	**BSC**	
		In English	**Thermodynamics**						Code	**DUEN(l)-MST-250**	
2026/2027 I.											
Responsible educational unit			**Institute of Engineering**								
Compulsory prerequisite subject:			-								
Type Full time		Number of lessons							Requirement	credit	**Language of education**
		Lecture		Seminar		Lab					
Part time	**150/39**	Per week	1	**Per week**	0	Per Week	**2**		V	5	**English**
Person responsible for the subject:	**150/15**	Per semester	5	Per semester	**0**	Per semester	**10**				
subject teacher				**Name**		**Dr. Imre Kovács**				Position	**Associate professor**

The training objective and justification of the course (content, outcome, place in the curriculum)	**Short-term Objective** The physical chemistry curriculum contains the special range of natural laws that provide essential knowledge for materials engineers and a sufficient basis for mastering the professional curriculum. After completing the module, the student should be able to analyze thermodynamic processes and perform energetic calculations.	
	Educational background, development goals The subject, based on basic knowledge of chemistry, provides the fundamental chemical and physical knowledge that is essential for understanding materials science. The course provides students with an engineering-level knowledge of the theory of metallurgical, plastic and silicate chemistry subjects	
Typical transfer methods	**Lecture**	**Power Point presentation with projector, whiteboard presentation**
	Exercise	solving basic computational tasks in the subject area
	Lab	**- Laboratory tasks**
	Other	-
Requirements (expressed in academic results)	**Knowledge** The student has theoretical and practical knowledge related to the subject matter.	
	Ability Able to perform tasks related to the subject matter.	
	Attitude Your attitude towards solving technical problems is developing.	
	Autonomy and responsibility Takes responsibility for your work.	

Brief description of the course content	The thermodynamic system. The main principles and basic concepts of thermodynamics. Thermodynamic functions and their applications. Enthalpy, entropy, free enthalpy. Phase equilibria. Phase transformations: evaporation, boiling, freezing in a single-component system. Multicomponent systems: mixtures, blends, solutions, compounds. The behavior of gases and the basic concepts of kinetic gas theory. Thermodynamic investigation of the possibilities of chemical reactions using free enthalpy and normal free enthalpy. Thermodynamic investigation of the processes of combustion, roasting, reduction and oxidation.
Student activities	Processing of heard text by taking notes 50% Task-led systematization of information 10% Independent processing of tasks 30% Teacher demonstration experiments 10%
Required literature and its availability	Csoknyai T, Zöld A. Épületenergetika (digitális jegyzet, http://tankonyvtar.hu) Épületgépészet 2000, Alapismeretek, Épületgépészeti kiadó kft. http://users.atw.hu/gepeszlev/6_szemeszter/fut1/Epuletgepeszet2000_I.pdf Épületgépészet 2000, Fűtéstechnika, Épületgépészeti kiadó kft. Baumann M. Épületenergetika
Recommended literature and its availability	Atkins, Physical Chemistry I.-II. -III. Volumes
Description of tasks/measurement reports to be submitted	As stated in the first lesson,
Description and schedule of closed places	As stated in the first lesson,
Frameworks and rules for the use of artificial intelligence	Within the framework of this course, the use of artificial intelligence is partially permitted: it may be applied for the preparation of in-class assignments (organizing thermodynamic concepts, reviewing fundamental relationships), as well as for developing the structure or improving the linguistic quality of submitted reports and written assignments. Students must ensure that all analyses, calculations, and interpretations of thermodynamic processes reflect 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.

Basics of machine design

Subject name		In Hungarian	**Géptervezés alapjai**						Level	BSc	
		In English	**Basics of machine design**						Code	**DUEN(L)-MUG-222**	
2023/2024 I.											
Responsible educational unit			**Institute of Engineering**								
Compulsory prerequisite subject:			DUEx-MUG-212 CAD DUEx-MUG-152 Mechanics 1. DUEx-MGT-111 Engineering description								
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	150/60	Per week	**2**	Per week	**1**	Per week	**0**	**V**	**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)			**Short-term objective** Introducing the basic principles and methods of mechanical design **Objectives and development goals** 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)			**Knowledge** 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.								
			Ability 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.
	Attitude 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.
	Autonomy and responsibility Taking responsibility for one's own work and the work of others.
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	Tamás Zahola: Machine structures II. - Workbook
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.

Mechanics 2

<table>
<tr><td colspan="2" rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Mechanika 2.</td><td>Level</td><td>BSc</td></tr>
<tr><td>In English</td><td colspan="4">Mechanics 2.</td><td>Code</td><td>DUEN(L)-MUG-257</td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="6">Institute of Engineering</td></tr>
<tr><td colspan="2">Compulsory prerequisite subject:</td><td colspan="6">Mechanika 1. (DUEN(L)-MUG-152)</td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="4">Number of lessons</td><td rowspan="2">Requirement</td><td rowspan="2">Credit</td><td rowspan="2">Language of education</td></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Seminar</td><td colspan="2">Lab</td></tr>
<tr><td>Full time</td><td>150/60</td><td>Per week</td><td>2</td><td>Per week</td><td>2</td><td>Per week</td><td>0</td><td rowspan="2">V</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Part time</td><td>150/15</td><td>Per semester</td><td>10</td><td>Per semester</td><td>10</td><td>Per semester</td><td>0</td></tr>
<tr><td colspan="2">Person responsible for the subject:</td><td colspan="3">name</td><td colspan="2">Gábor Ladányi</td><td>position</td><td>master teacher</td></tr>
<tr><td colspan="2">Course objectives and justification (content, learning outcomes, place in curriculum)</td><td colspan="6">Short-term objective
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.</td></tr>
<tr><td colspan="2"></td><td colspan="6">Objectives and development goals
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</td></tr>
<tr><td colspan="2" rowspan="4">Typical delivery methods
Requirements
(in learning outcomes)</td><td>Lecture</td><td colspan="5">Presentation with whiteboard and projector</td></tr>
<tr><td>Seminar</td><td colspan="5">Blackboard practice, partly with independent student problem solving.</td></tr>
<tr><td>Lab</td><td colspan="5">-</td></tr>
<tr><td>Other</td><td colspan="5">-</td></tr>
<tr><td colspan="2" rowspan="4">Requirements
(in learning outcomes)</td><td colspan="6">Knowledge
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.</td></tr>
<tr><td colspan="6">Ability
The student is able to perform static and structural design of machine elements, machines, devices, equipment, and structures, and analyze failure modes.</td></tr>
<tr><td colspan="6">Attitude
Mastering the construction, strength and safety engineering approach to machine elements, machines, devices, equipment.</td></tr>
<tr><td colspan="6">Autonomy and responsibility
Learn about the responsibilities and regulations of engineering design, apply safety regulations, and master the rules of group cooperation.</td></tr>
<tr><td colspan="2">Short description of subject content</td><td colspan="6">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.</td></tr>
</table>

Types of student activity	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. 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.
Required reading and resources	Processing of theoretical material with guidance/independently: 20/30% Solving problems with guidance/independently: 10/20% Solving laboratory problems with guidance: 20%
Compulsory reading and resources	Ladányi Gábor: Mechanika 2., elektronikus jegyzet, Dunaújvárosi Egyetem, 2020
Recommended reading and resources	Szőnyiné Passa Erzsébet - Dr. Koppány Imre: Mechanika - Tartószerkezetek I/A, Budapest, Nemzeti Tankönyvkiadó 1998. Dr. Vigh S. szerk.: Műszaki mechanika II/B főiskolai jegyzet, Dunaújváros, DF Kiadó, Dunaújváros, 2003. Tanszéki munkaközösség: Műszaki mechanika I. Elemi Statika, Munkafüzet, Dunaújváros, ME DFK Kiadói Hivatal,1994. Tanszéki munkaközösség: Műszaki mechanika II/2. Alkalmazott szilárdságtan, Munkafüzet. DF Kiadó, Dunaújváros, 2002. Dr. Vigh Sándor - Szlávik Béláné - Dr. Izsák Gyula: Műszaki mechanika I. Példatár 2. rész, Dunaújváros, DF Kiadói Hivatal, 2000. Dr. Vigh S.szerk.: Műszaki mechanika II. Példatár II/B, főiskolai jegyzet. DF Kiadó, Dunaújváros, 1998
Assignments	Required homework: 1. Week 2 Support forces and stress diagrams of a broken beam 2. Week 7 Determination of the bar forces of a truss beam 3. Week 10 Three-way strain measurement 4. Week 13 Solution of an indeterminate beam Diligence homework: 1. Week 3 Support forces and stress diagrams of a curved beam 2. Week 5 Support forces and stress diagrams of a hinged multi-support beam 3. Week 9 Determination of the characteristics of a composite cross-section 4. Week 11 Verification of a centrally compressed slender beam
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 tools is partially permitted during the acquisition of the subject: 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. the use of artificial intelligence tools in any form during the verification of the student's knowledge (exam papers, exams) is not permitted.
Conditions and rules to get result	Conditions for obtaining the signature (examination right): • Completing the mandatory homework assignments to an acceptable level and on time. In justified cases, the practice leader may grant a 1-week extension. • Attending 70% of lectures • Attending 80% of exercises Conditions for obtaining the offered grade: • Obtaining the signature. • Completing at least one of the homework assignments to an acceptable level and on time. Possibilities for obtaining the grade: a. The sum of the points that can be obtained from the mandatory homework assignments (max. 40 points) and the points that can be obtained from the homework assignments (max. 40 points). b. Successful participation in the exam: Assessment of the basic questions of the theoretical curriculum and the ability to solve examples from the entire curriculum in writing. Theoretical questions related to the assignments orally. The ratio of practical and theoretical questions in the exam paper is approximately 2/3 –1/3. A maximum of 80 points can be awarded for the exam paper. The grade is determined: a. based on the points obtained from homework or based on the points obtained in the exam according to the TVSZ.

Heat and Fluid Dynamics

Subject name		In Hungarian	**Hő és áramlástan**						Level	**BSc**	
		In English	**Heat and Fluid Dynamics**						Code	**DUEN(L)-MUT-250**	
2023/2024 I.											
Responsible educational unit			**Institute of Technology**								
Compulsory prerequisite subject:			**MUT-151**								
Type		Number of lessons							Requirement	Credit	Language of education
		Lecture		Seminar		Lab					
Full time		Per week	1	Per week	1	Per week	**1**				
Part time		Per semester	5	Per semester	**5**	Per semester	**5**		**V**	**5**	**English**
Person responsible for the subject:				name		**Endre Kiss, PhD**			position	College Professor	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The study of the practical problems solutions in heat and fluid dynamics. **Objectives and development goals** 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, problem solving	- For every student, problem solving in small groups
	Lab	-Measurements in pair
	Other	-
Requirements (in learning outcomes)	**Knowledge** 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.	
	Ability 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.	
	Attitude 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.	

	Autonomy and responsibility 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
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	• Kiss E. Heat and Fluid Dynamics Electronic notes (Moodle) • Kiss E. Heat and Fluid Dynamics Problem solving Electronic notes (Moodle) • Kiss E. Laboratory syllabuses Electronic notes (Moodle)
Recommended reading and resources	• Dr Gruber, Dr Blahó: Mechanics of Fluids, Tankönyvkiadó, Budapest, 1973 • Grósz Gy. Thermodynamics, BME 1996
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

Mathematics 3

Title of the subject	Hungarian	**Matematika 3**							Level	BSc	
	English	**Mathematics 3**							Code	DUEN(L)-IMA-110	
Responsible Academic Unit		Institute of Information Technology									
Compulsory prerequisite subject:		IMA-152 Engineering Mathematics 1.									
Type		Lecture		Seminar		Lab		Requirements	Credit	Language of instruction	
Full time		Per semester	0	Per semester	45		0	Midterm Mark	**5**	English	
Part time		Per semester	0	Per semester	15		0				
Person responsible for the subject:		name:		Zoltán Papp, Dr.					position:	Associate professor	
Lecturer:		name:		Zoltán Papp, Dr.					position:	Associate professor	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The aim of the course is to acquire and deepen the mathematical and functional foundations that are essential for understanding and applying specialized subjects. Students expand their mathematical knowledge for independent study of the literature and learn the most important concepts and relationships necessary for working in the field. The course also develops applied mathematical thinking. **Objectives and development goals** 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. 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. 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. The course supports independent learning and the development of students' analytical thinking, which are indispensable for later professional subjects.
Typical lesson types:	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)	**Knowledge** 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. 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.
	Skills 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. 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. 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.
	Attitude 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. 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. 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.
	Autonomy and responsibility 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. 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. 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.
Short description of subject content	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. Separable and reducible differential equations. First-order and second-order linear differential equations. Reduced (incomplete) second-order differential equations.
Forms of student activity	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.
Required reading and resources	Frank Ayres JR., Elliott Mendelson: Theory and Problems of Differential and Integral Calculus, McGraw-Hill, 1990, ISBN: 0-07-002662-9 Robert C. Wrede, Murray Spiegel: Theory and Problems of Advanced Calculus, Schaumn's Outline Series, McGraw-Hill, 2002
Recommended reading and resources	Smith, R. T., Minton, R. B.: Calculus: Early transcendental functions, 4th edition, McGraw Hill, New York, 2012

Assignments	As discussed during the first session.
Description and schedule of exams	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. 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.
Framework and rules for the use of artificial intelligence	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. Permitted uses of AI include: – supporting the comprehension of theoretical material (explanations, supplementary examples); – checking practice exercises and exploring possible solution approaches; – assisting autonomous learning processes (e.g., conceptual clarification, visualization). Prohibited uses of AI: AI may not be used in any context that affects the evaluation of semester performance. It is strictly forbidden to: – use AI during in-class assessments, make-up tests, or retakes; – generate or revise homework, assignments, or any work submitted for evaluation using AI; – substitute in-class problem-solving with AI assistance; – automatically generate solutions or solution plans using AI tools.

Materials Science

Subject name	In Hungarian	**Műszaki anyagtudomány**		Level	**BSC**
	In English	**Materials Science**		Code	**DUEN(L)-MGT-116**
2026/2027 I.					
Responsible educational unit		**Institute of Technology, Department of Structural Integrity**			
Compulsory prerequisite subject:		**-MST-210 Industrial materials**			

Type		Number of lessons						Requirement	credit	**Language of education**
Full time		Lecture		Seminar		Lab				
Part time	**150/60**	Per week	1	**Per week**	0	Per Week	**2**	M		
Person responsible for the subject:	**150/20**	Per semester		Per semester	**0**	Per semester		5	**English**	

subject teacher	**Name**	**Péter Ákos Szilassy, PhD**		Position	**Assistant Profes**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short Objective** The aim of the course is to familiarise students with the laws and principles governing the structure of solid materials used in technical practice. The aim is to enable students to apply the knowledge acquired about the structure and properties of materials in their future studies and work.	
	Objectives and development goals The course builds on students' previously acquired knowledge in the natural sciences and fundamental materials science, which provides the basis for understanding the physical and chemical principles governing the structure of solid materials. Its developmental aim is to enable students to interpret material structures, understand the origins of micro and macroscopic structural features, and recognise how these influence engineering properties. The course further aims to ensure that students can apply the knowledge gained from structure–property relationships in their subsequent studies and in engineering practice, particularly in the areas of material selection, technological decisionmaking, and predicting material behaviour.	
Typical transfer methods	Lecture	using PPT slides and a projector
	Exercise	-
	Lab	Laboratory work, individual and collaborative
	Other	-
Requirements (expressed in academic results)	**Knowledge** he student is familiar with the fundamental physicochemical processes occurring in material systems and their (basic) mathematical descriptions, with particular emphasis on the principles of thermodynamics and kinetics. The student has a broad understanding of the atomic, micro and macrostructure of solid materials, the essential methods required for structural characterization, the operating principles of basic analytical instruments, and the processes responsible for the development of material structures.and their alloys (plastic forming and casting). Knows heat treatment and welding technology procedures	
	Ability The student is able to apply the knowledge acquired about the structure of materials and the characteristics of their structural features. The student understands and applies the environmental, occupational safety, accidentprevention, and safetyengineering requirements relevant to the field, and is capable of modifying	

	processes to meet these expectations. The student is able to comply with the legal regulations and economic requirements applicable to the profession. The student understands and uses the characteristic online and printed technical literature of the field in both Hungarian and foreign languages.
	Attitude the student strives to ensure that their selfdevelopment within the field of materials engineering is continuous and aligned with their professional goals. The student aims to solve tasks and make managerial decisions by considering the views of colleagues involved and, whenever possible, through cooperation. The student possesses the persistence and tolerance for monotony required to carry out practical activities effectively.
	Autonomy and responsibility The student independently carries out assigned tasks based on the instructor's professional guidance and acts responsibly in the proper and safe use of laboratory equipment, instruments, and testing devices. The student is able to evaluate the effectiveness, efficiency, and safety of their own work, and, when necessary, adjust processes to meet professional requirements. The student strives for continuous professional development, supports the progress of peers, and actively contributes to enhancing the professional quality of the shared learning environment.
Brief description of the course content	The Materials Science course progresses from the characteristics of the four states of matter to the discussion of homogeneous and heterogeneous polycrystalline materials. It examines the nature of the forces acting between the building units of solids and the structure of atoms, with particular emphasis on the system of quantum numbers. The course analyses the mechanisms of strong and weak bonding, the significance of directional and nondirectional bonds, and the role of the relative sizes of the constituent particles.It covers the seven crystal systems and the fourteen Bravais lattices, integrating not only the classical categories but also the most recent findings in the field. The course discusses the crystal structures of pure metals, the possible phases occurring in alloys, and the various types of ionic crystals. A substantial part of the curriculum is devoted to the thermodynamic principles required for the description of equilibrium systems, the presentation of equilibrium phase diagrams of unary and multicomponent systems, and the analysis of the qualitative and quantitative information that can be extracted from such diagrams.As a counterpoint to the concept of an ideal crystal, the course dedicates significant attention to zero, one, and twodimensional lattice defects. The discussion of defects is not limited to metallic materials; defects in ionic and covalent crystals are also analysed. Special focus is placed on the properties and structures of grain boundaries and phase boundaries, as understanding both equilibrium and nonequilibrium grain boundary structures is essential for interpreting the architecture of bulk nanostructured materials—one of the most important scientific achievements of the past decade. The course concludes with the study of diffusion, the key transport process in solids. Throughout the curriculum, for each materialsscience phenomenon discussed, the corresponding analytical or experimental methods suitable for investigating that phenomenon are also introduced.
Student activities	Rarticipation 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 literature and its availability	Ahindra Ghosh, Amit Chatterjee – *Ironmaking and Steelmaking: Theory and Practice,* McGraw-Hill, 2008 R. H. Tupkary, V. R. Tupkary – *An Introduction to Modern Steel Making* Khanna Publishers, 2017
Recommended literature and its availability	G. E. Totten, D. Scott MacKenzie – *Handbook of Aluminum: Volume 1–2* CRC Press George F. Vander Voort – *Metallography: Principles and Practice* McGraw-Hill
Assignments	According to the information provided during the first class, students are required to complete one assignment during the semester.

Description and schedule of closed places	As communicated in the first lecture class
Frameworks 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 structure of engineering materials, structure–property relationships, material laws, and behavioural characteristics), 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 structures, the analysis of cause-and-effect relationships behind material properties, and the explanation of material behaviour—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.

Reaction kinetics

Subject name		In Hungarian	**Reakciókinetika**						Level	BSc	
		In English	**Reaction kinetics**						Code	**DUEN(L)-MGT-157**	
2025/2026-II.											
Responsible educational unit			**Institute of Technology**								
Compulsory prerequisite subject											
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**1**	Per week	**1**	Per week	**1**	**V**	**5**	**English**	
Part Time	**150/15**	Per Semester	**5**	Per Semester	**5**	Per Semester	**5**				
Person responsible for the subject			Name	**Dr. Imre Kovács**					Position	**Associate professor**	

Course objective and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The aim of the course is to introduce students to the basics of reaction kinetics and chemical equilibration. The students should be able to understand and apply there knowledge in the field of homogeneous and heterogeneous reacting as well as non-reacting systems.	
	Objectives and development goals Based on the course the student will understand the basic chemical and physical principles of production of different materials – in metallurgy, in plastic technology and in silicate technology – and in restructuring or heat treatment. The course contributes the developing students' ability to design temporal processes of transformations.	
Typical delivery methods	Lectures	**PPt slides with projector and lectures on the board**
	Seminars	Problem solving calculations in the field of reaction kinetics
	Labor	**Laboratory work , individual and collaborative**
	Other	**-**
Requirements (in learning outcomes)	**Knowledge** The student is familiar with fundamental general chemistry, physical and thermodynamic processes occurring in material systems and their basic mathematical descriptions..	
	Ability The student is able to apply the corresponding computational and modelling principles and methods, related to the subject.	
	Attitude With a creative approach , it strives for the continuous improvement of applied procedures. The student is capable of applying the environmental , safety, accident prevention and to protect the built and natural environment, .	
	Autonomy and Responsibility The student performs professional activities independently, consistently adhering to the relevant technical regulations and safety requirements, and assumes responsibility for the quality and reliability of their work. In their decision-making, the student upholds the primacy of professional ethics, legal compliance, and operational safety, and contributes responsibly to the effective and safe implementation of technological processes.	

Short decription of subject content	The direction of the chemical processes and equilibrium. The basics of chemical kinetics, experimental methods, the empirically determined reaction rate, reactions mechanism. Various types of reactions activation, homogeneous and heterogeneous catalysis, Diffusion. Chemical reactions in water. Nernst-equation. Basics of electrochemistry. Corrosion. Crystallization of metallic compounds.
Types of student activity	Participating in in lectures and taking notes Independent study using ppt slides. For preparing midterm tests (50%) Problemsolving on seminars (10%) and independently (30%), Demonstration experiments (10%) .
Required reading and resources	• Peter Atkins, Physical-Chemistry I.-II. -III.
Recommended readings and resources	• The Foundations of Chemical Kinetics" by Sidney W. Benson (1960
Assigments	According to the information provided during the first class, students are required to complete one assignment during the semester.
Description and schedule of exam	**As communicated in the first lecture class.**
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: AI tools may be used for specific task types (inclass work, support inpreparing written assigments and laboratory reports). Their use is strictly prohibited during midterm examinations

Production technologies of nuclear power plant devices

Subject name	In Hungarian	**Atomerőműi berendezések gyártástechnológiája**	Level	**BSC**
	In English	**Production technologies of nuclear power plant devices**	Code	**DUEN(L)-MST-150**
2026/2027 I.				
Responsible educational unit		**Institute of Engineering**		
Compulsory prerequisite subject:		-		

Type	Number of lessons			Requirement	credit	**Language of education**
Full time	Lecture	Seminar	Lab			
Part time **150/39**	Per week 1	**Per week** 0	Per Week **2**	V	5	**English**
Person responsible for the subject: **150/15**	Per semester 5	Per semester **0**	Per semester **10**			

subject teacher	**Name**	**Dr. Gábor Pór**	Position	**prof. emeirtus**

The training objective and justification of the course (content, outcome, place in the curriculum)	**Short Objective** The aim of teaching this subject is to enable students to select the materials and production technologies that best suit a given purpose. **Training history, development goals** In order to achieve the above goal, they will become familiar with the production, properties, and areas of application of the most important metallic and non-metallic structural materials, as well as the property-changing (alloying, casting, plastic forming, heat treatment and surface treatment) and forming (casting, plastic forming) technologies. They will learn about the manufacturing technology of individual units of nuclear power plants, such as the reactor vessel, steam generator, turbines, etc. Students will learn about the operation and application of the most important fusion and press welding processes, focusing on the processes used in nuclear power plants.	
Typical transfer methods	**Lecture**	**Projectors, ppt presentations, and teaching materials are available in Moodle.**
	Exercise	-
	Lab	**- Laboratory material testing, heat treatment, plastic forming, factory visit**
	Other	-
Requirements (expressed in academic results)	**Knowledge** Has a detailed knowledge of the operating principles of machines and equipment for material production, knows the basic technologies for the production and shaping of metals and their alloys (plastic forming and casting). Knows heat treatment and welding technology procedures	
	Ability Able to select the right raw material and technology for the purpose. Able to determine the steps of product manufacturing	
	Attitude He strives to ensure that his self-education in the field of materials engineering is continuous and consistent with his professional goals. He has the necessary stamina and tolerance for monotony to perform practical activities. He strives to continuously develop the applied technologies and procedures with a creative approach. He strives to apply energy and material-saving processes and technologies.	
	Autonomy and responsibility Determines the properties of various products, checks the quality of the work phases specific to the technology and carries out quality control of subtasks.	

	Assesses environmental impact related to production and strives to reduce it. Assesses and rationalizes energy consumption related to material production
Brief description of the course content	Production of metals: pig iron production, steel production, continuous casting, production of aluminum by electrolysis. Fe-Fe3C equilibrium phase diagram. Classification of steel and aluminum alloys, their characteristic properties. Nucleation and growth. Transformation diagrams for isothermal and continuous cooling. Formation of non-equilibrium tissue elements. Primary and secondary tissue structure. Tissue structure and mechanical properties of hot-formed alloys. Forging, pressing, hot rolling, tube manufacturing processes. Metallurgical phenomena of cold forming. Tissue structure and mechanical properties of cold-formed alloys. Sheet metal forming technologies: straightening of raw materials, material separation by thermal or shear stress, forming by bending, deep drawing, stretch drawing. Heat treatments covering the entire section. Surface heat treatments. Operation of the most important fusion and press welding processes, their application possibilities. Process and machines of the production technology of reactor vessels, steam generators and turbines.
Student activities	Processing heard text by taking notes and recording the material using your own and electronically available notes 40% Independent completion of laboratory exercises 20% Preparation of a semester assignment 20% Solving test tasks 20%
Required literature and its availability	[1] Dr. József Verő - Dr. Mihály Káldor: Metallurgy. Textbook Publishing House, Budapest, 1977 [2] Dr. Éva Dénes, dr. Péter Farkas, Zsoltné Fülöp and dr. Zoltán Szabó: Metal Technology, College Publishing House, Dunaújváros, 2008 [3] Dr. Tamás Tóth: Iron Alloys. National Textbook Publishing House, Budapest. 2002. [4] TÁMOP elearning curriculum: moodle.duf.hu; (DUE library) [5] Dr. Elemér Köves: Aluminum Industry Handbook, Chapter 2, pp. 35-74; Chapter 4, pp. 173-196, Technical Publishing House Budapest, 1984
Recommended literature and its availability	Antal Óvári: Ferrous Metallurgy Handbook, Technical Publishing House, 1985. International Atomic Energy Agency, IAEA website www
Description of tasks/measurement reports to be submitted	- Description of tasks/measurement reports to be submitted The student prepares a measurement report of the measurements performed.
Description and schedule of closed places	Description and timetable of closed sessions Closed session paper in the 6th and 12th weeks from the material from the lectures and lab classes.
Frameworks and rules for the use of artificial intelligence	b) partial authorization: artificial intelligence is allowed for certain types of tasks (e.g. classwork, submitted papers), but prohibited in other cases (e.g. closed-door papers).

Materials Engineering

<table>
<tr><td colspan="3" rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Fémtechnológia</td><td>Level</td><td>BSc</td></tr>
<tr><td>In English</td><td colspan="3">Materials Engineering</td><td>Code</td><td>DUEN(L)- MUA-150</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="4">Responsible educational unit</td><td colspan="5">Technical Institute</td></tr>
<tr><td colspan="4">Compulsory prerequisite subject:</td><td colspan="5"></td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="2" rowspan="2">Number of lessons</td><td colspan="3" rowspan="2"></td><td rowspan="2">Requirement</td><td rowspan="2">Credit</td><td rowspan="2">Language of education</td></tr>
<tr></tr>
<tr><td colspan="2">Lecture</td><td colspan="2">Seminar</td><td colspan="2">Lab</td><td rowspan="2">E</td><td rowspan="2">5</td><td rowspan="2">english</td></tr>
<tr><td>Full time</td><td>150/60</td><td>Per week</td><td>1</td><td>Per week</td><td>1</td><td>Per week</td><td>1</td></tr>
<tr><td>Part time</td><td>150/20</td><td>Per semester</td><td></td><td>Per semester</td><td></td><td>Per semester</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Person responsible for the subject:</td><td>name</td><td colspan="3">Dr. Andrea Szabó</td><td>position</td><td>Assistant Professor</td></tr>
<tr><td colspan="4" rowspan="2">Course objectives and justification (content, learning outcomes, place in curriculum)</td><td colspan="5">Short-term objective
The aim of the course is to enable students to understand the chemical and physico-chemical fundamental processes of pig iron and steel production along the entire technological chain, from the ore to the final product. In addition, the course provides an overview of the main steps of aluminium production, from bauxite preparation to the extraction of the metal.</td></tr>
<tr><td colspan="5">Objectives and development goals
The course builds on students' prior knowledge in chemistry and materials science, enabling them to understand the complex interrelationships of metal production processes. The developmental objective of the subject is to ensure that students gain a systems-level understanding of the technological procedures involved in metal production and develop an engineering perspective that can be effectively applied in industrial practice.</td></tr>
<tr><td colspan="4" rowspan="4">Typical delivery methods</td><td>Lecture</td><td colspan="4">using PPT slides and a projector</td></tr>
<tr><td>Seminar</td><td colspan="4">-</td></tr>
<tr><td>Lab</td><td colspan="4">Laboratory work, individual and collaborative</td></tr>
<tr><td>Other</td><td colspan="4">-</td></tr>
<tr><td colspan="4" rowspan="2">Requirements
(in learning outcomes)</td><td colspan="5">Knowledge

The student is familiar with the basic and auxiliary materials used in ironmaking, the melting equipment and energy carriers, as well as the metallurgical and operational characteristics of melting processes. The student understands the process cycles of oxygen steelmaking and electric steelmaking, the operations of ladle metallurgy, the casting technologies of steels, and the applied remelting procedures.
The student possesses knowledge of the industrial production processes of pig iron and steel, as well as of non-ferrous metals — with particular emphasis on aluminium. In the case of aluminium production, the student understands the main steps of alumina production from bauxite and the principles of the Hall–Héroult process.
The student is aware of the physical and chemical properties of the raw materials used, the reactions governing the processes and their optimisation possibilities, and also acquires practical insights through plant visits.</td></tr>
<tr><td colspan="5">Ability
Students are able to provide a systems-level overview of the subprocesses of pig iron and steel production and to interpret the entire technological process chain.
They can identify the characteristic microstructural features of various steels and independently carry out all steps of metallographic sample preparation required for microstructural examinations.
Furthermore, they are capable of understanding the fundamental process of aluminium production — from the main steps of alumina manufacturing starting from bauxite to the electrolytic reduction process of the Hall–Héroult method — recognising the key operations and their interdependencies.</td></tr>
</table>

	Attitude Students demonstrate appropriate perseverance and tolerance for monotony when carrying out practical activities. They prioritise the application of environmentally conscious technologies in the production of non-ferrous metals and alloys, keeping in mind the protection of both the built and natural environment. Their primary objective is to develop and apply energy- and material-efficient processes and technologies.
	Autonomy and responsibility The student is capable of evaluating the quality of the work phases characteristic of the technology and performing quality-control tasks related to the individual process steps. The student assesses and rationalises the energy consumption associated with material production, evaluates the environmental impacts of manufacturing, and strives to minimise them.
Short description of subject content	Characterisation and evaluation of iron ores. Pig iron production: raw materials and metallurgical processes of the operation. Products of pig iron manufacture. The objectives of steelmaking. Physico-chemical phases of steelmaking. Development and raw materials of oxygen steelmaking. Process cycles of the oxygen steelmaking route. Overview of process control models. Raw materials and process cycles of electric steelmaking (EAF: arc formation, melting, refining). Metallurgical processes of refining and finishing: desulphurisation and alloying. Impurities in steel. The role of ladle metallurgy, including passive and active ladle metallurgy. Degassing operations. Fundamental steps of bauxite and alumina production based on the Bayer process. Production of metallic aluminium by the Hall–Héroult electrolytic reduction process.
Types of student activity	Participation in lectures and taking handwritten notes; independent study using PPT slides for preparing for mid-term 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	Ahindra Ghosh, Amit Chatterjee – *Ironmaking and Steelmaking: Theory and Practice,* McGraw-Hill, 2008 R. H. Tupkary, V. R. Tupkary – *An Introduction to Modern Steel Making* Khanna Publishers, 2017
Recommended reading and resources	G. E. Totten, D. Scott MacKenzie – *Handbook of Aluminum: Volume 1–2* CRC Press George F. Vander Voort – *Metallography: Principles and Practice* McGraw-Hill
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 iron and steel production, aluminium and other metal manufacturing processes, structure–property relationships, and the interpretation of technological steps), 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 analysis of manufacturing routes, the justification of technological decisions, the interpretation of structural changes, and the formulation of related 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.

Plastic Physics

Subject name		In Hungarian	**Műanyagfizika**						Level	BSc	
		In English	**Plastic Physics**						Code	**DUEN(l)-MUA-255**	
2025/2026 II.											
Responsible educational unit			**Institute of Technology, Department of Structure Integrity**								
Compulsory prerequisite subject:			**…**								
Type		Number of lessons							Requirement	Credit	Language of education
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**1**	Per week	**0**	Per week	**2**		**V**	**5**	**English**
Part time	**150/15**	Per semester	**5**	Per semester	**0**	Per semester	**10**				
Person responsible for the subject:			name			**Henriette Mészáros**			position	**technical teacher**	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The aim of the course is to provide students with a comprehensive understanding of the chemical structure, production, physical states, and behavior of polymers. The subject links the chemical processes governing the synthesis of macromolecules with the thermodynamic, mechanical, and rheological properties of polymers, highlighting structure–property relationships. In addition, the course aims to enable students to apply engineering principles when selecting, characterizing, and assessing the applicability of polymer-based materials.	
	Objectives and development goals: The course provides fundamental chemical and physical knowledge essential for understanding the structure, behavior, and properties of polymer raw materials. It establishes the basis for students to perform engineeringlevel analyses of the lifecycle of plastics, particularly in the areas of material production, processing, application, ageing, and recycling	
Typical delivery methods	Lecture	-ppt slides, lecture near to the board
	Seminar	--
	Lab	laboratory practices, testing of polymers
	Other	-
Requirements (in learning outcomes)	**Knowledge** Understands the structure of polymers and the types of chemical bonds between them, as well as their roles in polymerization. Understands polymerization technologies and the properties of the resulting polymers. Understands the production methods and properties of thermoplastic and thermosetting polymers.	
	Ability Can interpret polymerization processes and evaluate their parameters from an engineering perspective. Can interpret material testing results (DSC, TGA, DMA, mechanical tests, etc.). Can apply rheological and structural models of polymers to practical problems. Can considering structure–property–processing relationships when selecting a given material.	
	Attitude Strives to continuously improve applied technologies and procedures through creative approaches. Is committed to using environmentally conscious technologies and to protecting the built and natural environment. Aims to apply energy and materialefficient processes and technologies.	
	Autonomy and responsibility Can independently and critically evaluate the properties of polymer materials.	

	Applies the acquired knowledge responsibly in engineering or laboratory environments. Can process and integrate new information in the rapidly evolving field of polymer technology.
Short description of subject content	Classification of organic compounds. Major reactions of hydrocarbons. Polymerization, polyaddition, polycondensation. Classification and structure of polymers. Physical and chemical properties of polymers. Physicochemical properties of polymer systems. Behavior of polymer systems under mechanical load. Stress and strain. Rheological characterization of solid and liquid polymer systems. Thermal properties of polymers. Testing methods for polymers.
Types of student activity	Processing of a lecture by taking notes (50%), accomplishing material tests (20%), evaluating measurements and making a report (30%)
Required reading and resources	[1] Dr. Endre Berecz: For Chemical Engineers, Budapest, Nemzeti Tankönyvkiadó Publishing House, 1995. [2] BÉLA PUKÁNSZKY, JÁNOS MÓCZÓ: Plastics, Budapest University of Technology and Economics, Faculty of Chemical Engineering and Bioengineering, Department of Physical Chemistry and Materials Science, 2011.
Recommended reading and resources	
Assignments	Measurement protocols and making a report as explained in the lab exercises, submission deadline: last day of the academic period
Description and schedule of exams	1 closed-door papers during the semester
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 polymer structure, properties, molecular interactions, processing behaviour, and physical principles), 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 polymer physical properties, the formulation of application-related conclusions, the analysis of processing parameters, and the justification of technological decisions — 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.

Up-to-date casting technologies

Subject name		In Hungarian	**Korszerű öntéstechnológiák**					Level	BSc	
		In English	**Up-to-date casting technologies**					Code	**DUEN(L)- MST-211**	
Responsible educational unit			**Technical Institute**							
Compulsory prerequisite subject:			**MST-210 Industrial materials** **MGT-116 Materials Science**							
Type		Number of lessons						Requirement	Credit	Language of education
		Lecture	Seminar			Lab				
Full time	**150/60**	Per week **1**	**1**	Per week		Per week	**2**	**M**	**5**	**english**
Part time	**150/20**	Per semester **5**		Per semester		Per semester	**10**			
Person responsible for the subject:			name			**Dr. Andrea Szabó**			position	**Assistant Professor**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The student shall be able to demonstrate an encyclopedic understanding of foundry technologies, select the appropriate casting technology and molding methods for a given metal component, and possess knowledge of molding materials, production equipment, and industrially significant casting alloys.	
	Objectives and development goals The course builds on the students' prior knowledge of materials science and materials engineering, which provides the foundation for understanding the behaviour and processing of metallic materials. Its developmental objective is to offer students a comprehensive overview of the operating principles and application possibilities of casting technologies. The course supports students in confidently selecting and evaluating various foundry processes in their future engineering tasks.	
Typical delivery methods	Lecture	using PPT slides and a projector
	Seminar	-
	Lab	Laboratory work, individual and collaborative
	Other	-
Requirements (in learning outcomes)	**Knowledge** The student is familiar with the fundamental technologies used in the production of metals and their alloys, as well as with the operating principles of foundry processes. The student has an overview of the structure, functions, and application fields of foundry machines and equipment. The student is aware of the properties of industrially significant casting alloys and understands the related considerations for selecting suitable mold materials and casting technologies.	
	Ability The student is capable of interpreting and practically applying the technical specifications required for operating foundry equipment. The student can consistently apply the principles of machine and equipment setup and operation throughout the manufacturing processes. Furthermore, the student recognizes the economic implications of technological decisions and, by considering these factors, is able to select efficient and safe operational solutions.	

	Attitude During the completion of practical tasks, the student demonstrates consistency, discipline, and a high level of professional rigor, performing all work in full compliance with quality assurance and occupational safety regulations. The student is committed to the continuous improvement of applied technologies and approaches tasks with an innovative mindset, aiming to implement modern, efficient, and reliable technical solutions. The student's work is characterized by a strong sense of responsibility, professional ethics, and constructive collaboration skills, and in decision-making consistently takes economic, environmental, and sustainability considerations into account.
	Autonomy and responsibility The student performs professional activities independently, consistently adhering to the relevant technical regulations and safety requirements, and assumes responsibility for the quality and reliability of their work. In their decision-making, the student upholds the primacy of professional ethics, legal compliance, and operational safety, and contributes responsibly to the effective and safe implementation of technological processes.
Short description of subject content	The role of foundry technology in industry. Fundamental aspects of foundry operations (molding materials, molding methods, solidification of metals). Melting furnaces and energy sources used in foundry practice. Alloys, typical molding methods, and melting equipment of iron and steel foundries. Alloys, molding technologies, and melting furnaces in light-metal and non-ferrous foundry practice. Pressure die casting. Modern foundry technologies (squeeze casting, rapid prototyping). Comparison of various casting processes. Cleaning and finishing of castings. The role of powder metallurgy, its raw materials, and typical powder-metallurgical products. Powder production. Compaction and sintering of metals. Properties of powder-metallurgical products. Metal additive manufacturing (3D metal printing), machines, technologies, and examination of finished parts.
Types of student activity	Participation in lectures and taking handwritten notes; independent study using PPT slides for preparing for mid-term 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	American Foundry Society (AFS) – *Metalcasting Technology for Students* (AFS Publications) ASM International – Powder Metal Technologies and Applications (ASM Handbook, Vol. 7)
Recommended reading and resources	John Campbell – *Castings* (Butterworth-Heinemann) William D. Callister & David Rethwisch – Materials Science and Engineering: An Introduction (Wiley)
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 concepts related to casting technologies, reviewing foundry processes), 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 description of casting processes, the interpretation of defect formation mechanisms, and the analysis of technological operations—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.

Instrumental analytical chemistry

Subject name		In Hungarian		**Műszeres analitikai kémia**					Level	BSc	
		In English		**Instrumental analytical chemistry**					Code	**DUEN(L)-MST-212**	
2025/2026-II.											
Responsible educational unit				**Institute of Technology**							
Compulsory prerequisite subject											
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**01**	Per week	**0**	Per week	**2**	**V**	**5**	**English**	
Part Time	**150/15**	Per Semester	**5**	Per Semester	**0**	Per Semester	**10**				
Person responsible for the subject				Name		**Dr. Imre Kovács**			Position	**Associate professor**	

Course objective and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The materials science students must be familiar with a chemical laboratory, they should know how to determine the chemical composition and materials characterization. At the end of this subject student must work independently in an analytical laboratory also students have to know how to use the various instruments in the lab evaluate the raw data to determine composition necessary for further applications.	
	Objectives and development goals These course is based on chemical principles. Students based on the chemical, physical properties of their materials they should be able to carry out the different analytical methods, to develop the calculations as well as confirm their results by the proper laboratory experiments; such as volumetric, optical methods as well as by other instruments.	
Typical delivery methods	Lectures	**PPt slides with projector and lectures on the board**
	Seminars	s
	Labor	Laboratory practice, individual and collaborative
	Other	-
Requirements (in learning outcomes)	**Knowledge** The student is familiar with fundamental general chemistry and physical problem solving as well as some basic mathematical descriptions and calculations. ..	
	Ability The student is able to apply the corresponding computational calculation and is understanding the results with censoriously critisise.	

	Attitude With a creative approach , it strives for the continuous improvement of applied procedures. The student is capable of applying the environmental , safety, accident prevention and to protect the built and natural environment, .
	Autonomy and Responsibility The student performs professional activities independently, consistently adhering to the relevant technical regulations and safety requirements, and assumes responsibility for the quality and reliability of their work. In their decision-making, the student upholds the primacy of professional ethics, legal compliance, and operational safety, and contributes responsibly to the effective and safe implementation of technological processes.
Short decription of subject content	During the course the students will repeat the basic knowledge of chemical and physical properties of hydrogen. The laboratory scale production of hydrogen. The purification methods of industrial scale gas, some, chemical storage possibilities. The principles of various fuel cells.
Types of student activity	Participating in in lectures and taking notes, **i**independent study using ppt slides. For preparing midterm tests (50%) Laboratory experiments connected to lecture chapters (30%). Individual learning for tests and exams (20%) .
Required reading and resources	- Skoog and Wests: - Fundamentals of Analytical Chemistry, Cengage Learning 9th edition
Recommended readings and resources	Skoog and Wests: Fundamentals of Analytical Chemistry, Cengage Learning 9th edition
Assigments	According to the information provided during the first class, students are required to complete one assignment during the semester.
Description and schedule of exam	**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 concepts related to analytical measurement methods, reviewing instrumental analysis principles), as well as for developing the structure or improving the linguistic quality of laboratory reports and written assignments. Students must ensure that all submitted professional content—particularly the interpretation of analytical procedures, measurement principles, calibration processes, error analysis, and the evaluation of instrumental data—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.

Life cycle of plastics

Subject name	In Hungarian	**Műanyagok életciklusa**		Level	BSc
	In English	**Life cycle of plastics**		Code	**DUEN(L)-MST-251**
2025/2026-II.					
Responsible educational unit		**Institute of Technology**			
Compulsory prerequisite subject					

Type		Number of lessons						Requirement	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	**150/39**	Per week	**01**	Per week	**0**	Per week	**2**	**V**		
Part Time	**150/15**	Per Semester	**5**	Per Semester	**0**	Per Semester	**10**		**5**	**English**

Person responsible for the subject	Name	**Dr. Imre Kovács**	Position	**Associate professor**

Course objective and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The materials science students must be familiar with the different polymer production technologies and various polymers. The student must be able to select the proper polymer material in order to fit the chemical, the mechanical requirements for application also in environmentally and economically best choice. Finally the student should know the recycling methods or waste treatment technologies in order keep the environment intact of used, plastics.	
	Objectives and development goals The student will learn besides the chemistry of plastic production technology as well as the waste treatment technology, the recycling of plastics and reparation of used materials.	
Typical delivery methods	Lectures	**PPt slides with projector and lectures on the board**
	Seminars	s
	Labor	Laboratory practice, individual and collaborative
	Other	-
Requirements (in learning outcomes)	**Knowledge** The student is familiar with fundamental general and organic chemistry and physical problem solving as well as some basic mathematical descriptions and calculations.	
	Ability The student is able to apply his corresponding chemical knowledge.	
	Attitude With a creative approach , it strives for the continuous improvement of applied procedures. The student is capable of applying the environmental , safety, accident prevention and to protect the built and natural environment, .	
	Autonomy and Responsibility The student performs professional activities independently, consistently adhering to the relevant technical regulations and safety requirements, and assumes responsibility for the quality and reliability of their work. In their decision-making, the student upholds the primacy of professional ethics, legal	

	compliance, and operational safety, and contributes responsibly to the effective and safe implementation of technological processes.
Short description of subject content	Different type of formating plastics, like casting, dipping, extrusion, injection moulding, blowing. After injection moulding the final treatment of products. Plastics reparation welding or cementation. Biological demolition of plastics. Production of filaments for 3D printing . Waste treatment. Separation and recycling.
Types of student activity	Participating in in lectures and taking notes, iindependent study using ppt slides. For preparing midterm tests (50%) Laboratory experiments connected to lecture chapters (30%). Individual learning for tests and exams (20%).
Required reading and resources	Christian Bonten: Plastics Technology Introduction and Fundamentals, Hanser Publications, Cincinnati, 2019
Recommended readings and resources	• Manas Chanda - Introduction to Polymer Science and Chemistry_ A Problem Solving Approach (2006) •
Assignments	According to the information provided during the first class, students are required to complete one assignment during the semester.
Description and schedule of exam	**As communicated in the first lecture class.**
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.

Micro and nano structures

Subject name		In Hungarian	**Mikro és nano struktúrák**						Level	BSc	
		In English	**Micro and nano structures**						Code	**DUEN(L)-MST-252**	
2025/2026 II.											
Responsible educational unit			**Institute of Technology, Department of Structure Integrity**								
Compulsory prerequisite subject:			**…**								
Type		Number of lessons							Requirement	Credit	Language of education
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**1**	Per week	**0**	Per week	**2**				
Part time	**150/15**	Per semester	**5**	Per semester	**0**	Per semester	**10**		**V**	**5**	**english**
Person responsible for the subject:			name			**Judit Pazman PhD**			position	**docent**	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** Materials engineers need to be familiar with the properties of various composite materials, their production technologies, and their application areas. The student should be able to select a composite material suitable for a given technical process. Based on the properties of micro and nano composites, they should be able to make optimal material choices.	
	Objectives and development goals Based on the physical, chemical, and mechanical properties of traditional material families learned during the BSc studies, the aim is to understand and get to know the structure of complex material systems. By the end of the course, students should have knowledge of materials and manufacturing technologies that can be applied under specific conditions..	
Typical delivery methods	Lecture	-ppt slides, lecture near to the board
	Seminar	--
	Lab	laboratorical practices, second phase volume fraction determination
	Other	-
Requirements (in learning outcomes)	**Knowledge** To be familiar with the basic material types (metals, polymers, and ceramics) and their production technologies, thus also with the manufacturing technologies of composite materials. To be familiar with the micro- and nanostructures used in electronics, their characteristic properties, and production technologies.	
	Ability Able to apply the related computational and modelling principles and methods of product and technology design. Able to select the optimal raw materials and specify the appropriate manufacturing technology for producing the composite product for a given application. Understands and uses the characteristic online and printed literature of their field in both Hungarian and foreign languages.	
	Attitude With a creative approach, it strives for the continuous improvement of applied technologies and procedures. It aims to apply environmentally conscious technologies and to protect the built and natural environment. It seeks to implement energy- and material-saving processes and technologies... .	
	Autonomy and responsibility Determines the properties of various products, checks the quality of process steps characteristic of the technology, and carries out quality control of sub-tasks. Assesses and rationalizes energy consumption related to material production..	

Short description of subject content	Types of technical materials (metals and alloys, ceramics, polymers, semiconductors). Particle-reinforced, fiber-reinforced, layered composites, their manufacturing technologies, properties, applications, and development possibilities. Sandwich structures, wood materials. Analysis of the properties of metals and other technical materials and trends in their changes. Polymer matrix and ceramic matrix composite materials. Materials for micro- and nanoelectronics. Layer formation technologies, electronic thin films (lithography, etching, chemical mechanical polishing). Scanning Probe Technologies. Nanocomposites, fullerenes, graphite and carbon nanotubes, ceramic nanotubes and particle manufacturing.
Types of student activity	Processing of a lecture by taking notes (50%), accomplishing material tests (30%), evaluating measurements and making a report (40%)
Required reading and resources	Dr. Tóth Tamás: Kompozit anyagok, Főiskolai kiadó, 2000. Gácsi Zoltán, Simon Andrea, Pázmán Judit: Fémkompozitok, Miskolci Egyetem, 2011.
Recommended reading and resources	ASM Handbook: Composites
Assignments	Measurement protocols and making a report as explained in the lab exercises, submission deadline: last day of the academic period
Description and schedule of exams	1 closed-door papers during the semester, on the topic of composites
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 polymer structure, properties, molecular interactions, processing behaviour, and physical principles), 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 polymer physical properties, the formulation of application-related conclusions, the analysis of processing parameters, and the justification of technological decisions — 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.

Mechanical Material testing

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Mechanikai anyagvizsgálat</td><td>Level</td><td>BSc</td></tr>
<tr><td>In English</td><td colspan="3">Mechanical Material testing</td><td>Code</td><td>DUEN(L)-MUA-212</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Technical Institute</td></tr>
<tr><td colspan="2">Compulsory prerequisite subject:</td><td colspan="5">MGT-116 Materials Science</td></tr>
<tr><td rowspan="2">Type</td><td rowspan="2"></td><td colspan="2" rowspan="2">Number of lessons</td><td colspan="2" rowspan="2"></td><td rowspan="2">Requirement</td><td rowspan="2">Credit</td><td rowspan="2">Language of education</td></tr>
<tr></tr>
<tr><td></td><td></td><td>Lecture</td><td colspan="2">Seminar</td><td colspan="2">Lab</td><td></td><td></td><td></td></tr>
<tr><td>Full time</td><td>150/60</td><td>Per week 1</td><td>1</td><td>Per week</td><td></td><td>Per week</td><td>2</td><td rowspan="2">M</td><td rowspan="2">5</td><td rowspan="2">english</td></tr>
<tr><td>Part time</td><td>150/20</td><td>Per semester 5</td><td></td><td>Per semester</td><td></td><td>Per semester</td><td>10</td></tr>
<tr><td colspan="2">Person responsible for the subject:</td><td colspan="2">name</td><td colspan="2">Dr. Andrea Szabó</td><td>position</td><td colspan="2">Assistant Professor</td></tr>
<tr><td colspan="2">Course objectives and justification (content, learning outcomes, place in curriculum)</td><td colspan="5">Short-term objective
The aim of the course is to introduce students to the fundamental methods of mechanical testing of metals, alloys, and polymers, as well as to the operating principles of the equipment used for these tests. The course prepares students to carry out mechanical tests independently and to interpret the measurement results professionally. Furthermore, it provides the foundation for selecting the appropriate testing technique even in more complex engineering tasks

Objectives and development goals
The course builds upon prior knowledge in materials science and materials structure, which provides the foundation for understanding the behaviour and mechanical responses of different material groups. Its developmental objective is to enable students to apply mechanical testing methods professionally, to use measurement systems correctly, and to carry out systematic evaluation of test results. The course contributes to developing the students' ability to select appropriate testing techniques with engineering responsibility, scientific rigor, and a comparative analytical approach, to design experiments, and to draw well-founded conclusions from the results.</td></tr>
<tr><td colspan="2" rowspan="4">Typical delivery methods</td><td>Lecture</td><td colspan="4">using PPT slides and a projector</td></tr>
<tr><td>Seminar</td><td colspan="4">-</td></tr>
<tr><td>Lab</td><td colspan="4">Laboratory work, individual and collaborative</td></tr>
<tr><td>Other</td><td colspan="4">-</td></tr>
<tr><td colspan="2">Requirements
(in learning outcomes)</td><td colspan="5">Knowledge

The student is familiar with the fundamental physicochemical processes occurring in material systems and their basic mathematical descriptions, with particular emphasis on thermodynamic and kinetic relationships. The student possesses extensive knowledge of the atomic, micro- and macrostructure of solid materials, of the methods required for structural characterization, and of the operating principles of the corresponding analytical instruments, and understands the processes that govern the formation of these structures. The student is aware of the occupational safety, fire protection, technical safety, and environmental regulations relevant to the field, as well as the practical requirements associated with their implementation.

Ability
The student is capable of applying the environmental, occupational safety, accident prevention, and technical safety requirements relevant to the field, and of modifying testing procedures accordingly. The student is able to interpret and professionally utilize Hungarian and foreign-language technical literature related to mechanical testing for the planning, execution, and evaluation of examinations.</td></tr>
</table>

	Attitude The student is committed to the continuous development of their professional knowledge and to self-directed learning in accordance with the expectations of the materials engineering discipline. The student performs practical tasks with perseverance, discipline, and adequate endurance even during repetitive or monotonous activities. In their work, the student consistently applies an environmentally conscious approach and strives to use technologies that support the protection of the built and natural environment.
	Autonomy and responsibility The student performs professional activities independently, consistently adhering to the relevant technical regulations and safety requirements, and assumes responsibility for the quality and reliability of their work. In their decision-making, the student upholds the primacy of professional ethics, legal compliance, and operational safety, and contributes responsibly to the effective and safe implementation of technological processes.
Short description of subject content	The course presents the fundamental testing methods used to determine the mechanical properties of solid materials, with particular emphasis on the theoretical and practical aspects of hardness testing and tensile testing. Students will also become familiar with the application of the Charpy impact test, as well as the principles and practical execution of surface roughness measurements. The course provides a detailed overview of the relevant testing standards, the operational characteristics of the equipment, and the interpretation of test results, with special attention to the specific testing considerations associated with different material types, including metals, polymers, ceramics, and composites
Types of student activity	Participation in lectures and taking handwritten notes; independent study using PPT slides for preparing for mid-term 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	Norman E. Dowling – *Mechanical Behavior of Materials: Engineering Methods for Deformation, Fracture, and Fatigue* (Pearson).
Recommended reading and resources	ASTM International – *ASTM E18, E92, E10* (Hardness Test Standards) Davis, J. R. (ed.) – *Tensile Testing*, 2nd ed. (ASM International).
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 concepts related to mechanical testing methods, measurement principles, and structure–property relationships), 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 mechanical test results, the analysis of material behaviour under load, the processing of measurements, 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.

Forming of Metals

Subject name		In Hungarian	**Fémek képlékenyalakítása**							Level	**BSC**		
		In English	**Forming of Metals**							Code	**DUEN(L)-MUA-251**		
2026/2027 I.													
Responsible educational unit			**Technical Institute**										
Compulsory prerequisite subject:			-										
Type Full time		Number of lessons								Requirement	credit	**Language of education**	
		Lecture		Seminar		Lab							
Part time	**150/60**	Per week	1	**Per week**		0	Per Week	**2**	M				
Person responsible for the subject:	**150/20**	Per semester	**5**	Per semester		**0**	Per semester	**10**	5	**English**			
subject teacher				**Name**		**Dr. Péter Bereczki**				Position	**Associate Professor**		
Course objectives and justification (content, learning outcomes, place in curriculum)				**Short-term Objective** The student will learn the basic concepts of metal forming. With knowledge of the basic concepts, he/she will be able to operate and design specific forming technologies.									
				Educational background and development objectives The course builds on the students' previous knowledge of materials science and manufacturing technology and provides theoretical and practical knowledge of the technologies of plastic forming of metals and alloys. Its development goal is to enable students to understand the operation of forming processes used in industry, to perform calculation and modeling tasks, and to interpret technological requirements.								
Typical transfer methods				**Lecture**		**Projector-based presentation using PowerPoint materials**							
				Exercise		-calculation exercise							
				Lab		In the framework of individual and group work in university laboratories							
				Other		- **Industrial visit**							
Requirements (expressed in academic results)				**Knowledge** He/She knows the theoretical and practical aspects of the plastic forming of metals and their alloys, as well as the basic technological methods. He/She knows the expectations and requirements of the occupational, fire protection and safety engineering areas related to his/her field, as well as the relevant environmental protection regulations.									
				Ability Able to apply the related calculation and modeling principles and methods of product and technological design. Understands and applies the environmental, occupational and accident protection, and safety requirements typical of his/her field, and is able to modify processes in accordance with expectations. Requirements (expressed in study results) Understands and uses the typical online and printed literature of his/her field in Hungarian and foreign languages.								
				Attitude Has the necessary stamina and tolerance for monotony to perform practical activities. Strives to apply environmentally conscious technologies and to protect the built and natural environment. Strives to apply energy and material saving processes and technologies.									
				Autonomy and responsibility Determines the properties of various products, checks the quality of the work phases specific to the technology and performs quality control of subtasks. Assesses and rationalizes energy consumption related to material production. Assesses environmental impact related to production and strives to reduce it.									
Brief description of the course content				Basic knowledge of plastic metal forming. Material structure aspects of plastic deformation. Classification of forming processes. Measurements of deformation. Cold and hot forming. Frictional conditions. Plasticity of metals. Stress state, flow conditions. Rolling. Geometry of the roll gap. Hot rolling. Systematization of rolled products. Structure and main units of roll trains. Hot rolling of flat products. Slab heating. Pre-stretching and finishing rolling. Rolling of shaped products (profiles). Modern versions of rolling technologies (CSP, ISP, etc.). Cooling, coiling, finishing. Cold rolling. Preparation of the starting product. Pickling. Reversing and unidirectional cold rolling mills. Properties of rolled products. Coating									

	technologies of sheets (plastic, metal layers, etc.). Rolling of bars and tubes. Bar drawing technologies. Forging technological methods. Technological foundations of open-form forging. Typical open-form operations. Burr-free forging. Determination of the basic parameters of the required forming machine, machine selection. Forming technological parameters of extrusion. Drawing. Drawing technologies. Wire drawing. Pipe drawing with wall thinning. Drawability conditions. Further processing of flat products and sheets (cutting, bending, deep drawing).
Student activities	Processing heard text by taking notes 50% Task-guided organization of information 30% Independent processing of tasks 20%
Required literature and its availability	Dr. Kiss Ervin: Plastic Forming. Technical Publishing House. 1996 Required literature and its availability • Dr. Voith Márton: The Theory of Plastic Forming I. Miskolc University Publishing House 1998. • Dr. Voith Márton: The Theory of Plastic Forming II. Miskolc University Publishing House 1995.
Recommended literature and its availability	Márton Voith: Plastic Forming of Light Metals. Textbook Publishing House, Budapest 1982
Description of tasks/measurement reports to be submitted	According to the information provided during the first class, students are required to complete one assignment during the semester.
As discussed in the first lesson. Submission of lab reports.	As stated in the first lesson.
Frameworks 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 concepts related to plastic deformation, forming processes, and material behaviour), 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 analysis of forming technologies, the interpretation of deformation mechanisms, the evaluation of processing parameters, 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.

Space Ceramics

Subject name		In Hungarian	**Űripari kerámiák**						Level	BSc	
		In English	**Space Ceramics**						Code	**DUEN(L)-MST-253**	
2025/2026 II.											
Responsible educational unit			**Institute of Technology, Department of Structure Integrity**								
Compulsory prerequisite subject:			**…**								
Type		Number of lessons							Requirement	Credit	Language of education
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**2**	Per week	**0**	Per week	**1**		**V**	**5**	**english**
Part time	**150/15**	Per semester	**10**	Per semester	**0**	Per semester	**5**				
Person responsible for the subject:			name	**Judit Pazman PhD**					position	**docent**	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The aim of the course is to introduce students to the raw materials necessary for ceramic production, their occurrences, and their possible applications. Within the framework of the course, students are expected to understand silicate chemistry processes. The goal of the course is for future materials engineers to acquire knowledge of the physical, chemical, and mechanical properties of ceramics and their areas of use, with a focus on industrial applications, which is an essential condition for understanding the relationships between chemical composition, structure, and material properties..	
	Objectives and development goals Based on the knowledge of inorganic chemistry from previous semesters, students will learn the basics of mineralogy, its terminology, lattice structures, and the physical, chemical, and mechanical properties of ceramics. By the end of the course, they will have a solid understanding of the structure of ceramics and their potential applications. With this knowledge, they will be able to select and evaluate suitable ceramic raw materials for specific applications.	
Typical delivery methods	Lecture	-ppt slides, lecture near to the board
	Seminar	--
	Lab	fracture analysis with 3D microscope, determination of the chemical composition using by scanning electron microscope
	Other	-
Requirements (in learning outcomes)	**Knowledge** To be familiar with the structure of silicates and the formation of rocks. To know the physical, chemical, and mechanical properties of ceramics and their possible uses. To be familiar with the main types of ceramics used in the construction industry and their main properties, as well as the material testing methods required for their classification.	
	Ability Able to select the ideal ceramics for specific applications. Able to choose the appropriate manufacturing technology for a given ceramic. Able to determine whether a given ceramic can be processed with the selected manufacturing technology or not.	
	Attitude With a creative approach, they strive for the continuous development of applied technologies and processes. The aim is to apply environmentally conscious technologies and to protect the built and natural environment. Striving to implement energy- and material-saving processes and technologies. To determine the characteristics of various products, check the quality of work phases characteristic of the technology, and carry out quality control of partial tasks. To assess and rationalize energy consumption related to material production.	

	Autonomy and responsibility To determine the properties of various products, checks the quality of the process steps characteristic of the technology, and to carry out quality control of partial tasks. To assess and rationalize the energy consumption related to material production. To be familiar with the main ceramics used in the space industry and their key properties, as well as the material testing methods required for their qualification. To be familiar with the different ceramic manufacturing technologies, their individual steps, and the equipment needed for them. To be familiar with the manufacturing technologies of special space industry ceramics, their equipment, and their operating principles.
Short description of subject content	Mineralogy overview. Basic concepts of crystallography. Crystal chemistry of silicates. Raw materials of the silicate industry. Rocks, their formation, properties, and applications. Basic knowledge of colloid chemistry. Physical and chemical properties resulting from the structure of silicates. Important minerals of igneous rocks, their characteristics, and uses. Sedimentary rocks. Formation and types of sedimentary rocks. Important minerals of sedimentary rocks. Technological characteristics and applications: SiO2. Clay minerals, mineralogical and chemical properties. Materials and ceramics used in the space industry. Ceramic matrix composites, classification, structural composition, relationship between structure and properties, ceramic components of spacecraft and their stresses. Classification of space industry ceramics and their areas of use, main properties, recyclability.
Types of student activity	Processing of a lecture by taking notes (50%), accomplishing material tests (20%), evaluating measurements and making a report (30%)
Required reading and resources	Juhász A. Zoltán: Bevezetés a szilikátkémiai technológiákba, Akadémiai kiadó, Budapest ASM Handbook Volume 21 – Composites 39-64 old.; 1400-1442 old.
Recommended reading and resources	Handbook Ceramics and Composites Volume 1-3; New York (USA) 1990
Assignments	Measurement protocols and making a report as explained in the lab exercises, submission deadline: last day of the academic period
Description and schedule of exams	1 closed-door papers during the semester, on the topic of silicate chemistry knowledge
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 ceramic raw materials, manufacturing processes, structure–property relationships, and application fields), 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 the physical, chemical, and mechanical properties of ceramic materials, the evaluation of requirements related to space-industry applications, 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.

Coating Processes

Subject name		In Hungarian	**Felületi és vékonyréteg technikák**						Level	**BSC**	
		In English	**Coating Processes**						Code	**DUEN(L)- MST-254**	
2026/2027 I.											
Responsible educational unit			**Technical Institute**								
Compulsory prerequisite subject:			-								
Type Full time		Number of lessons						Requirement		credit	**Language of education**
		Lecture		Seminar		Lab					
Part time	**150/60**	Per week	1	**Per week**	0	Per Week	**2**	M			
Person responsible for the subject:	**150/20**	Per semester	**5**	Per semester	**0**	Per semester	**10**		5	**English**	
subject teacher				**Name**		**Andrea Szabó, PhD**			Position	**Assistant Profes**	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The aim of the course is to provide students with comprehensive knowledge of surface-treatment and coating technologies for metals and metal alloys, with particular emphasis on corrosion protection and functional surface-engineering methods. Throughout the course, students become familiar with the types of industrial coatings, their manufacturing technologies, and the behaviour of metals in the presence of acids, bases, and environmental influences, enabling them to select and design appropriate coating systems.	
	Objectives and development goals The course builds on the students' prior knowledge in materials science, chemistry, and structural characterization. It presupposes an understanding of the atomic structure and basic chemical properties of metals and alloys, as well as the fundamentals of corrosion processes. The developmental aim of the course is to enable students to: understand the operating principles of various surface-treatment and coating technologies, analyse the corrosion behaviour of metals, select appropriate preventive or protective coatings for specific industrial environments, enhance the functional or aesthetic performance of products through targeted surface modifications. In this way, the course supports students' professional development both in engineering thinking and in the informed, technically sound application of industrial coating systems.	
Typical transfer methods	**Lecture**	**Using projector, PPT slides**
	Exercise	-
	Lab	Laboratory demonstrations and experiments.
	Other	-
Requirements (expressed in academic results)	**Knowledge** The student possesses theoretical and practical knowledge related to the subject area. The student understands the purpose of surface treatment and the classification of surface-treatment methods. The student knows the causes of corrosion formation and the reactions of metals with acids, oxygen, and alkalis. The student is familiar with the electrochemical fundamentals of corrosion, as well as the basic concepts and professional terminology used in corrosion science. The student understands the different types of corrosion and is aware of the corrosive effects caused by chemical agents. The student has an overview of the principles of material selection from a corrosion-resistance perspective.	
	Ability The student is able to carry out tasks related to the subject area. The student can distinguish between different forms of corrosion and can plan the sequence and workflow of corrosion tests. The student performs a comprehensive corrosion examination of a product and interprets the evaluation of a corrosion experiment's results. Based on the test results, the student can propose improvements to previously applied coating technologies.	
	Attitude The student develops the attitude necessary for solving engineering problems. The student cooperates effectively with peers and the instructor in the process of expanding professional	

	knowledge. The student strives to continuously broaden their understanding of surface-treatment techniques and remains open to learning and applying modern testing methods. The student aims for precise task execution in both analytical work and laboratory exercises. The student seeks to continuously improve applied technologies and procedures through a creative approach.
	Autonomy and responsibility The student takes responsibility for their work. The student independently carries out experiment-planning tasks based on the provided guidelines and resources. The student assesses the environmental impact associated with manufacturing and strives to reduce it. The student evaluates and rationalises the energy consumption related to materials production. The student performs the required occupational safety tasks
Short description of subject content	The student becomes familiar with and is able to apply coating-technology processes, and understands the properties and applicability of different coating types. Within the scope of the course, the student learns about the behaviour of metals in corrosive environments as well as various metal-deposition techniques. Gas-phase deposition techniques (PVD, CVD). Metal deposition from liquid phase (electroplating, electroless plating). Solid-phase layer-formation techniques (cladding). Anodizing of aluminum. Surface hardening. Formation of wear-resistant surface layers (nitriding, boriding, carburizing, carbonitriding, case hardening). Painting techniques and methods for examining coating layers.
Student activities	Processing of spoken text with note-taking: 50%, Task-guided organisation of information: 30%, Independent completion of assignments: 20%
Required reading and resources	
Assignments	Preparationof one laboratory report during the semester, in accordance with the instructions given in the first class.
Description and schedule of closed places	As specified in the first class.
Frameworks 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 surface-engineering methods, coating technologies, corrosion-protection mechanisms, and structure–property relationships of coated systems), 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 coating mechanisms, the analysis of corrosion behaviour, the evaluation of surface-treatment processes, and the formulation of technological 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.

Heat Treatment

Subject name	In Hungarian	**Hőkezelés**		Level	**BSC**
	In English	**Heat Treatment**		Code	**DUEN(L)- MUA-113**
2026/2027 I.					
Responsible educational unit		**Institute of Engineering**			
Compulsory prerequisite subject:		**-MST-210 Industrial materials**			

Type		Number of lessons						Requirement	credit	**Language of education**
Full time		Lecture		Seminar		Lab				
Part time	**150/60**	Per week	1	**Per week**	0	Per Week	**2**	M	5	**English**
Person responsible for the subject:	**150/20**	Per semester	**5**	Per semester	**0**	Per semester	**10**			

subject teacher	**Name**	**Dr. Péter Bereczki**	Position	**Associate Professor**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term Objective** The aim of the course is for students to become familiar with the fundamental heat treatment and surface treatment processes used in industry, and to be able to independently propose which heat treatment or surface treatment methods should be applied in order to achieve specific material properties.	
	Educational background and development objectives The course builds on the students' previously acquired basic knowledge of materials science, metallography, structure examination and metal technologies, particularly the interpretation of phase diagrams, microstructures and thermal effects. Its objective is to familiarize students with the operation, mechanisms and application conditions of industrial heat treatment and surface technology processes, and to enable them to select and propose appropriate heat treatment technologies independently in order to achieve the desired material properties.	
Typical transfer methods	Lecture	Projector-based presentation using PowerPoint materials
	Exercise	-
	Lab	Laboratory practice including heat treatment and simple surface treatment processes and the examination of material structure
	Other	- Industrial visit
Requirements (expressed in academic results)	**Knowledge** he student understands the basic physical and chemical properties of metals, alloys and polymers/plastics, their behavior in corrosive environments, and structural changes caused by temperature effects. Based on this knowledge, students learn heat treatment methods aimed at improving the physical, chemical and mechanical properties of materials (metals and polymers). They will therefore be able to recommend and apply appropriate heat treatment methods for specific applications. The student is familiar with the basic technologies of heat treatment and surface treatment.	
	Ability Students are able to apply the fundamental principles required for heat treatment design, ensuring that the technology meets material structure, surface quality, integrity and economic requirements. Taking the desired combination of properties into account, the student is able to select the appropriate heat treatment technology and propose the type and characteristics of the required heat treatment equipment.	
	Attitude The student strives for continuous self-development in the field of materials engineering and heat treatment in line with professional goals. The student aims to apply environmentally conscious technologies and energy- and material-efficient processes.	
	Autonomy and responsibility	

	The student determines the heat treatment technology required to ensure the properties of different products, supervises the quality of technological work phases, and performs quality control of subtasks.
Brief description of the course content	Detailed presentation of heat treatment processes, description of the technology and design principles related to them: austenitization, hardening, and tempering of steels; homogenization, annealing, and tempering of aluminum alloys. Surface layer formation, carbonization, nitriding, carbonitriding, nitrocementation.
Student activities	Processing of a lecture by taking notes (50%), conducting material tests (30%), evaluating measurements and preparing a report (20%)
Required literature and its availability	János Takács: Modern Technologies in the Development of Surface Properties, Technical University Publishing House, 2004 • Tamás Tóth: Iron Alloys. National Textbook Publishing House, Budapest, 2002
Description of tasks/measurement reports to be submitted	As stated in the first lesson. Submission of lab practice reports, which include a brief description of the heat and surface treatment procedures, their implementation processes, examination of the tissue structure of the heat-treated samples, summary and evaluation of the test results.
Assignments	According to the information provided during the first class, students are required to complete one assignment during the semester.
Description and schedule of closed places	As communicated in the first lecture class
Frameworks 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 heat-treatment processes, phase transformations, microstructural changes, and structure–property relationships), 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 heat-treatment mechanisms, the evaluation of microstructural results, the analysis of mechanical properties, and the formulation of technological recommendations—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.

Welding

Subject name		In Hungarian	Hegesztés						Level	BSc	
		In English	Welding						Code	DUEN(L)-MUA-210	
2023/2024 I.											
Responsible educational unit			Institute of Technology, Department of Structural Integrity								
Compulsory prerequisite subject:			DUEN(L)-MUA-116								
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture	Seminar			Lab					
Full time		Per week	2	Per week	x	Per week	1	E	5	English	
Part time		Per semester	10	Per semester	x	Per semester	5				
Person responsible for the subject:			name			Dr. habil Palotás Béla			position	Professor Emeritus	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** Main objective of subject is the learning of welding processes, their properties and application.	
	Objectives and development goals Students should be familiar with the basics of welding and related processes, welding parameters, their effects and the rules for their selection. Learn the basics of the welding procedure manual and welding plan, the basic welding tools and their selection principles. Know the weld defects, their effects and how to repair them, the basics of welding quality management, the basics of welding safety and environmental protection.	
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	-
	Lab	(Workshop) lab exercise, use of projector.
	Other	-
Requirements (in learning outcomes)	**Knowledge** Know the variations of joining technologies, be able to apply welding procedures by knowing the rules for making flawless joints, be able to design the welding technology and prepare the manufacturer's welding instructions.	
	Ability Ability to perform the job according to their qualifications. Ability to plan, organise and carry out independent learning. Ability to manage and control the production process in the field of specialised technology, in accordance with the principles of quality management.	
	Attitude They have the stamina and monotony tolerance to carry out practical activities. A creative approach to the continuous improvement of the technologies and procedures used. He/she strives to use energy and material-saving processes and technologies.	
	Autonomy and responsibility Directs the work of the personnel assigned to him/her, supervises the operation of machinery and equipment. Determines the characteristics of the various products, checks the quality of the work phases specific to the technology and carries out quality management of the sub-tasks.	

Short description of subject content	The physical principles of welding. The technology of the main fusion welding processes. The technology of the main pressure welding processes. Fundamentals of weldability. Basics of welding quality management. Welding technology documents and their preparation. Welding safety at work; fire and environmental protection. Welding economics, environmentally friendly selection of welding processes and materials.
Types of student activity	Active participation in lectures and laboratory exercises.
Required reading and resources	[1] Downloadable lecture notes from www.duf.hu, [2] Welding pocket book I. (Welding procedures), Cokom Mérnökiroda Kft., Budapest 2023, [3] Welding pocket book II. (Welding production technology), Cokom Mérnökiroda Kft., Budapest 2023.
Recommended reading and resources	[4] Welding Handbook, Tom 1-5. AWS, Miami, Fl, The USA, 2010.
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	a. b) Partial permission b. 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. c. 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. 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.

Non-Destructive Material Testing

Subject name		In Hungarian		Roncsolásmentes anyagvizsgálat					Level	BSc	
		In English		Non-Destructive Material Testing					Code	DUEN(L)(L)-MUA-215	
2025/2026 II.											
Responsible educational unit				Institute of Technology, Department of Structural Integrity							
Compulsory prerequisite subject:				-							
Type		Number of lessons						Requiremen	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**1**	Per week	**0**	Per week	**2**	**M**	**5**	**english**	
Part time	**150/15**	Per semester	**5**	Per semester	**0**	Per semester	**10**				
Person responsible for the subject:				name		Gábor Pór, PhD			position	research professor	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** By completing the course, students will be able to demonstrate the theoretical foundations and practical applications of non-destructive testing methods, and develop the competences required to interpret measurement results and select the appropriate testing technique.
	Objectives and development goals

Typical delivery methods	Lecture	Board-based lectures for all students, using a projector and an overhead projector.
	Seminar	-
	Lab	Laboratory practice
	Other	-

Requirements (in learning outcomes)	**Knowledge** The student is familiar with: • the basic concepts and significance of non-destructive testing, • the physical principles of the main non-destructive testing methods (VT, PT, MT, UT, RT, ET), • the fields of application of the individual testing methods, • the types and characteristics of material defects, • the basic equipment and operation of testing procedures, • the fundamentals of interpretation of test results.
	Ability The student is able to: • select the appropriate non-destructive testing method for a given task, • recognize and identify different types of material defects, • interpret test results, • perform basic measurement tasks under supervision, • contribute to the preparation of test reports.
	Attitude The student: • strives to perform accurate and reliable work, • complies with testing and safety regulations, • is open to learning modern materials testing methods, • is committed to quality control and technical safety.
	Autonomy and responsibility The student is able to: • independently perform basic testing tasks, • take responsibility for the accuracy of their work, • carry out their work under professional supervision, • recognize the importance of non-destructive testing in safe operation.
Short description of subject content	The course presents the basic principles, methods, and industrial applications of non-destructive testing. Students become familiar with the physical principles, equipment, and fields of application of the main testing methods (visual testing, penetrant testing, magnetic particle testing, ultrasonic testing, radiographic testing, and eddy current testing). The course also covers the types of material defects, their detection, the fundame

	ntals of interpretation of test results, and the importance of testing in quality control and operational safety.
Types of student activity	Participation in lectures and laboratory exercises, note-taking, performing measurement tasks, interpretation of test results, and independent preparation for assessments.
Required reading and resources	• Presentations and standards in MOODLE. • Giuseppe Lacidogna: Nondestructive Testing (NDT), MDPI AG, 2021
Recommended reading and resources	-
Assignments	-
Description and schedule of exams	-
Framework and rules for the use of artificial intelligence	a. The use of artificial intelligence is permitted for certain types of tasks (e.g. in-class work, assignments), but prohibited in other cases (e.g. midterm tests).

Thesis Project 1.

Subject name	In Hungarian	**Szakdolgozat 1. Kutatásmódszertan MUI**		Level	**BSC**
	In English	**Thesis Project 1.**		Code	**DUEN(L)- MUG-090**
2026/2027 I.					
Responsible educational unit		**Technical Institute**			
Compulsory prerequisite subject:		-			

Type Full time	Number of lessons			Requirement	credit	**Language of education**
	Lecture	Seminar	Lab			
Part time **150/60**	Per week 2	**Per week** 0	Per Week **0**			
Person responsible for the subject: **150/20**	Per semester 10	Per semester **0**	Per semester	**S**	5	**English**

subject teacher	**Name**	**Zoltán Gyukity**	Position	**master instructor**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The aim of the course is to enable students to learn the methods of literature research related to their chosen thesis topic and to independently identify and evaluate relevant sources in both Hungarian and foreign languages. The course also develops students' researchpreparation skills, including the formulation of the five required thesis outline points.	
	Objectives and development goals The course builds on the foundational professional knowledge acquired in earlier subject areas, particularly those that contributed to the student's choice of thesis topic and the development of their academic interests. Its developmental aim is to enable students to acquire independent researchmethodology competencies, to organise and critically evaluate scientific sources, and to prepare a wellfounded preliminary thesis document	
Typical transfer methods	**Lecture**	
	Seminar	- Support for literature research provided within the framework of consultatio
	Lab	
	Other	-
Requirements (expressed in academic results)	**Knowledge** The student is familiar with the fundamental concepts of scientific research methodology, the procedures for collecting and processing literature, and the use of relevant national and international databases. The student understands the structure, formal requirements, and citation rules of the thesis.	
	Ability The student is able to independently formulate a research problem, select appropriate keywor ds, and carry out professional literature searches based on them. The student can critically evaluate and organise the collected sources and, on this basis, prepare a structured thesis outline.	
	Attitude 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 decisionmaking situations involving material and technology selection, taking into account safety, quality, and sustainability considerations.	
	Autonomy and responsibility The student independently organises their research work, is able to plan and meet deadlines, and makes autonomous professional decisions regarding the selection and use of sources. The student takes responsibility for the content quality, scientific soundness, and formal correctness of the thesis being prepared.	

Short description of subject content	The course provides an overview of the process of scientific research, the methods of literature review, the use of databases, and the techniques of citation and source management. Students learn the principles of thesis structure, the key considerations for selecting a topic, and prepare a 5–6page research and content outline for their own thesis.
Types of student activity	Literature research and consultation.
Required reading and resources	**According to the chosen thesis topic.**
Recommended reading and resources	According to the chosen thesis topic.
Assignments	
Description and schedule of closed places	
Frameworks and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: it may be used during the literature res earch and processing phases of the thesis. However, the use of artificial intelligence is prohibited in any part of the thesis that contains conclusions or independent analysis.

Professional Internship - ANYBSC

Subject name	In Hungarian	**Szakmai gyakorlat – ANYBSC**		Level	**BSC**
	In English	**Professional Internship -ANYBSC**		Code	**DUEN(L)- MUA-093**
2026/2027 I.					
Responsible educational unit		**Technical Institute**			
Compulsory prerequisite subject:		-			

Type		Number of lessons						Requirement	credit	**Language of education**
Full time		Lecture		Seminar		Lab				
Part time	**150/60**	Per week	0	**Per week**	0	Per Week	**0**	**S**		**English**
Person responsible for the subject:	**150/20**	Per semester	0	Per semester	**0**	Per semester				

subject teacher	**Name**	**Zoltán Gyukity**	Position	**master instructor**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** Building on the knowledge acquired in previous courses, the student has developed a compre hensive understanding that enables them to solve an engineering task (such as heat treatment, plastic forming, failure analysis, or material testing). To demonstrate this, the student prepares a thesis in which the knowledge gained from individual subjects is integrated into a coherent body of expertise, allowing the student to understand the engineering problem, solve it, and produce a structured and wellorganised summary of their work.	
	Objectives and development goals The professional internship builds on the knowledge gained in previous courses in metal technology, materials science, mechanical engineering, and manufacturing engineering, which provide the foundation for the student's engineering m indset, analytical skills, and technological understanding. Its developmental aim is to enable the student to apply theor etical knowledge to practical tasks in a real industrial environment, to solve engineering problems independently or under guidance , and to develop a systemlevel perspective on manufacturing, testing, and organisational processes.	
Typical transfer methods	**Lecture**	
	Seminar	Solving the theoretical and practical tasks of the thesis, supported through consu ltation.
	Lab	
	Other	-
Requirements (expressed in academic results)	**Knowledge** The student is familiar with the fundamental physicochemical processes occurring in material systems and their basic mathematical descriptions, with particular emphasis on the principles of thermodynamics and kinetics. The student has a broad understanding of the atomic, micro and macrostructure of solid materials, the essential methods required for structural characterization, the operating principles of basic analytical instruments, and the processes responsible for the development of material structures. The student has detailed knowledge of the operating principles of machinery and equipment used in materials production and understands the fundamental technologies for producing and shaping metals and their alloys (plastic deformation and casting). The student is familiar with the basic technologies of heat treatment and surface engineering. The student knows the essential production technologies of ceramics (including glass and binders) and composite materials, as well as the fundamental technologies for producing and processing polymers. The student possesses systemlevel knowledge of the energy characteristics of technologies related to the field, the requirements for energy efficiency, and the possible methods for ensuring the necessary energy supply.	
	Ability	

	The student is able to apply the computational and modelling principles and methods required for product and process design. The student can interpret and characterize the structure, operation, and configuration of the structural units and elements of mechanical systems, as well as the relationships between the applied system components. The student understands and uses the characteristic online and printed technical literature of the field in both Hungarian and foreign languages.
	Attitude The student strives, with a creative approach, to continuously improve the technologies and processes applied in the field. The student is committed to using environmentally conscious technologies and to protecting the built and natural environment. The student aims to apply energy and materialefficient processes and technologies. .
	Autonomy and responsibility The student identifies the heattreatment processes required to achieve the desired properties of different products, monitors the quality of the technological work phases, and performs quality management for the individual process steps. The student assesses the environmental impact associated with manufacturing and strives to reduce it. The student evaluates and rationalises the energy consumption related to materials production.
Short description of subject content	The student plans and carries out the practical tasks related to their thesis, performs the necessary examinations, evaluates the obtained results, and summarises the work in a document of at least 20 pages
Types of student activity	Consultation, laboratory exercises, and tasks to be carried out in an industrial environment.
Required reading and resources	
Recommended reading and resources	
Assignments	
Description and schedule of closed places	
Frameworks and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: it may be used during the literature research and processing phases of the thesis. However, the use of artificial intelligence is prohibited in any part of the thesis that contains conclusions or independent analysis.

Environmental policy and protection against radioactivity

Subject name	In Hungarian	**Környezetpolitika és sugárvédelem**	Level	**BSC**
	In English	**Environmental policy and Radiation protection**	Code	**DUEN(L)-MGT-210**
2026/2027 I.				
Responsible educational unit		**Institute of Technology, Department of Mechanical and Energy Engineering**		
Compulsory prerequisite subject:		-		

Type		Number of lessons						Requirement	credit	Language of education
Full time		Lecture		Seminar		Lab				
Part time	**150/60**	Per week	2	**Per week**	1	Per Week	**0**	**V**		**English**
Person responsible for the subject:	**150/20**	Per semester	10	Per semester	**5**	Per semester				

subject teacher	**Name**	**Petrovickijné dr. Angerer Ildikó**	Position	**university associate professor**

Training objective and justification of the course (content, outcome, place in the curriculum)	**Short-term Objective** The aim of the subject is for the student to learn about circular environmental protection solutions, problems related to radioactive radiation and radiation protection, storage, transport and disposal of radioactive waste, environmental policy objectives, environmental management systems, international and domestic solutions, and technical development opportunities.
	Training history, development goals Learning about the general issues and subject matter of modern environmental protection, environmental policy, environmental management systems, protection against radioactive radiation. Mastering solutions related to radioactive radiation and radiation protection, storage, transport and disposal of radioactive waste.

Typical transfer methods	**Lecture**	**Projector presentation for all students**
	Seminar	Students' individual projector presentations.
	Lab	
	Other	-

Requirements (expressed in academic results)	**Knowledge** The student will learn the elements of knowledge related to modern environmental protection, environmental policy, environmental management systems, and general issues of protection against radioactive radiation. The student will understand what it means to weigh up environmental needs and opportunities. The student will recognize the relationships between natural resources and the economy and society. He/she will have theoretical and practical knowledge related to the subject matter. He/she will have a comprehensive knowledge of the basic facts, directions, and boundaries of the subject matter of environmental protection and radiation protection. He/she will know the general and specific rules, relationships, and procedures necessary for practicing the field. He/she will know the conceptual system, the most important relationships, and theories related to his/her field. He/she will have a comprehensive knowledge of the knowledge acquisition and problem-solving methods of the main theories of his/her field.
	Ability The student is able to consider technical, social, and economic decisions related to environmental protection, environmental policy, and radiation protection and their consequences through examples; The student is able to discover the systematic relationships between nature, his/her own lifestyle, and his/her environment. He/she is able to perform tasks related to the subject area. He/she is able to perform basic analysis of the disciplines that make up the knowledge system of the field of environmental management, environmental policy, and radiation protection, to formulate the connections synthetically, and to perform adequate evaluation activities. He/she is able to apply the most important terminologies, theories, and procedures of the field of

	radiation protection, environmental protection, and environmental policy when performing tasks related to them. He/she is able to plan, organize, and conduct independent learning. He/she is able to identify routine professional problems, to explore, formulate, and solve (by applying standard operations) the theoretical and practical background necessary for their solution. He/she is able to understand and use the typical literature, computer technology, and library resources of his/her field.He/She is able to apply the acquired IT knowledge in solving tasks arising in his/her field of expertise. He/She is able to create basic models of protection against radioactive radiation, environmental policy and environmental management systems and processes. He/She is able to communicate in his/her native language, both orally and in writing, in accordance with his/her field of expertise, in a professionally adequate manner.
	Attitude At the end of the course, the student should become committed to the protection of environmental values and environmentally conscious protection against radioactive radiation. The student should take responsibility for his own activities and the protection of the natural environment, and for cooperation with his social environment. The attitude necessary for solving problems related to radiation protection and environmental policy develops. He assumes and authentically represents the social role of his profession and its fundamental relationship to the world. He is open to learning about and accepting professional, technological development and innovation in the fields of radiation protection, environmental protection and environmental policy, and to authentically conveying it. He strives to solve problems in cooperation with others, if possible. He has the stamina necessary to carry out practical activities. By applying his acquired professional knowledge, he strives to learn as thoroughly as possible about observable phenomena, to describe and explain their laws. During his work, he complies with and enforces the relevant safety, health, environmental, quality assurance and inspection requirements.
	Autonomy and responsibility Makes independent decisions and takes responsibility for his/her work. Even in unexpected decision-making situations, he/she independently thinks through comprehensive, foundational professional questions and develops them based on given sources. In the course of performing his/her professional tasks, he/she also cooperates with qualified specialists from other fields (technical, economic and legal). He/she shares his/her experiences with his/her colleagues, thus helping them develop. He/she takes responsibility for the consequences of his/her technical analyses, the proposals formulated based on them and the decisions made.
Short description of subject content	Discovery of radioactivity, history, Chemical background, Protection against radioactive radiation, Possibilities of energy production, combined use of fossil, nuclear, renewable energies, foundations of environmental management, environmental policy. Interaction of radioactive radiation and different materials, absorption of radiation. Reduction of radiation intensity with different walls, walls consisting of thin layers. Effect of radiation on the human body, radiation decontamination procedures. Types of nuclear power plants. Nuclear accidents, nuclear disasters and their prevention. Management of nuclear industrial waste. Process and method of radioactive waste disposal.
Types of student activity	Processing of heard text by taking notes 50% Task-guided systematization of information 30% Independent processing of tasks 20%. Seminar practice: Processing of heard text by taking notes 10%, home presentation preparation, preparation for the short presentation 60%, giving the short presentation 40%.
Required literature and its availability	Sándor Bisztray-Balku, László Bozóki, László Koblinger: Development of radiation protection in Hungary, Akadémiai Kiadó, 1982 Dr. Endre Kiss: Environmental protection and energy management, electronic notes, in Moodle system Electronic course material, notes, lectures in Moodle system
Recommended literature and its availability	Martin James E: Physics for radioactivity, Wiley-VCM Verlag GMBH, 2013 Nikjoo Mooshang: Interaction of radiation with Matter, Taylor and Francis 2019U. Förstner: Environmental protection technique Springer-Verlag, Budapest, 1993
Description of tasks/measurement reports to be submitted	As discussed in the first class. Individual student PowerPoint presentations to be created and submitted, and short presentations to be given according to schedule.
Description and schedule of closed places	As stated in the first lesson. By the end of the academic year, prepare and submit 2 mid-year assignments/projects/evening studies in pre-specified elective topics. If the arithmetic average of the scores of the two mid-term assignments/theses 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 TVSZ. Conditions for signing and registering for the exam: In full-time studies: Writing and submitting 2 mid-year independent assignments/theses/case studies in electronic form.

Frameworks and rules for the use of artificial intelligence	Partial permission In the case of the subject, the use of artificial intelligence tools is partially permitted as a design support tool, primarily as a supplement and verification of independent work, with appropriate source identification. Students may use AI-based tools (e.g. literature summary, concept creation, data interpretation) in the preparation of class assignments, homework and project work, studies, case studies, presentations, provided that the fact of use is documented and the student also provides an independent professional interpretation of the results. The use of artificial intelligence is not permitted in assessments measuring individual performance (term paper, exam, calculation tasks), where the goal is to assess independent engineering thinking and calculation skills. In the case of project assignments, the use of AI is permitted as a design support tool (e.g. comparing energy alternatives, generating concepts), however, the final technical calculations and conclusions must be prepared and defended by the student independently.

Production technologies of Space Ceramics

Subject name		In Hungarian		**Űripari kerámiák gyártástechnológiája**					Level	BSc	
		In English		**Production technologies of Space Ceramics**					Code	**DUEN(L)-MST-111**	
2025/2026 II.											
Responsible educational unit				**Institute of Technology, Department of Structure Integrity**							
Compulsory prerequisite subject:				**…**							
Type		Number of lessons							Requirement	Credit	Language of education
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**2**	Per week	**0**	Per week	**1**		**F**	**5**	**english**
Part time	**150/15**	Per semester	**10**	Per semester	**0**	Per semester	**5**				
Person responsible for the subject:				name		**Judit Pazman PhD**			position	**docent**	
Course objectives and justification (content, learning outcomes, place in curriculum)				**Short-term objective** The aim of the course is to introduce students to the various manufacturing technologies of ceramics for different areas of application. The course aims for future materials engineers to master the technologies of grinding, pressing, and sintering ceramics, as well as the unique production processes of products for special applications, such as those designed for space industry applications.							
				Objectives and development goals Based on the properties and potential applications of space industry ceramics studied in the previous semester, students will learn the manufacturing technologies of space industry ceramics during the course, such as powder metallurgy processes and thin-film techniques. By the end of the course, the student will be able to select the appropriate manufacturing technology for a given application and perform quality control of the products.							
Typical delivery methods				Lecture	-ppt slides, lecture near to the board						
				Seminar	--						
				Lab	Laboratory tasks, comprehensive analysis of ceramic samples using laboratory equipment						
				Other							
Requirements (in learning outcomes)				**Knowledge** To be familiar with the main ceramics used in the space industry and their main properties, as well as the material testing methods necessary for their classification. To know the different manufacturing technologies of ceramics, the steps involved in each, and the equipment required. To be knowledgeable about the manufacturing technologies of special space industry ceramics and their equipment, as well as their operating principles.							
				Ability Able to select the appropriate manufacturing technologies for the given applications. Able to determine whether a ceramic with specific properties and characteristics can be processed with the selected manufacturing technology or not.							
				Attitude To determine the characteristics of various products, checks the quality of process steps specific to the technology, and to carry out quality management of partial tasks. To assess and rationalize the energy consumption related to material production.							
				Autonomy and responsibility To take responsibility for his work and decisions.							

Short description of subject content	Traditional and modern ceramic materials. An overview of the main properties and applications of advanced technical ceramics. Technology of ceramic materials. Ceramic products: classical ceramic materials, bricks and tiles, structure, properties, and uses of refractory materials. The relationship between chemical composition, microstructure, and properties. Requirements for raw materials. Synthesis of ceramic raw materials using physical and chemical methods. Production of dense ceramic bodies. Shaping and heat treatment (shrinkage, sintering) processes. Sintering under special conditions (thermal plasma, explosion, etc.). Post-processing of dense ceramics, manufacturing technologies required for specific space applications. Equipment necessary for the production of space ceramics. Manufacturing processes, quality control.
Types of student activity	Processing heard material with note-taking and recording the material using your own and electronically available notes 40% Independent completion of laboratory exercises 20% Preparation of the mid-term assignment 20% Solving test tasks 20%
Required reading and resources	ASM Handbook Volume 21 – Composites 39-64 old.; 1400-1442 old.
Recommended reading and resources	Handbook Ceramics and Composites Volume 1-3; New York (USA) 1990
Assignments	Semester assignment: Presentation of a space industry ceramic component, properties, manufacturing technology, and quality control, length: max. 10 pages, submission deadline: last teaching day of the semester. Presentation: ppt slides, max. 10 slides, to be presented during the last weekly class.
Description and schedule of exams	2 closed-door papers during the semester, on the topic of traditional and specific space technologies knowledge
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 manufacturing processes of space-grade ceramics, raw-material properties, structure–property relationships, and application-specific requirements), 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 evaluation of production methods, the analysis of quality criteria for ceramic components, the interpretation of application-related requirements, and the formulation of technological 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.

Product Management and Value Analysis

Subject name	**In Hungarian**	Termékmenedzsment és értékelemzés						Level	A		
	In English	Product Management and Value Analysis						Code	DUEN(L)-TVV-118		
Subject code											
Responsible educational unit		**Institute for Social Sciences** **Department of Management and Enterprise Sciences**									
Name of Mandatory Preliminary Study											
Number of Lessons								**Requirements**	**Credits (ECTS)**	**Language of Education**	
		Lecture		**Seminar**		**Laboratory**					
Full-time	3		1		2			CA (Continuous assessment)	5	**English**	
Correspondence	15		5		10						
Teacher responsible for the course		**Name**		Dr. Nádasdi Ferenc				**Position**	College Professor		

Educational goals	**Goals, development objectives** The student: - Acquire the basics, tools, and main characteristics of Value Analysis, - Acquire the forms of Value Analysis (Value Analysis, Value Engineering, Value Control, Value Investition, Value Management) - Be capable of applying the methods of product selection, - Be aware the basics of member selection for teamwork, - Be capable of forming a team in accordance with a given task, - Be aware of the most significant steps of the procedure of Value Analysis, - Be capable of defining product functions, - Be aware of defining the steps of function costs, - Be capable of defining weak points, - Be aware of the methods how to work out examine variants.	
Typical delivery methods	**Lecture**	In a classroom with the use of projector or computer in each lecture. Classroom for max. 30 students.
	Seminar	In a classroom with the use of projector or computer in each seminar. Classroom for max. 30 students.
	Laboratory	
Requirements (expressed in learning outcomes/competencies to be acquired)	**Knowledge** The student: • should learn the basic notions, features and tools of Value Analysis, • should learn about the types of Value Analysis (Value Analysis, Value Engineering, Value Control, Value Investition, Value Management) • should know the basic principles of team member selection, • should know the more important steps of the Value Analysis process, • should know the key steps of function cost definition, • should know how to define “weak points,” • should know the methods of option creation and assessment.	
	Ability Students will be able to: • should be able to apply product selection methods, • should be able to assemble a team for a specific task • should be able to define the functions of the product	
	Attitude • Open for cooperation • Reception, sharing, utilization for options, ideas others • No criticize, “tell better”	
	Autonomy and responsibility Cooperation with specialists of other fields to realize a living project.	
Brief description of the subject content	The basics and types of products and technologies. Life cycles of products and technologies. Product development conceptions. Product development with Value Planning (construction and technology) Product innovation. Introduction of new production technologies. Analysis of technology portfolio. Managing key competence. Technical and economic documentations. Product database. The emergence and validity of Value Analysis. Preparation work for Value Analysis.	

	Revision and characterization of Value Analysis. Information steps. Steps of Analysis.
Activity forms of students	Analyze of case studies, game, teamwork, presentation. Sharing, reception, utilization of knowledge, opinion and conception.
Compulsory reading and its availability	[1] Robert B. Stewart (2010): Value Optimization for Project and Perfomance Management. Xlibris Corporation, USA. ISBN: 978-0-470-55114-1. [2] FERENC NÁDASDI – KORNÉLIA VÁMOSI Zarándné: PRODUCT MANAGEMENT AND VALUE ANALYSIS. Dunaújvárosi Egyetem, 2024. [3] SAVE International: www.value-eng.org/pdf-docs/monographs/funcmono.pdf
Recommended reading and its availability	[4] VALUE Methodology. A Pocket Guide to Reduce Cost and Improve Value Through Function Analysis. GOAL/QPC, MemoryJogger.com [5] SAVE International: www.value-eng.org/pdf-docs/monographs/FAbasics.pdf [6] Handsouts from the Lecturer [7] Moodle: HUNLINE: Product Management and value analysis 100%
Hand-in Assignments/ measurement reports	1. Value Analysis project with teamwork (3-4 students) 2. Team presentation of a project. 3. Announcement of the exercises and rules of evaluation you can find in the Moodle. The exercise can not be replaced during examination period.
Description of midterm tests	. 12. week, Replace TEST 13. week
Frameworks and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: □ It can be used for all phases of the value analysis project, □ In experimental analyses, editing a FAST Diagram can primarily help in establishing functional relationships. Editing a full-fledged FAST Diagram was not possible. □ Suggestions can be made for the selection of the project, but the final decision is determined by the management of the given organization. The use of any AI tools is prohibited when writing a knowledge assessment or a closed-door paper.

Research Thesis

Subject name		In Hungarian	**Szakdolgozat - ANYBSC**						Level	**BSC**	
		In English	**Research Thesis**						Code	**DUEN(L)-MUA-091**	
2026/2027 I.											
Responsible educational unit			**Technical Institute**								
Compulsory prerequisite subject:			-Completion of all subjects in semesters 1-6								
Type Full time		Number of lessons Lecture		Seminar	Lab			Requirement	credit	**Language of education**	
Part time	**150/60**	Per week		**Per week**	0	Per Week	**12**	M	15	**English**	
Person responsible for the subject:	**150/20**	Per semester		Per semester	**0**	Per semester	**60**				
subject teacher			**Name**	**Henriette mészáros**					Position	**Engineering teacher**	
Course objectives and justification (content, learning outcomes, place in curriculum)			**Short-term objective** Based on previous subjects, the student has acquired comprehensive knowledge that enables him to solve an engineering task (heat treatment, plastic forming, defect detection, material testing). To prove this, the student prepares a thesis, during which he transforms the knowledge gained in individual subjects into complex knowledge, and is able to understand the engineering task, solve it, and prepare a systematic summary of it.								
			Objectives and development goals The subject builds on the students' previously acquired knowledge of natural sciences and basic materials science, which enable them to understand the physical and chemical laws that determine the structure of solid materials. The aim of the course is for students to be able to apply the knowledge gained from structural science in their later engineering practice, especially in the areas of material selection, technological decisions and prediction of material behavior.								
Typical transfer methods			**Lecture**								
			Exercise	- Szakdolgozat elméleti és gyakorlati feladatainak megoldása, támogatása konzultáció keretében							
			Lab	.							
			Other	-							
Requirements (expressed in academic results)			**Knowledge** He/She knows the basic physical-chemical processes taking place in material systems, their (basic) mathematical description, with special regard to the laws of thermodynamics and kinetics. He/She has extensive knowledge of the atomic, micro- and macro-structure of solid materials, the basic methods required for examining the structure and the operating principle of basic devices, and the processes that cause the formation of structures. He/She has detailed knowledge of the operating principles of machines and equipment for material production, and the basic technologies for producing and shaping metals and their alloys (plastic forming and casting). He/She knows the basic technologies of heat treatment and surface treatment. He/She knows the basic technologies for producing ceramics (including glass and binders) and composite materials. He/She knows the basic technologies for producing and processing polymers. He/She has systematic knowledge of the energetic characteristics of the technologies in his/her field, the energy efficiency requirements, and the possibilities of providing the necessary energy.								
			Ability Able to apply the knowledge acquired about the structure and characteristics of materials. Understands and applies the environmental, occupational and accident protection, and safety requirements specific to his/her field of expertise, and is able to modify processes in accordance with expectations. Able to comply with the laws and economic expectations relevant to his/her field of expertise. Understands and uses the								

	online and printed literature specific to his/her field of expertise in Hungarian and foreign languages
	Attitude It strives to continuously develop the applied technologies and procedures with a creative approach. It strives to apply environmentally conscious technologies and to protect the built and natural environment. It strives to apply energy and material saving processes and technologies.
	Autonomy and responsibility Determines the properties of various products, checks the quality of the work phases specific to the technology and carries out quality control of subtasks. Assesses environmental impact related to production and strives to reduce it. Assesses and rationalizes energy consumption related to material production
Short description of subject content	Within the framework of the course, the student prepares the tasks prescribed in the thesis (draft) announcement, which involve both theoretical, i.e., literature processing on the given topic, and the evaluation of the practical experiments and experimental results of the engineering task and the comparison and correspondence of the test results with the literature data.
Student activities	According to the topic description
Required reading and resources	**According to the topic description**
Assignments	
Description and schedule of closed places	
Frameworks and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: its use is permitted in the literature research and processing stages of the thesis. However, the use of artificial intelligence is prohibited in the part of the thesis containing conclusions and independent analysis.

Entrepreneurship

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="3">Vállalkozástan</td><td>Level</td><td>BSc</td></tr>
<tr><td>In English</td><td colspan="3">Entrepreneurship</td><td>Code</td><td>DUEN(L)-TVV-122</td></tr>
<tr><td colspan="2">Subject code</td><td colspan="5"></td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="5">Institute for Social Sciences
Department of Management and Enterprise Sciences</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="5">-</td></tr>
<tr><td colspan="3">Number of Lessons</td><td colspan="2" rowspan="2">Requirements</td><td>Credits (ECTS)</td><td>Language of Education</td></tr>
<tr><td></td><td>Theoretical</td><td>Practice</td><td>Lab</td><td></td><td></td></tr>
<tr><td>Full-time</td><td>150/39</td><td>1</td><td>2</td><td>0</td><td>M (Midterm mark)</td><td>5</td><td>English</td></tr>
<tr><td>Correspondence</td><td>150/15</td><td>5</td><td>10</td><td>0</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td>Name</td><td colspan="2">Dr. Andrea Keszi-Szeremlei</td><td>Position</td><td>College Teacher</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="5">Short-term Objective
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.</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td>Theoretical</td><td colspan="4">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Practice</td><td colspan="4">Flipchart, blackboard and other multimedia equipment in smaller seminar rooms suitable for group work</td></tr>
<tr><td>Lab</td><td colspan="4">-</td></tr>
<tr><td colspan="2" rowspan="4">Requirements</td><td colspan="5">Knowledge
• 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.</td></tr>
<tr><td colspan="5">Ability
• 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.</td></tr>
<tr><td colspan="5">Attitude
• 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.</td></tr>
<tr><td colspan="5">Autonomy and responsibility
• Takes responsibility for their own development.
• Cooperates with others and seeks solutions to problems.
• Feels responsible for the development of their work environment.</td></tr>
<tr><td colspan="2">Brief description of the subject content</td><td colspan="5">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 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</td></tr>
</table>

	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.
Activity forms of students	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.
Compulsory reading and its availability	• William D. Bygrave - Andrew Zacharakis (2014): Entrepreneurship, 3rd Edition, John Wiley & Sons, DUE Library • Dollinger, Marc J. (2008): Entrepreneurship, Marsh Publications, Letölthető: https://shorturl.at/R1ydn - egyes részei Materials on MOODLE
Recommended reading and its availability	• Jerome Katz, Richard Green (2014) Entrepreneurial Small Business. 4th ed. McGraw-Hill International Ed., ISBN: 978-0078029424, DUE Library
Hand-in Assignments/ measurement reports	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 of midterm tests	Midterm tests on weeks 7th and 12th. Supplementary test on week 13th.
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: - during class work, for data collection and information gathering for assignments - for data collection for certain HF assignments - during preparation for ZH The use of any AI tools is prohibited during knowledge assessment and closed book exams.

Management

<table>
<tr><td rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Menedzsment</td><td>Level</td><td>BSc</td></tr>
<tr><td>In English</td><td colspan="4">Management</td><td>Code</td><td>DUEN(L)-TVV-114</td></tr>
<tr><td colspan="2">Subject code</td><td colspan="6"></td></tr>
<tr><td colspan="2">Responsible educational unit</td><td colspan="6">Institute for Social Sciences
Department of Management and Enterprise Sciences</td></tr>
<tr><td colspan="2">Name of Mandatory Preliminary Study</td><td colspan="6"></td></tr>
<tr><td colspan="3">Number of Lessons</td><td colspan="3" rowspan="2">Requirements</td><td rowspan="2">Credits (ECTS)</td><td rowspan="2">Language of Education</td></tr>
<tr><td></td><td>Theoretical</td><td>Practice</td><td>Lab</td></tr>
<tr><td>Full-time</td><td>150/39</td><td>1</td><td>2</td><td>0</td><td rowspan="2">M</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Correspondence</td><td>150/15</td><td>5</td><td>10</td><td>0</td></tr>
<tr><td colspan="2">Teacher responsible for the course</td><td>Name</td><td colspan="3">Dr. habil Mónika Rajcsányi-Molnár</td><td>Position</td><td>College professor</td></tr>
<tr><td colspan="2">Educational goals</td><td colspan="6">Short-term Objective
The module provides a comprehensive understanding of management in theory and in practice.
The course is designed to familiarize students with the most important information for the management of labor organizations, to provide insight into the "special" management dimensions, and those determinants.</td></tr>
<tr><td colspan="2" rowspan="3">Typical delivery methods</td><td>Theoretical</td><td colspan="5">In a classroom with the use of projector or computer in each lecture.</td></tr>
<tr><td>Practice</td><td colspan="5">In a classroom with the use of projector or computer in each seminar.</td></tr>
<tr><td>Lab</td><td colspan="5"></td></tr>
<tr><td colspan="2" rowspan="3">Requirements</td><td colspan="6">Knowledge
Students as potential manager:
Familiar with the fundamental aspects of science organization, the most important concepts, requirements, relationships and procedures.
It learns supply management tasks, theoretical and methodological foundations of the exercise of the functions.
Familiar with the planning, organization and management frequently used procedures and methods.
Familiar with the leadership style models and understand their role in effective leadership behavior.</td></tr>
<tr><td colspan="6">Ability
Students will be able to:
analyse and develop the management and decision making mechanisms of work organizations
effectively organize individual and team work
identify and solve problems
integrate knowledge
recognize and evaluate alternatives
handle operative planning tasks
work in groups
accept divergent views
manage time
select and focus on various tasks
identify, understand and apply different leadership styles
understand and manage organizational processes</td></tr>
<tr><td colspan="6">Attitude
Open to accommodate new innovative approaches.
Avoids the stereotypes.
Not think schemas.
Susceptible development opportunities for exploitation.
Good, future-oriented bargainers respect their counterpart, are trustworthy and not aggressive.</td></tr>
</table>

	They are open and willing to discuss all points of the negotiation process, as well as express their opinion, but without disclosing any important information about the circumstances of their own company.
	Autonomy and responsibility In professional questions negotiators can play the role of a decision-maker and are able to solve problems alone. They can tackle problems as responsible persons, i.e. can decide if it is a need in a certain negotiation phase or situation to cooperate with others.
Brief description of the subject content	Interpretation and origin of management. The role and importance of management in the governance of companies. Historical overview of management studies: concepts, schools, trends; similarities and differences. Practicing management functions: - Planning: vision of the future, goal hierarchy, short term and operative planning, planning methods. - Organizing: changing the structure, processes, defining organizations, division of labor, developing processes and organizational structures, structural differences of organizations, organization types and characteristics. - Control: changing conditions, exercise authority, define norms, measurement, evaluation and adjusting, managing everyday problems. - Coordinating: harmonizing goals-processes-organization, coordination tools, operation control, task-authority-responsibility fit, control processes of organizations: rules of organization and operation, professional rules and regulations, job description. - Leadership: leadership effectiveness, leadership styles: characteristics, decision making theories, behavioral theories, contingency-approach. Organizational culture and strategy. Components and dimensions of culture. Understanding and analyzing cultural differences. Managing corporate culture.
Activity forms of students	Frontal work: 30 % Individual presentation 20% Group work: 35% Test: 15%
Compulsory reading and its availability	Louis A. Allen and Keith Davis (2013) Management and Organization : McGraw-Hill Series in Management Williams-DuBrin-Sisk (1995):Management & Organization, South-Western Publishing Co. Cincinnati, Ohio, USA Materials on Moodle
Recommended reading and its availability	Chelsom-Payne-Reavill (2005): Management for Engineers, Scientists and Technologists, John Wiley& sons, Ltd, England
Hand-in Assignments/ measurement reports	Case study analysis Group work Individual presentation: An organization working goal, process and organizational structure These tasks cannot be replaced during the exams.
Description of midterm tests	Test
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: - during class work, for data collection and information gathering for assignments - for data collection for certain HF assignments - during preparation for ZH The use of any AI tools is prohibited during knowledge assessment and closed book exams.

Elective subjects

Basics of nuclear safety

<table>
<tr><td colspan="2" rowspan="2">Subject name</td><td>In Hungarian</td><td colspan="4">Nukleáris biztonság alapjai</td><td>Level</td><td colspan="2">BSc</td></tr>
<tr><td>In English</td><td colspan="4">Basics of nuclear safety</td><td>Code</td><td colspan="2">DUEN(L)-MGT-117</td></tr>
<tr><td colspan="10">2025-2026. II.</td></tr>
<tr><td colspan="3">Responsible educational unit</td><td colspan="7">Technical Institute, Department of Mechanical and Energy engineering</td></tr>
<tr><td colspan="3">Compulsory prerequisite subject:</td><td colspan="7"></td></tr>
<tr><td colspan="2" rowspan="2">Type</td><td colspan="3" rowspan="2">Number of lessons</td><td colspan="3" rowspan="2">Requirement</td><td rowspan="2">Credit</td><td rowspan="2">Language of education</td></tr>
<tr></tr>
<tr><td></td><td></td><td>Lecture</td><td>Seminar</td><td>Lab</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Full time</td><td>150/39</td><td>Per week</td><td>2</td><td>Per week</td><td>0</td><td>Per week</td><td>1</td><td rowspan="2">F</td><td rowspan="2">5</td><td rowspan="2">english</td></tr>
<tr><td>Part time</td><td>150/15</td><td>Per semester</td><td>10</td><td>Per semester</td><td>0</td><td>Per semester</td><td>5</td></tr>
<tr><td colspan="3">Person responsible for the subject:</td><td colspan="3">name</td><td colspan="2">Judit Pazman PhD</td><td>position</td><td>docent</td></tr>
<tr><td colspan="3">Course objectives and justification (content, learning outcomes, place in curriculum)</td><td colspan="7">Short-term objective
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.
Objectives and development goals

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.</td></tr>
<tr><td colspan="3" rowspan="4">Typical delivery methods</td><td>Lecture</td><td colspan="6">power point presentation, black/whiteboard presentation</td></tr>
<tr><td>Seminar</td><td colspan="6"></td></tr>
<tr><td>Lab</td><td colspan="6">invited speakers, processing of case studies</td></tr>
<tr><td>Other</td><td colspan="6"></td></tr>
<tr><td colspan="3">Requirements
(in learning outcomes)</td><td colspan="7">Knowledge

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</td></tr>
</table>

	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 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.
	Ability 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.
	Attitude 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.
	Autonomy and responsibility

	Even in unexpected decision-making situations, he/she independently considers and develops comprehensive, foundational professional questions based on given sources. To profess responsibly and represent the values of the engineering profession, and openly accepts professionally founded critical comments. In the course of performing his/her professional tasks, he/she also cooperates 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 them. TO monitor closely the legal, technical, technological and administrative changes related to the field. 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. To evaluate the efficiency, effectiveness and safety of the work of subordinates. 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. To share the experiences with his colleagues, thus also helping their development. To take responsibility for the consequences of his technical analyses, the proposals formulated based on them, and the decisions made.
Short description of subject content	Development of safety philosophy. Fundamentals of modern safety philosophy. Risk and safety. Technical issues of safety philosophy, implementation of defence in depth. International safety requirements. IAEA and EU safety standards. Domestic regulatory requirements, Nuclear Safety Regulations. Safety functions. Safe heat removal from the reactor core. 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 operational period, Operating Conditions and Limits.
Types of student activity	Processing heard text by taking notes and recording the material using your own and electronically available notes 80% Developing test questions 20%
Required reading and resources	Fundamentals of Nuclear Safety (electronic note, lecturer's note)
Recommended reading and resources	European Utility Requirements IAEA Safety Standards (Safety Fundamentals, Safety Standards, Safety Guides) (NAA)
Assignments	
Description and schedule of exams	Week 7: Closed paper I Week 12: Closed paper II Week 13: Any closed paper can be substituted
Framework and rules for the use of artificial intelligence	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.

Basics of Atomenergetics

Subject name	In Hungarian	**Atomenergetikai alapismeretek**	Level	BSc
	In English	**Basics of Atomenergetics**	Code	**DUEN(L)-MGT-118**
2025/2026				
Responsible educational unit		**Institute of Technology, Department of Mechanical and Energy Engineering**		
Compulsory prerequisite subject:		**N/A**		

Type		Number of lessons						Requirement	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	**150/60**	Per week	**3**	Per week	**0**	Per week	**x**	**V**	**5**	**English**
Part time	**150/20**	Per semester	**15**	Per semester	**5**	Per semester	**x**			

Person responsible for the subject:	name	**Dr. Pór Gábor**	position	**Professzor emeritus**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** 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. **Objectives and development goals** 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)	**Knowledge** 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. **Ability** 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. **Attitude** 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. **Autonomy and responsibility** 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.
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	Gábor Pór: Textbook on Basic Nuclear Energy Knowledge • Volumes 1-10 of Nuclear Safety Regulations and Guidelines (OAH website) • IAEA Safety Standards (Safety Fundamentals, Safety Standards, Safety Guides) (IAEA website)
Recommended reading and resources	• Dr. Gyula Csom: Operations of Nuclear Power Plants, Volume I: Fundamentals of Reactor Physics and Technology, Műegyetemi Kiadó, 1997; • Dr. Gyula Csom: Operations of Nuclear Power Plants, Volume II: Operations of Energy Reactors, Parts I and II, Műegyetemi Kiadó, 2005;
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.

Ensuring the integrity of equipment

Subject name		In Hungarian		**Berendezések integritásának biztosítása**					Level				
		In English		**Ensuring the integrity of equipment**					Code			**DUEN(L)-MGT-119**	
2025-2026. II.													
Responsible educational unit				**Technical Institute, Department of Mechanical and Energy engineering**									
Compulsory prerequisite subject:													
Type		Number of lessons							Requirement		Credit	Language of education	
		Lecture		Seminar		Lab							
Full time	**150/39**	Per week	**2**	Per week	**0**	Per week	**1**		**F**		**5**	**english**	
Part time	**150/15**	Per semester	**10**	Per semester	**0**	Per semester	**5**						
Person responsible for the subject:				name		**Judit Pazman PhD**					position	**docent**	
Course objectives and justification (content, learning outcomes, place in curriculum)				**Short-term objective** 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.									
				Objectives and development goals									
Typical delivery methods				Lecture	power point presentation, black/whiteboard presentation								
				Seminar									
				Lab	outside practise in Maintenance and Practise Centre in Paks								
				Other									
Requirements (in learning outcomes)				**Knowledge** 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.
	Ability 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. To pay attention to promoting the professional development, managing and assisting such efforts, and applying the principle of equal access. To share experiences with his/her colleagues, thus also helping their development. To assume responsibility for the consequences of the technical analyses, the proposals formulated on the basis of them and the decisions made.
Short description of subject content	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. 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
Types of student activity	Processing heard text by taking notes and recording the material using your own and electronically available notes 80% Developing test questions 20%
Required reading and resources	Lecture notes Nuclear Power Plant Safety II. (eds.: Elter J., Gadó J.,
Recommended reading and resources	Holló E., Lux I.), ELTE Eötvös Kiadó, Budapest, 2013 Gábor Pór: Basic knowledge of nuclear power engineering textbook, in Moodle system
Assignments	
Description and schedule of exams	Week 7: Closed paper I Week 12: Closed paper II Week 13: Any closed paper can be substituted
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.

Equipments of Nuclear Power Plants

Subject name	In Hungarian	**Atomerőművek berendezései**	Level	**BSc**
	In English	**Equipments of Nuclear Power Plants**	Code	**DUEN(L)-MGT-152**
2025-2026. II.				
Responsible educational unit		**Technical Institute, Department of Mechanical and Energy engineering**		
Compulsory prerequisite subject:				

Type		Number of lessons						Requirement	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	**150/39**	Per week	**2**	Per week	**0**	Per week	**1**	**V**	**5**	**english**
Part time	**150/15**	Per semester	**10**	Per semester	**0**	Per semester	**5**			

Person responsible for the subject:	name	**Judit Pazman PhD**	position	**docent**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** 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.
	Objectives and development goals 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	power point presentation, black/whiteboard presentation
	Seminar	
	Lab	outside practise lessons in Maintenance and Practise Centre in Paks
	Other	

Requirements (in learning outcomes)	**Knowledge** 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.
	Ability 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.
	Attitude To carry out the activities with a systems-oriented and process-oriented mindset in a complex approach, giving priority to sustainability and energy awareness. Tp 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.
	Autonomy and responsibility 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.
Short description of subject content	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.
Types of student activity	Processing heard text by taking notes and recording the material using your own and electronically available notes 80% Developing test questions 20%
Required reading and resources	University of Technology and Economics (Budapest): Nuclear Power Plants II. (prepared within the framework of the Paks II. Academy), 2019, electronic notes Gyula Csom: Operation of Nuclear Power Plants, University Press, Budapest, 2005.
Recommended reading and resources	Péter Bihari: Nuclear Power Plants, Budapest, 2002.
Assignments	
Description and schedule of exams	Week 7: Closed paper I Week 12: Closed paper II Week 13: Any closed paper can be substituted
Framework and rules for the use of artificial intelligence	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.

Basic Principles of Hydrogen Technology

Subject name		In Hungarian		**Hidrogéntechnológia kémiai alapjai**				Level	BSc		
		In English		**Basic Principles of Hydrogen Technology**				Code	**DUEN(L)-MGT-257**		
2025/2026-II.											
Responsible educational unit				**Institute of Technology**							
Compulsory prerequisite subject											
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	**150/39**	Per week	**02**	Per week	**1**	Per week	**0**	**V**	**5**	**English**	
Part Time	**150/15**	Per Semester	**10**	Per Semester	**5**	Per Semester	**0**				
Person responsible for the subject				Name		**Dr. Imre Kovács**			Position	**Associate professor**	

Course objective and justification (content, learning outcomes, place in curriculum)	**Short-term objective** The aim of the course is to introduce students to the basic chemistry, physics properties of hydrogen gas and it's common compounds. Its preparation under laboratory and industrial environments. Even the preparation of high purity hydrogen gas. Besides some basic physical-chemical processes will be introduced, such as adsorption of hydrogen on the gas-solid surfaces, diffusion of dissolved hydrogen trough metals and membranes, The electrochemical transformation of active hydrogen containing materials (such as: water splitting).
	Objectives and development goals Based on the course the student will be familiar with the basic chemical and physical properties of hydrogen. During course student will learn the various methods of hydrogen preparation, storing in different chemical state as well as it's application in the energy production technologies (in fuel cell). Simultaneously, the student will understand how to work chemical and physical risk of working with hydrogen will be pointed out. The course contributes the developing students' ability to safety work.

Typical delivery methods	Lectures	**PPt slides with projector and lectures on the board**
	Seminars	Problem solving calculations in the field of reaction kinetics
	Labor	
	Other	-

Knowledge The student is familiar with fundamental general chemistry, physical and thermodynamic processes occurring in material systems and their basic mathematical descriptions..
Ability The student is able to apply the corresponding computational and modelling principles and methods, related to the subject.
Attitude With a creative approach , it strives for the continuous improvement of applied procedures. The student is capable of applying the environmental , safety, accident prevention and to protect the built and natural environment, .
Autonomy and Responsibility The student performs professional activities independently, consistently adhering to the relevant technical regulations and safety requirements, and assumes responsibility for the quality and reliability of their work. In their decision-making, the student upholds the primacy of professional ethics, legal compliance, and operational safety, and contributes responsibly to the effective and safe implementation of technological processes. the chemical and physical danger

Requirements (in learning outcomes)

Short decription of subject content	During the course the students will repeat the basic knowledge of chemical and physical properties of hydrogen. The laboratory scale production of hydrogen. The purification methods of industrial scale gas, some, chemical storage possibilities. The principles of various fuel cells.
Types of student activity	Participating in in lectures and taking notes Independent study using ppt slides. For preparing midterm tests (50%) Problemsolving on seminars (45%). Demonstration experiments (5%) .
Required reading and resources	- Csepeli-Kovács:Kémia és Anyagismeret jegyzet. - Peter Atkins, Physical-Chemistry I.-II. -III.
Recommended readings and resources	The Foundations of Chemical Kinetics" by Sidney W. Benson (1960
Assigments	According to the information provided during the first class, students are required to complete one assignment during the semester.
Description and schedule of exam	**As communicated in the first lecture class.**
Framework and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted: AI tools may be used for specific task types (in class work, support in preparing written assigments and laboratory reports). Their use is strictly prohibited during midterm examinations

Engineering construction

Subject name		In Hungarian	**Gépszerkesztés**						Level	BSc	
		In English	**Engineering construction**						Code	**DUEN(L)-MGT-112**	
2023/2024 I.											
Responsible educational unit			**Institute of Engineering**								
Compulsory prerequisite subject:			**DUEx-MGT-111 Engineering description**								
Type		Number of lessons						Requirement	Credit	Language of education	
		Lecture		Seminar		Lab					
Full time	**150/60**	Per week	**1**	Per week	**2**	Per week	**0**	**V**	**5**	**English**	
Part time	**150/15**	Per semester	**5**	Per semester	**10**	Per semester	**0**				
Person responsible for the subject:			name			Dr. Péter Ákos Szilassy			position	university assistant professor	

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** Developing mechanical design skills.	
	Objectives and development goals 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)	Knowledge 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.	
	Ability 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.	

	Attitude 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.
	Autonomy and responsibility Taking responsibility for one's own work and the work of others.
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	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	prof. Ferenc Szlivka: Machine structures III. - Workbook
Recommended reading and resources	
Assignments	Plane section of flat beam surfaces Plane section of bodies of revolution Interaction of flat beam surfaces Bolt and nut joint Parallel key joint Bearing installation
Description and schedule of exams	Week 7: Interaction of bodies of revolution Week 13: Tolerance calculation tasks
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.

Hydrogenstorage technologies

Subject name		In Hungarian	**Hidrogéntárolási technológiák**						Level	BSc	
		In English	**Hydrogenstorage technologies**						Code	**DUEN(L)-MGT-155**	
2025/2026 II.											
Responsible educational unit			**Institute of Technology, Department of Structure Integrity**								
Compulsory prerequisite subject:			**…**								
Type		Number of lessons							Requirement	Credit	Language of education
		Lecture		Seminar		Lab					
Full time	**150/60**	Per week		Per week		Per week			**V**	**5**	**English**
Part time	**150/20**	Per semester	**10**	Per semester	**0**	Per semester	**5**				
Person responsible for the subject:			name			**Henriette Mészáros**			position		**technical teacher**

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** Possibilities of hydrogen storage, including the exploration of methods for hydrogen storage. The main content elements of the course are the following: Hydrogen storage in pressure vessels and in metal hydrides; electrochemical and chemical hydrogen storage; hydrogen storage in carbonbased matrices.	
	Objectives and development goals: The course builds on students' prior knowledge of thermodynamics, materials science, electrochemistry, technical chemistry, and basic energy engineering. Its developmental goal is to enable students to gain a systemlevel understanding of the main methods of hydrogen storage (gas storage, liquid/cryogenic storage, solid carriers such as ferro and hydride systems, and electrochemical solutions); to compare their operating principles, applicability conditions, risks, and engineering requirements; and to formulate practically applicable decisionsupport criteria.	
Typical delivery methods	Lecture	-ppt slides, lecture near to the board
	Seminar	--
	Lab	in the university's laboratories, within the framework of individual and group work
	Other	-
Requirements (in learning outcomes)	**Knowledge** They understand the physicschemical fundamentals of hydrogen storage, the role of state variables and equilibrium conditions (p–V–T), as well as the significance of thermodynamic and kinetic factors. They review the main technological solutions: compressedgas and cryogenic liquid storage, metal hydrides and other solid carriers, porous materials (MOF/zeolite), as well as electrochemical and hybrid systems. They are familiar with the safety engineering, material selection, filling–discharging, thermal management and quality assurance requirements, as well as the relevant standards and compliance frameworks (at an overview level). They understand the systemlevel integration aspects (automotive, industrial, and energy applications), along with the economic and sustainability considerations.	
	Ability They can compare different storage methods based on technical requirements (capacity, energy density, efficiency, cycle life, mass/volume, temperature and pressure ranges) and to make applicationoriented recommendations. They can perform simple sizing, estimation, and operational calculations (e.g., estimating storage volume/pressure, charging–discharging time, or assessing heat load on an orderofmagnitude level). They can interpret procedures and handling protocols based on safety requirements, identify risks, and formulate basic preventive measures. They can process professional sources (articles, standards, manufacturer data) using critical evaluation criteria and to communicate the conclusions in a structured manner.	
	Attitude They are committed to safetyfocused, rulecompliant and environmentally conscious engineering practice. They are open to learning about new materials, technologies and measurement/qualification methods, and strive for evidencebased decisionmaking. They handle the risks arising from the specific properties of hydrogen responsibly and aim for transparent professional communication.	
	Autonomy and responsibility They can independently carry out a preliminary technicaleconomic assessment of storage concepts, collect the necessary data, and weigh the decisionmaking criteria.	

	They take responsibility for the accuracy of the referenced data, for complying with safety and conformity requirements, and initiate the involvement of experts when necessary. They can document their own work, plan and meet deadlines, and defend their results in a professional forum.
Short description of subject content	The course provides an overview of the main principles and technologies of hydrogen storage: compressedgas and cryogenic storage (tank technology, thermal management, filling and discharging processes), solid carriers (metal hydrides, porous materials), and electrochemical solutions. It addresses safety engineering, material selection, standard and compliance frameworks, system integration issues (mobile and stationary applications), as well as basic sizing and operational calculations. The course places particular emphasis on sustainability and economic aspects, supported by case studies and measurementlaboratory demonstrations to assist engineering decisionmaking.
Types of student activity	**Lecture:** • Processing spoken material with notetaking: **60%** • Independent study of theoretical material: **30%** • Independent research work: **10%** **Laboratory:** • Processing spoken material with notetaking: **30%** • Athome preparation for the measurement: **20%** • Active participation in the laboratory session: **50%**
Required reading and resources	Hydrogen StorageTechnologies, Mehmet Sankir (Editor), Nurdan Demirci Sankir (Editor) 2018 Solid-State Hydrogen Storage Walker Gavin (University of Nottingham UK) 2008
Recommended reading and resources	Hydrogen Storage Technology Klebanoff Lennie Taylor and Francis, 2016
Assignments	Measurement protocols and making a report as explained in the lab exercises, submission deadline: last day of the academic period
Description of assignments/laboratory reports	As stated during the first class.
Description and schedule of midterm tests	As stated during the first class.
Framework and rules for the use of artificial intelligence	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 theoretical part of the reports and collect information. To develop individual topics when preparing for a closed-door paper

Operating manual knowledge

Subject name		magyarul	**Üzemtani ismeretek**						Szintje	MSc	
		angolul	**Operating manual knowledge**						Kódja	**DUEN(L)-MGT-213**	
2025/2026. 2.											
Responsible educational unit			**Institute of Technology, Department of Mechanical and Energy Engineering**								
Name of required prior study											
Type		Weekly hours						On demandy	Credit	Language of instruction	
		Lecture		Exercise		Lab					
Fulltime	**150/39**	Weeks	2	weeks	**0**	Weeks	**1**	**F**	**5**	**English**	
Part time	**150/15**	Semesters	**10**	Semester	**0**	Semester	**5**				
Subject teacher				Name		**Alhafadhi Dakhil Mahmood Hasan Dr.**			position	university assistant professor	

Training objective and justification of the course (content, outcome, place in the curriculum)	**Short-term objective** The student should understand the basic reactor physics and thermohydraulic processes taking place in the reactor core. Be aware of the factors influencing reactivity. Recognize the relationships between technological systems and the behavior of the core. Be able to assess the role of a mechanical system in the safety of the core. Have an idea of the iterative process through which design and safety analysis are connected.	
	Educational background, development goals Based on the mechanical engineering and materials science knowledge acquired during the BSc training, you will acquire knowledge of nuclear power plants, both through structural design and operational processes. By the end of the course, you will know and be able to use the knowledge necessary for operation, and you will be able to decide whether the given feedbacks still allow safe operation or whether intervention is necessary, and if so, at what level and where to intervene.	
Typical transfer methods	Lecture	Power Point presentation, whiteboard presentation
	Exercise	-
	Lab	Visiting the Maintenance Training Center
	Other	-
Requirements (expressed in academic results)	**Knowledge** 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 knows the conceptual system related to his/her field, the most important relationships and theories. 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 thorough knowledge of the structural materials used in the field of mechanical engineering, the methods of their production and the conditions of their application. He/She has a basic knowledge of the principles and methods of machine design, machine manufacturing technology, control engineering procedures and operating processes. He/She has a practical knowledge of the measuring procedures used in mechanical engineering, their tools, instruments and measuring equipment. At an applied level, he/she knows the expectations and requirements of the work 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 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.	
	Ability 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 technology 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 in a creative way and to manage the resources of his/her workplace effectively. During his/her work, he/she is able to apply and enforce safety, fire protection and hygiene rules and regulations. He/she is able to communicate in his/her native language and at least one foreign language in a professionally adequate manner, both orally and in writing, in accordance with his/her field of expertise. He/she is able to apply the technical regulations related to the operation of mechanical systems, the principles of setting up and operating machines and mechanical equipment, and their economic relationships. He/she is able to manage and control specialized technological production processes, taking into account the elements of quality assurance and quality control. He/she is able to diagnose mechanical failures, select remedial operations, and solve repair technological tasks.
	Attitude Accepts and authentically represents the social role of his profession and its fundamental relationship to the world. Is open to learning about and accepting professional, technological development and innovation in the technical field, and authentically conveys it. Strives to make his self-education a means of achieving his professional goals. Makes his decisions in full consideration of legal and ethical norms, even in situations requiring a complex approach or unexpected decisions. Strives to solve problems in cooperation with others, if possible. Strives to ensure that his self-education in the field of mechanical engineering is continuous and consistent with his professional goals. Has the perseverance and tolerance for monotony required to perform practical activities. Is 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. During his/her work, he/she complies with and enforces the relevant safety, health, environmental, quality assurance and inspection requirements..
	Autonomy and responsibility Takes responsibility for his/her work. Even in unexpected decision-making situations, he/she independently thinks through comprehensive, foundational professional issues and develops them based on given sources. He/she responsibly professes and represents the values of the engineering profession, and openly accepts professionally founded critical comments. In the course of performing his/her professional tasks, he/she also cooperates with qualified specialists from other (primarily technical, economic and legal) fields. He/she reveals the shortcomings of the applied technologies, the risks of the processes and initiates the taking of measures to reduce them. He/she closely monitors the legal, technical, technological and administrative changes related to the field. He/she manages the work of the personnel entrusted to him/her, supervises the operation of machines and equipment based on the instructions of his/her workplace manager. He/she shares his/her experiences with his/her colleagues, thus also helping their development. He/She assumes responsibility for the consequences of his/her technical analyses, the recommendations formulated based on them, and the decisions made.

Brief description of the course content	Beam attenuation, NAA. Basic concepts of reactor physics: transport equation, diffusion approximation, cross section, neutron spectrum, reactivity coefficients. Moderation. Inherent safety. Framework parameters of reactor physics and their derivation. Charge design. Zone thermohydraulics: heat conduction from fuel to moderator, DNBR. Flow of RIA analyses. Fuel behavior. Framework parameters—safety analyses—technical design relationship. Maneuvering: reactor control modes, rod, boric acid, steam generator, Xe process. In-core, ex-core measurements.
Student activities	Processing heard text by taking notes and recording the material using your own and electronically available notes 40% Preparing a semester assignment 40% Solving test tasks 20%
Required literature and its availability	1. 1. Gyula Csom: Nuclear Power Plant Operation I. – Fundamentals of Reactor Physics and Technology (University Press, Budapest, 1997) **2.** 2. Gyula Csom: Nuclear Power Plant Operation II/1. – Operation of Power Nuclear Reactors (University Press, Budapest, 2005)
Recommended literature and its availability	1. 1. Gyula Csom: Nuclear Power Plant Operation II/1-3. – The energetic 2. 2. nuclear reactor operation (Műegyetemi Kiadó, Budapest, 2005) 3. 3. Gyula Csom: Nuclear Power Plant Operation II/4. - The operation of power reactors (University Press, Budapest, 2012) 4. 4. Zoltán Szatmáry: Introduction to reactor physics, (Academic Press, Budapest, 2000) 5. 5. Duderstadt, J and Hamilton, L.: Nuclear Reactor Analyses (Wiley, New York, 1976) 6. 6. Bell, G. I., and Glasstone, S.: Nuclear Reactor Theory (American Nuclear Society, 1970) 7. 7. Dénes Bódizs: Measurement techniques for nuclear radiation (Typotex, Budapest, 2009) 8. 8. G. F. Knoll, Radiation Detection and Measurement, 3rd Edition. (John Wiley & Sons, Inc., 2000.
Description of tasks/measurement reports to be submitted	Semi-annual assignment: Select a unit of the nuclear power plant, and provide and summarize its operational tasks, possible failures, and proposed solutions. Length: max. 10 pages, Times New Roman 12 font, 1.25 line spacing.
Description and schedule of closed places	1 closed-door paper during the semester, on the topic of mechanical knowledge
Frameworks and rules for the use of artificial intelligence	a. a. Partial permission: artificial intelligence is allowed for certain types of assignments (e.g. classwork, submitted papers), but prohibited in other cases (e.g. closed-door papers). b. b. Within the framework of the subject, artificial intelligence can be used to write the semester assignment and collect information. c. c. To develop individual topics when preparing for a closed-door paper.

NPP measurements and NDT

Subject name	In Hungarian	**Üzemi mérések és anyagvizsgálatok**	Level	**BSC**
	In English	**NPP measurements and NDT**	Code	**DUEN(L)-MGT-256**
2026/2027 I.				
Responsible educational unit		**Institute of Technology, Department of Structural Integrity**		
Compulsory prerequisite subject:		- Fundamentals of nuclear energy		

Type	Number of lessons			Requirement	credit	Language of education
Full time	Lecture	Seminar	Lab			
Part time **150/60**	Per week **4**	**Per week** 1	Per Week **0**	V	5	**English**
Person responsible for the subject: **150/20**	Per semester **40**	Per semester **10**	Per semester **0**			

subject teacher	**Name**	**Dr. Gábor Pór**	Position	**prof. emeirtus**

The training objective and justification of the course (content, outcome, place in the curriculum)	**Short-term Objective** Fundamentals of nuclear energy. **Training history, development goals** The student will master the modern model-based measurement philosophy, which enables the measurement of reactor parameters that cannot be measured directly, will learn about the most important nuclear power plant-specific, primarily primary circuit measurement chains, and will receive an overview of the material testing techniques used in destructive and non-destructive nuclear power plants.	
Typical transfer methods	**Lecture**	With projector, ppt presentations, videos
	Exercise	-
	Lab	-Laboratory tasks: material testing, basic level
	Other	-
Requirements (expressed in academic results)	**Knowledge** The student knows the primary circuit measurement methods and characteristic data collection and evaluation systems of nuclear power plants. He knows the measurement tools and methods used in the primary circuit of nuclear power plants.	
	Ability Able to set up appropriate measuring equipment in a nuclear power plant environment, think through its consequences and proper operation, develop the measurement procedure and measurement evaluation. Able to evaluate the impact of the nuclear power plant environment on measurements that already exist elsewhere but are special in this environment. Able to independently master nuclear power plant measurement procedures and prepare a study based on international literature, including risk analysis	
	Attitude Develops cooperation with group members and the instructor in expanding knowledge. Does not approach measurements automatically: thinks through the possibilities and their practical experiences in a nuclear power plant environment	
	Autonomy and responsibility Responsibly approaches measurement problems in a nuclear power plant environment, realizing that lack of foresight poses a serious risk. Able to review previously established methods..	

Brief description of the course content	Neutron flux measurements; Temperature measurements; In-zone neutron detectors, DPZ transmitters (KNI chains); Pressure measurements; Traffic measurements; Vibration measurements. Reactivity coefficients, fuel element temperature: Measurement philosophy model-based measurements. Nuclear power plant data acquisition systems. Hungarian data acquisition VERONA. Human-machine communication. Built-in reactor physics calculations in the new Verona. ALPS (Advanced Loose Part. System) is a modern acoustic system for searching for loose parts. Destructive and non-destructive testing: the six most important non-destructive methods and their role in nuclear power plants
Student activities	Participation in lectures, 40% independent study based on literature 50% material testing measurement in the laboratory 10%
Required literature and its availability	Instrumentation of nuclear power plants based on the MÜSZ. University notes (Moodle); • VERONA system brief description (Moodle); • ALPS description – articles; • Nuclear power plant control rooms internet search; • Non-destructive methods Leonardo notes
Recommended literature and its availability	IAEA (International Atomic Energy Agency) publications on nuclear power plant measurement methods and systems available on the internet, which we will draw attention to in the presentation
Description of tasks/measurement reports to be submitted	- According to what was said in the first class, preparation of a presentation and study on Nuclear Power Plant Systems based on previously agreed literature: 1 ppt presentation of approx. 20 slides and an essay describing it
Description and schedule of closed places	As stated in the first lesson
Frameworks and rules for the use of artificial intelligence	The use of artificial intelligence is partially permitted, but only in accordance with the usual scientific references: - for each submitted material, it must be stated exactly what AI, what it was used for and where it was used. - If the text was literally created with AI, it must be placed in quotation marks, if only knowledge/idea was used, but it is your own formulation, then it must be referenced according to the valid citation and referencing rules (including the date of access to the given AI!) - all figures and derivations must be cited, even if they were created with AI, it must be indicated / only figures not created with AI can be marked as your own - AI is not allowed in closed-class papers, written and oral exams, unless the teacher specifically permits it.

Metrology

Subject name	In Hungarian	Gépészeti méréstechnika		Level	BSc
	In English	Metrology		Code	DUEN(L)-MUG-213
2025/2026 II.					
Responsible educational unit		Institute of Technology, Department of Mechanical and Energetic			
Compulsory prerequisite subject:		DUEN-MUG-257 DUEL-MUG-222			

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 teacher

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** 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 most 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.	
	Objectives and development goals -	
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	Laboratory measurements performed in a measurement laboratory, with report preparation
	Other	
Requirements (in learning outcomes)	**Knowledge** 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.	
	Ability 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.	
	Attitude 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.	
	Autonomy and responsibility 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 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	• Materials on MOODLE • GUM (Guide ot Uncertainty of Measurement
Recommended reading and resources	• Jay L. Bucher, The Metrology Handbook Hardcover – April 1, 2004, springer, ISBN-13: 978-0873896207 • Heather A. Wade, The ASQ Metrology Handbook, Third Edition (eBook), Published 2023, ISBN: 9781636940205, Item Number: E1596
Assignments	-
Description and schedule of exams	-
Framework and rules for the use of artificial intelligence	a. 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).

Production technology

Subject name	In Hungarian	Gyártástechnológia		Level	BSc
	In English	Production technology		Code	DUEN(L)-MUG-252
2025/2026 II.					
Responsible educational unit		Institute of Technology, Department of Mechanical Engineering and Energy			
Compulsory prerequisite subject:		MUG-152			

Type		Number of lessons						Requirement	Credit	Language of education
		Lecture		Seminar		Lab				
Full time	150/39	Per week	2	Per week	1	Per week	0	V	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	Associate professor

Course objectives and justification (content, learning outcomes, place in curriculum)	**Short-term objective** Acquisition of basic of production technologies **Objectives and development goals** 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)	**Knowledge** 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.
	Ability Cognitive ability, ability to solve problems independently, ability to concentrate on one thing for a lon g period of time.
	Attitude 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.
	Autonomy and responsibility Taking responsibility for your 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 %
Required reading and resources	R.K. Rajput: Textbook of Manufacturing technology, LAXMI Publications (P) LTD 113, Golden House, Daryaganj,New Delhi-110002
Recommended reading and resources	K.C.Jain, A.K. Chitale: Textbook of Production Engineering, PHI Learning Private Limited, New Delhi-110001, 2010
Assignments	...
Description and schedule of exams	Week 7: machining section Week 13: plastic forming section
Framework and rules for the use of artificial intelligence	a. Total restriction: the use of artificial intelligence is prohibited in all educational situations and forms of assessment.