



Mechanical Engineering Master's course

UNIVERSITY OF DUNAÚJVÁROS

Content

COURSE DESCRIPTION	3
DAYTIME MECHANICAL ENGINEERING MASTERS COURSE	
SUBJECT MATTER PROGRAMS, DESCRIPTIONS OF SUBJECTS MATTERS	
Mathematics (M) 1	
Energetics and Environmental Politics	14
Up-to-date Material and Production Technologies	
Measuring Technologies and Signal Processing	
Mechanics	
Mathematics (M) 2	
The Damage of Engineering Materials	
Physics	
Management Skills	
Project Tasks	
Degree Planning 1	
Reliability Theory and Structure Integration Analysis	
Engineering Heat and Fluid Dynamics	
Degree Planning 2.	
LIFETIME MANAGEMENT SPECIALIZATION	
Lifetime management	
Assembly and Repairment Technologies	
Maintenance Strategies	
Inspectional Methods of Machine Condition	
MODERN MATERIAL STRUCTURE AND TECHNOLOGY SPECIALIZATION	
Information technology in materials science	
Cyberphysical systems	
Material and Structure Analysis	
Innovative application of polymers and composites	53
Weldability	
Special Materials and Technologies	
Simulation of heat treatment and welding processes	
Nanotechnology	60
Simulation of metallurgy and welding processes	
Computer and modelling simulation	64

¶

COURSE DESCRIPTION

Mechanical Engineering	Master's Course (Mechanical Engineering)
Institution responsible for education	University of Dunaújváros
ID of institution	FI60345
Address	2400 Dunaújváros, Táncsics Mihály utca 1/A
Responsible leader	István András, Dr. habil. Rector
Leaders responsible for education	
Institution responsible for course	Technical Institute
Director of institute	Róbert Sánta Dr. habil.
Responsible for course	Róbert Sánta Dr. habil.
Specialisations	
Lifetime management specialization	András Nagy Dr. PhD
Modern material structure and technology specialization	Zsolt Csepeli Dr. PhD
Parameters of education	
Level of education	Master education
Educational level	Master's degree (MSc)
Qualification indicated in the diploma in Hungarian	okleveles gépészmérnök
Qualification indicated in the diploma in English	Mechanical Engineer
Time of education	4 semesters
Number of credit scores to be acquired	120 credit

Condition for admission

a) To be considered for full credit: bachelor's degree in mechanical engineering.

b) To be admitted to the master's programme, you must have obtained at least 40 credits (including at least 12 credits in mathematics, at least 5 credits in physics and at least 20 credits in professional studies) out of the 70 credits listed below:

- 20 credits in basic sciences (mathematics, physics, mechanics, materials science, thermodynamics);

- 10 credits in economic and human sciences (economics, management, environment, quality assurance, occupational health and safety, social sciences);

- 40 credits in the field of professional knowledge (general engineering, machine and product design, structural engineering, materials science and technology, information technology, measurement and signal processing, control engineering, safety engineering, energy technology, machinery and processes, production technology, production automation, quality assurance, logistics, vehicles and mobile machinery, chemical and environmental processes, electrical engineering and electrical engineering).

In the master's programme, the missing credits in the listed areas must be acquired in accordance with the study and examination regulations of the higher education institution.

c) To the input b. The input can be primarily counted by completing the credits specified in b: from the engineering field of study, materials engineering, safety engineering, military and security engineering, light industrial engineering, civil engineering, engineering geology, engineering management, chemical engineering, environmental engineering, energy engineering, industrial product and design engineering, transport engineering, automotive engineering, mechatronics engineering, electrical engineering, and agricultural engineering in the field of agricultural engineering.

Professional practice	The professional practice shall take at least 4 weeks
Conditions for issuing a final certificate (diploma)	Nftv. § 108.47. paragraph 47: "The successful completion of the examinations prescribed in the curriculum and - with the exception of the preparation of the thesis (diploma thesis) - the fulfilment of other study requirements and the acquisition of the credits prescribed in the training and outcome requirements, which certifies that the student has fully met the study and examination requirements prescribed in the curriculum without grading and assessment."
	The University makes the award of the diploma (diploma) conditional on the completion of the foreign language requirement, which is the completion of a professional subject in a foreign language, as required by the institution responsible for the course
Diploma work	The diploma work consists in the solution of a mechanical engineering task or elaboration of a research task arising in a specific professional field that, relying on the knowledge acquired by the student during his/her studies, can be completed during a semester by means of studying additional special literature and under the management of internal and industrial consultants. By means of the diploma work, the candidate certifies that he/she obtained adequate skill in the practical application of the knowledge acquired, is capable of performing mechanical engineering tasks and, in addition to the curriculum, is also familiar with and capable of applying other professional literature in a value crating way. Formal requirements: the size of diploma work shall be 50 to 70 pages.

Final examination	The final examination is a test and assessment of the knowledge, skills and abilities required to obtain a diploma, during which the student must also demonstrate that he or she can apply the knowledge acquired. The final examination consists of the defence of a thesis and an oral examination in the subjects specified in the curriculum.
Lifetime management specialization	DUEN(L)-MUG-150 Lifetime management DUEN(L)-MUG-255 Maintenance strategies DUEN(L)-MUG-250) Inspectional Methods of Machine Condition
Modern material structure and technology specialization	DUEL-MGT-110 Information technology in materials science DUEL-MUA-111 Material and Structure Analysis DUEL-MGT-011 Innovative applications of polymers and composites
Diploma average	The result of diploma shall be calculated as follows: (SE + D + TA)/3. Arithmetical mean of marks for final examination subjects (SE), Mark for diploma work (D) awarded by the Final Examination Committee, weighted study average (TA) related to the total number of credits acquired during the full study period except the preparation of diploma work
Qualification of diploma	excellent 4.51 – 5.00; good 3.51 – 4.50; average 2.51 – 3.50; acceptable 2.00 – 2.50
Conditions for issuing a diploma	Successful completion of the final examination is a prerequisite for the award of a diploma certifying the completion of higher education.
Work order	Full-time (regular)

Required engineering competences

Knowledge:

- Know the general and specific mathematics, natural and social sciences principles, rules, relationships and procedures for the technical field of agriculture.
- Comprehensive understanding of global social and economic developments. Do you know the theories, and the relationship between them make up the terminology is essential in technical areas.
- Know and understand the technical field of activities for knowledge and basic facts, and the limits of the expected directions of progress and development.
- Knowledge and understanding related to the technical area and the occupation of a key importance in other areas (mainly in logistics, management, environmental protection, quality control, information technology, legal, economic, labor and fire protection, safety areas) terminology, the main specifications and criteria.
- In-depth knowledge and understanding of knowledge acquisition, data collection methods in the technical field, their ethical constraints and problem-solving techniques.
- A comprehensive overview of important structural properties of materials used in mechanical and areas of application.
- Details of the rules of the technical documentation created. Familiar productivity tools and methods necessary for the occupation specialty legislation related to driving.
- Provides a related engineering field measurement and test theoretical knowledge. Do you know a related engineering field of information and communication technologies.
- Know and understand the related computer modeling and simulation engineering skill of the art tools and methods.

- Wide range of theoretical and practical preparedness, methodological and practical knowledge of complex engineering systems and processes for the design, production, modeling, operation and management.
- Comprehensive knowledge of Mechanical design of machines, systems and process design methods.

Skills:

- Technical problems solving in field gained the ability to apply general and specific mathematics, natural and social sciences principles, rules, relationships and processes.
- Ability of the relevant technical field theories and related terminology when applied to solve problems in innovative ways.
- Ability to specific problems in the field of professional and versatile interdisciplinary approach to solve.
- The ability to organize in cooperation with experts from the related disciplines in problem solving.
- The use of modern methods of data acquisition to knowledge and innovative ways to be able to solve specific technical problems arising in the art.
- Can information and communication technologies and methods used to solve technical problems.
- Are you ready to trade territory, language and conduct at least one foreign language publications, presentations and business negotiations.
- After due practice is able to perform managerial tasks.
- Laboratory testing and analysis, evaluation and documentation of test results Able materials used in the engineering field.
- Are you ready to process and organize information gathered during the operation of engineering systems and processes to analyze, draw conclusions.
- Ability to original ideas to enrich the knowledge base of engineering sciences.
- Ability to apply integrated knowledge of machinery, mechanical equipment, systems and processes in engineering materials and technologies, and related areas of electronics and information technology professionals.
- Ability Based on a system-oriented, process-oriented way of thinking global design complex systems to learn.
- Ability to plan and manage complex technical, economic, environmental, and human resource utilization.
- Ability to design engineering systems and processes, used for organizing and operating procedures, models, their application and further development of information technologies.
- Ready for mechanical systems, technologies and processes, quality assurance, metrology, and process control for solving tasks you.
- Ability to deal with problems in creative and flexible to solve complex tasks, as well as lifelong learning and commitment to diversity and value-based side.

Attitude:

- An open and receptive to learn and adopt credible mediation of the technical field in a professional, technological development and innovation.
- It takes a professional and ethical values related to the technical area.
- Seek technical areas related to the development of new methods and tools to collaborate. Mind profound vocation.
- Striving to both its own staff and continuous self-knowledge and training to develop.
- Endeavor to respect the work and organizational culture of ethical principles are complied with.
- Strives to comply with the quality requirements are complied with.
- Strives for environmental awareness, according to health awareness and sustainability expectations organize and carry out tasks.
- Seek a broad, comprehensive literacy acquisition.
- Shall be guided by the requirements of sustainability and energy efficiency.
- Seek professional work individually or in groups to plan and execute the tasks at a high level.
- Striving to perform the work of a complex approach based on system-based and process-oriented way of thinking.
- Examining the possibility of setting the research, development and innovation objectives in its work and seek to implement them.
- Work towards the application of acquired technical knowledge of observable phenomena thorough knowledge of, the laws of the description, to explain.
- Committed to high standards, quality work toward, shows an example of staff for the purposes of this approach.
- Committed to the expansion of new areas of mechanical engineering knowledge with scientific evidence.

- Mechanical power turn-themed research and development projects, to achieve this goal, in cooperation with members of the development team will mobilize theoretical and practical knowledge and skills.
- Committed to the health and safety culture towards health promotion.

Autonomy and responsibility

- Knowledge and experience acquired in formal, non-formal and informal sharing of information reporting forms specializes in cultivating.
- Evaluate the work of his subordinates, critical comments of sharing promotes professional development.
- Independently be able to solve engineering problems.
- Assume a proactive role in solving technical problems.
- Take responsibility for part of the process taking place under his command.
- Working independently in the field to professional decisions.
- Responsible colleagues and subordinates and encourage ethical profession.
- Work in solving problems independently and proactively occurs.
- Bears responsibility for sustainability, occupational health and safety culture and awareness towards the environment.
- The decisions carefully, to other areas of expertise (mainly legal, economic, energy and environmental) in consultation with representatives be autonomous, assume any liability.
- In making its decision takes account of environmental protection, quality management, consumer protection, product liability, the principle and application of equal access, occupational health and safety, technical, economic and legal regulations, as well as engineering ethics basic specifications.

Full time	M	echanic	al Engineerin	g N	ISc												
			Decuinemen		Ş	Sen	iest	er	- Cl	ass	es p	ber	we	ek			
Subject code	Subject name	Credit	Requiremen		1			2			3			4			Prerequisite
			t	Т	Р	L	Т	Р	L	Т	Р	L	Т	F)	L	
-	Specialization	5	-	-	-	-											-
DUEN-IMA-150	Mathematics (M) 1.	5	Е	2	1	0											-
DUEN-MGT-250	Energetics and Environmental Politics	5	Е	2	1	0											-
DUEN-MUA-152	Up-to-date Material and Production Technologies	5	Е	2	0	1											-
DUEN-MUG-116	Measuring Technologies and Signal Processing	5	М	1	0	2											-
DUEN-MUG-154	Mechanics	5	Е	2	2	0											-
-	Specialization	10	Е				-	-	-								-
DUEN-IMA-250	Mathematics (M) 2.	5	Е				2	1	1								DUEN-IMA-150
DUEN-MUA-254	The Damage of Engineering Materials	5	Е				2	1	0								-
DUEN-MUT-150	Physics	5	Е				1	1	1								-
DUEN-TVV-252	Management Skills	5	Е				2	1	0								-
-	Specialization	5	М							-	-	-					-
DUEN-MUG-095	Project Tasks	5	S							0	5	0					-
DUEN-MUG-096	Degree Planning 1.	10	М							0	4	0					-
DUEN MUC 156	Poliobility Theory and Structure Integration Analysis	5	Б							2	0	1					DUEN-MUA-254,
DUEN-MUG-130	Remaining meory and structure integration Analysis	5	E							2	0	1					DUEN-MUG-154
DUEN-MUT-152	Engineering Heat and Fluid Dynamics	5	Е							2	0	1					-
-	Optional course - master	5	-										-	-		-	-
-	Specialization	5	-										-	-		-	-
DUEN-MGT-000	Internship (4 weeks)	0	S										0	0)	0	-
DUEN-MUG-097	Degree Planning 2.	20	М										0	#		0	-
	Number of Theoretical/Practice/Lab classes per week			9	4	3	7	4	2	4	9	2	0	#		0	
	Total number of classes per week				16	;		13	\$		15	5		1	2		
	Total credit points								1	20							

DAYTIME MECHANICAL ENGINEERING MASTERS COURSE

LIFETIME MANAGEMENT																
			Domiromon		S	lem	est	er -	Cl	asso	es p	erv	wee	k		
Subject code	Subject name	Credit	t t		1			2			3			4		Prerequisite
			L	Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEN-MUG-150	Lifetime management	5	Е	2	1	0										-
DUEN-MUA-256	Assembly and Repairment Technologies	5	Е				2	0	1							-
DUEN-MUG-255	Maintenance Strategies	5	Е				2	1	0							-
-	Optional course - specialization	5	-							-	-	-				-
DUEN-MUG-250	Inspectional Methods of Machine Condition	5	Е										2	0	1	DUEN-MUG-116
	Number of Theoretical/Practice/Lab classes per week			2	1	0	4	1	1	0	0	0	2	0	1	
	Total number of classes per week				3		6				0			3		
	Total credit points]		25												

	MODERN MATERIAL ST	RUCTU	RE AND TEC	HN	OL	OG	Y									
			Doguiromon		S	em	este	er -	Cl	asse	es p	er v	wee	k		
Subject code	Subject name	Credit	t		1			2			3			4		Prerequisite
			· ·	Т	Р	L	Т	Р	L	Т	P	L	Т	Р	L	
DUEN-MGT-110	Information technology in materials science	5	М	2	1	0										-
DUEN-MGT-010	Cyberphysical systems	5	М				2	0	1							-
DUEN-MUA-111	Material and Structure Analysis	5	М				2	0	1							-
-	Optional course - specialization	5	-							-	-	-				-
DUEN-MGT-011	Innovative application of polymers and composites	5	М										2	0	1	-
	Number of Theoretical/Practice/Lab classes per week			2	1	0	4	0	2	0	0	0	2	0	1	
	Total number of classes per week			3 6					0			3				
	Total credit points			25												

LIFETIME MANAGEMENT - Optional course - specialization																
			D		5	Sem	est	er -	Cla	asse	es p	er v	wee	ek		
Subject code	Subject name	Credit	Requiremen		1			2			3			4		Prerequisite
			l	Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEN-MUA-112	Weldability	5	М							2	0	1				-
DUEN-MUA-115	Special Materials and Technologies	5	М							2	0	1				-
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0	0	4	0	2	0	0	0	
	Total number of classes per week				0			0			6			0		
	Total credit points								1	.0						

	MODERN MATERIAL STRUCTURE AND TECHNOLOGY - Optional course - specialization																
Subject code	Subject name	Credit	Requiremen		1 1	em	est	er - 2	· Cl	ass	es] 3	per	we	eel	۲ 4		Prerequisite
DUEN MCT 124	Subject mille	crean	t	Т	P	L	Т	P	L	Т	' F	I		Г	P	L	Trerequisite
DUEN-MGT-124	Simulation of heat treatment and welding processes	5	М							2	0	1					-
DUEN-MST-110	Nanotechnology	5	М							2	0	1					-
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0	0	4	0	2	2 ()	0	0	
	Total number of classes per week			0 0				0 6 0]		
	Total credit points			10													

Optional course - master																
			D		S	Sem	est	er -	Cla	asse	s p	er v	wee	k		
Subject code	Subject name	Credit	Requiremen		1			2			3			4		Prerequisite
			L	Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEN-MGT-222	Simulation of metallurgy and welding processes	5	М										2	1	0	-
DUEN-MUG-220	Computer and modelling simulation	5	М										1	0	2	DUEN-IMA-250
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0	0	0	0	0	3	1	2	
	Total number of classes per week			0				0			0			6		
	Total credit points								1	.0						

Part time		Ν	Iechanical Eng	ginee	ring	MSc										
						Ν	umb	er of	class	ses p	er se	mest	er			
Subject code	Subject name	Credit	Requirement		1			2			3			4		Prerequisite
				Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
-	Specialization	5	-	-	1	-										-
DUEL-IMA-150	Mathematics (M) 1.	5	Е	10	5	0										-
DUEL-MGT-250	Energetics and Environmental Politics	5	Е	10	5	0										-
DUEL-MUA-152	Up-to-date Material and Production Technologies	5	Е	10	0	5										-
DUEL-MUG-116	Measuring Technologies and Signal Processing	5	Е	5	0	10										-
DUEL-MUG-154	Mechanics	5	Е	10	10	0										-
-	Specialization	10	-				-	-	-							-
DUEL-IMA-250	Mathematics (M) 2.	5	Е				10	5	5							DUEL-IMA-150
DUEL-MUA-254	The Damage of Engineering Materials	5	Е				10	5	0							-
DUEL-MUT-150	Physics	5	Е				5	5	5							-
DUEL-TVV-252	Management Skills	5	Е				10	5	0							-
-	Specialization	5	-							-	-	-				-
DUEL-MUG-095	Project Tasks	5	S							0	25	0				-
DUEL-MUG-096	Degree Planning 1.	10	М							0	20	0				-
DUEL-MUG-156	Reliability Theory and Structure Integration Analysis	5	Е							10	0	5				DUEL-MUA-254,
			_									_				DUEL-MUG-154
DUEL-MUT-152	Engineering Heat and Fluid Dynamics	5	E							10	0	5				-
-	Optional course - master	5	-										-	-	-	-
-	Specialization	5	-										-	-	-	-
DUEL-MGT-000	Industrial internship (4 weeks)	0	S										0	0	0	-
DUEL-MUG-097	Degree Planning 2.	20	М										0	60	0	-
	Number of Theoretical/Practice/Lab classes per semes			45	20	15	35	20	10	20	45	10	0	60	0	
	Total number of classes per semester				80			65			75			60		
	Total credit points								12	20						

LIFETIME MANAGEMENT																
						N	umbe	er of	class	ses pe	er sei	mest	er			
Subject code	Subject name	Credit	Requirement		1			2			3			4		Prerequisite
				Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEL-MUG-150	Lifetime management	5	Е	10	5	0										-
DUEL-MUA-256	Assembly and Repairment Technologies	5	E				10	0	5							-
DUEL-MUG-255	Maintenance Strategies	5	E				10	5	0							-
-	Optional course - specialization	5	-							-	-	•				-
DUEL-MUG-250	Inspectional Methods of Machine Condition	5	E										10	0	5	DUEL-MUG-116
	Number of Theoretical/Practice/Lab classes per semes	1		10	5	0	20	5	5	0	0	0	10	0	5	
	Total number of classes per semester				15			30			0			15		
	Total credit points			25												

	MODERN MATERIAL STRUCTURE AND TECHNOLOGY															
				Number of classes per semester												
Subject code	Subject name	Credit	Requirement		1			2			3			4		Prerequisite
				Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEL-MGT-110	Information technology in materials science	5	М	10	5	0										-
DUEL-MGT-010	Cyberphysical systems	5	М				10	0	5							-
DUEL-MUA-111	Material and Structure Analysis	5	М				10	0	5							-
-	Optional course - specialization	5	-							1	-	1				-
DUEL-MGT-011	Innovative application of polymers and composites	5	М										10	0	5	-
	Number of Theoretical/Practice/Lab classes per semes			10	5	0	20	0	10	0	0	0	10	0	5	
	Total number of classes per semester			15 30 0						0			15			
	Total credit points					25										

	LIFETIME MANAGEMENT - Optional course - specialization															
			Requirement	Number of classes per semester												
Subject code	Subject name	Credit			1			2			3			4		Prerequisite
				Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEL-MUA-112	Weldability	5	М							10	0	5				-
DUEL-MUA-115	Special Materials and Technologies	5	М							10	0	5				-
	Number of Theoretical/Practice/Lab classes per semes			0	0	0	0	0	0	20	0	10	0	0	0	
	Total number of classes per semester				0			0			30			0		
	Total credit points			10												

	MODERN MATERIAL STRUCTURE AND TECHNOLOGY - Optional course - specialization															
				Number of classes per semester												
Subject code	Subject name	Credit	Requirement		1			2			3			4		Prerequisite
				Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEL-MGT-124	Simulation of heat treatment and welding processes	5	М							10	0	5				-
DUEL-MST-110	Nanotechnology	5	М							10	0	5				-
	Number of Theoretical/Practice/Lab classes per semes			0	0	0	0	0	0	20	0	10	0	0	0	
	Total number of classes per semester				0			0			30			0		
	Total credit points			10												

Optional course - master																				
										Number of classes per semester										
Subject code	Subject name	Credit	Requirement		1			2			3			4		Prerequisite				
				Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L					
DUEL-MGT-222	Simulation of metallurgy and welding processes	5	М										10	5	0	-				
DUEL-MUG-220	Computer and modelling simulation	5	М										5	0	10	DUEL-IMA-250				
	Number of Theoretical/Practice/Lab classes per semes			0	0	0	0	0	0	0	0	0	15	5	10					
	Total number of classes per semester				0			0			0			30						
	Total credit points 10																			

Mathematics (M) 1.

Name of th	ne subject	in Hungaria	an	Matematika	(M) 1.		Level MSc							
Ivanie of u	ie subject	in English		Mathematics (M) 1. Code DUEN(L)-IMA-15										
Responsib	le educatio	nal unit		Institute of I Science	nformati	on Technolo	ogy, Dep	partment of Ma	athematic	s and Computer				
Name of c DUEN(L)·	ompulsory	prior learni	ng											
Туре		Presentatio	n	Practice		Laboratory		Requirement	Credit	Language of education				
Full time Part time	150/39 150/15	per week per term	2 10	per week per term	1	per week per term	0	Е	5	english				
Teacher re	sponsible f	for the subje	ect	Name	Vame László Bognár PhD schedule associate n									
10000010110	sponsiole	or are subje		Goals, deve	lopment	objectives		-	seniedaite	ussoenne proressor				
Fraining objective and justification of the course (content, output, location the curriculum)				Knowledge problems th use of up-t technical pr calculation mathematica	Inowledge of calculation methods and algorithms serving for solving mathematical roblems that occur in the technical life and, as a result of getting acquainted with the se of up-to-date mathematical program packages suitable to be used in solving echnical problems, making the student capable of elaborating and implementing alculation procedures for everyday technical mathematical tasks by using mathematical software.									
				Presentation	For all or an o	students, us verhead proj	ing a lar ector	ge speaker, a l	board pres	sentation, a projector				
Typical de	livery meth	nods		Practice	Small-1	oom board	exercise	s for up to 20	people					
				Laboratory										
				Other										
Requireme learning of	ents (expres litcomes)	ssed in term	s of	principles, r You have a are familiar them. You know development Ability Capable of of It is capable resolving the standard ope Capable of of Attitude It shall ender to the technic Strive strivit through con Strive strivit Autonomy Even in une broad, under	ules, con comprehe with the and under t and dev designing of identi- e practice erations i creating b eavour to cal field. ng to de tinuous s ng to acq and resp expected clying pro	texts and pro- ensive know e fundament erstand the velopment in cal and prace n practice). oasic models contribute to His sense of evelop both elf-training <u>uire a wide</u> onsibility decision-ma ofessional is	bocedures ledge of al theor basic fa the tecl and per e profes tical ba of tech o the de f vocati- your o and train range of sticus sit sues and	s necessary for global social ies, contexts acts, boundari mical field. forming self-s sional problem ackground nece nical systems evelopment of on deepened. wn knowledg ning. comprehensive uations, it inc development	the field and econo and termi ies and e: study. ns, identif cessary to and proce new meth e and yo ve literacy lependent on the bas	of technical field. omic processes. – You nology that make up xpected directions of ying, formulating and resolve them (using sses. nods and tools related ur staff's knowledge ly takes a look at the sis of specific sources.				
Short desc content	ription of t	he subject		 broad, underlying professional issues and development on the basis of specific sources. In carrying out his professional duties, he also cooperates with qualified professionals in other fields (primarily technical, economic and legal). Share your experiences with colleagues to help them grow. It takes responsibility for the consequences of its technical analyses, its proposals and the decisions that are taken. Probability theory: notable distributions occurring in the technical practice. Elementary complex functions, limit value, continuity. Differentiability of complex functions. Cauchy-Riemann equations, harmonic functions, analytic functions, Taylor's series. Integration of complex functions. Cauchy's integral theorem, Cauchy's integral 										

	theorem and its applications, conform mappings, Laplace transform, convolution.
	Solving linear differential equations by using Laplace transform. Boundary-value
	problems for second order linear differential equations. Bessel's differential equation,
	Bessel's functions, Legendre's differential equation, Legendre's polynoms. Generalized
	Fourier series, orthogonality properties, Parseval's theorem.
Types of student activities	Lecture: Written text processing with note-taking 40%, theoretical material self-
Types of student activities	processing 20%, task solution 40%.
	 László Csernyák (ed.): Probability Calculation, Budapest, Nemzeti Tankönyvkiadó, 2007, 216 p. ISBN 978-963-19-5949-9
Required literature and contact details	 Pál Szász: Elements of differential and integral calculus II. Budapest, Typotex, 2001, pp. 444-564, ISBN 963-932-605-4
	 János Tóth, Péter Simon L.: Differential Equations, Budapest, Typotex, 2009, pp. 141-149, ISBN 978-963-279-057-2
Recommended literature and contact details	 László Hanka, Miklós Zalay: Complex Function Exemplar, Budapest, Műszaki K., 2010, 416 p. ISBN 978-963-16-2816-6 Pál Szász: Elements of differential and integral calculus II. Budapest, Typotex, 2001, 606 p. ISBN 963-932-605-4
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

Energetics and Environmental Politics

		in Hungar	Ungerien Energetika és körnvezetnelitika I evel MSc							MSc					
Name of the	e subject	in Fnalish		Energetics a	nd Envir	onmental Pe	litics		Code	DUEN(L)-MGT-250					
Perpensible	aducatio	nal unit		Institute of 7	Institute of Technology, Department of Mechanical Engineering and Energy										
Neme of an		mai unit	ina		echnolog	gy, Departi			gineering	and Energy					
DUEN(L)-	mpuisory		mg			1		1	1	L					
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education					
Full time	150/39	per week	2	per week	1	per week	0	Е	5	english					
Teacher res	nonsible f	for the sub	iect	Name	5	Pér term Róbert Sán	ta PhD		schedule	College professor					
reaction res	polisible i		jeet	Goals deve	lonment	objectives	ia, i iiD		schedule	Conege professor					
Training ob	jective an	d justifica	tion of	Understand	the fund	amentals of	energy	its impact of	, the envi	ronment and how to					
the course (content, o	utput, loca	ation in	align cornor	ate envir	onmental n	olicy ol	viectives to he	eln solve	global environmental					
the curricul	um)			problems.	ute envir	omnentar p	oney of	Sjeeuves to it	sorve	giobar environmentar					
				Presentation	Projecto	or, ppt prese	entation								
				Practice Student seminar presentations											
Typical deli	ivery meth	nods		Laboratory											
				Other											
				Knowledge	_1										
				A comprehe	nsive kno	owledge of t	he basio	c facts, trends	and limits	of the subject area of					
				engineering	and econ	omics. Kno	wledge	of the general	and speci	fic rules, contexts and					
				procedures	necessary	for the op	eration	of the field of	of enginee	ring. Comprehensive					
				knowledge	of the ma	ain theories	and pr	oblem-solving	g methods	in the field. Has an					
				applied know	wledge of	f the measu	rement	procedures us	ed, their t	ools, instruments and					
				measuring e	quipment	t. Understar	d, chara	acterise and m	odel the s	structure and function					
				of the struct	of the structural units and elements of systems, the design and interrelationship of the										
				system elements used.											
				Ability											
				The student	is able to	analyse at a	basic le	vel the discipli	nes that m	ake up the knowledge					
				base of technical and economic disciplines, to synthesise interrelationships and to make											
				appropriate of	evaluation	ns. The stud	ent is al	ole to apply the	e most imj	portant terminologies,					
				theories and	procedur	res of the te	chnical	discipline in th	ne perform	nance of related tasks.					
				The student is able to plan, organise and conduct independent learning. The student is											
				able to ident	ify routin	e technical	problen	ns and to ident	ify, formu	late and solve (by the					
				practical app	olication	of standard	operation	ons) the theore	etical and	practical background					
				required to s	olve ther	n. The stud	ent is ab	ble to understa	nd and us	e literature, computer					
				and library r	esources	specific to	the field	I. The student	is able to	apply the acquired IT					
Requirement	nts (expres	ssed in teri	ms of	knowledge t	o the solu	ition of prob	lems in	the field. The	student is	able to construct basic					
learning out	tcomes)			models of s	ystems ai	nd processe	s. The s	student is able	to comm	unicate orally and in					
				of specialisa	s/ner mot	iner tongue	in a pro	lessionary app	propriate i	namer in ms/ner neid					
				Attitudo	tion.										
				The student	066117006	and authors	tically r	opresents the	ocial role	of its profession and					
				its fundame	assumes ntal relat	ionshin wit	h the w	orld Open to	learning	about accepting and					
				authentically		unicating r	n nie w rofessie	onal and tech	hnological	developments and					
				innovations	in the f	field of en	vineerin	g Seeks to	solve pro	blems preferably in					
				cooperation	with oth	ers Have t	he stam	ina and tolera	ance of m	onotony to carry out					
				practical act	ivities. A	ons: mave t	ner acqu	ired technical	knowleds	to gain a thorough					
				understandi	19 of obs	ervable phe	nomena	to describe a	nd explai	their laws, complies					
				with and oh	serves th	e relevant	safety. 1	ealth, enviro	nmental.	uality assurance and					
				control requirements.											
				Autonomy and responsibility											
				Independently thinks through and develops comprehensive. well-founded profession											
				questions based on given sources, even in unexpected decision-making situations.											
Ì				the performance of his/her professional duties, he/she will also cooperate with quali-											
p w			professionals from other disciplines (primarily technical, economic and legal). He												
			will share his/her experience with his/her colleagues, thus contributing to the												
			development. He/she is responsible for the consequences of his/her technical analyses,												
				the proposal	s he/she 1	makes and t	he decis	ions he/she ta	kes.	- /					

Short description of the subject content	Basic energy production processes and their environmental impact. Introduction to and comparison of fossil, renewable and nuclear energy production. Introduction to environmental management. Introduction to the basic principles of environmental policy. The relationship between environmental audits and environmental policy. Life cycle analysis and its use.								
Types of student activities	Listen to lectures, give small presentations, discuss. Preparation at home.								
Required literature and contact details	 Endre Kiss Environmental protection and energy management. Electronic note, Moodle system Mizuta Yutaka: Environmental management and life cycle analysis, Moodle note Moser M.,Pálmai Gy.: The Basics of Environmental Protection National Textbook Publisher, Budapest, 1992 U. Förstner: Environmental Technology, Springer-Verlag Budapest, 1993 U. U. Peststner, U.S. University of Applied Sciences, Budapest, 2000 								
Recommended literature and contact details	• Teaching materials and catalogues of the Department of Physics, Environment Laboratory, as well as materials in foreign languages.								
Description of tasks to be submitted/measurement reports	Hallgatói kiselőadások power pointjai								
Description and timetable of the workshops	Full-time students: Test with explicit questions, planning exercises in weeks 6 and 13, Part time students: Test with explicit questions, planning exercises in weeks 2 and 4.								

Up-to-date Material and Production Technologies

		in Hungaria	an	Korszerű anyag- és gyártástechnológiák						MSc
Name of th	e subject	in English		Up-to-date l	Material a	nd Producti	on Tecł	nologies	Code	DUEN(L)-MUA- 152
Responsibl	e educatio	nal unit		Institute of 7	Fechnolog	gy, Departm	ent of N	Mechanical En	gineering	and Energy
Name of co DUEN(L)-	ompulsory	prior learni	ng							
Туре		Presentation	n	Practice		Laboratory		Requirement	Credit	Language of education
Full time	150/39	per week	2	per week	0	per week	1	Е	5	english
Part time	150/15	per term	10	per term Name	0	per term Gábor Vizi	5 PhD		schedule	college teacher
Training of the course of the curricul Typical del	nts (expres)	or the subje	s of	Goals, deve By masterin separation t structural m Presentation Practice Laboratory Other Knowledge He knows t terminology expected din system of th Ability Capable of c It is capable resolving th standard ope Capable of c Attitude It shall ende to the technic o - Strives t continuous s o - Strives to organisation o - Strives to o - Strives to o - Strives to o - Strives to o - Strives to broad, under In carrying c in other field Share your c	Iopment g the mat technolog aterials c: For all i or an ov Small-r Small-r be funda that buil rections c te technic designing of identi te practic erations in creating b eavour to ical field. o develop self-traini to comply b acquire and resp expected rlying pro out his pr ds (prima experienc	mental theo design between an also be provided by students, using verhead projectives mental theo do board of mental theo do them up of developm al field. , organising fying routine al and prace on practice). asic models contribute t His sense of both your ng and train with and en a wide rang onsibility decision-ma of sessional des of sessional des of the set of the set of the practice of the set of the set of the set of the practice of the set of the set of the set of the practice of the set of the set of the set of the practice of the set of the set of the set of the practice of the set of the set of the set of the practice of the set of the set of the set of the set of the practice of the set of the practice of the set o	subject, l as th cocessee ng a lar ector exercise ries and . Know ent and and per e profes tical ba of tech o the de f vocati own kn ing. force th force qu e of cor king situ sues and uties, h l, econce	students learr e special tecl i, ge speaker, a l s for up to 20 d relationships s and understa development forming self-s sional problem ackground nec nical systems evelopment of on deepened. iowledge and e ethical prince tality requiren nprehensive li tuations, it ince a development e development a development cuality requirent nprehensive li tuations, it ince a development e development a development on degal	schedule a about too mologies board pres people s of the te ands the b of the kn study. ns, identif cessary to and proces new meth your staff iples of th hents. teracy. lependention on the bass tes with q). row.	ay's modern material with which modern sentation, a projector echnical field and the basic facts, limits and lowledge and activity ying, formulating and resolve them (using sses. hods and tools related 's knowledge through the culture of work and ly takes a look at the sis of specific sources. ualified professionals
In takes responsionly for the consequences of its technical analyses, its propositionthe decisions that are taken.Overview of modern cutting operations. High-speed cutting, high-speed n characteristics and areas of application. Ultra-precision and micro mach Characteristics of high energy density machining utilizing different physical print Modern processing methods with high energy density. Mechanical, chemic thermal energy utilization processes. Characteristics of radial mach Characteristics and applications of ultrasonic machining, abrasive water jet c Electroerosion machining. Processing with plasma and laser. Processing with e and ion beams									Ases, its proposals and high-speed milling, d micro machining. logies. Grouping and nt physical principles. anical, chemical and radial machining. ive water jet cutting. processing with electron	

Types of student activities	Lecture: Written text processing with note-taking 40%, theoretical material self-processing 20%, task solution 40%.
Required literature and contact details	 1. Takács János: Korszerű technológiák a felülettulajdonságok alakításában, Műegyetemi Kiadó, 2004, p346 2. Niebel-Draper-Wysk: Modern manufacturing process Engineering, Mc Graw-Hill Publishing Company 1989, p986.
Recommended literature and contact details	 1. Dudás I.: Gépgyártástechnológia III. A megmunkáló eljárások és szerszámaik. Fogazott alkatrészek gyártása és szerszámaik. Miskolci Egyetemi Kiadó, 2003., p539 2. Dudás Illés: Gépgyártástechnológia I., Gépgyártástechnológia alapjai, Miskolci Egyetemi Kiadó, Miskolc, 2000. 3. T. Jagadeesha: Non-Traditional Machining Processes, I K International Publishing House, 2016, p268
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

Measuring Technologies and Signal Processing

		in Hungari	ian	Méréstechni	ika és	s jelfe	eldolgozás	Level	MSc						
Name of	the subject	in English		Measuring 7	Геchr	nolog	ies and Sig	nal Proc	cessing	Code	DUEN(L)-MUG- 116				
Responsil	ble education	nal unit		Institute of 7	Fechr	nolog	gy, Departm	ent of N	Mechanical En	gineering	and Energy				
Name of ODUEN(L)	compulsory)-	prior learn	ing												
Туре		Presentatio	on	Practice			Laboratory		Requirement	Credit	Language of education				
Full time	150/39	per week	1	per week	0)	per week	2	М	5	english				
Part time	150/15	per term	5	per term	0)	per term	10 DhD		ashadula	Drofossor				
Teacher r	esponsible f	or the subj	ect	Name	lonn	aont	Gabor Por,	PhD		schedule	Professor				
Training	objective an	d justificat	ion of	Based on ar	und	ersta	nding of the	e relatio	nshins hetwee	n measur	ement and modelling				
the course	e (content, o	utput, loca	tion in	the student	shou	ld be	e able to de	sign in	dividual meas	urements.	including the use of				
the curric	ulum)			advanced sig	lvanced signal processing and interpretation skills.										
				Presentation	For	r all t	he students	in high-	-performance,	board per	formance. Using a				
				Practice		jeeto	1 (33.3370 (Ji total I	10013)(15 11001						
Typical d	elivery meth	nods			Up	to 30	0 people in	groups (of table counti	ng exercis	ses and lab				
				Laboratory	me	asure	ements. (66.	66% of	total hours) (2	26 hours)					
				Other											
				Knowledge											
				You are far	You are familiar with and understand in detail the methods of knowledge, data										
			collection, t	ellection, their ethical limitations and problem-solving techniques in the technical											
			field.	eld.											
			о паve кно field. Vou a	Have knowledge of metrology and measurement theory related to the engineering rield. You are familiar with information and communication technologies related to the											
				neid. You are familiar with information and communication technologies related to the engineering field.											
				o You know and understand the tools and methods of computer modeling and											
				simulation 1	relate	ed to	the field	of mec	hanical engin	eering	You have extensive				
				theoretical a	ind p	ractic	cal skills, m	ethodol	ogical and pra	ctical kno	wledge in the design,				
				manufacture	e, mo	odelli	ng, operatio	on and 1	nanagement o	f complex	x mechanical systems				
				and processe	es.										
				Ability											
				o It is able to	5 app	oly the	e theories a	nd relate	ed terminology	y in a give	n technical field in an				
Requirem	ents (expres	ssed in tern	ns of	o It is cape	vay v able (ofa	versatile ir	oterdisci	plinary appro	ach and i	resolution of specific				
learning o	outcomes)	see in tern	.15 01	problems wi	ithin	its fi	eld.	lieraisei	piniary appro-	uon una i	esolution of specific				
	,			o In solving	a pro	oblen	n, it is able	to organ	nise cooperatio	n with ex	perts in related fields.				
				o It can solv	e spe	ecific	technical p	oroblem	s in its field in	an innov	ative way using state-				
				of-the-art kr	iowle	edge	acquisition	and data	a collection me	ethods.					
				o It is able t	o use	e info	ormation an	d comm	nunication tech	nologies	and methods to solve				
				technical pro	oblen	ns.									
				o Using his	acar	ired	technical k	nowled	ga ha strives	to gain as	s much knowledge as				
				possible abc	out of	oserv	able phenor	nena. to	describe and	explain hi	is legalities.				
				o Committee	d to h	nigh-c	quality, qua	lity worl	k, sets an exam	ple for yo	our colleagues to apply				
				this approac	h	0		•			0 11 0				
				Autonomy	and 1	respo	onsibility								
				Its decisions	s sha qualit	ll tak tv. co	te into acco onsumer pr	ount the otection	principles and product liab	d applicat ility, equa	ion of environmental al opportunity access.				
				health and	safety	y at	work, techr	nical, ec	conomic and 1	egal regu	lations and the basic				
				requirements of engineering.											
			Measurement and modelling, the role of modelling in measurement, classification and												
Short des	cription of t	he subject		properties of models. Types of measurement tasks, the development of the necessary models. Cross-check, validation, verification and calibration of models.											
content				Measuremen	nt un	ncerta	ainty and e	valuatio	on. Extended	uncertain	ty. Determination of				
				resulting sta	indaro	d unc	certainty on	the bas	is of independ	ent input	(measured) quantities				

	and correlated quantities. Practical examples and methods of calculation. Metrology concept and requirement system. Rules for the communication of measurement results. Quality management system in the laboratory. Evaluation of the measurement results by computerised methods. Economical estimation procedures for the reliability of measurement results. Practical mastery of statistical tests. Zero hypothesis and counterhypothesis, one-sided and two-sided hypothesis test, first- and second-species errors. Test the match of two expected values. Comparison of experiential standard deviations, decision on the adequacy of the measurement. Estimate the goodness and measurement uncertainty of the parameters obtained from the function join from the empirical data. Signals and signal systems: amplitude distribution and measurement, correlation functions and measurement, spectrum, coherence and phase function measurement, autoregession modelling, sequential quotation test, basics of fuzzy modelling, wavelet principle and mathematics. Series measurement with programs (LABView); Measurement with a laser measuring arm, data recirculation for the preparation of a rapid prototype and for the redesign of the measured element (reverse engineering practice); Measurement with Digimatic (Mitutoyo); 3D measurement and reconstruction with measuring microscope.
Types of student activities	Measurements and finite battery modeling. Processing heard text with note-taking and recording of material using your own and electronically available note 40% Self-carrying measurement exercises 20%
	Tasks managed and self-processing 20% Solve test tasks 20%
Required literature and contact details	 Mallat: A wavelet tour to signal processing, 3rd edition, Academic Press, 2008 moodle.duf.hu International metrological interpretive dictionary, OMH, Budapest, MTA MMSZ ltd kft, 1998 49p. ISBN 963-03-5779-8-
Recommended literature and contact details	 Péter Bölöni, György Pataki, Introduction to General Metrology, OMH, Budapest, 1988, 582p. István Zoltán: Measurement Technology, University Textbook, Technical University Publishing House, 1997 (55029) ,Textbook, University Publishing House
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	

Mechanics

		in Hungarian 🛛 🛛		Mechanika				Level MSc					
Name of the	e subject	in English		Mechanics					Code	DUEN(L)-MUG- 154			
Responsible	e educatio	nal unit		Institute of	Technolo	gy, Departm	ent of N	Mechanical En	gineering	and Energy			
Name of co DUEN(L)-	mpulsory	prior learni	ing		·				<u> </u>				
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education			
Full time	150/39	per week	2	per week	2	per week	0	F	5	english			
Part time	150/15	per term	10	per term	10	per term	0	L	5	english			
Teacher res	ponsible f	for the subje	ect	Name	_	Róbert Sán	ta, PhD		schedule	Professor			
Training objective and justification of the course (content, output, location in			ion of	Goals, deve	elopment	objectives							
			tion in	By complet	By completing the subject, the student should be able to identify and model major								
the curricul	um)	1 /		flexibility issues and, in simpler cases, solve them; in addition, the interpretation and									
-				modelling o	f basic m	echanical vi	bration	phenomena.	1				
				Presentation	or an ov	students, us verhead proj	ng a lar ector	ge speaker, a	board pres	sentation, a projector			
Typical deli	ivery meth	hods		Practice	Small-r	oom board	exercise	s for up to 20	people				
				Laboratory									
				Other									
				Knowledge	:								
				He has kno	wledge o	f metrology	and me	easurement th	eory relat	ed to the engineering			
				field He i	ield He is familiar with information and communication technologies related to the								
				engineering	field.								
				You know a	You know and understand the tools and methods of computer modelling and simulation								
				related to the field of mechanical engineering You have extensive theoretical and practical skills, methodological and practical knowledge in the design, manufacture									
				modelling, operation and management of complex mechanical systems and processes.									
				Ability									
				In solving a problem, it is able to organise cooperation with experts in related fields									
				It can solve specific technical problems in its field in an innovative way using state-of-									
				the-art know	vledge ac	quisition and	d data c	ollection meth	ods.	, , , , , , , , , , , , , , , , , , , ,			
				It is able to	use info	rmation and	comm	unication tech	nologies a	and methods to solve			
				technical pr	oblems.				-				
				Prepared to	conduct	publication,	presen	tation and dis	cussions i	in your field, in your			
Requiremen	nts (expres	ssed in term	ns of	native langu	age and i	n at least on	e foreig	n language.					
learning out	tcomes)			Attitude									
				It shall end	eavour to	contribute t	o the de	evelopment of	new meth	nods and tools related			
				to the techn	ical field.	His sense o	f vocati	on deepened.					
				Strive strivi	ng to deve	elop both yo	ur own l	cnowledge and	l your staf	f's knowledge through			
				Continuous	self-traini	ng and train	ing.	othical main a	mlag of th	a aulture of work and			
				organisation	compry v	vititi and em	orce the	e etnical princi	pies of th	e culture of work and			
				It strives to	r. comply w	vith and enfo	rce qua	lity requireme	nte				
				Autonomy	and resp	onsihility	nee qua	inty requireme	into.				
				It is self-suf	ficient to	solve engin	eering t	asks					
				Take the ini	tiative to	solve techni	cal prol	olems.					
				Assume res	ponsibilit	y for the sub	proces	ses under you	r control.				
				It makes pro	ofessional	decisions o	n its ow	n in its field o	f operatio	n.			
				Encourages and ethical	your staf wav.	f and subor	dinates	to practise the	eir profess	sions in a responsible			
				When solvi	ng profess	sional proble	ems, it a	cts independe	ntly and p	proactively			
	 			Determinati	on of the	stresses and	displac	ement of static	ally indef	inite structures. Use a			
				power meth	od, prescr	ibe the conn	ection c	condition (com	patibility)) equation system, and			
Short descri	iption of t	he subject		resolve it. U	Jse of a p	ower metho	od for sj	pecially constr	ructed stru	ctures, multi-support			
content				straight brac	ckets, the	Clapeyron 6	equation	n. The basis fo	r calculati	ng voltages in curved			
				shaft symn	netric she	lls once an	d twice	e. Thick-walle	ed pipes,	shrink binding, pipe			
				diagram. Si	zing for lo	ad capacity	, plastic	load-bearing 1	eserve for	r statically determined			

	and statically indefinite structures.									
	It is complex to reduce a degree of freedom of swinging systems. Prescribing a reduced									
	swing system and its motion equation based on the items learned in classical dynamics.									
	Prescribing a reduced swing system and its motion equation using an energy method,									
	using lagrange motion equations, general coordinates. Vibrations of multi-freedom									
	systems, matrix shape of motion equations. Examine and resolve your own value									
	problem in simpler cases. Bending swings. Methods of vibration reduction, passive and									
	active vibration reduction.									
Types of student activities	Lecture: Written text processing with note-taking 40%, theoretical material self-									
	processing 20%, task solution 40%. $\mathbf{I}_{i} = \mathbf{I}_{i} + \mathbf{I}_{i$									
	 Janos Egert - Zoltan Nagy: Mechanics (Movement Studies), Gyor, Széchenyi István University, 2006. 									
	Béla Csizmadia - Ernő Nándori: Mechanics for Engineers (Strength of									
Required literature and contact details	Science), National Textbook Publisher, Budapest 1999.									
	 Béla Csizmadia - Ernő Nándori: Mechanics for Engineers (Movement 									
	Studies), National Textbook Publisher, Budapest 1997.									
	 Attila Hegedűs: Fundamentals of Technical Vibration Theory, Szent István University Press, Gödöllő, 2009. 									
Recommended literature and contact	 István Nagy: Technical diagnostics I. Vibration diagnostics, 2006, ISBN: 9630608073 									
details	• Ferenc Dömötör: Vibration Diagnostics I., 2008, DF Publisher									
	• Ferenc Dömötör: Vibration Diagnostics II., 2011, DF Publisher									
Description of tasks to be										
submitted/measurement reports										
Description and timetable of the										
workshops										

Mathematics (M) 2.

		1		1								
Name of th	ne subject	in Hungarian		Matematika	Matematika (M) 2. Level MSc							
	is subject	in English		Mathematics	s (M) 2.				Code	DUEN(L)-IMA-250		
Responsib	le educatio	nal unit		Institute of I Science	nformatio	on Technolo	ogy, Dep	partment of M	athematic	s and Computer		
Name of co DUEN(L)-	ompulsory	prior learnin	ng	IMA-150								
Туре		Presentation	n	Practice		Laboratory	Laboratory I		Credit	Language of education		
Full time	150/52	per week	2	per week	1	per week	1		-			
Part time	150/20	per term	10	r per term	5	per term	5	E	5	english		
Teacher re	sponsible f	for the subje	ct	Name		László Bog	nár, Phl	D	schedule	Associate professor		
		5		Goals, development objectives								
Training objective and justification of the course (content, output, location in the curriculum)			on of ion in	Understandin in technical 1 As a result o should be ab mathematica	ng compo life and s f learning le to deve	utational me olving techi g how to app elop and imp sing mathen	thods, a nical pro ply mod plement	algorithms for oblems ern mathemati calculation pr oftware	solving m ical progra ocedures f	athematical problems am packages, students for everyday technical		
				For all students, using a large speaker, a board presentation, a prejector								
					or an or	verhead nroi	ector	50 speaker, a	source pres	semation, a projector		
Typical da	livory mot	ande		Practice	Small_r	oom board	ector	$r_{\rm s}$ for up to 20	neonle			
i ypicai de	iivery meu	1008		Laboratory	Sinan-i	oom board v	-ACICISC	s 101 up to 20	people			
				Other								
				Viner								
				He has comprehensive knowledge of global social and economic processes Know the fundamental theories and connections of the technical field and the terminology that make them up. He knows and understands the basic facts and boundaries of the knowledge and activity system of the technical field and the expected directions of development and development. Ability Ability to plan, organize, and conduct self-study. He is able to identify routine professional problems, explore, formulate and solve (with the practical application of standard operations) the theoretical and practical background necessary for their solution.								
Requireme	nts (expres	sed in terms	s of	Attitudo	eate Dast		technica	ai systems and	processes	5.		
Requirements (expressed in terms of learning outcomes)			Attitude It strives to contribute to the development of new methods and tools related to the technical field. His sense of vocation deepened. It strives to develop both its own knowledge and that of its colleagues through continuous self- and further training. It strives to observe and enforce the ethical principles of work and organizational culture. It strives to comply with and enforce quality requirements. It strives to acquire a broad, comprehensive education. Autonomy and responsibility Even in unexpected decision-making situations, it independently considers comprehensive, foundational professional issues and elaborates them based on given resources. In carrying out its professional tasks, it also cooperates with qualified professionals from other fields (primarily technical, economic and legal). He shares his experiences with his colleagues to help them develop. It assumes responsibility for the consequences of its technical analyses suggestioned									

Short description of the subject content	Nonlinear differential equations, phase image, classification of equilibrium positions, stability, asymptotic stability, Lyapunov's theorems. Autonomous equations, dynamical systems. Important partial differential equations in physics. First-order partial differential equations. In their main part, they are a classification of linear second-order partial differential equations, canonical forms. The Laplace equation and the Poisson equation. The thermal conductivity equation, Fourier transform and its application. The wave equation, Fourier series decipherment. In technical practice, numerical solutions that can be linked to the learned theory are: iterative solutions of systems of linear equations, initial and boundary value tasks of ordinary differential equations.									
Types of student activities	Lecture: Written text processing with note-taking 40%, theoretical material self- processing 20%, task solution 40%.									
Required literature and contact details	 Stoyan Gisbert: Numerikus matematika, Budapest, Typotex, 2007, pp. 181-205, ISBN 978-9-639664-41-8 Szász Pál: A differenciál- és integrálszámítás elemei II. Budapest, Typotex, 2001, pp. 45-61, 70-77, ISBN 963-932-605-4 Tóth János, Simon L. Péter: Differenciálegyenletek, Budapest, Typotex, 2009, pp. 120-138, 153-293, ISBN 978-963-279-057-2 									
Recommended literature and contact details	 Stoyan Gisbert, Takó Galina: Numerikus módszerek I. Typotex, 1993, pp. 82-130, ISBN 963-7546-31-6 Stoyan Gisbert, Takó Galina: Numerikus módszerek II. Typotex, 1995, pp. 11-60, pp. 155-229, pp. 236-275, ISBN 963-7546-53-7 Stoyan Gisbert, Takó Galina: Numerikus módszerek III. Typotex, 1997, pp. 13-43, ISBN 963-7546-77-4 									
Description of tasks to be submitted/measurement reports										
Description and timetable of the workshops										

The Damage of Engineering Materials

		in Hungar	n Hungarian 🛛 🛛 🛛 🛛		/agok kár	osodása	Level MSc					
Name of	the subject	in English	1	The Damage	e of Engin	neering Mat	erials		Code	DUEN(L)-MUA- 254		
Responsil	ble educatio	nal unit		Institute of 7	Institute of Technology, Department of Structural Integrity							
Name of ODUEN(L)	compulsory)-	prior learr	ning									
Туре		Presentati	on	Practice	actice Laboratory Requir			Requirement	Credit	Language of education		
Full time Part time	150/39 150/15	per week per term	2 10	per week 1 per week 0 E				Е	5	english		
Teacher r	esponsible	for the sub	ject	Name		Zsolt Csepe	eli, PhD		schedule	College professor		
				Goals, deve	Gals. development objectives							
Training objective and justification of the course (content, output, location in the curriculum)			tion of ation in	o Th degradations on their form to collect i degradations	e aim of s based or ner studie nformations and to p	of this sub their know es and the k on and san revent addit	ect is ledge of nowledg nples of ional da	to enable stu f materials scie ge gained in th n the spot, t amages.	adents to ence and r is subject to highlig	investigate material naterial testing. Based , students will be able tht the cause of the		
				Presentation	Lecture	s with black	board a	nd projector.				
Typical delivery methods				Practice Laboratory Other	Carryin	g out exper	ments a	nd calculation	1.			
Requirements (expressed in terms of learning outcomes)			ns of	Students hav materials, ar Ability Students are degradations Attitude Try to apply material fail Autonomy a Can work in fields to solv Failure mod related to m assessment r equipment.	tudents have detailed knowledge of the theoretical background of the degradation of aterials, and are familiar with material testing methods. bility tudents are able to evaluate the information collected during investigation of the egradations, and are able to define the appropriate questions. ttitude ry to apply state-of-the-art knowledge and methods to detect, analyse and prevent aterial failures. utonomy and responsibility an work independently and takes responsibility. Cooperates with experts from other elds to solve the revealed problems but can make their own decisions. ailure modes and effect analysis. Materials selection for failure prevention. Failure elated to metalworking, casting, welding and heat treating operations. Structural life assessment methods. Failure analysis and life assessment of structural components and classification of the appropriate and classification of the selection.							
Short description of the subject content				damage. Tools and techniques in failure analysis. Creep and stress rupture failures. Corrosion-related failures. Hydrogen damage and embrittlement. Fundamentals of wear failures. Failures of manufactured components and assemblies. Failures of shafts, sliding bearings, rolling-element bearings, tools and dies. Understanding and assimilation of the topics of presentations 50%								
Types of	student acti	vities		Testing of m Laboratory e	aterials 3	30% 20%						
Required	literature a	nd contact	details	 Failure Analysis and Prevention, ASM Handbook Volume 11, 2002 Fatigue and Fracture, ASM Handbook Volume 19, 1996 								
Recomme details	ended literat	ture and co	ontact	• Fr	actograph	ny, ASM Ha	undbook	Volume 12, 1	987			
Description submitted	on of tasks t /measurem	to be ent reports										
Descriptio workshop	on and time	table of the	9									

Physics

N		in Hungar	ian	Fizika		Level	MSc							
Name of th	ie subject	in English	l	Physics					Code	DUEN(L)-MUT-150				
Responsibl	e educatio	nal unit		Institute of '	Fechnolog	gy, Departn	ent of N	Mechanical En	gineering	and Energy				
Name of co	ompulsory	prior learn	ning						0 0					
DUEN(L)-	1 2	1	U											
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education				
Full time	150/39	per week	1	per week	er week 1 per week 1 E				5	english				
Part time	150/15	per term	5	per term	per term 5 per term 5					english				
Teacher res	sponsible f	for the subj	ject	Name	ame Endre Kiss, PhD schedule Colle									
Training ol	bjective an	d justificat	tion of	Goals, deve	Soals, development objectives									
the course	(content, c	output, loca	tion in	o study thebasics of modern Physics with special emphases of the Physics of material										
the curriculum)				esting, fracture mechanics, and surface phenomena										
				Presentatior	For all students, using a large speaker, a board presentation, a projector or an overhead projector									
Typical delivery methods				Practice	Small-r	oom board	exercise	es for up to 20	people					
				Laboratory	Measur	ement in me	easuring	pairs in the P	hysics lab	oratory				
				Other										
				Knowledge										
				You are full	y aware o	f the basic fa	acts, dir	ections and bo	undaries o	f the field of technical				
				expertise.	xpertise.									
				You are fam	iliar with	the general	and spe	cific rules, con	ntexts and	procedures necessary				
				for the cultiv	or the cultivation of the technical field.									
				He knows the	He knows the concept of his field, the most important contexts and theories.									
				He is fully	le is fully familiar with the main theories of his field of knowledge and problem									
				solving	olving Aethods									
				vienious. At the employing level, he is familiar with the measurement procedures used in										
				At the employing level, he is familiar with the measurement procedures used in mechanical engineering their tools instruments and measuring equipment										
				mechanical engineering, their tools, instruments and measuring equipment.										
				It can interpret, characterize and model the structure, operation, design and relationship										
				of the structural units and components of mechanical systems.										
				Ability										
				It is capable	e of basic	c analysis o	t the di	sciplines that	make up	the technical field of				
				knowledge,	the synth	etic formula	uion oi	correlations a	nd the acti	vity of evaluating the				
				quanty. It is able to	annly th	ne most im	ortant	terminology	theories a	nd procedures of the				
				technical fie	ld in whi	ch they are:	perform	ed	uncornes a	nd procedures of the				
				It is canable	of planni	ing organiz	ing and	performing in	denendent	t learning				
Requireme	nts (expre	ssed in terr	ns of	It is able to	identify r	outine profe	ssional	problems, to s	olve them	in principle and				
learning ou	itcomes)			to explore. f	ormulate	and provide	practic	al background	l (standard	l operations				
				(e.g., the ap	olication	of this probl	em).	8	(T T T T				
				It is able to	understa	ind and use	the typ	oical expertise	, compute	er science and library				
				resources of	its field.					-				
				The knowle	dge acqui	red is capab	le of ca	rrying out task	ks in its fie	eld				
				solution of t	he applic	ation.								
				It is capable	of creating	ng basic mo	dels of	technical syste	ems and pr	ocesses.				
				It is able to	communi	cate in your	mother	tongue in a p	rofessiona	l, professional lyande				
				manner, ora	lly and in	writing.								
				Attitude										
				He accepts	and au	thentically	represe	nts the social	l role of	his profession, his				
			fundamenta	l relations	ship with the	e world.	1.1.							
			It is open to	the know	riedge and a	cceptan	ce and authent	tic transmi	ission of professional,					
			tecnnologic	a ueveloj	ment and in	inovatio	n in the field	or technol	ugy.					
			IL SUIVES TO	esoive pi	could ms as I	nuch as	possible in co	operation	with others.					
			with suffici	em endur	ance and m	JIIOtony	toterance to c	arry out p	actival activities					
			Hsing his a	cauited t	echnical kn	owleda	e he strives t	o learn m	ore about observable					
				phenomena	to descri	be and expl	ain his 1	egalities						
				In the cours	e of its v	work, it cor	nplies v	with and enfor	ces the re	elevant safety, health,				

	environmental and quality assurance and control requirements.								
	Autonomy and responsibility								
	Even in unexpected decision-making situations, it independently takes a look at the								
	broad, underlying professional issues and developthem on the basis of specific sources.								
	In carrying out his professional duties, he also cooperates with qualified professionals								
	in other fields (primarily technical, economic and legal).								
	Share your experiences with colleagues to help them grow.								
	It takes responsibility for the consequences of its technical analyses, its proposals and								
	the decisions that are taken.								
Short description of the subject content	Overview and revival of BSC physics education. Properties of light, microscope, spectroscope, Schlieren equipment. Foundations of atomic physics and quantum mechanics. Properties of solid supheasians. Electron microscopes (SEM TEM, and their application in the material test. The crystal structure of solid shards. Amorphous structures. Structure of the surface of solid supheasi. Surface phenomena and their application in the material test. Surface plasmonos, quantum dots and other structures.								
	Absorption, Auger spectroscopy. The basics of fracture mechanics.								
Types of student activities	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 propagation 20%								
Required literature and contact details	 Gruber: Physics for Engineers Endre Kiss Engineering Physics/Engineering Physics, Electronic Note/Electronic book, Moodle.duf.hu/Mérnöki Physics Lab Exercises Guides/Syllabuses for laboratory practices, Moodle/duf/en Serway: Physics for Engineers 								
Recommended literature and contact details	 Ágoston Budó: Experimental Physics I, II, III. (National Textbook Publisher, Budapest, 1997) R. Feynmann: Modern Physics 1, 2, 3, 5, 7, 9 (Technical Publishing House, Budapest, 1986)- 								
Description of tasks to be									
submitted/measurement reports									
Description and timetable of the workshops									

Management Skills

			•	T T . (1					T 1					
Name of	the subject	in Hungar	ian	Vezetesi isn						MSC				
D	1 1 1	in English		Managemer	it Skills			63.6		DUEN(L)-1 V V-252				
Responsi	ble educatio	nal unit		Institute of S	Social Sci	iences, Depa	artment	of Manageme	nt and Ent	repreneurship				
Name of DUEN(L)	compulsory)-	prior learn	ing											
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education				
Full time	150/39	per week	2	per week	1	per week	0	Е	5	english				
Teacher r	esponsible f	for the subj	ect	Name	5	per term Mónika Ra	0 icsánvi	Molnár PhD	schedule	College professor				
reacher r	esponsible i	tor the subj		Goals deve	lonment	objectives	jesanyi-		senedule	conege professor				
				The subject matter is aimed at making the students acquainted with the fundamentals										
				of strategic thinking and planning, the project thinking management and the system										
.		1		thinking pr	oduction	manageme	nt, whil	le relying on	the man	agement-organization				
Training	objective an	d justificat	10n of	fundamenta	l knowled	lge obtained	l during	their BSc stu	dies. Thro	ugh the attainment of				
the course	e (content, o	output, loca	tion in	knowledge	transferr	ed, the stu	dents a	re capable o	f underst	anding the planning				
the curric	ululli)			processes th	at take pl	ace in work	organiz	ations, allocat	ing the res	ources in a successful				
				way and sol	ving the p	problems in	an effic	ient way. The	practical e	examples promote the				
				students in	tudents in utilizing their theoretical knowledge and recognizing the relevant									
				relationship	elationships.									
				Presentatior	Lecture	s with black	board a	nd projector.						
Typical d	elivery metl	hods		Practice	Using p student	orojector and s).	additic	onal materials	(max. 30					
				Laboratory Other										
				Knowledge										
				Knows the fundamental aspects of his profession, the most important concepts,										
				requirements, relationships and procedures.										
				Has knowledge of the principles and methods for shaping and changing the										
				organisational behaviour of organisations and institutions.										
				Learns the fundamentals, theoretical and methodological foundations of strategic										
				thinking and strategic management.										
				Knows the methodological basics and techniques of managerial learning, information										
				gathering, data processing and their ethical constraints and problem-solving methods.										
				Recognises the importance of managerial efficacy and they know which factors, in										
				Knows the t	elationsh	in between	projects	and corporate	strategy	understands their and				
				production management's systematic interpretations.										
				Ability										
				Able to mas	ter the gl	obal design	of comp	olex systems b	ased on a	systems-based,				
Requirem	ents (expres	ssed in tern	ns of	process-orie	ented min	dset.								
learning o	outcomes)			Ability to co	omplexly	plan and ma	anage th	e use of techn	ical, econo	omic, environmental				
				and human	resources			1 f	£1	-h1- (
				Able to mar	age the v	vork of their	own an	id for others ef	fectively,	able to manage				
				Able to lead	I nlan m	anaga chac	z and de	walon the mat	arial and i	nformation processes				
				of enterprise	s and wo	allage, cliect	tions	welop the mat		mormation processes				
				Able to ider	tify prob	lems and to	integrat	e their knowle	dge in ord	ler to solve the				
				problems an	id able to	use the tech	niques :	and methods of	of problem	solving in regard to				
				their application possibilities.										
				Has high set	nse of res	ponsibility,	(self)res	spect, analysin	g and syn	thetizing ability.				
			Attitude				-							
				Strives to de	evelop the	e knowledge	of both	himself and h	nis employ	vees through				
				continuous	self- and	further train	ing.							
				Open to acc	ommodat	e new innov	vative ap	pproaches. Op	en and wil	lling to work in				
				groups and	to share k	nowledge w	ith othe	ers.						
				Strives to m	ake decis	ions in cohe	erence w	ith the relevant	nt legal an	d ethical norms.				
				Strives to ac	there to th	ne ethical pr	inciples	ot work and o	organizatio	onal culture.				

	Strives to perform work with a complex approach applying systematic and							
	process-oriented thinking.							
	Examines research, development and innovation possibilities and aims to effectuate							
	them during work.							
	Autonomy and responsibility							
	Acts independently and proactively when solving professional problems and							
	initiating new practices.							
	Able to manage, organise and supervise an organisational unit by taking							
	responsibility for the organisation and their colleagues.							
	Take responsibility for keeping professional, legal and ethical norms and rules in							
	connection with their work and behaviour.							
	Able to undertake the responsibilities in the management of an organization's							
	technical and financial processes.							
	They are responsible for sustainability.							
	Characteristics of strategic thinking and planning, historical overview. Strategic							
	planning processes and phases. Company environment, methodology of its analysis and							
	evaluation. Development of company objectives, their levels and planning of							
	implementation. Definition and regulation of competences, responsibilities and tasks.							
Short description of the subject	Characterization of organizational capabilities. Development of value chain.							
content	Relationships between the projects and company strategy. System of project							
	management, methodological means of leading and organizing projects. Concept							
	of production, management and production management and their interpretation in							
	system theory respect. Production process and its structural types.							
	Processing of theoretical material with control and independently 40%							
	Task solution with management and independently 40%							
Types of student activities	Analysing case studies, group work. Processing complex exercises in teams 20%.							
	Gathering professional information corresponding the subject matters, processing and							
	presentation 20%							
	Balaton Károly - Hortoványi Lilla - Incze Emma - Laczkó Márk -Szabó							
	Zsolt Roland - Tari Ernő: Stratégiai menedzsment, Budapest: Akadémiai							
	Kiadó Zrt., 2017. 338 p. ISBN 9789630594745							
	Csath Magdolna: Stratégiai tervezés és vezetés a 21. században, Budapest:							
Required literature and contact details	Nemzeti Tankönyvkiadó, 2004. 356 p. ISBN 9789631952513							
	• Eric Verzuh: Projektmenedzsment, Budapest: HVG Könyvek, 2006. 424 p.							
	ISBN 9789637525773							
	• Koltai Tamas: Termelesmenedzsment, Budapest: Typotex, BME, GT, 2006.							
Pasammandad literatura and contact	280 p. ISBN 9789032790330							
details	• Pataki Bela: A technologia menedzselese, Budapest: Typotex,							
Departmention of tasks to be	2000. 100 p. ISBN 9789039348701							
submitted/magurament reports								
Description and time to black the								
Description and timetable of the								
worksnops								

Project Tasks

		in Hungarian P		Projektfelada	ıt		Level	MSc				
Name of	the subject	in English		Project Tasks	5				Code	DUEN(L)-MUG- 095		
Responsi	ble educatio	nal unit		Institute of T	echnolo	gy, Departn	ent of N	Mechanical En	gineering	and Energy		
Name of DUEN(L	compulsory .)-	prior learni	ng									
Туре		Presentatio	n	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/65	per week	0	per week	5	per week	0	S	5	english		
Part time	150/25	per term	0	per term	25	per term	0		5	english		
Teacher 1	responsible f	for the subje	ect	Name Mrs. Ildikó Angerer Petro PhD				r Petrovickij,	schedule	Professor		
Training objective and justification of the course (content, output, location ir the curriculum)			on of ion in	Goals, devel The aim of the solving tasks methods. Afte to ensure that	Goals, development objectives The aim of the course's education is to educate students about the current technical by solving tasks independently or primarily in small groups, group work, with tools and nethods. After a successful course, students will be able to and to solve it in groupwork, o ensure that work and results are document interpretation and evaluation							
				Presentation								
Typical delivery methods				Practice Laboratory Other	Consult	ation with t	he indus	strial and univ	ersity con	sultants		
Requirements (expressed in terms of learning outcomes) Short description of the subject content			s of	You are familiar are familiar the technical Have extens knowledge i complex med Have compre- engineering f Ability Prepared for information of It is able to e It is able to e It is able to a and processe information t It is capable oriented, pro Attitude Using his ac possible abou Committed to this approach Autonomy a Taking respo	 Totale familiar with the interviews for the piparation of technical documentation Fourier familiar with the organisational tools and methods associated with management; he technical legislation necessary for the exercise of the profession. Have extensive theoretical and practical skills, methodological and practical cnowledge in the design, manufacture, modelling, operation and management of complex mechanical systems and processes. Have comprehensive knowledge of machine, system and process design methods in the engineering field. Ability Prepared for processing and organizing, analysing and drawing conclusions of information collected during the operation of mechanical systems and processes. It is able to enrich the knowledge base of the mechanical field with original ideas. It is able to apply integrated knowledge of machinery, mechanical equipment, systems and processes, mechanical materials and technologies, and related electronics and information technology. It is capable of mastering the global design of complex systems based on a system-priented, process-oriented mind-set. Attitude Using his acquired technical knowledge, he strives to gain as much knowledge as possible about observable phenomena, to describe and explain his legalities. Committed to high-quality, quality work, he sets an example for his colleagues to apply this approach. Autonomy and responsibility Taking responsibility for his own work and the work of his peers 							
			innovation tasks of the Departments of Technology and solve problems brought by themselves from industry, in small groups or individually. Students independently explore and interpret problems, use the processing of domestic and international literature to gain an insight into the subject area, then formulate various solutions for implementation, sometimes conducting model experiments. In solving the tasks, the students apply the knowledge they have learned independently. The tasks for longevity management are primarily related to materials science, material technologies, repair and assembly, measurement and signal processing, and material testing and diagnostics. The task can be prepared for the diploma plan task									
Types of student activities				Regular cons	ultation o the for	with industr thcoming pr	ial and roject re	university con port or the dip	sultants. I loma plar	ncorporate the paper. Continuous		

	development and documentation of the thesis at an appropriate level.
Required literature and contact details	 Guide to the preparation of thethesis and diploma design. Extended version 2. UNIVERSITY PUBLISHER Recommended by a consultant, the topic is processed by literature.
Recommended literature and contact details	• Dr. Pál Majoros: Research methodology or how to write a good diploma thesis easily and quickly. National Textbook Publisher, Budapest, 1997.
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

Degree Planning 1.

		in Hungarian		Diplomaterv	ezés 1.				Level	MSc	
Name of the sub	ject	in English		Degree Plan	ning 1.				Code	DUEN(L)-MUG- 096	
Responsible edu	catio	nal unit		Institute of T	Technolog	gy, Departn	gineering	and Energy			
Name of compul DUEN(L)-	lsory	prior learning	3								
Туре		Presentation		Practice		Laboratory	Laboratory		Credit	Language of education	
Full time 150/	52	per week	0	per week	4	per week	0	М	10	english	
Part time 150/	20	per term	0	per term	20	per term	0	D (11	10	engilon	
Teacher responsi	ible f	or the subject		Name		Mrs. Ildiko PhD	Angere	r Petrovickij,	schedule	Professor	
Training objective and justification of the course (content, output, location in the curriculum)			ı of n in	Goals, devel The aim of t solving tasks methods. After a succe that work an	Coals, development objectives The aim of the course's education is to educate students about the current technical by polving tasks independently or primarily in small groups, group work, with tools and nethods. After a successful course, students will be able to and to solve it in groupwork, to ensure nat work and results are document, interpretation and evaluation.						
Typical delivery methods				Presentation Practice Laboratory	consult	ation with a	n indust	rial and univer	sity consu	ıltant	
Requirements (expressed in terms of learning outcomes) Short description of the subject content			of	You are fam are familiar v technical leg Have exten knowledge i complex me Have compre- engineering Ability Prepared fo information It is able to a and processo information It is capable oriented, pro Attitude Using his ac possible abo Committed t this approact Autonomy a <u>Taking respo</u> Students can	 'ou are familiar with the rules for the preparation of technical documentation You re familiar with the organisational tools and methods associated with management, the schnical legislation necessary for the exercise of the profession. lave extensive theoretical and practical skills, methodological and practical nowledge in the design, manufacture, modelling, operation and management of omplex mechanical systems and processes. lave comprehensive knowledge of machine, system and process design methods in the ngineering field. bility repared for processing and organizing, analysing and drawing conclusions of nformation collected during the operation of mechanical systems and processes. is able to enrich the knowledge base of the mechanical field with original ideas. tis able to apply integrated knowledge of machinery, mechanical equipment, systems nd processes, mechanical materials and technologies, and related electronics and nformation technology. tis capable of mastering the global design of complex systems based on a system-riented, process-oriented mindset. Attitude Jsing his acquired technical knowledge, he strives to gain as much knowledge as ossible about observable phenomena, to describe and explain his legalities. Committed to high-quality, quality work, he sets an example for his colleagues to apply his approach. Autonomy and responsibility Caking responsibility for his own work and the work of his peers. 						
			innovation tasks of the Department tasks from the current application, research and innovation tasks of the Departments of Technology and solve problems brought by themselves from industry, in small groups or individually. Students independently explore and interpret problems, use the processing of domestic and international literature to gain an insight into the subject area, then formulate various solutions for implementation, sometimes conducting model experiments. In solving the tasks, the students apply the knowledge they have learned independently. The tasks for longevity management are primarily related to materials science, material technologies, repair and assembly, measurement and signal processing, and material testing and diagnostics. Prepare the task for the diploma plan task. It's about 30% of the								

Types of student activities	Regular consultation with industrial and university consultants. Incorporate the proposals into the forthcoming project report or the diploma plan paper. Continuous development and documentation of the thesis at an appropriate level.
Required literature and contact details	 Guide to the preparation of the thesis and diploma design. Extended version 2. UNIVERSITY PUBLISHER Recommended by a consultant, the topic is processed by literature.
Recommended literature and contact details	• Dr. Pál Majoros: Research methodology or how to write a good diploma thesis easily and quickly. National Textbook Publisher, Budapest, 1997
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	

Reliability Theory and Structure Integration Analysis

		in Hungar	ian	Megbízható elemzés	ság elmél	Level	MSc						
Name of th	e subject	in English		Reliability 7	Theory an	d Structure	Code	DUEN(L)-MUG- 156					
Responsibl	e educatio	nal unit		Institute of '	Institute of Technology, Department of Mechanical Engineering and Energy								
Name of co DUEN(L)-	ompulsory	prior learn	iing	MUG-154 MUA-254									
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education			
Full time	150/39	per week	2	per week	0	per week	1	Е	5	english			
Part unie Teacher re	sponsible f	for the subi	ect	per term Name	0	Péter Tram	J nus Phl	 D	schedule	Professor			
reaction rea	sponsible	tor the subj		Goals, deve	lopment	objectives	<i>Jus</i> , 1 m		senedule	110103301			
Training ol the course the curricu	bjective an (content, c lum)	d justificat output, loca	ion of tion in	Understand student sho (security, r Knowledge to determine	nderstand the elements and modelling of reliability. Having the knowledge, the udent should be able to understand the most important concepts of technical life ecurity, reliability and risk) and their practical interpretation and application. nowledge of the basics of fracture mechanics should be able to contain the crack.								
				Presentatior	Large le of total	ecture for al hours) (26 ł	l studen 10urs)	ts, board lectu	re. Using	a projector (66.66%			
Typical de	livery met	hods		Practice Laboratory	Board c hours) (counting pra	ctice in	groups of up t	o 30 peop	ble. (33.33% of total			
				Other									
Requirements (expressed in terms of learning outcomes)			ns of	Has a wide knowledge complex me Has a comp the mechani Ability Ability to ap in the design Prepared fo solving mea Ability to de learning and Attitude It strives to Strives to o environmen Autonomy Shares the a in formal, n Evaluates the	range of for the d echanical orehensive ical field. oply and fu n, organiz or quality usurement eal creativ d commit adhere to organize a tal awarei and resp acquired k on-formal ne work of	theoretical lesign, man systems and e knowledge urther devel- ation and op assurance of and process ely with pro nent to dive and adhere and perform ness, health onsibility mowledge a l and inform	and pra ufacture process of made op process peration of mech s contro blems, s rsity an to quali n its ta awaren nd expe al form dinates,	ectical training e, modelling, ses. chine, system edures, models of mechanica nanical system l tasks. solve complex d value. ty requiremen sks in accord ess and sustair erience with th s of informatic promotes the	g, methodo operation and proce s, informat l systems us, techno tasks flex ts. ance with ability. e practition on transfer ir professi	ological and practical and management of ess design methods in tion technologies used and processes. logies and processes, ibly, and with lifelong n the expectations of oners of his / her field r. ional development by			
Short descr content	ription of t	he subject		 sharing critical remarks. In making its decisions, it takes into account the principles and application of environmental protection, quality management, consumer protection, product liability, equal access, occupational health and safety, technical, economic and legal regulations, and basic ethical standards. Basic concepts and parameters of reliability. Impact of environment and load. Measurement and extrapolation of reliability characteristics of systems and equipment. Modelling the reliability of systems. Classification of models, modelling procedures. Determination of characteristics on an analytical and simulation basis. Characterization of performance and fault tolerance. Development of the system of tools used to assess reliability. Fundamentals of fracture mechanics. Linearly elastic fracture mechanics: stress intensity factor; energy theory; deformation theory. Linearly elastic fracture 									

	Factors influencing the structural integrity (safe operation) of engineering structures:						
	operating loads and conditions, material properties and their changes (damage						
	processes) and various discontinuities. Dual criterion method (R6). Probabilistic						
	fracture mechanics analysis. The concept of crack sensitivity of structures, its						
	significance in the selection of non-destructive tests and in the evaluation of the						
	reliability of fracture mechanical tests.						
	Processing of heard text with notes and recording of the material using own and						
	electronically available notes 40%						
Types of student activities	Performing measurement exercises independently 20%						
	Controlled and independent processing of tasks 20%						
	Solving test tasks 20%						
	Birolini, A.: Reliability Engineering, Springer Verlag GmbH, 2007						
Required literature and contact details	http://mek.oszk.hu/01100/01190/						
	•						
	Rausand, M., Hoyland, A.: System Reliability Theory: Models, Statistical						
Recommended literature and contact	Methods and Applications, 2nd edition, Wiley, Hobolen, 2004.						
details	Broek, D.: The Practical Use of Fracture Mechanics Klujwer Academic						
	Publishers, London, ISBN 0-7923-0223-0, 1988. p.1-522.						
Description of tasks to be							
submitted/measurement reports							
Description and timetable of the							
workshops							

Engineering Heat and Fluid Dynamics

Name of th	ne subject	in Hungar	ian	Műszaki hő-	- és	áraml	ástan	Level	MSc				
	ic subject	in English	1	Engineering	g He	at and	l Fluid Dyn	Code	DUEN(L)-MUT-152				
Responsib	le educatio	nal unit		Institute of Technology, Department of Mechanical Engineering and Energy									
Name of c	ompulsory	prior learn	ning										
DUEN(L)-													
Tuna		Dracantati	0.12					Cradit	Language of				
rype		Presentati	on	Practice			Laboratory		ľ	Requirement	Credit	education	
Full time	150/39	per week	2	per week		0	per week	1		Б	5	1' 1	
Part time	150/15	per term	10	per term		0	per term	5		E	5	english	
Teacher re	sponsible t	for the subj	ject	Name			- Róbert Sán	ta, PhE)		schedule	Associate professor	
Training o	bjective an	d justificat	tion of	Goals, deve	lop	ment	objectives	,					
the course	(content, c	output, loca	ation in	After compl	letin	g the	course. stud	lents w	/il	l be able to pl	av in mec	hanical	
the curricu	lum)	1 /		measuremer	nt, m	nodell	ing and pla	nning c	of	thermal and f	low proce	esses.	
	,				Fc	or all t	the students	in high	h-	performance.	board per	formance. Use a	
				Presentation	1 pr	ojecto	or (66.66%	of total	l h	ours)(26 hour	rs)		
				Practice	-		(
Typical de	livery met	hods			A	table	counting ey	ercise	ir	groups of up	to 30 per	ople. (33,33% of total	
				Laboratory	hc	ours) (1 n.m.)	lerense		i gioups oi up	10 30 pec	pre. (55.5570 of total	
				Other		(- p)						
				Knowledge									
				He is fully	fan	niliar	with the b	asic fac	ct	s directions	and hound	daries of the field of	
				technical ex	nert	ise	with the ba	1510 140	CL.	s, uncertons a	and bound	daries of the field of	
				You are far	nilia	r with	the general	and sn	าค	cific mathema	atical nati	ral and social science	
				nrinciples r	ules	cont	exts and nr	ncedure	es	necessary for	the field	of technical field	
				You are far	nilis	ar wif	h the conce	ont syst	te	m related to	vour field	the most important	
				contexts and theories									
				Ability									
				In solving a problem, it is able to organise cooperation with experts in related fields									
				It can solve specific technical problems in its field in an innovative way using state-of-									
Doquiroma	nts (avpra	seed in terr	ms of	the-art knowledge acquisition and data collection methods									
learning of	itcomes)	sseu ili teri	115 01	It is able to use information and data contection methods.									
icarining of	itcomes)			technical problems									
				Prenared to conduct publication, presentation and discussions in your field, in your									
				repared to conduct publication, presentation and discussions in your field, in your native language and in at least one foreign language									
				Attitude									
				Autuate									
				using instactured technical knowledge, he surves to gain as much knowledge as									
				Committed to high-quality, quality work, he sets an example for his colleagues to apply									
				this approach									
				Autonomy and responsibility									
				Taking responsibility for his own work and the work of his peers									
				Doopon the	har	of and	flow proc		ai Icr	hu lie wolk of	PSo and I	o. Ioorn mora about tha	
				theoretical c	nea	a and a	n overview	of the	KI bi	lowit ill the l	tions and	how they are applied	
				and an exte	neio	n m n'	in ly of non	station	na	asic now equa	ic process	now they are applied,	
Short desc	ription of t	ha subject		turbulent flo		turbu	lanca mode	-station		and uynann	free row	s multiphase flows	
content	inpuon or i	ne subject		Learn abou	ut h	eat tr	ansport an	d the	h	asics of non	-equilibri	um thermodynamics	
content				Exchangers	La	ahorat	orv exercis	es: sta	ate	-of-the-art fl	ow and t	thermal measurement	
				methods nu	. Da Imer	rical si	imulation n	ethods		and their appli	cations in	the framework of the	
				solution of t	task	s in n	articular in	mechai	ni	cal structures	cutions, m	The function of the	
				Processing 1	hear	d text	with note-t	aking s	9n	d recording of	f material	using your own and	
				electronicall	lv av	vailah	le note 40%	uking t	un		i materiai	using your own and	
Types of s	tudent acti	vities		Self-carryin	σm	easure	ement exerc	, rises 20)%	6			
-, P05 01 5				Tasks mana	ged	and s	elf-processi	ng 20%	~ /' %	•			
				Solve test ta	isks	20%	P1000551		5				
				• D:	r F	erenc	Szlivka: He	at-and	F	low Technolo	ov Dunaú	uváros 2019	
Required 1	iterature a	nd contact	details	• M	1. 10 fikló	s Rlal	hó: Selecter	nrohl	er	ns in Fluid M	echanics	g. ar05, 2017	
	ure u		a contact uctails	• M	100	DLE	system	~ p1001	-		- marines		
						,							

Recommended literature and contact details	 Meinhard T. Schobeiri, Advanced Fluid Mechanics and Heat Transfer for Engineers and Scientists, Springer Cham, ISBN978-3-030-72924-0, eBook ISBN978-3-030-72925-7
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

Degree Planning 2.

	in Hungarian	Diplomaterv	ezés 2.	Level	MSc				
Name of the subject	in English	Degree Planr	ning 2.		Code	DUEN(L)-MUG- 097			
Responsible educatio	Institute of T	echnolog	gy, Departn	nent of N	Aechanical En	gineering	and Energy		
Name of compulsory DUEN(L)-	prior learning								
Туре	Presentation	Practice		Laboratory		Requirement	Credit	Language of education	
Full time 150/156 Part time 150/60	per week 0 per term 0	per week per term	12 60	per week per term	0	М	20	english	
Teacher responsible t	for the subject	Name		- Mrs. Ildikó PhD	Angere	r Petrovickij,	schedule	Professor	
Training objective an the course (content, c the curriculum)	d justification output, location	Goals, devel of The aim of th in o by solving and methods groupwork, t	opment ne course tasks ind . After a o ensure	objectives s's education lependently a successfu that work a	n is to ec or prim l course nd result	lucate students aarily in small , students wil ts are documer	s about the groups, g l be able at, interpre	e current technical roup work, with tools to and to solve it in etation and evaluation.	
Typical delivery metl	hods	Practice Laboratory	consult	ation with a	n indust	rial and univer	rsity consi	ultant	
Requirements (expressed in terms of learning outcomes)		OtherKnowledgeYou are familiar vare familiar vtechnical legHave extenseknowledge icomplex medHave compreseengineering fAbilityPrepared forinformation ofIt is able to aand processeinformation tIt is capableoriented, proAttitudeUsing his acpossible abouCommitted tothis approachAutonomy aTaking respo	iliar with vith the c islation r sive the n the de chanical chensive field. r proces collected nrich the pply inte es, mech echnolog of maste cess-orie equired t at observe b high-qu n. md resp msibility	a the rules f organisation necessary fo oretical ar esign, man systems and knowledge sing and o during the expanded knowledge egrated knowledge grated knowledge ering the gl ented minds echnical knowledge grated knowledge grate	or the p al tools a r the exi d prac ufacture l process of mach organizin operation base of vieldge of erials an obal des et.	reparation of t and methods a ercise of the p tical skills, , modelling, o ses. ine, system an ng, analysing n of mechanic of machinery, n d technologie sign of comple e, he strives t o describe and he sets an exa	echnical of ssociated rofession. methodolo operation d process and dra cal system al field ware chanica es, and re ex system o gain as explain hi mple for h	documentation You with management, the ogical and practical and management of design methods in the wing conclusions of s and processes. ith original ideas. al equipment, systems lated electronics and is based on a system- much knowledge as is legalities. his colleagues to apply	
Short description of t content	he subject	Students car innovation ta themselves f explore and literature to g implementati students appl The tasks for technologies, testing and d	Students can receive part-time tasks from the current application, research and innovation tasks of the Departments of Technology and solve problems brought by themselves from industry, in small groups or individually. Students independently explore and interpret problems, use the processing of domestic and international literature to gain an insight into the subject area, then formulate various solutions for implementation, sometimes conducting model experiments. In solving the tasks, the students apply the knowledge they have learned independently. The tasks for longevity management are primarily related to materials science, material technologies, repair and assembly, measurement and signal processing, and material testing and diagnostics. The task is to prepare a diploma plan 100% of the total.						
Types of student acti	vities	Regular cons proposals int	ultation o the for	with industr thcoming p	rial and roject re	university con port or the dip	sultants. I loma plar	ncorporate the paper. Continuous	

	development and documentation of the thesis at an appropriate level. Finish your
	thesis by
Required literature and contact details	• Guide to the preparation of the thesis and diploma design. Extended version 2. UNIVERSITY PUBLISHER
	• Recommended by a consultant, the topic is processed by literature.
Recommended literature and contact	• Dr. Pál Majoros: Research methodology or how to write a good diploma
details	thesis easily and quickly. National Textbook Publisher, Budapest, 1997
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

LIFETIME MANAGEMENT SPECIALIZATION

Lifetime management

	in Hungarian		Élettartam g	gazdálkod	ás	Level	MSc				
Name of the subject	in English		Lifetime ma	anagemen	Code	DUEN(L)-MUG- 150					
Responsible educatio	nal unit		Institute of Technology, Department of Mechanical Engineering and Energy								
Name of compulsory prior learning DUEN(L)-				instate of reening and Energy							
Туре	Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education		
Full time 150/39	per week	2	per week	1	per week	0	F	5	english		
Part time 150/15	per term	10	per term	5	per term	0	Б	5	clightsh		
Teacher responsible f	for the subje	ect	Name		Péter Tram	pus, PhI)	schedule	Professor		
Training objective and justification of the course (content, output, location ir the curriculum)			Goals, development objectives Having been learned the elements of life management of industrial facilities, on the basis of the reliability of operation and maintenance, the economy of the production process and taking further (quality, safety and environmental) aspects into consideration the student should be able to design the necessary actions, to make the decisions and arrangements in order to optimize the service life of an equipment or an industrial facility In the past decades, life management became an independent, multidisciplinary area o engineering. Its key task is to have actual information on condition of operating system and components, to maintain their function in accordance with the designer's inten which is a serious economic and quality / safety question as well. To be able to answer these questions one has to know the design principles of the systems and components; the technological processes, from which operation loading and other environmental conditions can be derived; the performance of the structura and functional materials used under operation loads and environment, i.e. the material degradation processes, and the impact of the flaws and other inhomogeneities if any. The student has to be able to apply in skill level the methods of determination of loading in the component materials, as well as the methodologies to monitor and mitigation.								
Typical delivery metl	hods		Presentation Practice Laboratory	n Lecture Maxim	s using proj um 20 stude	ector, fl nts, calc	ip chart culations, dem	onstration	IS		
			Other	Prepara	tion of hom	e works	, individual le	arning, stu	idying literature		
Requirements (expressed in terms of learning outcomes)			OtherPreparation of home works, individual learning, studying literatureKnowledgeKnows the design principles of components; the technological processes from which the normal and off-normal loading and other operating conditions can be derived; the behaviour of structural and functional materials and the degradation processes and effects; the impact of flaws and other geometrical inhomogeneities in the materials.AbilityCan apply the methodologies for determination of component loading (stress/strain states) and detection and mitigation of degradations. Can optimize operation and maintenance taking the goals of life management into account. Understands and applie the online and printed technical literature pertaining to life management.AttitudeSeeks to contribute to the development of new methods and tools related to th technical field. Tries to utilize environmentally friendly technologies and to save buil and natural environment. Tries to use energy-saving procedures and technologies.Autonomy and responsibilityDetermines the methodology of analyses and/or inspection and testing; performs th analyses and the inspection or test, oversees the processes, the correctness of th						processes from which hs can be derived; the dation processes and es in the materials. loading (stress/strain timize operation and nderstands and applies gement. l tools related to the ogies and to save built and technologies. testing; performs the he correctness of the ttation responsible for		

Short description of the subject content	The definition of lifetime and operational/service life. Life management as the complex of technical and economic arrangements (with the purpose of the optimization of the service life of industrial facilities and their equipment while maximizing the profit). The degradations and other losses of functions in the structural materials induced by the operation. Aging processes. Running out of the life of components and systems. The safety aspects of component aging (decrease of the safety margin). Ageing of the design philosophies and the applied technologies. Mitigating actions: aging management, reconstruction, replacement (restoration of the safety margin). Connection between maintenance and life management. Spare part strategies (inventory management, disappearance and replacement of producers and suppliers). The human aspects of life management.					
Types of student activities	Participation in the lectures (20%), practicum (20%), home work (10%), preparation of presentation (10%), individual learning (40%).					
Required literature and contact details	 Shah, V. N., Macdonald, P. E. (1993): Aging and Life Extension of Major Light Water Reactor Components. Eslevier, Amsterdam. Integrity for Life: Structural Integrity Assessment for Life Cycle Management (ed. Flewitt et al), EMAS Publishing, UK, 2004. Presentation slides (in Moodle) 					
Recommended literature and contact details	 Materials Ageing and Life Management (ed. B. Raj et al), Vol. 1-3. Allied Publishers, New Delhi, 2000. Understanding and mitigating ageing in nuclear power plants (ed. P. Tipping), Woodhead Publishing, Oxford, 2010 					
Description of tasks to be submitted/measurement reports	Home works (in Moodle)					
Description and timetable of the workshops	1 written test, 1 home work					

Assembly and Repairment Technologies

	in Hungarian		Szerelési és javítási technológiák						MSc		
Name of the subject	in English	1	Assembly a	nd Repair	ment Techr	Code	DUEN(L)-MUA- 256				
Responsible educatio	nal unit]	Institute of Technology, Department of Mechanical Engineering and Energy								
Name of compulsory prior learning DUEN(L)-											
Туре	Presentation	J	Practice	actice Laboratory Requirement Cred					Language of education		
Full time 150/39	per week 2	2	per week	0	per week	1	F	5	english		
Part time 150/15	per term 1	0	per term	0	per term	5	L	5	engiish		
Teacher responsible f	for the subject	1	Name		András Nag	gy, PhD		schedule	associate professor		
Training objective and justification of the course (content, output, location in the curriculum)			Goals, deve Based on a rechnologies nounting ar and repair te capable of c suitable for Presentation	lopment attaining s, the m ad restora chnologi leterminin the given Lecture	objectives the procedu ounting and tion process es as well as ng the costs purpose bas a using proje	ares and d restor es, the s manag of tech sed on to ctor.	d instruments ration strategi tudents shall b ing their applic mologies as w echnical and e	of mounters, the present of mounters, the present of the present o	nting and restoration planning methods of of planning mounting addition, they shall be ecting the technology aspects.		
Typical delivery meth	nods			Using p	fojector and		mai materiais.				
		ļ	Laboratory								
			Jther								
Requirements (expressed in terms of learning outcomes)			Knows the c he field req Has knowled of engineering Ability Able to ma process-orie Ability to cc and human f Able to app n the design Attitude Seeks to cc echnical fie Strives to a continuous s Strives to a culture. Strives to a culture. Strives to a culture. Strives to a culture.	erganizati uired for lge of me ng. ormation ster the nted mino omplexly resources ly and fun n, organiz ontribute ld. develop self- and f dhere to a organize tal awares and resp e enginee itiative ir sibility for essional d its emplo ndently a sponsible	and cons asurement to and com global designed dset. plan and m ther develo to the develo to the develo to the develo to the develo to the develo to the develo tation and op to the knowle further train and adhere to and perform ness, health onsibility ering tasks in a solving tec or the sub-pre- lecisions ind pyees and su	nd meth of the p echnolo umunica gn of c anage th p procee- peration elopment dge of ing. to the e o quality n its ta awarene- hnical p rocesses epender bordina	oods related to profession. gy and measur tion technolo omplex system he use of technolo dures, models, of mechanica at of new me both himself ethical princip requirements sks in accord ess and sustain lently. problems. s under your con ntly in its field tes to practice n solving profe occupational	managem ement the ogies rela- ns based nical, econ , informat l systems thods and f and his les of wo , ance with nability.	ent, the legislation of cory related to the field ated to mechanical on a systems-based, nomic, environmental ion technologies used and processes. I tools related to the s employees through rk and organizational n the expectations of ion.		

Short description of the subject content	Place and part the mounting plays in planning of technology. Component parts of mounting units. Analysis of mounting: functional and technological analysis of the product to be mounted. Methods of assuring the mounting tolerance. Deterministic and stochastic models of mounting. Mounting procedures and their means. Mounting of workpieces, assembly (joining), control, special mounting procedures. Specification of tools, devices, machines, requisites, mounting demands and the necessary activities: mounting tree, graph of activities. General model of mounting process, event-oriented tree. Restoration by using mechanical methods; welding, soldering and brazing, thermal spray, sticking and plastic technology. Determining welding materials for hardfacing, planning the necessary pre-heating and heat treatment technology. Technologies of high energy density to modify surface integrity and surface solidifying procedures.
Types of student activities	Processing of theoretical material with control 60% Independent processing of theoretical material 40% Task solution with management 15% Task independent processing 85%
Required literature and contact details	 Richard Crowson, Assembly Processes: Finishing, Packaging, and Automation (Handbook of Manufacturing Engineering, Second Edition) 1st Edition, Kindle Edition, ISBN-13 978-0849355653, 2006.
Recommended literature and contact details	Geoffrey Boothroyd, Peter Dewhurst, Winston A. Knight, Product Design for Manufacture and Assembly (Manufacturing Engineering and Materials Processing, 74) 3rd Edition, ISBN-13 978-1420089271, 2010.
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	2 tests, 5 and 12 weeks, 2 homeworks and 2 presentations.

Maintenance Strategies

		in Hungarian		Karbantartási stratégiák						MSc	
Name of the	he subject	in English		Maintenance	e Strategi	es	Code	DUEN(L)-MUG- 255			
Responsib	le educatio	nal unit		Institute of Technology, Department of Mechanical Engineering and Energy							
Name of c DUEN(L)	ompulsory -	prior learn	ing								
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education	
Full time	150/39	per week	2	per week	1	per week	Е	5	english		
Part time	150/15	per term	10	per term	5	per term	0	Ľ			
Teacher re	esponsible f	or the subj	ect	Name		Szabó Attil	a, PhD		schedule	College associate professor	
Training o the course the curricu	bjective an (content, o ılum)	d justificati utput, loca	ion of tion in	Goals, deve Based on the become capa eliminating and planning	lopment ne attainr able of pla the weak g specific	objectives nent of mo anning and o points of eq maintenand	dern tre optimizi uipmen ce techn	ends in mainten ng the mainten t, selecting du ologies.	enance strance strance active rability in	rategies, the students /ities, recognizing and nproving technologies	
				Presentation	Lecture	using proje	ctor.				
Typical de	livery meth	nods		Practice	Using p	projector and	additic	onal materials.			
21	2			Laboratory Other							
Requirements (expressed in terms of learning outcomes)		ns of	Knowledge Has a wide knowledge complex me Has a comp the mechani Ability Ability to ap in the desigr Prepared for solving mea Ability to so learning and Attitude Strives to c environment Autonomy a Shares the a in formal, no Evaluates th sharing critic In making environment equal access and basic ettl Maintenance	range of for the o chanical rehensive cal field ply and fi h, organiz r quality surement olve crea committe organize tal awares and resp cquired k on-formal work of cal remar its decis tal protec , occupat	theoretical lesign, man systems and knowledge urther devel ation and op assurance and process tive probler nent to dive and perform ness, health onsibility mowledge a l and inform of his subor ks. ions, it tak tion, quality ional health dards. and strateg	and pra uufacture l process e of mace op proce peration of mech s contro ns, solv rsity and n its ta: awarene nd expendion dinates, es into manage and safe	actical training e, modeling, ses. chine, system edures, models of mechanica anical system l tasks. e complex tas d value-based sks in accord ess and sustair erience with th s of informatic promotes their account the ement, consun ety, technical, nection betwee	and proce and proce and proce a, informat l systems is, techno ks flexibl ance with ability e practitic on transfer ir professi principle ner protec economic en mainte	ological and practical and management of ess design methods in tion technologies used and processes. logies and processes, y, as well as lifelong n the expectations of oners of his / her field r. ional development by s and application of tion, product liability, and legal regulations, nance and production.		
Short description of the subject content			Maintenance systems and strategies. Connection between maintenance and production. General maintenance philosophies/strategies: failure based corrective maintenance (FBCM), planned preventive maintenance (PM), condition based maintenance (CBM, CCM, CM); reliability centered maintenance (RCM), total productive maintenance (TPM), risk based maintenance (RBM, RBIM), parameter condition based maintenance (PCBM), automatic maintenance (AM). Instruments of RCM. Methods serving the analysis of reliability. Instruments of TPM. Applications of maintenance strategies. Strategies of rigid cycle structure. Strategies of flexible cycle structure. Strategy based on economic and reliability criteria. Substitution interventions. Restoration (repair) processes. Restoration methods. Problems of lifetime (durability). Lifetime increasing technologies. Paletionching								

	between properties, stress and technologies. Place and part of qualifying the traditional surface transforming technologies, modern thin layers, plasma procedures, laser procedures as well as surface layers in the development of maintenance strategies.
Types of student activities	Processing of theoretical material with control 60% Independent processing of theoretical material 40% Task solution with management 15% Task independent processing 85%
Required literature and contact details	 Terry Wireman, Maintenance Strategy Series - Six Book Bundle Hardcover, August 26, 2014, ISBN-13 978-1941872277 Terry Wireman, Total Productive Maintenance (Volume 1) Second Edition, ISBN-13 978-083113172, 2005.
Recommended literature and contact details	 Anthony Kelly, Strategic Maintenance Planning, 1st Edition - May 10, 2006, Paperback ISBN: 9780750669924, eBook ISBN: 9780080478999
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	2 tests, 5 and 12 weeks, 2 homeworks and 2 presentations.

Inspectional Methods of Machine Condition

in Hungarian				Gépállapot o	ellenőr	zési	Level	MSc			
Name of the s	subject	in English		Inspectional Methods of Machine Condition						Code	DUEN(L)-MUG- 250
Responsible e	educatio	nal unit		Institute of Technology, Department of Mechanical Engineering and Energy							
Name of com DUEN(L)-	pulsory	prior learn	ing	MUG-116							
Туре		Presentatio	on	Practice]	Laboratory		Requirement	Credit	Language of education
Full time 1	50/39	per week	2	per week	0	1	per week	1	Е	5	english
Part time 1	50/15	per term	10	per term	0	1	per term	5	-		D
Teacher respo	onsible f	or the subj	ect	Name	1	4	András Nag	gy, PhD		schedule	Professor
Training obje	ctive an	d justificat	ion of	Goals, deve	lopme		objectives	1		-4-4 6 41	J
the course (co	ontent, o	utput, loca	tion in	Students wi	ing on	ible	to use mad	fraa dia	atus based on	state-of-tr	ie-art non-destructive
the curriculur	n)			method of d	nig an etermi	u III nati	ion and the	nlannin	g of the audit i	u on praci	icai examples
				incuiou or u	For a	all t	he students	in high	-performance.	board per	formance. Use a
				Presentation	proje	ecto	r (66.66% (of total l	hours)(13 hour	s)	
т. · і і і.				Practice						,	
I ypical deliv	ery metr	lods		Laboratory	Up to	o 30) people in	groups o	of table counti	ng exercis	ses and lab
				Laboratory	meas	sure	ments. (33.	44% of	total hours).		
			Other								
				Knowledge							
				You are fa	miliar	wit	th and und	erstand	in detail the	methods	of knowledge, data
				collection, t	heir et	thic	al limitatio	ns and	problem-solvi	ng techni	ques in the technical
				Have knowl	edge o	fm	etrology an	d measu	rement theory	related to	the engineering field
				rave knowledge of metrology and measurement theory related to the engineering field.							
				engineering field.							
				You know and understand the tools and methods of computer modelling and simulation							
				related to the field of mechanical engineering You have extensive theoretical and							
				practical skills, methodological and practical knowledge in the design, manufacture,							
				modelling, operation and management of complex mechanical systems and processes.							
				Ability							
				It is able to	apply 1	the	theories an	d relate	d terminology	in a given	n technical field in an
				Innovative v It is capable	vay wn	ien a v	solving pro	olems. erdiscir	linary approa	ch and r	resolution of specific
Requirements	s (expres	ssed in tern	ns of	problems wi	thin its	s fie	eld.	eruiseip	appioa		esolution of specific
learning outco	omes)			In solving a problem, it is able to organise cooperation with experts in related fields.							
				It can solve	- specifi	ic te	chnical pro	blems i	n its field in ar	innovativ	ve way using state-of-
				the-art know	ledge	acq	uisition and	data co	ollection meth	ods.	
				It is able to	use in	nfor	mation and	comm	unication tech	nologies a	and methods to solve
				technical pro	oblems	s.					
				Attitude	aguira	d to	abrical kr	owlada	a ha strives t	o goin og	much knowledge og
				nossible abc	out obs	u ie erva	able phenoi	nena, to	b describe and	explain hi	is legalities.
				Committed	to high	1-qu	ality, quali	ty work.	, sets an examp	ole for you	ur colleagues to apply
				this approac	h.	•			•		0 11 1
				Autonomy	and re	espo	onsibility				
				Its decision	s shall	tak	e into acco	ount the	principles and	d applicat	ion of environmental
				protection,	quality	, cc	onsumer pr	otection	, product liab	ility, equa	al opportunity access,
				health and	safety	at	work, techi	nical, ec	conomic and I	egal regu	lations and the basic
				Technology	s of en	igin na:	eering.	or the r	acassami data	processie	r noise and vibrati-
				analyses	u ackli on-dee	ng; struc	plaining lo	л ше п jal test	s (visual ulta	rasonic	s, noise and vibration
Short description	tion of t	he subject		emission fa	st cam	iera	thermal in	naging)	: intervention.	free diag	nostics (measurement
content				of noise an	d fluct	tuat	ions, use c	f inhere	ent noise sour	ces in di	agnostics, coherence,
				wavelet, fu	zzy an	nd c	orrelation	method	s in practice,	autoreges	ssion, use of SPRT).
				Voltage for	i of n	nacl	hinery and	materia	als; condition	check an	nd vibration types of

	rotating machines, mathematical modelling of vibrations and flows, rotary machine							
	testing in practice. Failure statistics and use in failure analysis, probability risk							
	assessment, average time between two failures and expected time to failure;							
	development of causal analyses, data sets and knowledge bases.							
	Use fluctuation models and their time-dependent differential equations in frequency							
	pace through examples.							
	Availability, monitoring and analysis of technological processes for machine status.							
	Processing heard text with note-taking and recording of material using your own and							
	electronically available note 40%							
Types of student activities	Self-carrying measurement exercises 20%							
	Tasks managed and self-processing 20%							
	Solve test tasks 20%							
	Oliver Fodor - Gábor Pór: Destructive and non-destructive techniques, e- learning curriculum, Dunaújváros College, TAMOP 4.1.2 / A, 2011, moodle.duf.hu							
	• Own literature research, according to the criteria given:							
Required literature and contact details	 http://literature.rockwellautomation.com/idc/groups/public/documents/weba ssets/browseresults.hcst?familyTitle=General%20Information&categoryTitl e=Condition%20Monitoring&xLanguage=EN%20%20English&CategoryId =3636&FamilyId=3638&passedLangVal=EN%20%20English. ISO (2011). ISO 17359:2011, Condition monitoring and diagnostics of machines - General guidelines. The International Organization for Standardization (ISO) 							
	 Randall, Robert Bond: Vibration-based condition monitoring: industrial, automotive and aerospace applications. Chichester: Wiley, 2011. 308 p. ISBN: 978-0-470-74785-8 							
Recommended literature and contact details	 Kusek, Jody Zall, Rist, Ray C.: Ten steps to a results-based monitoring and evaluation system: a handbook for development practitioners. Washington, Dc: World Bank, 2004. Idhammar, Torbjörn: Condition Monitoring Standards. Vol 1-4. Raleigh: IDCON. 2001-2009. 							
Description of tasks to be								
submitted/measurement reports								
Description and timetable of the workshops								

MODERN MATERIAL STRUCTURE AND TECHNOLOGY SPECIALIZATION

Information technology in materials science

in Hungarian				Anyaginfor	matik	a		Level	MSc					
Name of th	ie subject	in English		Information	tech	nolog	gy in materi	Code	DUEN(L)-MGT-110					
Responsibl	le educatio	nal unit		Institute of Technology, Department of Mechanical Eng				gineering	ineering and Energy					
Name of co	ompulsory	prior learn	ing				JJ 1			<u>c c</u>				
DUEN(L)-		I · · · ·	0											
Туре		Presentatio	on	Practice	Practice		Laboratory		Requirement	Credit	Language of			
Eull time	150/20	man waalt	2	mon woolr	1		mon uvoolr	0			education			
Full time	150/39	per week	10	per week	1		per week	0	M	5	English			
Tart time	ronsible f	For the subj	act	Nama	5	,	Péter Barac	zki Dhi		schadula				
Teacher Tea	sponsible i	or the subj	ect	Coole dov	Name Péter Bereczki, PhD schedule									
Training of	hiactiva an	d instificat	ion of	Goals, deve	to th	iem	objectives	ing and	information a	istoms use	d in materials science			
the course	(content o	u justificat	tion in	and techno		Ie Ille	an engineer	ing and	mormation sy	stems use	a in materials science			
the curricu	(content, o	utput, ioca	uon m	motorials so	logy.		stome and a	on anal c	haractoristics	of system	ses, computer-based			
uie cuiricu	iuiii)			materials se	chnol	ogy	processes	ellerarc	maracteristics	of system	s for the ff support of			
				Dresentation		ogy	processes.	ator						
				Dractice		ing p	rojector and	Ladditic	nal matarials					
Typical de	livery metl	nods		Laboratory	USI	ing p	TOJECTOI and		mai materiais.					
				Other	-									
				Uner										
				Knowledge			1 1 1	6.4	1	<i>.</i> .	11			
				Have a com	prene	ensiv	e knowledg	e of the	basic facts, dif	ections an	a limits of the subject			
				area of engl	neern	ng. K	nowledge	i the ge	neral and spec		matical, scientific and			
					ipies,	rule	s, contexts a	ind proc	redures necess	ary for the	operation of the field			
				of engineer	ing. r	xnov	field Know	e termi	nology, the m	ost impor	tant relationships and			
				theories rela		5 the	neid. Knov	viedge (of the materials	s used in ti	Te field of mechanical			
				engineering	engineering, their production methods and conditions of use. He/she has a working									
				knowledge of the measurement procedures, instruments, apparatus and measuring										
				equipment used in mechanical engineering. Knowledge of the requirements and										
				standards of health and safety at work, fire protection, safety and health at work and										
				environmental protection in the field of engineering. Comprehensive knowledge of the										
				dasics, iiiii	ts and	u rec	formation to	or logis	au law and a	ient, envi	which are integrally			
				related to th	a fial	z, iii d of	onginooring		gy, law allu e	cononnes,	, which are integrany			
					e nei	u oi	engineering	•						
				Ability										
				of the techn	ical f	inyse iold	to synthesi	ever the	onships and to	at make up	o une knowledge base			
				A bility to a	ncar r.	bo m	to synthesis	nt torm	inclogies the	rios and n	propriate evaluations.			
Daguinama	nta (avena	and in term	na of	technical di	scipli	ne in	the perform	nance o	f related tasks	A bility to	o identify routine			
Requireme	ents (expres	ssed in tern	ns of	technical u	oblon		d to identif	form	a related tasks	(by pract	tical application of			
learning of	itcomes)			technical problems and to identify, formulate and solve (by practical application of										
				A bility to u	standard operations) the theoretical and practical background necessary to solve them.									
				field Abilit	v to a	nnlv	the acquire	d IT kn	owledge to the	solution	of problems in the			
				field Abilit	y to a	nnlv	and enforc	e safety	fire safety an	d hygiene	rules and			
				regulations	y to a	ppry		e salety	, me safety an	u nygiene	Tutes and			
				Attitudo										
				It is open to	loor	ina	about amb	acing a	nd authentical	vcommu	nicating professional			
				technologic	al des	unig a velor	about, enior	acing a	nu authentican	ng He/sh	a will strive to ensure			
				that his/her	colf_l	earni	ing in mech	anical	ngineering is (ng. nc/sn	s and consistent with			
			his/her.prof	accion	nal a	oale Heing	the tech	nical knowled		ed he/she shall				
			endeavour t	0 0 0 0 0 0 0	na fl	oais. Osing	eretand	ling of observe	ble nheno	omena to describe				
				and explain	their	laws		ier stand	ing of observe	iote prieno	inena, to describe			
				Autonom	and -	nawa	,. nsihili t.							
				Responsible	anu I	olde	nd represer	t the ve	lues of the one	ineering	profession and be			
				open to pro-	upile fossio	oiu d	ind represent	une va	nues of the eng	nitor loci	slative technical			
				technologia	al and	niairy 4 o d-	y informed (ohongo:	in the field	A sources =	sauve, tecillical,			
				consecuers	ai dil(os of	⊥ aun bic/b	ar technical	lanelye	s in the next F	a propose	esponsionity for the			
				taken	es 01	111S/ []	iei tecimica	analys	es, me resultin	g proposa	is and the decisions			
1				IANCII.										

Short description of the subject content	Classification of materials used in engineering practice. Evolution of materials, the world of materials. Material information, development direction of modern steels. Motivations for Material Selection. Steps in the design process. Relationship between design and material selection. Basic tasks of material selection. Material selection concepts. Main aspects of material selection. Technical aspects: functional, performance, safety and technological suitability, sizing, environmental and recyclability aspects. Relationship between material selection and manufacturing processes. Crystallisation, fabric structure, mechanical properties of ferroalloys. Equilibrium and non-equilibrium g-a transformations in Fe-C alloys. Microscopic and macroscopic consequences of cold working of metals. The Ashby concept of material selection. Material selection at the conceptual design stage. Interpretation and derivation of material indices. Material property maps, material properties, basic mechanical material properties. Parameters determining the basic property of materials and their relationship. Introduction to Cambridge Materials Selector and its application in computer aided materials selection. Software system: use of the different functions. Interpretation, construction, main types and applications of column and bubble diagrams. Material selection Material selection (CES) in the context of a classroom exercise Typical forms of damage to metals. Microscopic examination, surface preparation Material selection according to demand L: Material selection according to demand H: Material selection according to dynamic stresses. The concept and characteristics of togeness. Sizing philosophies for dynamic stresses. The concept and characteristics of togeness. Sizing philosophies for repetitive stress. Technical information systems and materials calcotion under repeated stresses. Surface durability databases
Types of student activities	Processing heard text with note-taking and recording of material using your own and electronically available note 40% Self-carrying measurement exercises 20% Tasks managed and self-processing 20% Solve test tasks 20%
Required literature and contact details	 Presentation in moodle S.Z. Cai, Q.F. Zhang, X.P. Xu, D.H. Hu and Y.M. Qu, Materials Science, Computer and Information Technology, ISBN-13 (eBook): 9783038265566, 2014 Ehrenfried Zschech, Caroline Whelan, Thomas Mikolajick, Materials for Information Technology, Springer London, eBook ISBN978-1-84628-235- 5, 2006.
Recommended literature and contact details	 <u>https://www.ensingerplastics.com/en-us/shapes/plastic-material-selection</u> Shubham Tayal, Parveen Singla, Ashutosh Nandi, J. Paulo Davim, Computational Technologies in Materials Science, ISBN 9781003121954, 250 Pages 152 B/W Illustrations, Published October 6, 2021 by CRC Press.
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

Cyberphysical systems

Name of the subject	in Hungar	ian	Kiber-fizika	i rendsze	rek	Level	MSc				
	in English		Cyberphysi	cal systen	18	Code	DUEN(L)-MGT-010				
Responsible education	nal unit		Institute of Technology, Department of Mechanical Engineering and Energy								
Name of compulsory DUEN(L)-	prior learn	ing									
Туре	Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education		
Full time 150/39	per week	2	per week	0	per week	1	М	5	english		
Tanahar rasponsible f	per term	10	Nomo	0	per term Endro Kiss	J DhD		cabadula	professor		
reacher responsible i	or the subj	ect	Cools deve	lonment	objectives	, FIID		schedule	professor		
Training objective and justification of the course (content, output, location in the curriculum)			To introduce th introduce th representation devices (net	To introduce future engineers to the main principles of cyber-physical systems, ntroduce the basic methods by which physical devices (hardware) and their virtual epresentation (software) are inextricably connected and interact with other similar levices (network).							
			Presentatior	For all projecto	the students or.	in high	-performance,	board per	formance. Use a		
Typical delivery meth	ods		Practice	-							
J. T. T. J.			Laboratory	Up to 3 measure	0 people in ements. (33	groups of .44% of	of table counti total hours).	ng exercis	ses and lab		
			Other								
Requirements (expres learning outcomes)	sed in terr	ns of	To have deprocedures systems. To have sor To be basic: to his profes To have knot Ability To be able to production, technologie To be able to in a systema To be able to in a systema To be able to in a systema To be able to process-orice To contribut process-orice To contribut process-orice To be able specialization Attitude To strive to To strive to To strive to To strive to oriented wa In the cout innovation g Autonomy To act indep To share the To assume	etailed kn related to ne applica ally famil ssional ac owledge in o apply ce shaping s. o perform tic mannet to process duction sy ss. te to the ented way to apply on. put the la enforce th o plan and level. carry out y of think rse, to e goals and and resp oendently nsible for e experient	owledge of the materi ation knowl- iar with the tivities and n the field o rtain knowl and proces a certain org er. s and organ ystems and planning o of thinking typical pro test results he requirem d execute h his work in ing. xamine the strives to ac onsibility and proacti sustainabili ces with the ility for the	the sc als engi edge relinforma cyber-fi fsome n edge relising tec ganization ize the i processo f compli- duction of his file ents of sis is tasks a compli- chieve th vely whity and e e colleag consequ	ientific and te neering profes ated to modern ation and communacial system modern produce ated to the plan chnologies in onal and manage information co es, and draw co ex systems by technology pro- eld at the servi- sustainability a independently dex approach b ility of settim- nem. en solving pro- environmental gues, thus help ences of his te	echnical t ssion, incl a production nunication is. ction techn relation to gement tas offered du ertain con a using a rocedures ce of his of and energy ased on a ng researc fessional awareness ing them	heories and practical uding cyber physical on technology. In technologies related nologies. operation of materials of modern production sks related to the field uring the operation of clusions by modeling system approach and corresponding to his own development. y efficiency. work group at a high systemic and process- th, development and problems. s. to develop. nalyses, the proposals		

Short description of the subject content	Acquiring the basic knowledge related to cyber-physical systems, getting to know the basic elements that play a role in the construction and operation of the equipment, in connection with the implementation of modern production technology. With this knowledge, you will master the most important factors related to the application of cyber-physical systems and their development, and you will be able to provide support in connection with the introduction of these technologies. Presentation: Definition of cyber-physical systems, presentation of examples of cyber- physical systems. Characteristics of cyber-physical systems and IIoT systems, connection with the field of Industry 4.0. Presentation of the possibilities of Small and Big Data and artificial intelligence methods, connection to process control systems. Laboratory: Examples of cyber-physical systems, their examination, assembly of a simpler cyber-physical system as part of a project task. Two hours every two weeks on a daytime schedule.
Types of student activities	
Required literature and contact details	 Subject-related supporting materials made available through the learning support framework (https://moodle.uniduna.hu/login/index.php) Edward A. Lee and Sanjit A. Seshia, IntroductiontoEmbedded Systems, A Cyber-Physical Systems Approach, SecondEdition, ISBN 978-1-312-42740-2, 2015(http://LeeSeshia.org) Lee, Edward A. and Seshia, Sanjit A.: Introduction to Embedded Systems, A Cyber-Physical Systems Approach, http://LeeSeshia.org, ISBN 978-0-557-70857-4, 2011.
Recommended literature and contact details	 Rajeev Alur, Principles of Cyber-Physical Systems, ISBN 978-0-262-02911-7, 2015(<u>https://mitpress.mit.edu/books/principles-cyber-physical-systems</u>) M. Broy: Cyber-Physical Systems, Springer, 2010
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	

Material and Structure Analysis

		in Hungarian	Anv		arkazatu	izegálat			Loval	MSc			
Name of the	asubject	in Hungarian	Ally	DUFN						DUEN(L) MUA			
	e subject	in English	Mate	Material and Structure Analysis Code 111									
Perpensible	aducatio	nol unit	Insti	Institute of Technology, Department of Structural Integrity									
Name of co	mpulsory	nrior learning	msu										
DUEN(L)-	mpuisory	prior learning											
2 C LI ((L)										Language of			
Туре		Presentation	Prac	tice		Laboratory		Requirement	Credit	education			
Full time	150/39	per week 2	per v	veek	0	per week	1						
Part time	150/15	per term 10) per t	erm	0	per term	5	M	5	english			
		<u> </u>	r		-	r				university associate			
Teacher resp	ponsible f	for the subject	Nam	e		Zsolt Csepe	eli, PhD		schedule	professor			
		1	Goa	ls, devel	opment	objectives							
I raining ob	jective an	d justification	. Fund	lamental	test me	thods for th	e study	of the atomic,	micro- a	nd macro-structure of			
the course (content, o	output, location	ⁱⁿ solid	ls, as wel	ll as the	principles of	f operati	ion and applica	ations of th	he most important test			
the curricult	um)		tools	5.			-			-			
			Pres	entation	PPT pro	esentations							
T:			Prac	tice									
i ypical dell	lvery meu	lods	Labo	oratory	laborate	ory material	tests						
			Othe	r									
			Kno	wledge									
			Requ	irement	s for en	gineering st	ructures	s and the gene	eral prope	rties of the structural			
			mate	rial.									
			Test	methods	s that ve	rify the suit	ability c	of the chosen s	structural	material for the given			
			appli	ication.									
			Tran	Transferability of laboratory test results to structures.									
			Abil	Ability									
			Able	Able to select and design a laboratory testing process for the actual /given properties.									
			Able	Able to coordinate the laboratory testing procedures and interpret the results									
Requiremen	nts (expres	ssed in terms of	f Und	Understand and uses the online and printed literature in Hungarian and foreign									
learning out	tcomes)		lang	languages specific to her/his field.									
0	,		Atti	Attitude									
			With	With a creative approach strives for the continuous development for the applied test									
			meth	methods.									
			n su	It strives to apply environmentally procedures and to protect the built and natural									
			It str	environment.									
			Anto	Autonomy and responsibility									
			Defi	Autonomy and responsibility									
			cont	control the process the registered data and the quality of the documentation									
			Taki	Taking responsibility for his own work and the work of his peers									
			The	content	of the	course con	nected	to the follow	ing logica	al chain: In order to			
			deter	determine the necessary material and structural properties it is important to know the									
			requ	irements	of the	given struct	ture and	l material. Suc	ch are, fo	r example the design			
Short descri	iption of t	he subject	requ	irement (of the stu	ucture (med	chanical	loads, enviror	nmental ef	ffects), special aspects			
content	•	U	ofn	nanufact	urability	, and this	includes	s property cha	inge that	occur as a result of			
			use/o	operation	n (materi	al damage)	. Test p	rocedures mus	st be chos	en that modelling the			
			stres	stress and damage process on a laboratory scale, and the result of the test are suitable									
			for a	ssessing	the safe	and reliable	e use of	the structure/n	naterial.				
Types of stu	udent activ	vities											
				• De	rek Sew	ard, Unders	tanding	Structures, Re	d Globe F	ress London,			
				http m:	ps://doi.o	org/10.1007	<u>/978-1-3</u>	<u>349-12083-3</u> ,	1994.				
Required lit	terature ar	nd contact detai	ls	• Tis	za M. (s	zerk.) Anya	gvizsgá	lat . Miskolc:	Miskolci	Egyetemi Kiadó.			
				200 • Dre	10. 493P	I Fémelz és	Ótvöze	tek mechanika	i tulaidan	ságai Budanest			
				- FIC	iegveten	ni Kiadó. 20	01.409	D.	i tulajuoli	sagai. Duuapesi.			
Recommend	ded literat	ure and contac	t	• No	ndestruc	tive Testing	Handh	ook. Colombo	s. Oh: Ar	merican Society for			
details				No	ndestruc	tive Testing	g 1997-2	2007. Vol. 1-7,	Third edi	ition			

	 Fémek hegesztett kötéseivel szemben támasztott követelmények, a hegesztett kötések vizsgálata. In: Szunyogh László (szerk.): Hegesztés és rokon technológiák. Budapest: GTE, 2007. ISBN 978-963-420-910-2
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	1 closing thesis during the semester, in case of its sufficient grade obtaining a
workshops	signature, than an exam based on the set of item issued from the semester curriculum

Innovative application of polymers and composites

		in Hungar	ian	Polimerek é	s komnoz	vitok innova	tív alkal	mazásai	Level	MSc			
Name of th	e subject	in English	iun	Innovative a	nnlicatio	n of polyme	Code	DUEN(L)-MGT-011					
Responsible	e educatio	nal unit		Institute of 7	nstitute of Technology Department of Struc			Structural Integ	rity				
Name of co	mpulsory	nrior learn	ina	institute of .									
DUEN(L)-	mpuisory		шg			1		1	1				
Туре		Presentatio	on	Practice		Laboratory	Laboratory		Credit	Language of education			
Full time	150/39	per week	2	per week	0	per week	1	М	5	english			
Part time	150/15	per term	10	per term	0	per term $D'_{1} D 1 t'$			1 1 1	D.C.			
Teacher res	sponsible i	or the subj	ect	Name	1	Bela Palota	s, PhD		schedule	Professor emeritus			
Training objective and justification of the course (content, output, location in the curriculum)		ion of tion in	Goals, deve The aim of polymers an applications	The aim of the course is to familiarise students with new methods of producing polymers and composites, the possibilities of bonding technologies and the industrial applications of these materials.									
				Presentation	comput	er projector	ire, pres	sentation on th	e blackbo	ard. Use of a			
Typical del	ivery metl	nods		Practice									
				Laboratory	(Works	hop) lab exe	ercise, u	se of projector	r.				
				Other									
Requirements (expressed in terms of learning outcomes)			ns of	Knowledge a position of design techr Ability Ability to pe a systematic operation o assurance, n technologies measuremer Attitude Strive to im and carry ou Strive to car oriented thin setting resea Autonomy Act indepen responsibilit experience	of the point application of the point application erform ce c way. A f modern netrology s. Ability at results. plement at tasks to ry out the hking. In arch, deve and resp dently an cy in the a	tential uses tion technolo rtain organi bility to pro- manufactu and process to perform sustainability a high pro- eir work in a the course of clopment and onsibility d proactivel rea of sustai eagues to 1	of advan ogy issu sational ocess ar ring sy control m spec y and e fessiona a compl of his/he d innova y when nability help the	and managen and managen and managen nd organise in stems and pr tasks for mate ific tests, pro- energy efficier al standard, eit ex approach b er work, he/she ation objective solving profest and environm	and comp select bond ment tasks aformation occesses. (erial manu occess, eva ncy requir her indepenased on a e will exp es and striv ssional pro- mental awa Assumes in	posites, ability to take ding technologies and related to the field in a gathered during the Contribute to quality facturing systems and luate and document ements.Strive to plan endently or in a team. systems and process- lore the possibility of ze to achieve them. oblems. Demonstrates reness. Shares his/her responsibility for the			
Short descr content	iption of t	he subject		 consequences of his/her technical analyses, proposals and decisions. Classification of polymers, their production methods and bonding processe Measurement of polymers. Classification of composites, their preparation and bondi methods. Sizing of composites. Applications of these materials in vehicles, aircra rapid prototyping, additive manufacturing. 					bonding processes. eparation and bonding in vehicles, aircraft,				
Types of st	udent activ	vities		Active parti	cipation i	n lectures, c	lassrooi	m exercises an	d laborate	ory exercises.			
Required li	terature ar	nd contact o	letails	 Downloadable lecture notes from www.duf.hu, Welding pocket book I. (Welding procedures), Cokom Mérnökiroda Kft., Budapest 2023. Welding pocket book II. (Welding production technology), Cokom Mérnökiroda Kft. Budapest 2023. 				Mérnökiroda Kft., ogy), Cokom					
Recommen details	ded literat	ure and co	ntact	• Lá Te	ászló M. V echnology	Vass - Géza ⁄, Budapest,	Bodor: 2005	Polymer Mate	erials Stru	cture, University of			
Description	n of tasks t	o be				• '							
submitted/r	neasureme	ent reports											
Description workshops	and time	table of the		Test 1. at W week 7 - 11, unwritten fir	eek 6: fro , Test 3. (nal exams	om the mater optional) in S.	rial of w week 1	veeks 1 - 5, and 3, to make up	d Test 2. or correct	at week 12: from any failed and			

Weldability

in Hungarian		Hegeszthető	óség		Level	MSc				
Name of the subject	in English	Weldability		Code	DUEN(L)-MUA- 112					
Responsible educatio	nal unit	Institute of 7	Technolog	gy, Departm	ent of S	Structural Integ	grity			
Name of compulsory DUEN(L)-	prior learning									
Туре	Presentation	Practice		Laboratory		Requirement	Credit	Language of education		
Full time 150/39	per week 2	per week	0	per week	1	М	5	english		
Part time 150/15	per term 10	per term	0	per term	5		111 -	Due ferenza entre mitere		
Training objective and justification of the course (content, output, location in the curriculum)		Goals, deve The aim o cracks/defec materials.	Soals, development objectives The aim of the course is to provide an understanding of the causes of weld tracks/defects and how to avoid them, as well as the rules for welding different naterials.							
Typical delivery methods		Practice	For each	er projector h student in or.	lecture,	example solu	tion. Usin	g a computer		
			(WORKS	nop) lab exe	acise, u	se or projector	•			
Requirements (expressed in terms of learning outcomes)		Knowledge The student necessary p correct choi Ability Ability to pe a systematic operation o assurance, n technologies measuremen Attitude Strive to im and carry ou Strive to can oriented thin setting resea Autonomy Act indepen responsibilit experience consequence	will kno reheating ce of weld erform ce c way. A f modern hetrology s. Ability nt results. aplement ut tasks to rry out the nking. In arch, deve and resp dently an ty in the a with coll es of his/F at process	w the rules and post-h ding materia ertain organi bility to pro- n manufactu and process y to perfor- sustainability a high pro- eir work in a the course of elopment and onsibility d proactivel rea of sustai leagues to 1 her technica ses, modellin	for ma eating f d and th sational ocess ar ring sy control m spec cy and e fessiona a compl of his/he d innova y when nability help the l analysing of he	king flawless for a given m the correct weld and managen ad organise in stems and pr tasks for mate ific tests, pro- energy efficient al standard, eitt ex approach b er work, he/she ation objective solving profest and environm em develop. A es, proposals a pat processes in	joints, be aterial, ar ling seque nent tasks formation ocesses. O erial manu ocess, eva necy requir her indepo ased on a e will exp ssional pro- nental awa Assumes and decision n differen	able to prescribe the ad will also learn the ences. related to the field in a gathered during the Contribute to quality facturing systems and aluate and document ements.Strive to plan endently or in a team. systems and process- lore the possibility of ve to achieve them. oblems. Demonstrates ireness. Shares his/her responsibility for the ons. t cases, calculation of		
Short description of t content	different heat cycles and cooling rates. Causes of welding cracks (crystallization, cold, terracing and reheating cracks), crack avoidance. Calculation of preheating temperatures. Investigation of crack susceptibilities. Welding heat induced material structural anomalies and their avoidance. Weld stresses, deformations, correct welding sequences. Modelling of weld stresses and strains. Correct selection of welding materials for different applications. Welding rules for non-alloyed, mild and high alloy steels (hot strength, cold suction, heat and corrosion resistant and tool steels). Overlay welding of tools. Welding rules for cast irons. Welding rules for non-ferrous and light metals. Making mixed joints. Rules for welding ceramics and composites. Welding of polymers. Soldering and bonding techniques.									
Types of student activ	vities	Active parti	cipation i	n lectures, c	lassrooi	m exercises an	d laborato	ory exercises.		
Required literature ar	nd contact details	D	 Downloadable lecture notes from <u>www.duf.hu</u> Welding pocket book I. (Welding procedures), Cokom Mérnökiroda Kft., Budapest 2023 							

	 Welding pocket book II. (Welding production technology), Cokom Mérnökiroda Kft., Budapest 2023
Recommended literature and contact	 Welding and allied technologies, GTE. Budapest, 2007 Dr. Kárzhy Bödöly Correction registeres of non-alloyed low elloyed and
details	 Dr. Katory Bodok: Corrosion resistance of non-anoyed, low-anoyed and high-alloyed structural steels, with special reference to their weldability, Corweld Ltd., Bp.1997.
Description of tasks to be	
submitted/measurement reports	
	Test 1. at Week 6: from the material of weeks 1 - 5, and
Description and timetable of the	Test 2. at week 12: from week 7 - 11,
workshops	Test 3. (optional) in week 13, to make up or correct any failed and unwritten final
	exams.

Special Materials and Technologies

Name of the subject		in Hungarian in English		Különleges anyagok és technológiák						MSc	
				Special Mat	erials and	l Technolog	Code	DUEN(L)-MUA- 115			
Responsible educational unit				Institute of Technology, Department of Structural Integrity							
Name of con DUEN(L)-	npulsory	prior learn	ing								
Туре		Presentatio	on	Practice		Laboratory	Laboratory		Credit	Language of education	
Full time 1	150/39	per week	2	per week	0	per week	1	М	5	english	
Part time 1	150/15	per term	10	per term	0	per term	5				
Teacher resp	onsible f	or the subj	ect	Name	1 4	Zsolt Csepe	elı, PhD		schedule	College professor	
Training obje the course (c the curriculu	ective and ontent, o m)	d justificati utput, loca	ion of tion in	After compl science and apply the lat	eting the technolo	course, stug gy problem s of materia	dents sh s in life ls sciend	ould be able t cycle manage ce in an inform	o approac ement in a ned way.	h and solve materials a modern way and to	
				Presentation	Projecto	or, ppt lectu	res, lear	ning materials	available	in moodle.	
Typical deliv	very meth	nods		Practice	Laborat	0.000	monto	and coloulation			
				Other	Labora	ory measure	ements		18		
				Knowledge							
				Knowledge of metrology and measurement theory in the field of mechanical engineering. You will have a broad theoretical and practical background, methodological and practical knowledge of the design, manufacture, modelling, operation and management of complex engineering systems and processes. Ability Ability to perform laboratory testing and analysis of materials used in the engineering field, evaluate and document test results. Ability to process, organise, analyse and draw							
Requirements (expressed in terms of learning outcomes)			and processes. Ability to contribute original ideas to the knowledge base in the field of mechanical engineering. Ability to apply an integrated knowledge of machinery, mechanical equipment, systems and processes, materials and technologies for mechanical engineering, and related electronics and information technology. Ability to master the global design of complex systems based on a systems and process-oriented mindset. Ability to plan and manage the use of technical, economic, environmental and human resources in a complex way. Attitude								
				They strive to work in a complex approach based on a systems and process-oriented mindset. Explore and pursue research, development and innovation objectives.							
				Autonomy and responsibility It takes its decisions independently, in consultation with other disciplines, and takes responsibility for them.							
Short description of the subject content				Technologies to repair damaged (e.g. worn) surfaces. Application conditions for so- called cold metals. So-called cold metals as PMCs. Techniques and technology of laser cladding. Production of metal powders by gas and/or liquid sputtering. Rapid prototyping technology. Requirements for parts manufactured by rapid prototyping. Possible materials for rapid prototyping. Laser hardening of worn surfaces of large components. Surface hardening of parts subjected to intense abrasion using a combination of laser alloying and nitriding. Controlled crystallisation of alloys. Manufacturing technology of single crystal turbine blades from Ni-based superalloys. Metallurgical and thermal aspects of 'fibre-reinforced' composites made from eutectic alloys by directional crystallisation. Production technologies for ultrafine-grained (UFG) or nano-grained (NG) metals and alloys. ECAP, HPT and MF technologies. Characteristics of metal matrix particle reinforced composites with enhanced creep resistance, production of ODS materials by powder metallurgy (HIP) technology. Production of amorphous alloys by rapid cooling (RS) techniques. Preconditions for the formation of the amorphous state. Mechanical, corrosion and magnetic properties of amorphous ribbons. Compositional variations of high entropy HEA alloys.							

	memory, members of the NITINOL family of alloys, applications based on the						
	phenomenon of one and two way shape memory. Silicon nitride as wear resistant						
	structural material, engine valve made of silicon nitride. Different modifications of						
	arbon from diamond to graphene. Applications as a functional and structural mate						
	Processing of heard text by taking notes and recording the material using your own						
Types of student activities	notes and those available electronically 40%. Independent performance of						
	measurement exercises 30%. Supervised and independent processing of tasks 30%.						
	• János Prohászka, Mechanical properties of metals and alloys, Technical University of Budapest, 2001, Chapter 7: Creep, pp. 247-273.						
	 Dunaújváros College TÁMOP 4.2.2. report Literature summary, 2010. 						
	Li Myong Son, Verő Balázs: A W9 típusú, gyengén ötvözött szerszámacél						
Dequired literature and contact details	szuperképlékeny állapota, Bányászati és Kohászati Lapok - Kohászat, 1988. 10.						
Required literature and contact details	 András Csanádyné - Erika Kálmán - Géza Konczos (eds.): Introduction to the World of Nanostructured Materials Centre for Chemical Research ELTE Eötvös Kiadó, 2009. pp. 25-30. 						
	 István Artinger - Gábor Csikós - György Krállics - Árpád Németh - Béla Palotás: Technology of Metals and Ceramics, University of Technology Publishing House, 1997, Chapter 7: Ceramics 7-1 to 7-16. 						
	Werkstoffwissenschaft Hereusgegeben von Werner Schatt - Hartmut Woseli; Deutscher Verlag für Grundstoffindustrie Stuttgart 1996						
Recommended literature and contact	 Yuqing Weng: Ultra-fine Grained Steels, Metallurgical Industry Press, Springer, 2003 						
details	• WENG Yu-qing, SUN Xin-jun, DONG Han: Overview on the Theory of						
	Deformation Induced Ferrite Transformation						
	 Verö Balázs és szerzőtársai: Anyagtudományi modellezés: moodle.duf.hu/course/category.php?id=400 						
Description of tasks to be	The student shall draw up a measurement report on the measurements carried out						
submitted/measurement reports	The student shan draw up a measurement report on the measurements carried out.						
Description and timetable of the workshops	A final paper in weeks 6 and 12 from the lectures and laboratory classes.						

Simulation of heat treatment and welding processes

Name of the subject		in Hungarian		Hőkezelési és hegesztési eljárások szimulációja						MSc		
		in English		Simulation of	of heat tre	atment and	Code	DUEN(L)-MGT-124				
Responsible educational unit			Institute of Technology, Department of Mechanical Engineering and Energy									
Name of co	ompulsory	prior learn	ning									
DUEN(L)-												
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	2	per week	0	per week	1	М	5	english		
Part time	130/13	per term	10	Nome	0	per term Dátan Danaa			a a ha dula	College medagen		
Teacher res	sponsible I	or the subj	ject	Name	lonmont	Peter Berec	ZKI, Phi)	schedule	College professor		
Training ol the course the curricu	bjective an (content, o lum)	d justificat output, loca	tion of tion in	The purpose prepare mod in the planni	Goals, development objectives The purpose of the subject is to present the simulation and prepare modeling procedures, methods and existing programs for their use, and assist in the planning and monitoring of such programs.							
				Presentation	projecto moodle	or, ppt lectu	res 1 ho	ur per week, s	tudy mate	rials are available in		
Typical del	livery meth	nods		Practice								
				Laboratory	to apply	the softwar	res and	to solve exerci	ises			
				Other								
Requirements (expressed in terms of learning outcomes)			Laboratory to apply the softwares and to solve exercises Other Image: Control of the software is the the software is the software is the softwa									
Short description of the subject content				Presentation: Summary of heat treatment procedures. The rules of heating, keeping warm and cooling. Heat treatment of different materials. Possibilities of heat treatment modeling. Summary of welding procedures. Construction of welding software. Welding modeling options. Lab: Heat treatment modeling case studies. Designing heat management software principles. Learning about heat treatment simulation programs. Welding software presentation. Welding Modeling Case Studies. Welding software design rules. Processing of heard text by taking notes and recording the material on your own and								
Types of student activities			electronically using an available note 40% Independent completion of laboratory exercises 20%									

	Preparing a semester assignment 20%
	Solving test tasks 20%
Required literature and contact details	 Palotás B., Farkas A.: CAD/CAM systems in the welding technologies. Globe Edit - OmniScriptum GmbH, Saarbrücken. 2016 ISBN: 978-3-330-80646-7 Metals Handbook, Vol. 4. Heat Treating, ASM Handbook. 10th edition, 1991 Welding and relation technologies, (Handbook), GTE, Budapest, 2007
Recommended literature and contact	Comsol, Ansys software descriptions, catalogies, Guides, technological
details	literatures/articles.
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

Nanotechnology

·		1							1	1		
Name of the subject		in Hungarian		Nanotechnológia Level MSc								
		in English		Nanotechno	logy		Code	DUEN(L)-MST-110				
Responsib	le educatio	onal unit		Institute of Technology, Department of Mechanical Engineering and Energy								
Name of c	ompulsory	prior learn	ing									
DUEN(L)-	•											
m		D				T 1 .		D · ·		Language of		
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	education		
Full time	150/39	per week	2	per week	0	per week	1					
Part time	150/15	per term	10	per term	0	ner term	5	M	5	English		
Teacher re	sponsible	for the subj	iect	Name	0	Judit Pázm	án PhD)	schedule	Professor		
reaction to	sponsible	ior the subj	cei	Coole dov	lonmont	objectives	an, i no		senedule	110103301		
Training	hiaatiya ar	d instifiant	ion of	Goals, ueve	ainaana	objectives	the mea	montion of your		agita motoriala thair		
the course	(acentant of	iu justificat			gineers i	nust know	the pro	perties of vari	ous comp	be able to marfante		
the course	(content, (butput, loca	uion in	production	methods	and their ai	rea or u	ise. The stude	nt should	be able to perform a		
the curricu	lum)			specific tech	inical to	select a com	iposite i	material suitab	le for the	process. Properties of		
				micro and n	ano com	posites based	d on the	optimal mater	rial selecti	on.		
				Presentation	project	or, ppt lectu	res I ho	our per week, s	tudy mate	rials are available in		
					moodle							
Typical de	livery met	hods		Practice								
				Laboratory	laborat	ory practice,	, produc	ction and testin	g of comp	osite specimens		
				Other								
				Knowledge								
				To know th	ne basic	types of m	aterials	(metals, poly	mers and	ceramics) and their		
				production t	echnolog	ies, includir	ng the pi	oduction tech	nologies of	f composite materials.		
				To know t	he micro	and nanc	structu	res used in e	electronics	, their characteristic		
				properties and production technology.								
				Ability								
				To be able to apply product and technological design related calculation and modelling								
				principles and methods								
				principles and inclinuus. To be able to select the optimal raw materials for the given application and to specify								
				no be able to select the optimal raw materials for the given application and to specify production technology for the production of the composite product.								
Requireme	onts (evore	ssed in terr	ns of	production technology for the production of the composite product.								
learning of	itcomes)	sseu in terr		and to use the online and printed literature in Hungarian and in a foreign								
learning of	accomes)											
				With a creative approach, the applied technologies and procedures strive to be								
				continuous development.								
				10 surve to use environmentally conscious technologies, both built and natural to								
				protect the environment.								
				Enforts are made to save energy and materials, or for the application of technologies.								
				Autonomy and responsibility								
				To determine the properties of the various products and to checks the quality of work								
				phases characterizing the technology and to perform the quality control of sub-tasks.								
				Assesses and rationalizes energy consumption related to material production.								
				Types of technical materials (metals and alloys, ceramics, polymers, semiconductors).								
				Grain-reinforced, fiber-reinforced, layered composites, their production technologies,								
				properties,	areas of	use, develoj	pment p	ossibilities. S	andwich s	structures, wood. The		
				analysis of the properties of metals and other technical materials and trends in their								
				changes. Po	olymer m	atrix and co	eramic	matrix compo	site mater	ials. Micro and nano		
Short desc	rintion of t	the subject		electronics i	materials							
content	ription of t	ine subject		Layer-form	ing techr	ologies, ele	ectronic	thin layers (lithograph	y, etching, chemical		
content				mechanical polishing). Scanning Probe Technologies. Nanocomposites, fullerene,								
				graphite an	d carbon	nanotubes,	cerami	c nanotubes a	nd particl	es production. Logic		
			devices (MO	OSFETs,	ferroelectric	field e	ffect transistor	s.				
				Quantum tr	ansport d	evices, sing	le-elect	ron devices, s	upercondu	cting digital devices,		
				quantum co	mputing	using supe	rconduc	ctors, carbon i	nanotubes	for data processing,		
				molecular electronics). Problems of material selection.								
				Processing	of heard t	ext by takin	g notes	and recording	the mater	ial on your own and		
Types of s	tudent acti	vities		electronical	ly							
				using an available note 40%								

	Independent completion of laboratory exercises 20%
	Preparing a semester assignment 20%
	Solving test tasks 20%
	2 tests during the
Required literature and contact details	 Rainer Waser: Nanoelectronics and Information technology, Wiley-VCH, 2005. II-III. pp187-498
	 Yanhui Liu et al.: Metallic glass nanostructures of tunable shape and composition, NATURE COMMUNICATIONS 6:7043 DOI: 10.1038/ncomms8043
Recommended literature and contact	www.nature.com/naturecommunications
details	• Zhuofei Gan et al.: High-fidelity and clean nanotransfer lithography using structureembedded and electrostatic adhesive carriers; Microsystems & Nanoengineering (2023) 9:8,
	• www.nature.com/micronan;
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

Simulation of metallurgy and welding processes

		in Hungar	ian	Metallurgia	és hegesz	ztési eliáráso	ok szim	ulációia	Level	MSc		
Name of th	e subject	in English		Simulation of	of metallu	irgy and we	Code	DUEN(L)-MGT-222				
Responsibl	e educatio	onal unit		Institute of Technology, Department of Mechanical Engineering and Energy								
Name of co	ompulsory	prior learn	ning	Inducate	answare or reenhology, bepartment of weenanical Englitering and Energy							
DUEN(L)-	,	P				1		1	1	1		
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	2	per week	1	per week	0	М	5	english		
Teacher reg	sponsible.	for the subi	iect	Name	5	Péter Berec	zki Ph	<u> </u> D	schedule			
reaction rea	sponsible	for the subj	jeet	Goals, deve	lonment	objectives	ZKI, I III		senedule			
Training ot the course	ojective an (content, c	ıd justificat output, loca	tion of tion in	The purpos procedures,	The purpose of the subject is to present the simulation and prepare modeling procedures methods and existing programs for their use and assist in the planning and							
the curricul	lum)			monitoring (of such pr	rograms.						
				Presentation	projecto	or, ppt lectu	res, stud	ly materials ar	e available	e in moodle		
				Practice								
Typical del	livery met	hods		Laboratory	to apply	y the softwa	res and	to solve exerc	ises			
				Other								
				Knowledge								
				Knowledge	of mode	ling and si	mulatio	n of welding	and heat	treatment processes,		
				available k	nowledge	e of existin	ng soft	ware. Knowle	edge of	designing simulation		
				programs, m	odelling	user-level k	nowled	ge of software	÷			
				Ability				0				
				Ability to us	e welding	g and heat tr	eatment	t programs, ma	athematica	al and physical models		
				preparation,	planning	g of progra	m syste	ms, input and	d output o	data for defining and		
				formulating programming requirements.								
				To be capable to test the software and software systems.								
Requireme	ents (expre	ssed in terr	ns of	Attitude								
learning ou	itcomes)	0000	10 01	Solving IT tasks with adequate persistence and tolerance for monotony								
				With a creative approach, the software and procedures used are continuous								
				development.								
				Efforts are made to save energy and materials, or for the application of technologies.								
				Autonomy and responsibility								
				With a considerable degree of independence, to think through comprehensive and								
				special professional questions and develops them based on given sources.								
				Formed a professional opinion known in advance for decision-making represents								
				independently in situations.								
				To plan and to carry out the activities independently.								
				Summary of heat treatment procedures. The rules of heating, keeping warm and								
				cooling.								
				Heat treatment of different materials. Possibilities of heat treatment modeling.								
Short descr	ription of t	the subject		Summary of welding procedures. Construction of welding software. Welding modeling								
content				options.								
				Heat treatme	ent model	ing case stu	dies. De	signing heat n	nanagemer	nt software principles.		
				Learning about heat treatment simulation programs. Welding software presentation.								
				Welding Modeling Case Studies. Welding software design rules.								
				Processing c	of heard to	ext by taking	g notes	and recording	the mater	ial on your own and		
				electronicali	y 	400/						
Types of st	udent acti	vities		using an ava	alabie no	te 40%	4 AT	-: 200/				
		Independent	completi	ION OF TADOL	atory ex	ercises 20%						
			Preparing a	semester	assignment	20%						
				Solving test	tasks 20%	<u>%</u>			· .			
				• Pa	lotás B.,	Farkas A.	: CAD/	CAM systems	s in the v	welding technologies.		
Required li	iterature ar	nd contact (details	Gl	obe Edit	- OmniScr	iptum C	imbH, Saarbr	ücken. 20	16 ISBN: 978-3-330-		
1				80	646-7							
			• M	etals Han	dbook, Vol.	4. Heat	Treating, ASI	M Handbo	ok. 10th edition, 1991			

	• Welding and relation technologies, (Handbook), GTE, Budapest, 2007			
Recommended literature and contact	Comsol, Ansys software descriptions, catalogies, Guides, technological			
details	literatures/articles.			
Description of tasks to be				
submitted/measurement reports				
Description and timetable of the	2 tasts during the competent the overlage of these gives the competent ment			
workshops	2 tests during the semester, the average of these gives the semester mark.			

Computer and modelling simulation

Name of the subject in English		in Hungarian		Számítógépes modellezés és szimuláció					Level MSc		
		1	Computer and modelling simulation Code DUEN(L)-MUG- 220								
Responsible educational unit			Institute of Technology, Department of Mechanical Engineering and Energy								
Name of co DUEN(L)-	ompulsory	prior lear	ning	IMA-250				-			
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education	
Full time Part time	150/39 150/15	per week per term	1 5	per week per term	0	per week per term	2 10	М	5	english	
Teacher res	sponsible f	or the sub	ject	Name		Gábor Pór,	PhD		schedule	Assistant professor	
Training of the course the curricu Typical del	ojective an (content, o lum)	d justifica utput, loca	tion of ation in	Goals, development objectives To acquaint students with the most important numerical modelling procedures and a brief introduction to the mathematical and numerical modelling of complex technical-physical processes occurring in engineering practice. With this knowledge, students will be able to study processes occurring in the wider vertical of mechanical science, as well as finite element strength calculations (VEM) of mechanical equipment, computer modelling of thermal and flow processes using ANSYS CFX. Presentation Large lecture for all students, board lecture. Using a projector (66.66% of total hours) (26 hours) Practice Practice							
				Laboratory Other Knowledge	Laboratory Board counting practice in groups of up to 30 people. (33.33% of total hours) (13 hours) Other Knowledge						
Requirements (expressed in terms of learning outcomes)				Knows and related to the practical trae modelling, of Has a comp the field of of Ability Prepared for operation of conclusions Able to emi ideas. Ability to equipment, electronics Able to ma process-orice Attitude Strives to of process-orice In the cours and innovat By applying phenomena Autonomy He (She) sh and informa Evaluate the professional Able to solv Takes the in	understan ne field or ining, me operation prehensiv engineerin r the proo of mecha rich the k apply in systems a and inform systems a and inform ster the ented min conduct it ented min se of its w ion goals g the acqu as thorou and resp ares his (I d forms o e work of I develop ve enginee nitiative in	ads the tools f mechanica thodologica and control e knowledg ng cessing and nical syste: nowledge b tegrated kn nd processe natics. global desig d-set. s work in a d-set. ork, it exan and strives ired technic ghly as poss onsibility ner) acquire f informatio ? your subor nent. ering tasks in a solving tec	s and ma l engine l and pra of comje e of ma system ms and ase of the asse of the cowledge s, mech gn of c a comple nines the to achie al know sible, to d knowl on transfer dinates ndepence	ethods of com eering Has a actical knowled plex mechanic ichine, system atization of in a processes, f he mechanical ge in the fiel anical materia complex system lex approach e possibility o ve them. ledge, he strive describe and expe- fer with practit by sharing cr dently. problems.	puter moc a wide ran dge for the al systems and proce formation for analys engineeri ds of ma ls and tech based on f setting r es to get to explain the erience wi ioners in l	telling and simulation hge of theoretical and e design, manufacture, s and processes. ess design methods in a collected during the sis and for drawing ng field with original achinery, mechanical hnologies, and related on a systems-based, a systems-based and esearch, development b know the observable eir laws. th formal, non-formal cis (her) field. ments promotes their	

	Numerical solution possibilities of mathematical models describing strength and heat							
	methods, the basics of the finite volumetric method.							
	Basic iterative solution methods for systems of linear equations with a special							
Short description of the subject	coefficient matrix obtained during discretization (Gauss-Seidel, Conj. Grad, Multi							
content	Grid). Advantages, disadvantages and applicability of the methods. Structure of the							
	ANSYS and ANSYS-CFX program system, INPUT / OUTPUT data, definition and							
	interpretation of boundary conditions, mathematical form of each boundary condition.							
	Strength applications using finite element program, shape optimization. Solving major							
	heat and flow problems with a finite volume program.							
	Processing of heard text with notes and recording of the material using own and							
	electronically available notes 40%							
Types of student activities	Performing measurement exercises independently 20%							
	Controlled and independent processing of tasks 20%							
	Solving test tasks 20%							
	 György Popper, Ferenc Csizmás: Numerical Methods for Engineers, Budapest, Akad. K. 							
Required literature and contact details	 Typotex, 1993. 166 p. ISBN 963-05-6454-8 							
Required interature and contact details	Gábor Ladányi: Finite element calculation methods, E-learning curriculum,							
	Dunaújváros College, TAMOP 4.1.2 / A, 2011, moodle.duf.hu							
	ANSYS user manual							
	• Stoyan Gisbert: Numerical Mathematics for Engineers and Programmers,							
Recommended literature and contact	Typotex ISBN 978-963-9664-41-8							
details	• Stoyan Gisbert, Takó Galina: Numerical Methods 1., Typotex (2005)							
	• Stoyan Gisbert: MATLAB, Typotex, ISBN 9639548499, 9789639548497							
Description of tasks to be								
submitted/measurement reports								
Description and timetable of the								
workshops								