



# Bachelor of Science in Materials Engineering

UNIVERSITY OF DUNAÚJVÁROS

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#### Description of the degree study program

Ba	chelor of Science in Materials Engineering (Materials Engineering)
Institution responsible for training	University of Dunaújváros
Institutional identification number	FI60345
Address	1/A, Tancsics Mihaly street, Dunaújváros, H-2400
Responsible manager	Dr. habil István András, Rector
Managers responsible for training	
Institute of Specialists	Technical Institute
Institute Director	Dr. habil Róbert Sánta, PhD
Responsible	Dr. Judit Pázmán, PhD
Main aspects of the study program	
Precondition of student application acceptance:	General Certificate of Education or a certificate of secondary school final exam, that certificate, which is required to start a higher educational study program in the home country of the student, the level of the required English language knowledge to start bachelor studies: IELTS 5.5
Training data	
Level of educational program	undergraduate
Level of qualification	bachelor (BSc)
Description of qualification in the diploma in Hungarian	Anyagmérnök
Description of qualification in the	Materials Engineer
diploma in English	
Scheme of Study	7 semesters
Credit points to be acquired	210

The objectives of the training and the professional competencies to be acquired	The aim of the course is to train materials engineers who are capable of understanding and managing the processes in metals, polymers and ceramics, as well as in advanced complex material systems, i.e. composites. They will also have the ability to modify material properties in different technologies, to investigate the structure and properties of materials, to manage and organise material production processes in a systems approach and to ensure the quality of materials produced by these technologies, and the theoretical knowledge to pursue the course at Master's (MSc) level.
Practical training	In the 7th (last) semester, at least 6 weeks of organized practice at a professional practice location
Conditions for issuing the 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.
Thesis	The thesis is a solution to a materials engineering problem or a research project in a specific field of study, which can be completed in one semester under the guidance of internal and industrial consultants, based on the knowledge acquired by the student during his/her studies, by studying additional literature. The candidate will demonstrate through the thesis that he/she has acquired sufficient competence in the practical application of the knowledge acquired, is able to carry out his/her tasks in materials engineering and is familiar with other literature beyond the course material and is able to apply it in a value-adding manner. Formal requirements: the thesis is 50-70 pages long.
Condition for passing the final examination	To be admitted to the final examination, you must have a final certificate (diploma) obtaining and having a thesis accepted for examination.
Final exam	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.
Final examination subjects	<ul> <li>ZV1:</li> <li>DUEN-MUA-212 Mechanical Material Testing</li> <li>DUEN-MGT-116 Materials Science</li> <li>DUEN-MST-210 Industrial materials</li> <li>ZV2:</li> <li>DUEN-MUA-150 Production technologies of nuclear power plant devices</li> <li>DUEN-MST-111 Production technologies of space ceramics</li> <li>DUEN-MST-251 Life cycle of plastics</li> </ul>
Diploma average	<ul> <li>The average of the certificate should be calculated in the following way: (FE + D + SA)/3.</li> <li>(FE) The mathematical average of the marks of the final exam subject(s).</li> <li>(D) The mark given by the final exam committee to the thesis.</li> <li>(SA) the weighed average mark of subjects for the total number of credit points collected in the complete study time period – except the credit points of thesis writing.</li> </ul>

Diploma qualification	Excellent 4,51 - 5,00; Good 3,51 - 4,50; Satisfactory 2,51 - 3,50; Pass 2,00 - 2,50
Conditions for the award of a diploma	Successful completion of the final examination is a prerequisite for the award of a diploma certifying the completion of higher education.
Language education	English
Physical education	Over 4 semesters, 2 hours per week
Work schedule	Full-time course

#### **Required engineering competences**

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

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

#### Knowledge:

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

#### Ability:

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

#### Attitude:

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

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

#### Autonomy and responsibility:

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

Curriculum	for N	<b>Materials</b>	Engineeri	ing BSc	programme
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	N	Aaterials Engin	neer	ring	g BS	Sc																			
											Sen	nest	er -	Cla	asses	s per	r we	ek							
Subject code	Subject name	Credit	Requirement		1			2			3			4			5			6			7		Prerequisite
Ū	5		•	Т	Р	L	Т	ГР	L	Г	P	L	Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEN-IMA-152	Engineering Mathematics 1.	5	Е	0	3	0	T			T												T			-
DUEN-ISF-010	Informatics	5	М	0	0	3	T		1	T					1									1	-
DUEN-MGT-111	Engineering representation	5	М	1	2	0																			-
DUEN-MUG-152	Mechanics 1.	5	Е	1	2	0	T		1	T					1									1	-
DUEN-MUG-212	CAD	5	М	0	0	3			1				1		1						1	1			-
DUEN-MUT-151	Engineering Physics	5	E	1	1	1	1		1	1												1		1	-
DUEN-IMA-212	Engineering Mathematics 2.	5	М				0	) ()	3	t												T		1	-
DUEN-MST-210	Industrial materials	5	M		1		1	0	2			1	1									1		1	_
DUEN-MST-250	Thermodynamics	5	E	-	t -	1	1	0	2	t	1	1	1	1	1	-					1	t	1	1	_
DOLLY MD1-250	Thermodynamics	5	Ľ		1		1		2	1		+	1	-	-	-						1		1	DUEN-MGT-111
DUEN MUG 222	Basics of machine design	5	м				2	, 1	0																DUEN MUG 212
DOLAY MICO 222	busies of machine design	5	101				1	1	<sup>o</sup>																DUEN-MUG-152
DUEN-MUG-257	Mechanics 2	5	F	-	1		1	2	0			+	+		-								-	+	DUEN-MUG-152
DUEN MUT 250	Heat and Fluid Dynamics	5	E	-	1	1	1	1 1	1	1	+	+	-	1	1	-					1	1	1	+	DUEN MUT 151
DUEN IMA 110	Mathematics 2	5	M	_	-		-	1	1	ſ	1 2	0	-		-	_						-	-	+	DUEN IMA 152
DUEN-IMA-110	Mathematics 5.	5	M		-	1	+	-	-	1	0	2	-	-	+	-					1	-	+	+	DUEN-IMA-152
DUEN-MOT-110	Production technologies of nuclear newer plant devices	5	IVI E		-	1	+	-	-	1	0	2	-	-	+	-					1	-	+	+	-
DUEN-MIST-150	Materials Engineering	5	F		-	1	+	-	-	1	1	1	-	-	+	-				-	1	-	+	+	-
DUEN-MUA-150	Pagation linguise	5	E		-	+	+	-	-	1	1	1	-	-	+	-					+	-	+	+	-
DUEN-MUA-232	Plastic physics	5	E		-	1	+	-	-	1	0	2	-	-	+	-				-	1	-	+	+	-
DUEN-MOR-233	Le te dete contine technologie	5	E M	_	-	-	+	-	-	+	0	- 2	1	0	2	_	-				-	-	-	+-	-
DUEN-MST-211	Up-to-date casting technologies	5	M		-	-	+	-	-	+	+	+	1	0	2	_	-			-	-	+	-	+	-
DUEN-MST-212	Life analytical chemistry	5	NI E		-	-	+	-	-	┢	+	+	1	0	2	_	-			-	-	+	-	+	-
DUEN-MST-251	Miero and nano structures	5	E		-	-	+	-	-	┢	+	+	1	0	2	_	-			-	-	+	-	+	-
DUEN-MST-252	Space commiss	5	E		-	+	+	-	-	+	+	+	2	0	1	-	-				+	-	+	+	-
DUEN-MIST-233	Maghaniaal Matarial Tasting	5	M		+	1	+	-	+	-	-	+	1	0	2	-					1	-	+	+	-
DUEN-INIOA-212	Ortical course Materials Engineering	5	IVI	_	-	-	+	-	-	+	+	+	1	0	2	_	-		_		-	-	-	+	-
DUEN MET 111	Des duction to the la size of anone commission	5	-		-	-	+	-	-	+	+	+	-	-	-	-	-	-		-	-	+	-	+	-
DUEN-MIST-III	Production technologies of space ceramics	5	M		-	-	+	-	-	┢	+	+	-	-	-	2	0	1		-	-	+	-	+	-
DUEN-MUA-115	Welding -	5	M		-	-	-	_	-	-	-	+	-	-	-	1	1	2		-	-	+	+	+	-
DUEN-MUA-216	Weiding	5	IVI M		-	-	-	-	-	-	-	+	+	-	-	1	1	1			-	-	+	+	-
DUEN-MUA-213	Forming of Matels	5	IVI E	-	-	-	-	-	-	-	-	+	+	-	-	1	1	1			-	-	+	+	-
DUEN-INIOA-251	Politing of Metals	5	Е		-	-	+	-	-	+	+	+	-	-	-	1	1	1		-	-	+	-	+	-
	Optional course - Materials Engineering	5	-		-	-	+	-	-	+	+	+	-	-	-	_	-		-	-	-	+	-	+	-
	Optional course	5	-		-	-	+	-	-	+	+	+	-	-	-	_	-		-	-	-	+	-	+	-
DUEN MCT 210	Environment of a straight of the sector of t	5	-		-	-	┝	-	-	┝	+	+	-	-	-	_	-		-	-	-	┢	-	+-	-
DUEN-MGT-210	Environmental policy and protection against radioactivity	5	M		-	-	-	_	-	-	+	+	+	-	-				1			-	+	+	-
DUEN-MIST-234	These services 1	5	E		-	-	+	-	-	+	+	+	-	-	-		-		2		2	_	-	+	-
DUEN-MUG-090	Entropy and the	0	5 M		-	-	+	-	-	+	+	+	-	-	-	_	-		1			-	-	+	-
DUEN-1 VV-122	Entrepreneursmp	5	IVI		-	-	-	_	-	-	+	+	+	-	-				1	2	. 0	-	+	+-	-
-	Descent Thesis ANADSC	5	-	-	⊢	+	╀	+	⊢	╀	+	+	+	┢	+	-	-	⊢	-	-	+	-	1-	-	-
DUEN-MUA-091	Research Thesis - ANYBSC Drefessional Internship ANVDSC	15	5	-	⊢	+	╀	+	⊢	╀	+	+	+	┢	+	-	-	⊢	-	-	+		12		-
DUEN-MUA-095	Professional Internship - AN IBSC	0	5 M		-	-	-	_	-	-	+	+	-		-						-	1	2	0	-
DUEN-1 VV-114	Product Management and Value Analysis	5	M	-	⊢	+	╋	+	⊢	╋	+	+	1-	╋	+	-	<del> </del>	⊢	-	┝	+		12	0	+ -
DUEN-1 V V-118	Product intanagement and value Analysis	5	M	2	0	-	1		0	1			1_	6	1.		-	7		-	-	2	11	0	-
	Tetal number of closes and make			5	10	1/	6	10	8	13	19	18	+	10	<u>111</u>	0	15	/	0	12	13	13	113	10	-
	Total number of classes per week	-		⊢	18		1	19		1	16	,	1	10		L	15		I	11		1	18		-
	Total credit points			1										- Z1	10										

		Optiona	al course - Mat	eria	ls F	ìngi	neer	ing																
									5	Sem	este	er -	Cla	sses	s per	r we	ek							
Subject code	Subject name	Credit	Requirement		1			2		3			4			5			6			7		Prerequisite
				Т	Р	L	Т	ΡΙ	L T	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	Т	Р	L	
DUEN-MGT-117	Basics of nuclear safety	5	М												2	0	1							-
DUEN-MGT-118	Basics of Atomenergetics	5	М												2	1	0							-
DUEN-MGT-119	Ensuring the integrity of equipment	5	М												2	1	0							-
DUEN-MGT-152	Equipments of Nuclear Power Plants	5	Е												2	1	0							-
DUEN-MGT-257	Basic Priciples of Hydrogen Technology	5	E												2	1	0							-
DUEN-MGT-112	Engineering construction	5	М															1	2	0				DUEN-MGT-111
DUEN-MGT-155	Hydrogenstorage technologies	5	Е															2	0	1				-
DUEN-MGT-213	Industrial knowledge	5	М															2	0	1				-
DUEN-MGT-256	NPP measurements and NDT	5	E															2	1	0				-
DUEN-MUG-213	Metrology	5	М															2	0	1				DUEN-MUG-257
DUEN-MUG-252	Production Technology	5	Е															2	1	0				DUEN-MUG-152
	Number of Theoretical/Practice/Lab classes per week			0	0	0	0	0 0	0	0	0	0	0	0	10	4	1	11	4	3	0	0	0	
Total number of classes per week				0 0 0 0 15 18 0																				
	Total credit points			40																				

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

#### Short description of the subjects

#### **Engineering Mathematics 1.**

Nama af 41	1-:4	in Hungaria	n	Mérnöki mate	ematika 1	•			Level	BSc						
Name of the	e subject	in English		Engineering I	Mathema	tics 1.			Code	DUEN(L)-IMA-152						
Responsible	e educatior	nal unit		Institute of Information Technology, Department of Mathematics and Computer Science												
Name of co	mpulsory	prior learnin	g													
DUEN(L)-						-		<u> </u>	•							
Туре		Presentation	n	Practice		Laboratory		Requirement	Credit	Language of education						
Full time	150/39	per week		per week	3	per week		Б	5							
Part time	150/15	per term	0	per term	15	per term	0	E	5	english						
Teacher res	ponsible fo	or the subjec	t	Name		Antal Joós,	PhD		schedule	Associate Professor						
Training ob	jective and	l justification	n of	Goals, develo	opment o	bjectives										
the course (	content, or	utput, locatio	on in	To acquire the mathematical foundations necessary to master the subjects, and to broaden												
the curricul	um)			mathematical knowledge for the study of the literature.												
				Presentation												
Typical dal	worn moth	oda		Practice	Small ta	bles, compu	itational	exercises.								
i ypicai dei	ivery meu	ous		Laboratory												
				Other												
				Knowledge												
				Knowledge of	f the gene	eral and spec	ific mat	hematical, scie	ntific and	social principles, rules,						
				contexts and	procedure	es necessary	for the	operation of th	e technical	l field.						
				Ability												
Doquiromo	ate (avarae	sad in tarms	of	Ability to pla	n, organis	se and carry	out inde	ependent learni	ng.							
learning ou	tcomes)	seu in terms	01	Attitude												
icannig ou	utonics)			Open to lean	rning abo	out and em	bracing	mathematical	ly based,	applied mathematical						
				developments	s and in	novations re	elated to	o their qualifi	cations ar	nd areas of expertise.						
				Interested in 1	new meth	ods and too	ls relate	d to the field.								
				Autonomy a	nd respo	nsibility										
				Taking respon	nsibility f	for your own	1 work a	nd the work of	others							
				Operations w	vith com	plex numbe	ers. Set	theory, the c	concept of	a function. Number						
				sequences lin	nit, conve	ergence crite	eria. Bas	ic properties o	f univariat	e real functions, limit,						
				continuity. In	nterpretat	tion of diffe	rential c	coefficient of u	inivariate	real functions, relation						
				between diffe	rentiabili	ity and cont	inuity, d	lerivative funct	ion, differ	ential of differentiable						
Chart daar			4 4	function. Gen	eral diffe	rentiation ru	iles, diff	erentiation of e	elementary	functions. Mean value						
Short descr	iption of th	ie subject co	ntent	function disi	interentia	al calculus,	nigner (	integral condi	tions for i	ents, L Hospital's rule,						
				of definite int	agral me	an value the	orem of	integral calcul	uons ioi i	Leibniz formula. The						
				primitive fun	iction th	e indefinite	integra	l and some of	f its prop	erties basic integrals						
				Integration m	ethods. I	mproprius i	ntegral.	Basic propertie	es of mult	ivariate real functions.						
				differential ca	alculus, c	alculation of	f extrem	al values.		,						
				Processing th	eoretical	material wit	h guida	nce 10%								
<b>T</b>	1	•,•		Independent j	processin	g of theoreti	cal mate	erial 30%								
Types of sti	udent activ	ities		Task solving	with guid	lance 30 %										
				Independent j	processin	g of tasks 30	) %									
Required li	terature an	d contact det	tails	• · Ana	Kovác alysis, 16	s J Takács th Edition, I	s G Ta Budapes	kács M.: Analy t, National Tex	ysis. 16th e tbook Pub	edition. Takis, lisher, 2004.						
Recommen details	ded literatu	are and conta	act	• · rev	P. Hor ised editi	váth: Multir on. Dunaújv	ole choic város, Pu	e exercises for blishing Office	mathemat e of Dunaú	ics exercises. 2nd jváros College, 2008.						
Description submitted/r	of tasks to neasureme	o be nt reports														
Description	and timet	able of the														
workshops																

#### Informatics

NT C.A	1	in Hungaria	an	Informatika					Level	BSc
Name of the	e subject	in English		Informatics					Code	DUEN(L)-ISF-010
Responsible	e education	al unit		Institute of I	nformatic	s, Departme	tware Develop	ment and	Applications	
Name of co DUEN(L)-	mpulsory p	orior learnin	g							
Туре		Presentation	n	Practice		Laboratory		Requirement	Credit	Language of education
Full time	150/39	per week	0	per week	0	per week	3	м	5	english
Part time	150/15	per term	0	per term	0	per term	15	141	5	english
Teacher res	ponsible fo	or the subject	t	Name		Nagy Bálin	t, PhD		schedule	Associate professor
Training ob the course ( the curricult	jective and content, ou um)	l justificatio Itput, locatio	n of on in	The students The students The students create spread The students They should	s should be should be should be should be should be should be be able to	e able to man e able to bro be able to pro- using spread e able to pre- poprepare sin	hage gra wse the epare do sheet pr pare and pple pres	phical operatin Internet and se ocuments with ogram. manage simpl sentations as w	ng system s nd emails. a word pr e database ell.	surely. rocessing program and rs.
				Presentation						
				Practice						
Typical deli	ivery metho	ods		Laboratory	In class individu Comput	rooms with t al tasks on t ter based exe	he use c he comp rcises, i	f projector and outers, using pr ndividual tasks	l computer rograms, w S.	, students solve /ith teacher assistance.
				Other						
Requiremer learning out	nts (express tcomes)	sed in terms	of	Knowledge Students fan relationships They have a selecting too Ability Students are system prob efficiently in Attitude Students are their own pr and accomm Autonomy a Students stri carried out in	and proc adequate of all and to of able to pe- able to	the general edures of the expertise in carry out its erform partia ey apply the tasks d in new me l competence fessional, tec nsibility icient and quintly.	and spe e user p the IT f tasks. l activit eir stud thods an es and a chnologi ality wo	cific mathemat rograms in the ield specialist ies independen ied problem s d tools related ctivities on ref <u>cal developme</u> rk. The respon	ics, inforn field of in knowledg tly during olving me to IT sect lective wa <u>nt and inn</u> sible for tl	natics principles, rules, formation technology. e of specific tools for solving more complex thods and procedures tion. Students consider y. Open to understand ovation area.
Short descri	iption of th	e subject co	ontent	Confident us Goal-oriente Internet. Use Word proces creating tabl mail merges Spreadsheet formatting ta applying sim Making a pr operations, u presentation Independent	se of opera d use of email ssing with es, applyi managem ables, usin nple datab resentation using the s technique , creative	ating system the Internet programs. MS Word y ing styles, cr and styles, cr and cell refere ase operation with MS F slide master, es. use of any k	manage t, know word pro- reating a S Excel ences, fo as, mana PowerPo slide ten	ing files and fo ledge of NET occessor progra- a table of conto spreadsheet pro- prmulas, functi- aging and visua int or Prezi: ba nplates, applyi- novative IT too	Iders. iquette. Ta m: Basic t ents and o rogram: Cr ons, charts ulizing data asic slide o ng styles, ols and app	argeted search on the ext editing operations, ther lists, and creating reating, uploading and s as data visualization, a. editing and formatting slideshow settings and plications
Types of stu	udent activ	ities		Heard inform	nation pro	cessing by c	reating	notes, systemat	tization of	information has led
Required lit	erature and	l contact de	tails	• [1] W • [2] Ind • [3] Al Ind • [4] Pu • [5] Le	WORD 2 iley Publi   EXCEL c., 2010, I   ACCESS ison Barro dianapolis   POWER blishing I   The Inte vvine You	2010 All-In- shing Inc., 2 2010 All-In- ndianapolis, S 2010 All-In- pows, and Jos a, Indiana (fro POINT 201 nc., 2010, In rnet for Dur ng, Wiley Pu	One for 010, Ind One for Indiana n-One for ee pdf o 0 All-In dianapo nmies 12 ablishing	Dummies by I ianapolis, Indi Dummies by ( (free pdf on Ir or Dummies by tockman, Wile n Internet) -One for Dum lis, Indiana (fre th edition by J g Inc, Indiana (	Doug Lowe ana (free p Greg Harve (ternet) Margaret ey Publishi mies by De ee pdf on I ohn R. Lev free pdf or	e with Ryan Williams, odf on Internet) ey, Wiley Publishing Levine Young, ing Inc., 2010, oug Lowe, Wiley internet) vine – Margaret o Internet)

	• [6] OFFICE 2010 All-in-one for Dummies by Peter Weverka, Wiley Publishing, Inc. Indiana (free pdf on Internet)
Recommended literature and contact details	• Electronic literature in Moodle or in Neptun. Microsoft Office Tutorial and examples (Internet).
Description of tasks to be submitted/measurement reports	The student has the opportunity to solve a Word and Excel tasks on a topic of his or her own choice that match and are consistent with the learning materials of the semester. The extra point will be included in the final grade. It is necessary to discuss
Description and timetable of the workshops	At the end of each topic, students write closed papers, typically: - Week 5: Word processing computer-based test - Week 11: Spreadsheet management computer-based test In case of any computer-based tests, the opportunity for replacement and correction is

#### Engineering representation

	in Hungari	an	Műszaki ábr	ázolás				Level	BSc					
Name of the subject	in English		Engineering	represent	ation			Code	DUEN(L)-MGT-111					
Responsible educatio	nal unit		Institute of 7	Technolog	v. Departme	neering an	d Energy							
Name of compulsory	prior learni	19			<i>J</i> ,									
DUEN(L)-	I · · · ·	0												
Туре	Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education					
Full time 150/39	per week	1	per week	2	per week			-						
Part time 150/15	per term	5	per term	10	per term	0	M	5	english					
Teacher responsible f	for the subje	ct	Name		Gábor Vizi,	PhD	•	schedule	Associate Professor					
Training objective an the course (content, o	d justificatio utput, locati	on of on in	<b>Goals, development objectives</b> The student should be able to perform any variation of the basic constructions found in descriptive geometry. Recognise the elementary constructions needed to solve various complex problems and be able to determine their correct sequence. Be able to select the optimal solution for a given situation from a range of possible solutions. The student should be familiar with the theory and practice of technical drawing projections and sections. The											
			to read techr	Id be able nical draw parts.	to edit techn ings. The stu	ical drav ident sh	wings of machinological draw	ne parts us construct	ing conventional tools, dimensional drawings					
Tunical delivery mot	anda		Presentation	projecto	or roup avarais		$\frac{1}{2}$ to 25 people	skatahing	and aditing					
r ypical denvery met	ious		Laboratory	Sman g	roup exercis	es for u	5 to 25 people,	sketenning	and cultilig					
			Other	+										
Requirements (expres learning outcomes)	ssed in terms	s of	Knowledge You know th You have a d in your field Basic know technology, Comprehens power tools, Understand, elements of n used. Ability Performs the Ability to pla Ability to pla Ability to id (using standa Attitude Open to lear qualification Autonomy a Taking respo	ne termino comprehe ledge of control pr sive knowl mechanica character mechanica e job accor an, organi lentify rou ard operat ning abou s and area and respo onsibility	blogy, key co nsive knowle machine de: ocedures and ledge of the c cal equipmen ise and mode al systems, th rding to his/f se and carry atine profess ions in pract at and embra of expertise <b>onsibility</b> for your own	ancepts a edge of t sign pri d operating t and to el the strue design her qualit out inde ional pri ice) aga cing dev . Interes	and theories rel the main theori nciples and m ing processes. g principles and ols used. ructure and open and interrelati ifications. ependent learni roblems, to ide inst a theoretic velopments in n ted in new meth	ated to you es and pro- lethods, m d structural eration of t onship of t ng. entify, form al and prace machine de hods and to others.	ur field. blem-solving methods achine manufacturing l units of the machines, the structural units and the system components nulate and solve them ctical background esign related to his/her pols related to the field.					
Short description of t	he subject co	ontent	Image plane image. Law Projections of Transversals rotation. Inte basic constru- projection sy and sections	, coordina of projec lependent a, notable ersection c actions. B ystems in . Dimensi	tte system, p tion and of on the positi lines of a p of two planes asic standard engineering oning on eng	rojection change ons of a lane. Tr , angles ls of tec practice gineering	n. Representati of view. Mutu straight line, li ue magnitude of inclination, hnical drawing e. Application g drawings. Gri	on of a po al position nes of dev of the pla distances. design. T of views,	int, real line and point is of spatial elements. iation and intersection. ne, constructions with Solving problems with heoretical overview of views. Use of sections ensions					
Types of student activ	vities		Theoretical J Problem solv measuremen	processing ving with its with gu	g with guidar guidance 20 iidance - Pre	nce 20 % % Prob paration	6 Theoretical p lem solving wi of laboratory 1	rocessing th guidanc reports -	with guidance 20 % ee 40 % Laboratory					
Required literature ar	nd contact de	etails	• • Ta • • Fő	Illi imás Zaho Lá iiskolai Ki	ustrative Geo Ia) szló Tóth- T iadó	ometry I amás Za	3asic Tasks (G ahola: Mechani	uide and p ical Engine	ractical exercises, eering. Zahra Zahola.					
Recommended literat details	ture and cont	tact	• • • • He	Ká Ko buse.	aroly Koffán offán Károly	: 15 lect : 15 exe	ures. 15 lecture rcises. College	es. Főiskol notes. Col	ai Kiadó. llege Publishing					
Description of tasks t	o be													
submitted/measureme	ent reports													

Description and timetable of the	
workshops	

#### Mechanics 1.

Name of th	ambiaat	in Hungarian		Mechanika 1					Level	BSc		
iname of th	e subject	in English		Mechanics 1			Code	DUEN(L)-MUG-152				
Responsible	e education	al unit		Institute of T	echnolog	y, Departme	neering an	d Energy				
Name of co	mpulsory p	orior learnir	ıg			•						
DUEN(L)-						T						
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	1	per week	2	per week	0	Е	5	english		
Part time	150/15	per term	5	per term	10	per term			1 1 1			
Teacher res	ponsible ic	or the subject	ct	want         pera r alotas, rind         schedule           Coole development objectives								
Training ob the course ( the curricul	jective and content, ou um)	l justificatio utput, locati	on of on in	Goals, devel Students wil by applying preparation. of materials.	tudents will learn the mechanical principles of designing simple engineering structures by applying the concepts and contexts presented in the lectures to exercises and home reparation. You will learn the concepts and practical relationships of statics and strength of materials.							
				Presentation	projecto	or.	,e reetar	e, asing reetar	, 1 0 01 1			
Typical del	ivery meth	ods		Practice	Small ta	able for up to	25 peo	ple, calculation	exercises			
				Laboratory								
				Other								
				Knowledge Have a comp area of engin Knowledge c	prehensiv eering. of the gen	e knowledge eral and spec	of the	basic facts, dir hematical, scie	ections an ntific and	d limits of the subject social principles, rules,		
Requirements (expressed in terms of learning outcomes)			c	You know th You have a c in your field.	contexts and procedures necessary for the operation of the technical field. You know the terminology, key concepts and theories related to your field. You have a comprehensive knowledge of the main theories and problem-solving methods n your field.							
			sof	Ability to plan, organise and carry out independent learning. Ability to identify routine professional problems, to identify, formulate and solve them (using standard operations in practice) against a theoretical and practical background. Ability to build basic models of technical systems and processes. Attitude Open to learn about and embrace developments in mechanics related to his/her qualifications and area of expertise. Interested in new methods and tools related to the field. Autonomy and responsibility								
				Autonomy a	nu respo	for your own		nd the mode of	othong			
Short description of the subject content			ontent	Statics of a material point: concept of vector, operations that can be performed on vectors. Force, force system, equilibrium. Statics of rigid bodies: concept of rigid body. Concept of momentum. Equivalence of force systems, reduction. Concept of force. Equilibrium of rigid body. Ideal constraints. Determination of force systems for spatial and planar force systems. Statics of supports: support elements, supports and constraints, concepts and principles of determination of internal forces and stresses, relationships between stresses. Fundamentals of strength of materials: basic concepts, subdivision, methods of strength of materials, purpose of strength tests, requirements for structural elements, the tensile diagram and mechanical properties that can be derived from it. Determination of mechanical stresses under simple loading conditions. Concept and definition of stress state. Evaluation of stress state, principal stresses, principal stress directions. Elements of strain state: specific strains and angular distortions. Evaluation of strain state. Relationship								
Types of st	udent activ	ities		Theoretical p Task comple	processing tion with	g with guidar guidance/inc	nce/inde lepende	pendent: 15/35 nt: 15/35 %	%			
Required literature and contact details			etails	<ul> <li>Dr. Sandor Vigh: Mechanics. College notes</li> <li>Engineering Mechanics I. Elementary Statics, Workbook, Departmental Working Group, Dunaújváros, ME DFK Publishing Office, 1994.</li> <li>Engineering Mechanics II/1. Elementary Strength, Workbook, Dunaújváros, DF Kiadó, 2000.</li> <li>Dr Vigh S Engineering Mechanics IV. Cross-sectional Characteristics. college note, Dunaújváros, DF Kiadó, Dunaújváros, 1998.Engineering Mechanics I. Exemplar: part 1, Dunaújváros, DF Kiadói Hivatal, 2000.</li> <li>Technical Mechanics II. Manual: II/A, , Dunaújváros , DF Publishing Office,</li> </ul>								
Recommen details	ded literatu	ire and cont	tact									

Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

#### CAD

N	1. :	in Hungaria	n	CAD		Level	BSc				
Name of th	ie subject	in English		CAD					Code	DUEN(L)-MUG-212	
Responsib	le educatior	nal unit		Institute of T	Technolog	y, Departme	nt of Me	echanical Engi	neering an	d Energy	
Name of co	ompulsory	prior learning	5								
DUEN(L)-						1			1		
Туре		Presentation	l	Practice		Laboratory		Requirement	Credit	Language of education	
Full time	150/39	per week	0	per week	0	per week	3	М	5	english	
Part time	150/15	per term	0	Nama	0	Cábar Vizi	15		cabadula	Associate Drofessor	
Part time       150/15       per term       0         Teacher responsible for the subject         Training objective and justification of the course (content, output, location in the curriculum)         Typical delivery methods         Requirements (expressed in terms of learning outcomes)			of n in	NameGábor Vizi, PhDscheduleAssociate ProfessGoals, development objectivesThe student should be familiar with the practice of computer geometric modelling. Be a to build parametric geometric models of parts that "survive" design changes incorporate design intent. Be able to select the optimum modeling sequence and methods. Be a to build an assembly from the parts created. Be able to produce technical drawings components and assemblies that best meet the requirements of the applicable draw standards.PresentationPracticeLaboratoryComputer laboratory exerciseOtherKnowledgeApply the related computational and modelling principles and methods of engineer product, process and technology design.AbilityAbility to plan, organise and carry out independent learning. Ability to build basic models of technical systems and processes.Attitude							
				Autonomy and responsibility Taking responsibility for your own work and the work of others.							
Short desc	ription of th	ie subject cor	itent	The student will learn the practice of computer geometric modelling through computer laboratory sessions using a modern parametric modelling system (SolidWorks). You will learn the use of commands to create machine parts. You will learn how to build assemblies. You will be able to create technical drawing documentation that best complies with current standards in your engineering work, based on the component and assembly models you have already built							
Types of student activities				Processing theoretical material with guidance 20 % Independent processing of theoretical material 20 % Task solving with guidance 20 % Independent processing of tasks 40 % Laboratory measurements under supervision							
Required 1	iterature an	d contact det:	ails	••	Sc	lidWorks O	nline He	lp			
Recommen	Recommended literature and contact				Sp	ecifications	and doc	umentation for	the Solid	Works software	
Description	Description of tasks to be				stelli						
submitted/	measureme	nt reports									
Description	n and timet	able of the									
workshops											

#### **Engineering Physics**

Name of the subject         Engineering Physics         Code         DUEN(L)-MUT-151           Responsible decontinual unit         Institute of Technology, Department of Mechanical Engineering and Energy         Presentation         Impuge of education           Type         Presentation         Practice         Laboratory         Requirement         Credit         Impuge of education           Full time         15015         per term         5         per term         5         enginsh           Facher responsible for the subject         Name         Goal, development Objectives         Facher sequentifies         College professor           Fraining objective and justification of the course is to learn the nechanics of the material point electrodynamics, the torust proceentation         Presentation         Presentation           Projector, ppt presentation         Presentation         Projector, ppt presentation         Presentation           Projector, ppt presentation         Projector, ppt presentation         Presentation         Presentation           Projector, ppt provide to rows the most important theorems of the mechanics of the point of material point o		1.	in Hungarian	Mérnöki fizi	ka	Level BSc							
Responsible educational unit         Institute of Technology. Department of Mechanical Engineering and Energy           Name of computation prior learning         Presentation         Presentation         Requirement         Coding         Angrunge of elucation           Type         Presentation         Presentation         Interview         Laboratory         Requirement         Coding         Angrunge of elucation           Part time         150(15)         per term         5         per term         5         Per term         5         english           Fainting objective and justification of econse (content, output, location in the subsequent metahanics and semi-conductors and modern physics, the following subjects preparation for the subsequent metahalism and semi-conductors and modern physics, the following subjects preparation for the subsequent metahalism.         Presentation           Typical delivery methods         Protector, ppt presentation         Practice         Presentation           The visual of the subsequent metahalism and semi-conductors and modern physics, the following subjects preparation for the subsequent metahalism and experiments.         Presentation           Typical delivery methods         Robit Name         Protector, ppt presentation         Practice         Protector, ppt presentation           Trapical delivery methods         Robit Name         Protector, ppt presentation         Protector, ppt presentation         Protector, ppt presentation <td>Name of the</td> <td>e subject</td> <td>in English</td> <td>Engineering</td> <td>Physics</td> <td colspan="3">Code DUEN(L)-MUT-151</td>	Name of the	e subject	in English	Engineering	Physics	Code DUEN(L)-MUT-151							
Name of compulsory prior learning DUTEN(L)	Responsible	e education	nal unit	Institute of T	echnolog	y, Departme	ent of Me	echanical Engi	neering an	d Energy			
Type         Presentation         Practice         Laboratory         Requirement         Credit         Language of subcation           Full time         150/15         per term         5         per term         1         E         5         english           Training objective and justification of the asubject         Name         Mikios Horváhl, PhD         schedule         College professor           Training objective and justification of the course is to learn the mechanics of the material point, electrodynamics, the trainics and dynamics of liquids and gaes, thermodynamics, a well as the basics of optics: gramtum mechanics and semiconductors and modern physics. the following subjects preparation for the subjector, preparation for the subject presentation           Typical delivery methods         Presentidor         Presentidor         Presentidor           Typical delivery methods         Knowledge         The student knows the most important theorems of the mechanics of the point of matter including kinematics, dynamics, monetune, work, energy output, vibrations, damped vibrations and can solve problems related to these theorems at a proficie scand theig application. He/shk knows the laws of state changes of gaes, the laws of thema dates and the said of the subject server and the said of the subject server and the said of the said state and the said of thema sequence vibratis and sequence and and solve pr	Name of co DUEN(L)-	mpulsory	prior learning										
Full time       150/39       per week       1       per veek       1       Secondary       Secon	Туре		Presentation	Practice		Laboratory		Requirement	Credit	Language of education			
and the problem         Executing to provide the professor           Coals, development objectives         Coals, development objectives           Training objective and justification in the curriculum)         Coals, development objectives           The aim of the course is to learn the mechanics of the material point, electrodynamics, the tatics and dynamics of liquids and gases, thermodynamics, as well as the basics of optics upuntum mechanics and semiconductors and modern physics, the following subjects preparation for the subsequent modules.           Typical delivery methods         Presentation           Presentation Projector, ppt presentation         Presentation           The aim in optication of the subsequent modules.         The student knows the most important theorems of the mechanics of the point of matter helding kinematics, dynamics, momentum, work, energy output, vibrations, damped vibrations and can solve problems related to these theorems at a proficiency level. You know the properties of ideal fluids and the most important laws of thermal expansion and phase transitions, the first and second laws of thermodynamics, and can solve simple problems with these. You will know the most important concepts of geometry and physical optics, their applications and the basics of atomic physics and quantum mechanics.           Requirements (expressed in terms of earming outcomes)         Foraw conclusions and on understand physical problems in technical practice <b>Xuitude</b> Collaborate with classmates and the teacher to develop knowledge.         Open to learning and applying modern investigative techniques. Striver for accuracy in both numerical and ald boratory exercises, can recognis measurement	Full time	150/39	per week 1	per week	1	per week	1	Е	5	english			
Construction         Goals, development objectives         Function         Function           Training objective and justification of the course (content, output, location in he course (content, output, location in he course)         The aim of the course is to learn the mechanics of the material point, electrodynamics, and dynamics of liquids and gases, thermodynamics, as well as the basics of optics preparation for the subsequent modules.           Typical delivery methods         Prescritter Projector, ppt presentation           Laboratory         Laboratory presentation           Laboratory         Laboratory presentation           Prescritter         Projector, ppt presentation           Laboratory         Laboratory presentation           Laboratory         Laboratory presentation           Laboratory         Laboratory presentation           Laboratory         Laboratory presentation           Nowledge         The student knows the most important theorems of the mechanics of the point of matter including kinematics, dynamics, momentum, work, energy output, vibrations, damped wibrations and can solve prohemis related to these theoremodynamics. Heiske knows the basics of electrostatics, DC entworks, magnetism and induction, and AC networks, and ear or low simple problems with these; You will know the most important concepts of geometry and physical optics, their applications and to understand and solve problems in technical practice <b>Xuttorion</b> Requirements (expressed in terms of earning outcomes)         The ability to recognise and understand physical phenomena in th	Teacher res	nonsible f	or the subject	Name	5	Miklós Hor	váth Ph	D	schedule	College professor			
he curriculum) yuantom mechanics and semiconductors and modern physics, the following subjects preparation for the subject context Presentation Projector, ppt presentation Practice Projector, ppt presentation Practice Projector, ppt presentation Context Laboratory Laboratory presentations and experiments Other Character Laboratory presentations and experiments Character Laboratory presentations and experiments Character Laboratory Desentations and experiments Character Laboratory Character Laboratory presentations Practice Projector, ppt presentations Character Laboratory Character Laborato	Training ob the course (	jective and content, o	d justification of utput, location in	<b>Goals, development objectives</b> The aim of the course is to learn the mechanics of the material point, electrodynamics, the statics and dynamics of liquids and gases, thermodynamics, as well as the basics of optics,									
Presentation         Projector, ppt presentation           Projector, ppt presentation         Projector, ppt presentation           Laboratory         Laboratory presentations and experiments           Other         Image: Construction of the mechanics of the point of matter including kinematics, dynamics, momentum, work, energy output, Urbations, damped vibrations and can solve problems related to these theorems at a proficiency level. You know the properties of ideal fluids and the most important laws of fluid statiss and their application. He/she knows the laws of state changes of gases, the laws of thermolynamics. He/she knows the basics of electrostatics, DC networks, magnetism and induction, and AC networks, and can solve simple problems with these. You will know the most important concepts of geometry and physical optics, DC networks, magnetism and induction, and AC networks, and can solve simple problems with these. You will know the most intornical practice.           Requirements (expressed in terms of fearming outcomes)         The ability           The ability to recognise and understand physical phenomena in the areas listed in the theme, to draw conclusions and to understand and solve prohems in technical practice.           Attitude         Collaborate with classmates and the teacher to develop knowledge.           Open to learning and applying nodem investigative techniques.         Strives for accuracy in both numerical and laboratory exercises.           Automary and responsibility         Solve tasks independently using the resources and materials provided.           Independently set up and carry out measurements in laboratory exercises, can recognise measurement resc	the curricul	um)		quantum me preparation f	quantum mechanics and semiconductors and modern physics, the following subjects preparation for the subsequent modules.								
Typical delivery methods         Projector, ppt presentation           Laboratory         Laboratory           Laboratory         Laboratory           Autoratory         Laboratory           Autoratory         Laboratory           Requirements         Other           Including kinematics, dynamics, momentum, work, energy output, vibrations, damped vibrations and can solve problems related to these theorems at a proficiency level. You know the properties of ideal fluids and the most important taws of fluid statics and thein application. He/she knows the laws of state changes of gases, the laws of thermodynamics. He/she knows the basics of electrostatics, DC networks, magnetism and induction, and AC networks, and can solve simple problems with these. You will know the most important concepts of geometry and physical optics, their applications and the basics of atomic physics and quantum mechanics.           Requirements (expressed in terms of teamines, to cance on the second and solve problems in technical practice Attitude           Collaborate with classmates and to understand and solve problems in technical practice Attitude           Collaborate with classmates and the teacher to develop knowledge. Open to learning and applying modern investigative techniques. Strives for accuracy in both numerical and laboratory vertices.           Stort description of the subject content         Its and calculate errors.           Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating in circular motion, momentum, work, energy, power, and related aws. Statics of ideal fluids, Pascar's law, Archinmedes law, bu				Presentation	Projecto	or, ppt prese	ntation						
Laboratory         Laboratory         presentations and experiments           Other         Other         Nowledge           The student knows the most important theorems of the mechanics of the point of matter including kinematics, dynamics, momentum, work, energy output, vibrations, ad amped vibrations and can solve problems related to these theorems of fluid statics and thei application. He/she knows the laws of state changes of gases, the laws of fluid statics and thei application. He/she knows the laws of state changes of gases, the laws of thermodynamics. He/she knows the basics of electrostatics, DC networks, magnetism and induction, and AC networks, and can solve simple problems with these. You will know the most important concepts of geometry and physical optics, their applications and the basics of atomic physics and quantum mechanics.           Requirements (expressed in terms of the ability to recognise and understand physical phenomena in the areas listed in the theme, to draw conclusions and to understand and solve problems in technical practice Attitude           Collaborate with classmates and to taccher to develop knowledge. Open to learning and applying modern investigative techniques. Strives for accuracy in both numerical and laboratory exercises. Can independently process measurement results and calculate errors.           Metchanics of matterial point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and relate laws. Statics of ideal fluids, Pascal's law, Archimees' law, buoyancy, Ideal gases, gas laws statics of ideal fluids, Pascal's law, Archimees' law, buoyancy, Ledel gases, gas laws statics of ideal fluids, Pascal's law, Archimees' law, buoyancy, Ledel gases, gas laws stator of ideal fluids, Pascal's law, Archimees' law, buo	Typical del	ivery meth	ods	Practice	Projecto	or, ppt prese	ntation	1					
Knowledge           Knowledge           The student knows the most important theorems of the mechanics of the point of matter ncluding kinematics, dynamics, momentum, work, energy output, vibrations, damped vibrations and can solve problems related to these theorems at a proficiency level. You know the properties of ideal fluids and the most important laws of fluid statics and their application. He'she knows the laws of state changes of gases, the laws of thermal expansion and phase transitions, the first and second laws of thermodynamics. He'she knows the basics of electrostatics, DC networks, magnetism and induction, and AC networks, and can solve simple problems with these. You will know the most important concepts of geometry and physical optics, their applications and the basics of atomic physics and quantum mechanics.           Ability The ability to recognise and understand physical phenomena in the areas listed in the theme, to draw conclusions and to understand and solve problems in technical practice Attitude           Collaborate with classmates and the teacher to develop knowledge. Open to learning and applying modern investigative techniques. Strives for accuracy in both numerical and laboratory exercises, can recognise measurement results and calculate errors.           Mechanics of material point, kinematics, dynamics, Unifornly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and relate laws. Statics of ideal fluids, Pascal's law, Archinedes law, buoyancy. Ideal gases, gas laws. It and laws of thermodynamics, entropy, thermal expansion, phase transitions Electrostatics, DC networks, angenetism and electromagnetic induction. Calculation alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.           Types	51	2		Laboratory	Laborat	ory presenta	ations and	d experiments					
Provide         The student knows the most important theorems of the mechanics of the point of matter including kinematics, dynamics, momentum, work, energy output, vibrations, damped vibrations and can solve problems related to these theorems at a proficiency level. You know the properties of ideal fluids and the most important laws of fluid statics and their application. Hc/shk knows tha laws of state changes of gases, the laws of thermal expansion and phase transitions, the first and second laws of thermodynamics. He/she knows the assiss of electrostatics, DC networks, magnetism and induction, and AC networks, and car solve simple problems with these. You will know the most important concepts of geometry and physical optics, their applications and the basics of atomic physics and quantum mechanics.           Requirements (expressed in terms of learning outcomes)         Ability           The ability to recognise and understand physical phenomena in the areas listed in the theme, to draw conclusions and to understand and solve problems in technical practice Attitude           Collaborate with classmates and the teacher to develop knowledge. Open to learning and applying modern investigative techniques. Strives for accuracy in both numerical and laboratory exercises, can recognise measurement errors and estimate their consequences. Can independently process measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.           Short description of the subject content         Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal slaw, Archimedes' law, buoyancy, Ideal gases, gas laws state and laws of thermodynamics, entropy, hermal expansion, phase transi				Knowledge									
Invalue				The student including ki	knows the nematics,	e most impo dynamics,	ortant the moment	eorems of the r um, work, end	nechanics ergy outpu	of the point of matter, it, vibrations, damped			
and phase transitions, the first and second laws of uternodynamics, He she knows in         basics of electrostatics, DC networks, angenesism and induction, and AC networks, and can         Requirements (expressed in terms of         iearning outcomes)         Ability         The ability to recognise and understand physical phenomena in the areas listed in the theme, to draw conclusions and to understand and solve problems in technical practice         Attitude         Collaborate with classmates and the teacher to develop knowledge.         Open to learning and applying modern investigative techniques.         Strives for accuracy in both numerical and laboratory exercises.         Autionomy and responsibility         Solve tasks independently using the resources and materials provided.         Independently set up and carry out measurements in laboratory exercises, can recognise measurement rerors and estimate their consequences. Can independently process measurement results and calculate errors.         Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws.         Short description of the subject contert       Col networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.         Types of student activities       Endre Kiss: Text-based learnin				know the pro application.	vibrations and can solve problems related to these theorems at a proficiency level. You know the properties of ideal fluids and the most important laws of fluid statics and their application. He/she knows the laws of state changes of gases, the laws of thermal expansion								
Requirements (expressed in terms of earning outcomes)       Ability         The ability to recognise and understand physical phenomena in the areas listed in the theme, to draw conclusions and to understand and solve problems in technical practice         Attitude       Collaborate with classmates and the teacher to develop knowledge.         Open to learning and applying modern investigative techniques.       Strives for accuracy in both numerical and laboratory exercises.         Autonomy and responsibility       Solve tasks independently using the resources and materials provided.         Independently set up and carry out measurements in laboratory exercises, can recognise measurement results and calculate errors.       Muchanics.         Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes law, buoyancy. Ideal gases, gas laws.         Short description of the subject content       Ist and 2 Tal laws of thermodynamics, entropy, thermal expansion, phase transitions.         Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical physica physics, photometry. Fundamentals of atomic physics and quantum mechanics.         Types of student activities       Attending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.         Required literature and contact details       • Endre Kiss: Tex-based learning material based on the engineering physics textbook				and phase u basics of elec solve simple and physical mechanics	basics of electrostatics, DC networks, magnetism and induction, and AC networks, and can solve simple problems with these. You will know the most important concepts of geometry and physical optics, their applications and the basics of atomic physics and quantum mechanics.								
htme, to draw conclusions and to understand and solve problems in technical practice         Attitude         Collaborate with classmates and the teacher to develop knowledge.         Open to learning and applying modern investigative techniques.         Strives for accuracy in both numerical and laboratory exercises.         Autonomy and responsibility         Solve tasks independently using the resources and materials provided.         Independently set up and carry out measurements in laboratory exercises, can recognise measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.         Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws.         Short description of the subject content       Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions. Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.         Types of student activities <ul> <li>Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle</li> <li>Physics textbook in Moodle</li> <li>Physics verking group; edited by Dr. Miklós Horváth: Exercises based on the physics textbook in Moodle</li> <li>Physics verking group; edited by Dr. Miklós Horváth: Exercises based on Physics Laboratory Exercises I in Moodle</li> <li< td=""><td>Requiremen learning ou</td><td>nts (expres tcomes)</td><td>sed in terms of</td><td>Ability The ability</td><td>to recogn</td><td>ise and und</td><td>erstand</td><td>physical pheno</td><td>omena in</td><td>the areas listed in the</td></li<></ul>	Requiremen learning ou	nts (expres tcomes)	sed in terms of	Ability The ability	to recogn	ise and und	erstand	physical pheno	omena in	the areas listed in the			
Autuude         Collaborate with classmates and the teacher to develop knowledge. Open to learning and applying modern investigative techniques. Strives for accuracy in both numerical and laboratory exercises.           Autonomy and responsibility         Solve tasks independently using the resources and materials provided. Independently set up and carry out measurements in laboratory exercises, can recognise measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.           Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion, uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws, Short description of the subject content           Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.           Types of student activities         Attending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.           Required literature and contact details         • Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle           Recommended literature and contact letails         • Agoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budgest, 1997)           • R. Feynmann: Modern Physics (Müszaki Könyvkiadó, Budapest, 1986)         • Agasurement reports from laboratory exercises				theme, to draw conclusions and to understand and solve problems in technical practice									
Commonded literature and contact details         Required literature and contact details         Recommended literature and contact         Recommended literature and contact         details         Action of tasks to be wobict of tasks to be wobic to find tasks to be wobict of tasks to be wobic tasks to be wobict of tasks to be wobic tasks to be wo				Attitude Collaborate with classmates and the teacher to develop knowledge									
Strives for accuracy in both numerical and laboratory exercises.Strives for accuracy in both numerical and laboratory exercises.Autonomy and responsibility Solve tasks independently using the resources and materials provided. Independently set up and carry out measurements in laboratory exercises, can recognise measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes'law, buoyancy. Ideal gases, gas laws. Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.Types of student activitiesAttending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.Required literature and contact details• Endre Kiss: Text-based learning material based on the engineering physics textbook in MoodleRecommended literature and contact tetails• Measurement descriptions based on Physics Laboratory Exercises I in Moodle• Agoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997) • R. Feynmann: Modern Physics (Müszaki Könyvkiadó, Budapest, 1986)Description of tasks to be winwind/doseurament reports from laboratory exercises				Open to lear	Open to learning and applying modern investigative techniques.								
Autonomy and responsibility           Solve tasks independently using the resources and materials provided. Independently set up and carry out measurements in laboratory exercises, can recognise measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.           Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws, Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions. Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.           Types of student activities <ul> <li>Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle</li> <li>Physics working group; edited by Dr. Miklós Horváth: Exercises based on the physics textbook in the Moodle system</li> <li>Kelemen A. :Measurement descriptions based on Physics Laboratory Exercises I in Moodle</li> <li>Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises II in Moodle</li> <li>Ágoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997)</li> <li>R. Feynmann: Modern Physics (Műszaki Könyvkiadó, Budapest, 1986)</li> </ul>				Strives for accuracy in both numerical and laboratory exercises.									
Solve tasks independently using the resources and materials provided. Independently set up and carry out measurements in laboratory exercises, can recognise measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws. Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions. Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.Types of student activities• Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle • Physics working group; edited by Dr. Miklós Horváth: Exercises based on the physics textbook in Moodle • Physics Verking group; edited by Dr. Miklós Horváth: Exercises based on the physics textbook in Moodle • Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises I in Moodle • Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises I in Moodle • Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises II in Moodle • Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises II in Moodle • Agoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997) • R. Feynmann: Modern Physics (Müszaki Könyvkiadó, Budapest, 1986)				Autonomy and responsibility									
Independently set up and carry out measurements in laboratory exercises, can recognise measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws. Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions. Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.Types of student activitiesAttending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.Required literature and contact details• Endre Kiss: Text-based learning material based on the engineering physics textbook in MoodleRecommended literature and contact details• Kelemen A. :Measurement descriptions based on Physics Laboratory Exercises I in MoodleRecommended literature and contact details• Ágoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997) • R. Feynmann: Modern Physics (Müszaki Könyvkiadó, Budapest, 1986)Description of tasks to be whowithed (measurement reports from laboratory exercises Uniformit measurement reports from laboratory exercises				Solve tasks independently using the resources and materials provided.									
measurement errors and estimate their consequences. Can independently process measurement results and calculate errors.           Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws. Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions. Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.           Types of student activities         Attending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.           e         Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle           e         Physics working group; edited by Dr. Miklós Horváth: Exercises based on the physics textbook in the Moodle system           e         Kelemen A. :Measurement descriptions based on Physics Laboratory Exercises I in Moodle           e         Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises II in Moodle           e         Ágoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997)           e         Resurement reports from laboratory exercises				Independently set up and carry out measurements in laboratory exercises, can recognise									
Interstituent results and calculate criots.         Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion, uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws, Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions. Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.         Types of student activities       Attending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.         Required literature and contact details       Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle         Recommended literature and contact details       Kelemen A. :Measurement descriptions based on Physics Laboratory Exercises I in Moodle         Recommended literature and contact details       Ágoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997)         Recommended literature and contact       Measurement reports from laboratory exercises				measurement errors and estimate their consequences. Can independently process									
Short description of the subject content       Interim and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws. Ist and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of atomic physics and quantum mechanics.         Types of student activities       Attending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.         Required literature and contact details       Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle         Recommended literature and contact       Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises I in Moodle         Recommended literature and contact       Ágoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997)         Resurement reports from laboratory exercises       Measurement reports from laboratory exercises				Mechanics of material point, kinematics, dynamics. Uniformly accelerating motion.									
atomic physics and quantum mechanics.         Types of student activities         Attending lectures, solving problems in numerical exercises, active participation in laboratory exercises, taking notes.         Required literature and contact details         Recommended literature and contact details         Resource in the system (Measurement reports from laboratory exercises)         Resource in the system (Measurement reports from laboratory exercises)	Short descr	iption of tl	ne subject content	uniform and accelerating circular motion, momentum, work, energy, power, and related laws. Statics of ideal fluids, Pascal's law, Archimedes' law, buoyancy. Ideal gases, gas laws, 1st and 2nd laws of thermodynamics, entropy, thermal expansion, phase transitions. Electrostatics, DC networks, magnetism and electromagnetic induction. Calculation of alternating current networks. Geometric and physical optics, photometry. Fundamentals of									
<ul> <li>Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle</li> <li>Physics working group; edited by Dr. Miklós Horváth: Exercises based on the physics textbook in the Moodle system</li> <li>Kelemen A. :Measurement descriptions based on Physics Laboratory Exercises I in Moodle</li> <li>Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises I in Moodle</li> <li>Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics Laboratory Exercises I in Moodle</li> <li>Kagoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997)</li> <li>R. Feynmann: Modern Physics (Műszaki Könyvkiadó, Budapest, 1986)</li> <li>Measurement reports from laboratory exercises</li> </ul>	Types of stu	udent activ	vities	Attending le	cs and qu ctures, sol vercises t	antum mech lving proble aking notes	nanics. ms in nu	merical exerci	ses, active	participation in			
Recommended literature and contact <ul> <li>Ágoston Budó: Experimental Physics 1., 2., 3. (National Book Publishing House, Budapest, 1997)</li> <li>R. Feynmann: Modern Physics (Műszaki Könyvkiadó, Budapest, 1986)</li> </ul> Description of tasks to be withing dimeasurement reports       Measurement reports from laboratory exercises	Required lit	erature an	d contact details	En     tex     Ph     ph     Ke     I in     Ha     La	<ul> <li>Endre Kiss: Text-based learning material based on the engineering physics textbook in Moodle</li> <li>Physics working group; edited by Dr. Miklós Horváth: Exercises based on the physics textbook in the Moodle system</li> <li>Kelemen A. :Measurement descriptions based on Physics Laboratory Exercises I in Moodle</li> <li>Hartai J. Kiss E. Spissák L.: Measurement descriptions based on Physics</li> </ul>								
Description of tasks to be submitted/measurement reports from laboratory exercises	<ul> <li>Agoston Budó: Experimental Physics 1., 2., 3. (National Book House, Budapest, 1997)</li> <li>R. Feynmann: Modern Physics (Műszaki Könyykiadó, Budap</li> </ul>								Book Publishing udapest, 1986)				
	Description	of tasks to	be	Measuremen	t reports i	from laborat	ory exer	cises					

Description and timetable of the	Examination papers in weeks 7 and 13: The papers contain 10 test questions, 2 theoretical
workshops	questions to be explained and 2 problems to be solved, for which a total of 100 points can
workshops	be awarded.

#### **Engineering Mathematics 2.**

		in Hungaria	n	Mérnöki ma	tematika 2	Level BSc							
Name of the	e subject	in English		Engineering	Mathema	Code DUEN(L)-IMA-212							
Responsible	e education	nal unit		Institute of I	nformatio	n Technolog	rtment of Math	nematics an	nd Computer Science				
Name of con DUEN(L)-	mpulsory j	prior learnin	g	IMA-152						<u> </u>			
Туре		Presentation	1	Practice		Laboratory		Requirement	Credit	Language of education			
Full time	150/39	per week	0	per week	0	per week	5	english					
Part time	$\frac{150/15}{150}$	per term	0 t	per term	0	per term László Bog	15 nár DhF		schadula	College professor			
Training objective and justification of the course (content, output, location in the curriculum)			n of on in	Goals, deve The purpose statistical me objective of analysing da world situati	<b>Goals, development objectives</b> The purpose of the course is to make the students familiar with analysing data using statistical methods and tools. Having covered this course students understand the objective of probability and statistics, they know the different ways of gathering data, analysing datasets with statistical software and they can make inferences for real world situations based on samples of data								
				Presentation	These for Students text, slig	ormal lectures are expected les or transp	es mostl ed to tak arencies	y aim at transfe e personal note	erring info es in additi	rmation. on to the course			
Typical delivery methods				Laboratory	Studenta exercise analysis expected	s are expected s, feedback with softward.	ed to be on an as are packa	actively involv signment or pr age personal in	ed. Wheth acticing st put will al	er it is about atistical data ways be			
				Other									
Requirements (expressed in terms of learning outcomes)			of	Students wil described by Students wil appropriate 1 from their m Students wil communicat presentation Students wil related to fut <b>Ability</b> Students wil the related fi <b>Attitude</b> Collaborate Open to lear Strives for a <b>Autonomy</b> a Taking respondent	I have a so quantitat I demonst level and c ajor to rea I demonst ing critica s. I acquire t ture career I be able t eld. with class ning and a <u>ccuracy in</u> <b>and respo</b>	blid foundative data. rate their ab demonstrate al world moorate mastery lly reasoned up-to-date share choices. o read, inter mates and the applying moorable both numer <b>nsibility</b> for your own	ility to a their abi dels. of data analysi kills and pret, and pret, and he teached dern inv rical and h work a	alysing proces pply statistics i lity to apply ki analysis and st s through writt 'or applications I critically anal er to develop ki estigative techi laboratory exe nd the work of	ses or phe in other fie nowledge a ratistical co en and ora s of compu- yse journa nowledge. niques. ercises.	nomena elds at an acquired oncepts by 1 iter use I articles in			
Short descri	ption of th	e subject co	ntent	During the course students will be engaged in the following topics: introduction, descriptive statistics, probability, random variable, method of estimation, test of hypotheses, simple linear regression									
Types of stu	ident activ	ities		Frontal work Individual or Testing 20%	x 30% r group we	ork 50%							
Required lit	erature and	d contact det	ails	<ul> <li>James T. McClave, P. George Benson, Terry Sincich : Statistics for Business and Economics. Ed 12th. Pearson Education, Inc. 2014.</li> <li>Douglas C. Montgomery George C. Runger : Applied Statistics and</li> <li>Probability for Engineers. Ed 5th. John Wiley &amp; Sons Inc. 2011.</li> <li>Moodle textbook</li> </ul>									
Recomment details	ded literatu	are and conta	act	<ul> <li>http://onlinestatbook.com/2/index.html</li> <li>James T. McClave, P. George Benson, Statistics for business and economics, Twelfth edition, Info Tech, Inc., University of Florida.</li> </ul>									
Description	of tasks to	be											
Submitted/n	and timet	nt reports											
workshops	and timeta	able of the											

#### Industrial materials

NI 6.4	1. (	in Hungari	an	Műszaki any	agismeret	Level BSc						
Name of the	e subject	in English		Industrial m	aterials		Code	Code DUEN(L)-MST-210				
Responsible	e educatior	nal unit		Institute of T	Technolog	y, Departme	nt of Str	ructural Integri	ty	·		
Name of co DUEN(L)-	mpulsory	prior learni	ng		¥			<u> </u>	•			
Туре		Presentatio	on	Practice		Laboratory	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	5	english				
Teacher res	ponsible fo	or the subje	ct	Name		Zsolt Csepe	li, PhD	•	schedule	College professor		
Training objective and justification of the course (content, output, location in the curriculum)		on of on in	Goals, deve The aim of t which they w that determ macroscopic types of mat between the materials for	lopment of the course will becom- ines mate propertie erials (me structure a a given a	bbjectives is to provide the familiar we erial proper s, and the mi- tals, ceramic and propertie pplication in	student ith the s ties, the croscop s, polyn es of ma simple	ts with a basic l tructure of mat e types of c ic structure and ners). Students terials, enablin cases.	knowledge erials, the hemical b d methods will learn g them to s	e of chemistry, through electron shell structure bonds that determine of analysis of different about the relationships select the most suitable			
				Presentation	Projecto	or, ppt lectur	es, learn	ing materials a	vailable in	n moodle.		
Typical delivery methods				Practice Laboratory Other	Laborat	ory measure	ments a	nd calculations				
Requirements (expressed in terms of learning outcomes)			s of	Have a comprehensive knowledge of the basic facts, directions and limits of the subject area of engineering. Knowledge of the general and specific mathematical, scientific and social principles, rules, contexts and procedures necessary for the operation of the field of engineering. Thorough knowledge of the materials used in the field of engineering, the methods of their manufacture and the conditions of their use. <b>Ability</b> Ability to plan, organise and carry out independent learning. <b>Attitude</b> Open to learning and absorbing knowledge related to chemistry and materials related to their qualifications and areas of expertise. Interested in new methods and tools related to the field. <b>Autonomy and responsibility</b> It takes its decisions independently, in consultation with other disciplines, and take								
Short description of the subject content				Atomic structure. The structure of the periodic table. Electron configuration. Types and characteristics of chemical bonding. Electron affinity, electronegativity, oxidation number. Strong bonds. Weak bonds. General characterisation of metals, reactivity. Basic knowledge of organic chemistry. Grouping of carbon compounds, nomenclature. Isomerism. Main reactions of organic substances. Interconnection of macromolecules as a basis for polymer production. Basic knowledge of silicate chemistry. Basic knowledge of colloid chemistry. State change in solid phase processes. Polymorphic transformation. Types of engineering materials. Structure - processing - properties interaction. Crystal structure, crystal systems. Crystal, crystallite. Crystal lattice defects. Movement of atoms in matter, diffusion. Phases and constituents of metallic materials. Significance, definition of equilibrium phase diagrams. Basic types of two-element equilibrium phase diagrams.								
Types of stu	udent activ	vities		Processing of heard text with annotation 50%. Conducting material tests 30%. Evaluation of measurements, preparation of report 20%								
Required lit	terature and	d contact de	etails	<ul> <li>Balázs Verő, Éva Dénes, Zsolt Csepeli:Introduction to the Engineering Materials Science, Főiskolai Kiadó, Dunaújváros</li> <li>Éva Dénes, Péter Farkas, Zsoltné Fülöp, Zoltán Szabó.</li> </ul>								
Recommendetails	ded literati	ure and con	tact	Dr     inv	:. Tamás T vestigatior	°óth: Mechaı ı. Főiskolai I	nical pro Kiadó, E	perties of mate Dunaújváros, H	erials and 1 ungary	methods of their		
Description submitted/n	of tasks to neasureme	o be nt reports		The student	shall draw	up a measu	rement	report on the m	easuremer	nts carried out.		
Description workshops	and timeta	able of the		A final pape	r in weeks	6 and 12 fr	om the l	ectures and lab	oratory cla	asses.		

#### Thermodinamics

	1.	in Hungari	ian	Termodinan	nika	Level	BSc						
Name of the	ne subject	in English		Thermodina	mics				Code	DUEN(L)-MST-250			
Responsib	le education	nal unit		Institute of 7	Institute of Technology, Department of Mechanical Engineering and Energy								
Name of c DUEN(L)·	ompulsory	prior learnii	ng										
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education			
Full time	150/39	per week	1	per week	0	per week	5	english					
Fart time	130/13	per term	J ot	Nama	0	per term Imro Kováo			cabadula	-			
Teacher re	sponsible i	or the subje	ci	Coals deve	Name [Imre Kovacs, PhD schedule]								
Training objective and justification of the course (content, output, location in the curriculum)			on of on in	The Thermo materials en curriculum. thermodyna	The Thermodynamics curriculum covers the specific set of natural laws that provide naterials engineers with the essential knowledge and foundation for a professional curriculum. After completing this module, students should be able to analyse processes in hermodynamics and perform energy calculations.								
				Presentation	A prese	ntation for a	ll studer	nts. Use of proj	ector, over	head projector.			
Typical de	liverv meth	ods		Practice									
i j prour de	in er j men			Laboratory	Minden	hallgatónak	laborate	óriumi gyakorl	at.				
				Other	Other								
Paquiromo				Knowledge You will hay Ability	You will have theoretical and practical knowledge of the subject. <b>Ability</b> Ability to carry out tasks related to the subject of the course.								
learning of	utcomes)	sed in terms	\$ 01	Attitudo	illy out tas	sks telateu to	o the sub	ject of the cou	180.				
icaning of	uteomes)			Develops th	e necessar	v attitude to	solve te	chnical proble	me				
				Autonomy	and resno	y attitude to	30170 10	enniear probler					
				Taking responsibility for its work									
Short description of the subject content				The thermodynamic system. Main principles and basic concepts of thermodynamics. Thermodynamic functions and their applications. Enthalpy, entropy, free enthalpy. Phase equilibria. Phase transitions: evaporation, boiling, freezing in a single component system. Multicomponent systems: mixtures, blends, solutions, compounds. Gas behaviour and basic concepts of kinetic gas theory. Thermodynamic investigation of the end-to-end potential of chemical reactions using free enthalpy and normal free enthalpy. Thermodynamic study of combustion masting reduction and oxidation processes									
Types of s	tudent activ	vities		Task solving	g with guid	dance 20 %							
Required l	iterature an	d contact de	etails	• 1. 20	P.W. Atk 02. 2. Sz	ins : Physica xegedi J.: Me	l Chemi tallurgy	stry I., III. Nen of metallurgic	nzeti Tank al process	önyvkiadó, Budapest, es.			
Recommen details	nded literati	ure and con	tact	György Diószegi: Mechanical Engineering Handbook. Technical Book     Publishing House, Budapest, 1988.									
Descriptio submitted/	n of tasks to measureme	o be nt reports		The formal teacher.The in a frame, v	requirement calculation vith the ur	nts of the ass ns must be p nit of measur	signmen resentec ement c	t must be comp l in several step learly indicated	pleted in th ps, the resu d. The form	e form given by the ilts must be presented nal requirem			
Descriptio workshops	n and timet	able of the		Students are examination expository of	required , the stude or test form	to write 2 Fin ent will answ 1.	nal Exar ver quest	n papers during ions and solve	g the seme computati	ster. In the final onal problems in an			

#### Basics of machine design

Name of the	aubiaat	in Hungari	an	Géptervezés	alapjai	Level BSc						
Iname of the	e subject	in English		Basics of ma	achine des	ign	Code	DUEN(L)-MUG-222				
Responsible	education	nal unit		Institute of 7	Fechnolog	y, Departme	nt of Me	echanical Engi	neering an	d Energy		
Name of co DUEN(L)-	mpulsory	prior learnii	ng	MUG-212 MUG-152 MGT-111								
Туре		Presentatio	on	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 5	per week per term	0	М		english		
Teacher res	ponsible f	or the subje	ct	Name	Name Szabó Attila, PhD schedule <sup>Coll</sup>							
Training objective and justification of the course (content, output, location in the curriculum)			on of on in	Goals, deve The student components standard par components computer to Engineering assemblies.	lopment of should 1 , assemblic ts for suc . Be able ols. The s I, CAD	bbjectives know the c es and sub-a h units, dete to prepare tudent will t and Mecha	onstruct ssemblic ermine the drawing be able t unics I	ion and oper- es used in engin he main dimer documentatic o apply the kn to the constru	ation of t neering pra asions, and on of units owledge a action of	ypical machine parts, actice. Be able to select design the associated using traditional and cquired in Mechanical simple structures and		
				Presentation	projecto	or		e, using lecture	e, rower r			
Typical deli	very meth	lods		Practice Laboratory	Small g	roup of up to	o 25 peo	ple, sketching,	drafting, c	calculation exercises		
				Other Vice and a data								
Requirements (expressed in terms of learning outcomes)			s of	<ul> <li>Have a comprehensive knowledge of the basic facts, directions and limits of the sare of engineering.</li> <li>You know the terminology, key concepts and theories related to your field.</li> <li>You have a comprehensive knowledge of the main theories and problem-solving m in your field.</li> <li>Basic knowledge of machine design principles and methods, machine manufatechnology, control procedures and operating processes.</li> <li>Comprehensive knowledge of the operating principles and structural units of the mapower tools, mechanical equipment and tools used.</li> <li>In-depth knowledge of learning, knowledge acquisition, data collection methods ethical limitations and problem-solving techniques in mechanical engineering.</li> <li>Understand, characterise and model the structure and operation of the structural un elements of mechanical systems, the design and interrelationship of the system compused.</li> <li>Apply the related computational and modelling principles and methods of engir product, process and technology design.</li> <li>Ability</li> <li>Performs the job according to his/her qualifications.</li> <li>Ability to plan, organise and carry out independent learning.</li> <li>Ability to build basic models of technical systems and processes.</li> <li>Routinely identifies professional problems, explores and formulates the theoretic practical background necessary to solve them, and solves them by applying st operations in practice.</li> <li>Attitude</li> <li>Open to learning and absorbing knowledge related to mechanical engineering rel his/her qualifications and area of expertise. Interested in new methods and tools rel the field.</li> </ul>					d limits of the subject ur field. bblem-solving methods tachine manufacturing l units of the machines, lection methods, their ngineering. the structural units and the system components ethods of engineering nulate and solve them ctical background. tes the theoretical and by applying standard engineering related to ods and tools related to			
Short descri	ption of th	ne subject co	ontent	Repeutive parts or units of machinery performing the same function and having a similar design - machine components. Definition, grouping, description, description, representation, strength dimensioning, correct construction, operation and maintenance of machinery parts. The main machine components or groups to be discussed in detail are: drive and connecting screws, shafts, shaft couplings, couplings, bearings, belt drives, gears. In the discussion of the subjects, the emphasis is on the illustration and overview of the								
Types of st	ident activ	vities		Processing t	heoretical	material wit	h mide	nce 20 %				
r ypes of st	actit dettiv	11103		1 rocessing t	neoreneal	material WI	ii guiudi	100 20 70				

	Independent processing of theoretical material 20 %
	Task solving with guidance 20 %
	Independent processing of tasks 40 %
	Laboratory measurements under supervision
	Preparation of laboratory reports.
Required literature and contact details	<ul> <li>László Tóth- Tamás Zahola: Mechanical Engineering. Zahra Zahola. Főiskolai Kiadó</li> <li>Dr. Péter Szendrő and co-authors, Mechanical Engineering BSc. textbook. 2007. Mezőgazda Kiadó, Budapest, 758 p.</li> </ul>
Recommended literature and contact details	<ul> <li>Dr. József Őze: Mechanical Elements I/2. I/3. I/4. I/5. I/6. I/7. I/8. manuscripts.1.</li> <li>Árpád Zsáry:Machine Elements II., Budapest, 1991.</li> <li>György Diószegi: Mechanical Engineering Handbook. Technical Book Publishing House, Budapest, 1988.</li> <li>István Majdán: Technical Pocketbook. Technical Book Publishing House, Budapest, 1995.</li> <li>Géza Nagy: Atlas of Mechanical Engineering. GTE ME Machine Elements Department, Budapest, 1991</li> <li>4000 SKF Bearing Master Catalogue</li> </ul>
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	

#### Mechanics 2.

Nome of the subject	in Hungari	an	Mechanika 2	2.				Level	BSc			
Name of the subject	in English		Mechanics 2	2.		Code	DUEN(L)-MUG-257					
Responsible education	al unit		Institute of T	Technolog	y, Departme	neering an	d Energy					
Name of compulsory p DUEN(L)-	orior learnir	ng	MUG-152		2 / 1			<u> </u>				
Туре	Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education			
Full time 150/39	per week	1	per week	2	per week	0	Е	5	english			
Tant time 150/15	per term	3	Nama	10	per term Dála Dalatás			a a ha dula	Drofogger emeritus			
reacher responsible ic	or the subject		Name Caala daval		bela Palotas	s, PhD		schedule	Professor emeritus			
Training objective and the course (content, ou the curriculum)	l justificatio htput, locati	on of on in	The student the concepts will learn ab method.	The student will learn the mechanical principles of complex structure design by applying the concepts and contexts presented in the lectures to exercises and home preparation. You will learn about the statics of structures, limit states of use, the basics of the finite element method.								
		Presentation	All stud	ents in a larg	ge lectur	e, using Power	Point and	overhead projector.				
Typical delivery meth		Practice	Small ta	ible for up to	o 25 peoj	ple, calculation	exercises					
J. T. J.			Laboratory	12-perse	on laboratory	y exercis	se in solid mec	hanics and	finite elements			
			Other	Other								
			Knowledge Have a com area of engir Knowledge of contexts and You know th You have a of in your field	prehensive neering. of the gene procedure termino comprehee	e knowledge eral and spec es necessary ology, key co nsive knowle	e of the fific mat for the oncepts a edge of t	basic facts, dir hematical, scie operation of th ind theories rel he main theori	rections an ntific and s e technical ated to you es and pro	d limits of the subject social principles, rules, l field. ur field. blem-solving methods			
Requirements (expressed in terms of learning outcomes)			Ability to identify routine professional problems, to identify, formulate and solve them (using standard operations in practice) against a theoretical and practical background. Ability to build basic models of technical systems and processes. Attitude Open to learn about and embrace developments in mechanics related to his/her qualifications and area of expertise. Interested in new methods and tools related to the field Autonomy and responsibility									
			Taking respo	onsibility	for your own	work a	nd the work of	others.				
Short description of the subject content			Statics of structures: classification of supporting structures. Articulated multi-girder, triple- jointed frame, truss and additional support structures - strength analysis, determination of support forces and loads. Rope structures. Friction, slip connections and their application in engineering. Applied strength of materials: working principles of strength of materials. Their application to the determination of displacements of rod structures. Approximate methods for determining displacements. Basic concepts of the finite element method. Solution of statically indeterminate structures by force method. Stability problems of flexible bodies: in-plane and spatial rod deflection, buckling. Flexible-ductile deformations, dimensioning of rod structures using ductile principles. Fatigue									
Types of student activ	ities		Theoretical material processing with guidance/independently: 20/30% Task completion with guidance/independent: 10/20 % Laboratory work under supervision: 20 %									
Required literature and	l contact de	etails	• • Su • • Du	Sz pporting S Dr 1naújváros	őnyiné Passa Structures I/A Vigh S. ed. s, DF Kiadó,	a Erzséb A, Budaj : Techn Dunaúj	et - Dr. Koppá pest, Nemzeti ical mechanics város, 2003.	ny Imre: M Fankönyvk II/B colleg	1echanics - kiadó 1998. ge notes,			
Recommended literatu details	act	<ul> <li>Departmental Working Group: Engineering Mechanics I. Elementary Statics, Workbook, Dunaújváros, ME DFK Publishing Office, 1994.</li> <li>Departmental Working Group: Engineering Mechanics II/2. Applied Strength, Workbook. DF Publishing House, Dunaújváros, 2002.</li> <li>Dr. Sándor Vigh - Béláné Szlávik - Dr. Gyula Izsák: Technical Mechanics I. Manual Part 2, Dunaújváros, DF Publishing Office, 2000.</li> <li>Dr. Vigh S.ed.: Engineering Mechanics II. Tutorial II/B, college notes. DF Kiadó, Dunaújváros, 1998.</li> </ul>										
Description of tasks to submitted/measurement	be nt reports								2-1			

Description and timetable of the	
workshops	

#### Heat and Fluid Dynamics

Name of the subject in Hungarian				Hő- és áram	lástan		Level BSc							
Name of tr	ne subje	ct	in English		Heat and Flu	uid Dynan	nics		Code DUEN(L)-MUT-250					
Responsib	le educa	ation	al unit		Institute of 7	Fechnolog	y, Departme	ent of M	echanical Engi	neering an	d Energy			
Name of co DUEN(L)-	ompuls -	ory p	prior learnin	ng	MUT-151									
Туре			Presentatio	n	Practice		Laboratory		Requirement	Credit	Language of education			
Full time	150/3	89	per week	1	per week	1	per week	1	Е	5	english			
Part time	150/1	<u>5</u>	per term	5	per term	5	per term	5	_	111-	Callere and			
Teacher re	sponsio biective	and	iustificatio	n of	Roals deve	lonment d	Endre Kiss,	PnD		schedule	College professor			
the course	(conten	it, ou	tput, locati	on in			• 1 11	1.0	• • • •	a • 1 1				
the curricu	ılum)		•		The study of	t the pract	ical problem	is solutio	ons in heat and	fluid dyna	mics.			
Typical delivery methods				Presentation	Presentation For all students, using a large speaker, a board presentation, a projector or an overhead projector									
			Practice	Practice For every students, problem solving in small groups										
					Laboratory	Measur	ements in pa	irs						
					Other									
					Knowledge	v awara o	f the basic f	acts dir	ections and bo	undaries o	f the field of technical			
					expertise. Y	ou are fai	niliar with t	he gene	ral and specifi	ic rules, co	intexts and procedures			
					necessary fo	or the culti	vation of the	e technie	cal field. He ki	nows the c	oncept of his field, the			
					most import	ant contex	ts and theori	es. He is	s fully familiar	with the m	ain theories of his field			
					of knowledg	ge and pro	blem solvin	g Metho	ods. At the em	ploying lev	vel, he is familiar with			
					the measure	ment proc	edures used	in mech	nanical enginee	ering, their	tools, instruments and			
					design and r	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 capabl	It is capable of basic analysis of the disciplines that make up the technical field of								
					knowledge, the synthetic formulation of correlations and the activity of evaluating the									
					quality. It is able to apply the most important terminology, theories and procedures of the technical									
					field in which they are performed.									
					It is able to identify routine professional problems, to solve them in principle and									
					to explore, formulate and provide practical background (standard operations									
					(e.g., the application of this problem).									
					It is able to understand and use the typical expertise, computer science and library resources									
					of its field.	The knowl	ledge acquire	ed is cap	able of carryin	ig out tasks	s in its field			
Requireme	ents (exp	press	sed in terms	s of	It is capable	of creatin	g basic mod	els of te	chnical system	s and proc	esses.			
learning ou	utcomes	;)			manner, ora	lly and in	writing.	r motne	r tongue in a j	professiona	ai, professional fyande			
					Attitude	2	U							
					He accepts a	and auther	ntically repre	esents th	e social role o	f his profe	ssion, his fundamental			
					It is open to	the know	vledge and	acceptar	nce and auther	ntic transm	ission of professional,			
					technologica	al develop	ment and ini	novation	in the field of	technolog	y.			
					It strives to	resolve pr	oblems as m	uch as p	ossible in coop	peration wi	th others.			
					With suffici	ent endura	ance and more	notony t	olerance to car	ry out prac	ctical activities			
					Have. Using his :	acquired t	echnical kn	owledge	e he strives t	o learn m	ore about observable			
					phenomena,	to describ	be and explai	in his les	galities.	o iouin n				
					In the cour	se of its	work, it co	mplies v	with and enfo	rces the r	elevant safety, health,			
					environmental and quality assurance and control requirements.									
			Autonomy	and respo	nsibility	· ·	41 14 1							
			Even in une	xpected de	constant and issues and	ng situa develor	uons, it independent	asis of spe	kes a look at the broad,					
					In carrying	out his pro	ofessional di	ities, he	also cooperate	es with au	alified professionals in			
			other fields	(primarily	technical, e	conomic	and legal).	. 1	1					
					Share your e	experience	s with collea	agues to	help them gro	w.				
					It takes resp	onsibility	tor the cons	equence	s of its technic	al analyse	s, its proposals and the			
					practical act	at are tak	en. with suff	icient e	nourance and	monotony	toterance to carry out			
				Have.										

	Using his acquired technical knowledge, he strives to learn more about observable phenomena, to describe and explain his legalities. In the course of its work, it complies with and enforces the relevant safety, health, environmental and quality assurance and control requirements.							
Short description of the subject content	The basics of fluid dynamics and thermodynamics. Euler and Bernoully equations, Haagen-Poiseuille equations, viscosity, laminar and turbulent flow, pressure drag in turbulent flow. Pressure drop in fittings. Impulse theorem. Similarity. Solid body in viscous substance. Intensive and extensive quantities. Uneversal and unified gas law. The mechanical work and the heat, and the firstlaw of thermodynamics. Isochoric, isobaric, isotherm and adiabatic processes. The politropic process. Cycles. Otto and Diesel cycles. Enthalpy, entropy, the second law of thermodynamics. Real gases. Thermal energy transport, conductance. convection and radiation. Heat pump and refrigerator.							
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 preparation 30%							
Required literature and contact details	<ul> <li>Kiss E. Heat and Fluid Dynamics Electronic notes (Moodle)</li> <li>Kiss E. Heat and Fluid Dynamics Problem solving Electronic notes (Moodle)</li> <li>Kiss E. Laboratory syllabuses Electronic notes (Moodle)</li> </ul>							
Recommended literature and contact details	•							
Description of tasks to be submitted/measurement reports	Full time: 5 measurement reports Part time: 3 measurement reports							
Description and timetable of the workshops	There are two tests during the semester. the first is in the 6th, and the second in the 13th week. The test is consisting of 10 freechoise questions (max. 30 points), two assay questions (max 20 points), and two problems tos olve for 50 points. If the res							

#### Mathematics 3.

	a 1° .	in Hungarian 🛛 🛛		Matematika	3.		Level	BSc			
Name of t	the subject	in English		Mathematic	s 3.		Code	DUEN(L)-IMA-110			
Responsit	ble education	nal unit		Institute of I	nformatio	n Technolog	y, Depa	urtment of Math	nematics a	nd Computer Science	
Name of a DUEN(L)	compulsory j )-	prior learnii	ng	IMA-152					•		
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education	
Full time Part time	150/39 150/15	per week per term	0	per week per term	3 15	per week per term	0	М	5	english	
Teacher r	esponsible for	or the subje	ct	Name		Nagy Bálin	t. PhD		schedule	Associate professor	
Training objective and justification of the course (content, output, location in the curriculum)			on of on in	Goals, deve Azoknak a elsajátításáh szakirodalor legfontosabl Rendelkezik számítógép-	Joals, development objectives Azoknak a matematikai, függvénytani alapoknak a megszerzése, melyek a szaktárgyak Isajátításához nélkülözhetetlenek, valamint matematikai ismeretek bővítése a szakirodalom tanulmányozásához. Ismeri és érti a szakterület műveléséhez szükséges egfontosabb matematikai összefüggéseket és az ezeket felépítő fogalomrendszert. Rendelkezik az alkalmazott matematikai fogalmak elsajátítását segítő valamely számítógép-algebrai rendszer ismeretével a feladatok elvégzéséhez.						
Typical delivery methods				Presentation Practice Laboratory	Presentation Practice Fogalmak, módszerek ismertetése nagy előadóban, táblás előadás. aboratory						
Requirements (expressed in terms of learning outcomes)			s of	Other Knowledge Knows the n IT field. He education re Ability Able to app problem-sol it in debates Able to effe learning ress Attitude They are op related to the related to the Autonomy They take re in the same	Databolities         Other         Knowledge         Knows the methods and procedures required to solve mathematical tasks appropriate to the IT field. He has the knowledge and knowledge of the mathematical and functional education required for his field of expertise.         Ability         Able to apply the learned mathematical knowledge and activity system. Uses learned problem-solving methods and procedures. Able to prepare own solution plan and to defend it in debates (argumentative debate skills) in relation to learned mathematical concepts. Able to effectively organize your own learning process, find and use a wide variety of learning resources (printed, electronic)         Attitude         They are open to learning about and accepting mathematical development and innovation related to their qualification and field of expertise. Interested in new methods and tools related to the field.         Autonomy and responsibility						
Short dese	cription of th	ie subject co	ontent	Special diff surfaces of Numerical i Variable tra differential second orde	erentiatior revolutio integratior ansformati equations r different	iation rules. Geometric application of derivatives. Area. Volumes and olution. Length of a curve. Centre of gravity. Multiple integration. ration. Solving nonlinear equations. Separable differential equations. rmation: ax+by+c. Variable transformation: y/x. First order linear tions. Second order linear differential equations. Missing variable in ferential equations.					
Types of s	student activ	ities		Processing t material. Ta Processing c	heoretical sk solution of informa	material with n with contro tion individu	th guida ol. Indep tally and	nce. Independe bendent process d in groups. Co	nt process sing of task nflicting o	ing of theoretical ks. Text interpretation. pinions. Le	
Required	literature and	d contact de	etails	• Ta El	ılata, I.: A ectronic S	Guide to M tudy Guide	athemat	ical Analysis, I	Dunaújváro	os, 2007, pp. 1- 79.	
Recomme details	ended literatu	ire and con	tact	• Finney, R. L.; Thomas, G. B.: Calculus, Addison-Wesley, New York, 1990.							
Submitted/measurement reports											
Descriptio workshop	on and timeta	able of the		During the semester, there are two compulsory tests: one (maximum 50 points) on the 6th week in the practice session, the second (maximum 50 points) on the 12th week in the practice session. The tests consist of questions on theoretic and applied problems							

#### **Materials Science**

Name of the subject in Hungarian			Műszaki anyagtudomány					Level	BSc			
Name of the subje	ect	in English		Materials Sci	ence				Code	DUEN(L)-MGT-116		
Responsible educa	ation	al unit		Institute of T	echnolog	y, Departme	nt of Str	uctural Integri	ty	· · /		
Name of compulse DUEN(L)-	ory p	rior learnin	g		<i>.</i>	<u>, , , , , , , , , , , , , , , , , , , </u>			<u>.</u>			
Туре		Presentation	n	Practice		Laboratory		Requirement	Credit	Language of education		
Full time 150/3	39 15	per week	1	per week	0	per week	2	М	5	english		
Teacher responsib	le fo	r the subjec	t	Name	0	Zsolt Csepe			schedule	College professor		
Training objective the course (conten the curriculum)	e and it, ou	justification tput, location	n of on in	Goals, devel The aim of th and principle is to enable s materials in t	Goals, development objectives The aim of the course Technical Materials Science I is to familiarise students with the laws and principles governing the structure of solid materials used in technical practice. The aim is to enable students to apply the knowledge acquired about the structure and properties of materials in their future studies and work.							
				Presentation	resentation Projector, ppt lectures, learning materials available in moodle.							
Typical delivery n	netho	ods		Practice				1 1 1				
51 5				Laboratory	Laborat	ory measure	ments a	nd calculations				
Requirements (expressed in terms of learning outcomes)			of	Other Knowledge Ismeri az a (alapszintű) törvényszerű makroszerke: alapvető es: folyamatokat Ability The ability t structural fea accident prev adapt process requirements Hungarian ar Attitude Strive to keep professional decisions by the stamina a Autonomy a Directs the machinery ar effectiveness the profession in their effort	nyagi re matemati ségeire. zetét, a zközök i zközök i o apply t atures. Un vention re ses to mee in his/he ad foreign o their self goals. He seeking t nd toleran nd respo work of ad equipn and safet nal develo ts in this o	endszerekber ikai leírását Széles kör szerkezet v működési o he knowled nderstands a quirements a quirements er field. Und languages s f-education i e/she will e the opinion o nce of mono nsibility the personr nent. Carries ty of the wo opment of hi direction. As	n zajló , külön űen isr izsgálata elvét, i ge acqu and appi specific nts. Abil lerstand pecific t n materi ndeavou of his/he tony req mel assig s out saf ck of sul s/her su ssists ju	alapvető fizi ös tekintettel neri a sziláro ához szüksége lletve a szer ired about the lies the enviro to his/her field ity to comply v s and uses the to his/her field als engineering ur to carry out er supervisors, uired to carry out gned to him/h fety and health pordinates. He/ bordinates and nior staff in the	kai-kémiai a termod d anyago es alapveté kezetek structure nmental, l d of special with the leg online an of speciali g continuou : his/her ta preferably out practic er, superv a duties. A /she is resp for manag eir professi	i folyamatokat, azok dinamika és kinetika k atomi, mikro- és ő módszereket és az kialakulását előidéző of materials and their health and safety and lisation, and is able to gislation and economic d printed literature in sation. us and in line with their asks and management v in cooperation. Have al activities. ises the operation of ssesses the efficiency, ponsible for promoting ing and assisting them fonal development and		
Short description of the subject content			In their efforts in this direction. Assists junior staff in their professional development as career progression. Engineering Materials Science I starts from the characteristics of the four states of matt and progresses to a discussion of homogeneous and heterogeneous polycrystalli materials. It discusses the nature of the interactions between the building blocks of soli and the structure of atoms, with particular reference to the quantum number system. analyses the mechanism of formation of strong and weak bonds, the importance of t directional and non-directional nature of bonds and the scale of building blocks. It dea with the seven crystal systems and the 14 Bravais lattices, but also incorporates rece results beyond the classical categories. It discusses the lattice structure of pure meta possible variations of phases in alloys, and types of ionic crystals. A significant part of t course is devoted to the thermodynamics essential for the description of equilibriu systems, the presentation of equilibrium phase diagrams of single- and multi-eleme systems, and the analysis of qualitative and quantitative information that can be extract from such diagrams. As a counterpoint to the structure of the ideal crystal, ample space devoted to the discussion of 0-, 1- and 2-dimensional lattice defects. The discussion lattice defects is not limited to metallic materials, but also includes an analysis of latti defects in ionic and covalently bonded crystals. The properties and structure of the gra boundaries and phase boundaries considered as lattice defects will be discussed particular, since the structure of the array nanostructured materials, which represent one the meta-since the structure of the array nanostructured materials, which represent one the meta-since the structure of the array nanostructured materials, which represent one						the four states of matter eneous polycrystalline ilding blocks of solids um number system. It the importance of the hilding blocks. It deals so incorporates recent ucture of pure metals, a significant part of the ription of equilibrium le- and multi-element in that can be extracted crystal, ample space is cts. The discussion of s an analysis of lattice l structure of the grain will be discussed in which represent one of ly be understood by grain boundaries. The			

	course concludes with a discussion of diffusion, the transport process in solids. In the discussion of each material science phenomenon, a method based on the relevant body of knowledge or suitable for the study of the particular material science phenomenon is also described.
Types of student activities	Attending lectures and taking notes, solving computational problems in laboratory exercises and carrying out laboratory measurements.
Required literature and contact details	<ul> <li>Balázs Verő, Éva Dénes, Zsolt Csepeli: Introduction to engineering materials science. Dunaújváros College Publishing House, Dunaújváros, 2010. József Verő, Mihály Káldor. Metallurgy</li> </ul>
Recommended literature and contact details	<ul> <li>Tamás Tóth: Materials science: the basics of engineering materials science, Dunaújváros College, Dunaújváros. DF Publishing House, Dunaunaztam University of Dunauntas, Dunauntas, Dunauntas, Dunauntas, 2003.</li> <li>József Verő, Mihály Káldor.</li> <li>János Prohászka: Mechanical Properties of Metals and Alloys, Budapest University of Technology and Economics, Budapest University of Technology and Economics, 2003.</li> <li>Mihály Káldor: Physical Metallurgy, Hungarian Iron and Steel Association, 1993.</li> </ul>
Description of tasks to be submitted/measurement reports	The student shall 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.

#### **Reaction kinetics**

	Isma of the subject		in Hungarian 🛛 I		tika		Level	BSc			
Name of the	subject	in English		Reaction kir	netics		Code	DUEN(L)-MGT-157			
Responsible	education	al unit		Institute of 7	Fechnolog	y, Departme	nt of M	echanical Engi	neering an	d Energy	
Name of cor	npulsory p	orior learni	ng								
DUEN(L)-		1				1		T	1	1	
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education	
Full time	150/39	per week	1	per week	1	per week	1	F	5	english	
Part time	150/15	per term	5	per term	5	per term	5	E	5	english	
Teacher resp	onsible fo	or the subje	ect	Name		Imre Kovác	s, PhD		schedule		
Training objective and justification of the course (content, output, location in the curriculum)			on of ion in	Goals, deve After compl chemical kir basic laws o homogeneou	lopment of eting the metics, be a of homogous and hete	<b>Objectives</b> module, stuc able to apply eneous and erogeneous e arning the b	lents wi the bas heteroge electroch	Il know the bas ic concepts of eneous reactive memical system	sics of che reaction ki e and non- s.	emical equilibrium and inetics, and acquire the -reactive systems, and	
Tunical delivery matheda				Presentation	course,	you will ana /real chemic	lyse the al reacti	application of ons.	basic ther	modynamic laws to	
Typical delivery methods				Practice	Blackbo	oard presenta	ation, us	e of projector.			
				Laboratory	Blackbo	oard calculat	ion exer	cise			
				Other	Student	laboratory p	ractice				
				Knowledge							
Requirement	ts (express	sed in term	s of	Ability You will be able to design chemical reactions, select the apparatus, perform theoretical reaction kinetics and thermodynamic calculations.							
learning out	comes)			Attitude Be able to identify technical problems and outline possible solutions							
				Autonomy and responsibility							
				You will be able to assess the health and environmental hazards inherent in the occurrence and execution of chemical reactions, and to create the necessary safety preconditions.							
Short descrij	ption of th	e subject c	ontent	The direction of chemical processes and chemical equilibrium. Basics of chemical kinetics, experimental methods, empirical rate equation, mechanism of reactions. Activation, its types, catalysis, kinetics of homogeneous and heterogeneous and quasi-heterogeneous chemical reactions. Diffusion. Physical chemistry of aqueous solutions. Nernst equation. Fundamentals of electrochemistry. Corrosion. Crystallisation of metallic compounds.							
Types of stu	dent activ	ities		Attending le completing l semester's cr	ctures and aboratory urriculum	l taking note work. Givir	s, solvin 1g a shoi	ng calculation p rt presentation	oroblems in on a topic	n exercises and related to the	
Required lite	erature and	l contact d	etails	<ul> <li>P.W. Atkins : Physical Chemistry I. Nemzeti Tankönyvkiadó, Budape</li> <li>P.W. Atkins : Physical Chemistry III. Nemzeti Tankönyvkiadó, Budap 2002.</li> </ul>						iadó, Budapest, 2002. kiadó, Budapest,	
Recommend details	ed literatu	ire and con	tact	• Sz Li	egedi J.: N szi: Physio	Metallurgy o cal Chemistr	f metall y Veszp	urgical process prém, Universit	es. Dr. En y Publishi	dre Berecz. János ng House, 1993.	
Description submitted/m	of tasks to easuremen	be ht reports		Submission	of a labora	atory measur	rement r	eport.			
Description workshops	and timeta	able of the		1 written fin	al paper fi	rom the lectu	ires give	en during the se	emester in	the last class.	

#### Production technologies of nuclear power plant devices

in Hungarian		Atomerőmű	i berendez	esek gvártás	ógiáia	Level	BSc					
Name of the	e subject	in English		Production t	echnologi	es of nuclear	nower	nlant devices	Code	DUEN(L)-MST-150		
Responsible	e education	al unit		Institute of 7	Technolog	v Denartme	nt of Str	uctural Integri	tv			
Name of co	mulsory r	rior learnir	וס	institute of 1	reennoiog	y, Departite	int of Su	ueturar mitegri	ly .			
DUEN(L)-	inpuisory j		Ig					Γ	1			
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	1	per week	0	per week	2	Е	5	english		
Part time	150/15	per term	5	per term	0	per term	10	_				
Teacher res	ponsible fo	or the subject	ct	Name		Zsolt Csepe	li, PhD		schedule	College professor		
				Goals, development objectives The sim of the course is to enable students to select the materials and production								
				technologies best suited to the purpose. To this end, they will learn about the production								
			properties a	nd applic	ations of the	pose. It	important met	will learn	nabout the production,			
Training ob	jective and	l justificatio	on of	materials a	s well as	about the	echnolo	gies for modi	fving (all	oving casting plastic		
the course (	content, ou	ıtput, locati	on in	forming, her	it treatmer	t and surface	e treatme	ent) and shapin	g (casting.	plastic forming). They		
the curricul	um)			will learn ab	out the fal	prication tech	nology	of individual u	nits in nuc	lear power plants, such		
				as reactor ve	ssel, stear	n generator,	turbines	, etc. Students	will learn a	about the operation and		
				application of	of the mai	n bulk and p	essure v	velding proces	ses, with a	focus on those used in		
				nuclear pow	nuclear power plants.							
				Presentation	Projecto	or, ppt lectur	es, learn	ing materials a	vailable in	n moodle.		
Typical deli	iverv meth	ods		Practice								
i ypicai den	ivery mean	ous		Laboratory	Laborat	ory material	s testing	, heat treatmen	it, plastic f	orming, plant visits.		
				Other								
				Knowledge								
				Detailed kn	owledge	of the princ	iples of	f operation of	machine	ry and equipment for		
				materials pro	duction,	basic technol	ogies fo	r the productio	on and shap	oing of metals and their		
				alloys (plastic forming and casting). Knowledge of heat treatment and welding processes.								
				Ability	1			1. 1 1 0				
				Ability to se	elect the r	ight raw mai	erial and	d technology f	or the pur	pose. Ability to define		
				the steps in t	ine produc	ction of prod	ucts.					
Requiremen	nts (express	sed in terms	of	Attitude Strive to kee	n thair cal	faducation	n motori	als anginagrin	acontinuo	us and in line with their		
learning out	tcomes)		5 01	professional	goals F	lave sufficie	in materi	ing and tolers	ance of m	onotony to carry out		
iourning out	comes)			professional goals. Have sufficient standing and tolerance of monotony to carry out practical activities. A creative approach to the continuous improvement of applied								
				technologies and processes. Strive to apply energy and material-saving processes and								
				technologies.								
				Autonomy and responsibility								
				It determines the properties of the different products, checks the quality of the work phases								
				specific to the technology and performs quality management of the sub-tasks. Assesses and								
				seeks to reduce the environmental impact of production. Assess and rationalise energy								
				consumption	n related to	o the produc	ion of n	naterials.				
				Metal produ	iction: pig	; iron produ	ction, st	eel production	, continuo	us casting, aluminium		
				production t	y electrol	ysis. Fe-Fe3	C equilit	orium phase di	agram. Cla	issification of steel and		
				aluminium	alloys,	ineir charac	thormal	properties.	Germ for	mation and growth.		
				equilibrium	tissue ele	ments Prim	ary and	secondary tiss	ie structur	e Fabric structure and		
				mechanical	properties	of hot work	ed alloy	s. Forging. sta	amping, ho	ot rolling, tube making		
Short descri	iption of th	e subject co	ontent	processes. N	/letallurgi	cal phenome	ena in c	old forming.	Fabric stru	cture and mechanical		
				properties of	of cold for	ormed alloy	s. Plate	forming tech	nologies:	straightening of base		
				materials, n	naterial se	eparation by	therma	l or shear str	ess, formi	ing by bending, deep		
				drawing, str	etch form	ing. Full sect	ion heat	treatments. Su	urface heat	treatments. Operation		
				and applicat	ion of the	main bulk a	nd press	welding proc	esses. Proc	cess and machinery for		
				reactor vessel, steam generator and turbine fabrication.								
T		:4:		Processing of heard text by taking notes and recording the material using your own notes								
Types of su	Types of student activities			and those available electronically 40% Independent completion of laboratory exercises								
					$1 D_{r} I_{670}$	of Vorő Dr	Mihálu	<u>Váldor: Matal</u>	lurgy Tox	thools Publishing		
				• [] 	J Dr. Jozs Duce Bud	er vero - Dr.	viinaiy	Kaldor: Metal	lurgy. Tex Dátar Fark	libook Publisning		
L .		_		D	. Zoltán S	zabó. Nemz	∠1 D1. E eti Tank	önvykiadó Bu	danest 20	02. [4] TÁMOP e-		
Required lit	erature and	d contact de	etails	les	arning cor	irseware: mc	odle.du	f.hu: (DUE lib	rary) [4] D	r. Elemér Köves:		
				A	uminium	Industry Ha	ndbook.	Chapter 2, pp.	35-74: Ch	apter 4, pp. 173-196.		
				М	űszaki Kö	nyvkiadó Bi	ıdapest,	1984.	,			
Recommend	ded literatu	ire and cont	tact	• A1	ntal Óvári	: Iron Metall	urgy Ha	ndbook, Techr	nical Book	Publishing House,		
details				19	85. Intern	ational Ator	nic Ener	gy Agency, IA	EA websit	te www.iaea.org		

Description of tasks to be submitted/measurement reports	The student shall 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.

#### **Process Technology**

Name of the subject in Hungarian				Fémtechnold	bgia			Level BSc			
Name of the subj	ject i	in English		Process Tech	nnology				Code	DUEN(L)-MUA-150	
Responsible educ	cationa	al unit		Institute of T	echnolog	y, Departme	nt of Str	uctural Integrit	ty		
Name of compuls DUEN(L)-	sory p	rior learnir	ıg								
Туре	ŀ	Presentatio	n	Practice		Laboratory		Requirement	Credit	Language of education	
Full time 150/	/39	per week	1	per week	1	per week	1	Е	5	english	
Teacher responsil	ble for	the subject	יד יד	Name	5	Andrea Szal	bó PhD		schedule	Senior lecturer	
Training objectiv the course (conter the curriculum) Typical delivery	e and ent, out metho	justificatio tput, locatio	on of on in	Goals, devel The student pig iron and will also lease Presentation Practice Laboratory	Goals, development objectives         The student will learn about the chemical and physical chemical processes used to produce         big iron and steel using ores and other auxiliary materials extracted from the earth. They         will also learn the process of aluminium production from bauxite.         Presentation       ppt slide, porjektor használatával         Practice       Számítási feladatok         Laboratory       Egyetem laboratóriumaiban egyéni és csoportmunka keretében,						
Requirements (expressed in terms of learning outcomes)			of	Other           Knowledge           A hallgatónak ismernie kell a vaskohászat alap- és segédanyagait, az olvasztó berendezéseket, az energiahordozókat, az olvasztás metallurgiai és üzemi sajátosságait, az oxigénes és elektroacélgyártás adagperiódusait, az üstmetallurgiai műveleteket, az acélok leöntési módjait. Az átolvasztási eljárásokat. A hallgatók elsajátítják a nyersvasgyártás és acélgyártás, továbbá a színfémek, főként az alumínium gyártásának folyamatait. Ismereteket szereznek a folyamatokhoz szükséges alapanyagok fizikai és kémiai tulajdonságairól, a folyamatok során végbemenő kémiai reakciókról és az egyes folyamatok optimalizálásáról, és gyakorlati ismereteket kapnak üzemlátogatások keretében.           Ability         A kurzus végén a hallgatók képesek lesznek átlátni a nyersvas és acél gyártásának egyes részfolyamatait és így a teljes technológiát. Különböző acélok mikro-szerkezetét felismerik és a mikroszkópos vizsgálatokhoz szükséges mintaelőkészítést önállóan el tudják végezni.           Attitude         Gyakorlati tevékenységek elvégzéséhez megfelelő kitartással és monotóniatűréssel rendelkeznek. Az hallgatók környezettudatos technológiák alkalmazását igyekeznek előtérbe helyezni az egyes színfémek és ötvözetek gyártásánál, így az épített és természeti környezet megóvását tartják szem előtt. Az energia és anvagtakarékos folvamatok. ill.							
				A hallgató a technológiára jellemző munkafázisok minőségét ellenőrzi és elvégzi a részfeladatok minőségirányítását. Felméri és racionalizálja az anyaggyártással kapcsolatos energiafelhasználást. Felméri a gyártással kapcsolatos környezeti terhelést és törekszik annak csökkentésére.							
Short description of the subject content			ontent	Az ércek jellemzése és értékelése. Nyersvasgyártás. Az eljárás alapanyagai, és metallurgiai folyamatai. A nyersvasgyártás termékei. Az acélgyártás célja. Az acélgyártás fizikai kémiai fázisai. Az oxigénes acélgyártás kifejlődése, alapanyagai. Az eljárás adagperiódusai. Irányítási modellek jellemzése. Az elektroacélgyártás alapanyagai és adagperiódusai. A frissítés és a kikészítés metallurgiai folyamatai, kéntelenítés, ötvözés. Az acél szennyezői. Az üstmetallurgia szerepe. Passzív és aktív üstmetallurgia. Gáztalanítás. Az acél kristályosodása és öntése. Hagyományos öntés, folyamatos öntés. Az acélok elektronsugaras és elektrosalakos átolyasztása							
Types of student	activit	ties		Előadásokor használatáva üzemlátogat	i való rész l önálló fe áson való	vétel és sajá elkészülés a részvétellel	t kézzel zh dolgo a gyakoi	írott jegyzet ko ozatokra, laborg lati ismeretek	észítése, pp gyakorlato elsajátítása	ot slideok kon és a	
Required literature and contact details			tails	<ul> <li>[1] Óvári Antal: Vaskohászati kézikönyv. Budapest. Műszaki Könyvkiadó, 1985. DF könyvtár [2] Dr. Farkas Ottó. Nyersvaskohászattan II. Tankönyvkiadó Budapest, 1989 DF Könyvtár [3] Károly Gyula, Józsa Róbert: Konverteres acélgyártás, Miskolci egyetem 2012-2013. [4] Károly Gyula, Kiss László, Harcsik Béla: Elektroacélgyártás, Miskolci Egyetem, 2013. Elérhetőség: DUE Moodle, pdf formátumban</li> </ul>							
Recommended lit details	teratur	re and cont	act	• [5] DU Bu	Szegedi . JE könyvi Idapest. 19	J Szabó Z. tár. [6] Alur 980. DUE K	Acélgyá níniumij önyvtár	rtás II. Tankör pari kézikönyv	ıyvkiadó. 1 . Műszaki	Budapest, 1986 Könyvkiadó,	
										34	

Description of tasks to be submitted/measurement reports	Laborban végzett vizsgálatok jegyzőkönyvei.
Description and timetable of the workshops	A zh dolgozatok az egyes ppt-k végén lévő ellenőrző kérdésekből tevődnek össze. Témakörönként 2-3 kérdés. Kifejtős kérdések, melyekre lényegre törően kell válaszolni - Ábrák pontos felrajzolásával és rövid szövegekkel. Szorgalmi időszakban, utolsó előadás

#### **Polimer Phisics**

Nome of th	a anhiast	in Hungari	an	Műanyag fiz	Műanyag fizika				Level	BSc		
Name of th	e subject	in English		Polimer Phis	sics				Code	DUEN(L)-MUA-255		
Responsibl	e education	nal unit		Institute of 7	Fechnolog	y, Departme	ent of Me	echanical Engi	neering an	d Energy		
Name of co DUEN(L)-	ompulsory	prior learnin	ıg									
Туре		Presentatio	'n	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	1	per week	0	per week	2	Е	5	english		
Part time	150/15	per term	<u> </u>	per term Name	0	per term Imre Kovác	PhD		schedule	-		
Training of the course the curricu	ojective and (content, or lum)	l justificatio utput, locatio	on of on in	Goals, devel The student plastic produ know the fin Learn and management	Goals, development objectives The student will learn to apply plastics manufacturing technology in order to produce a plastic product suitable for a given application under economical conditions. He/she will know the final properties of polymers and be able to adapt them to the specific application. Learn and apply moulding, welding and refining techniques. Learn about waste nanagement processes and recycling of used products back into production.							
Typical del	Typical delivery methods			Presentation Practice Laboratory Other	projecto moodle laborato software	or, ppt lectur ory exercise, e	introduc	r per week, lea	e of Ansys	Granta EDUPACK		
Requirements (expressed in terms of learning outcomes)			of	Other       Image: Construct of polymers is the types of chemical bonds between them and their role in polymerisation.         You will learn about polymerisation technologies and the properties of the resulting polymers.       You will learn about the production methods and properties of thermoplastic and thermosetting polymers.         You will learn about the production methods and properties of thermoplastic and thermosetting polymers.       Ability         The ability to select the ideal polymer/plastic for a given application.       Ability to select the appropriate production technology for the polymer.         Ability to decide whether or not the polymer can be processed with the selected production technology       Attitude         It takes a creative approach to continuously improve the technologies and processes used.       It strives to use environmentally sound technologies and to protect the built and natural environment.         strive to use energy and material-saving processes and technologies       Autonomy and responsibility         It determines the properties of the different products, checks the quality of the work phases specific to the technology and performs quality management of the sub-tasks.								
Short description of the subject content				Classification of organic compounds. Major reactions of hydrocarbons. Polymerisation, polyaddition, polycondensation. Classification and structure of polymers. Physical and chemical properties of polymers. Physical chemical properties of polymer systems. Behaviour of polymer systems under mechanical stress. Stress and deformation. Rheological characterization of solid and liquid polymer systems. Thermal properties of polymers. Production and modification of properties of plastics. Preparation, properties and uses of the main thermoplastics and thermoplastics. Current research trends and recent advances in macromolecules.								
Types of st	udent activ	ities		Preparation	of laborate	ory reports						
Required li	terature an	d contact de	<ul> <li>[1] Dr. Endre Berecz: Kémiai műszakiaknak, Budapest, Nemzeti Tankönyvkiadó Kiadó, 1995 [2] BÉLA PUKÁNSZKY, JÁNOS MÓCZ Plastics, Budapest University of Technology and Economics, Faculty o Chemical and Bioengineering, Department of Physical Chemistry and Materials Science, 2011.</li> </ul>					Jemzeti ÁNOS MÓCZÓ: hics, Faculty of hemistry and				
Recommen details	ded literati	are and cont	act									
Description	n of tasks to	b be										
submitted/1	neasureme	nt reports										
Description workshops	and timet	able of the										
Name of the subject in Hungarian				Korszerű ön	téstechnol	lógiák		Level BSc				
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Name of the	e subject	in English		Up-to-date c	asting tec	hnologies		Code DUEN(L)-MST-211				
Responsible	e education	al unit		Institute of T	Fechnolog	y, Departme	nt of Stu	ructural Integri	ty			
Name of co	mpulsory p	orior learnii	ng	MUA-213								
DUEN(L)-			-	MUA-153								
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	onglish		
Part time	150/15	per term	5	per term	0	per term	10	IVI	5	english		
Teacher res	ponsible fo	or the subje	ct	Name		Andrea Sza	bó, PhD	)	schedule			
Training ob the course ( the curricul Typical del:	jective and content, ou um) ivery meth	l justificatio htput, locati	on of on in	Goals, deve The student select the tec with mouldi Presentation Practice Laboratory Other	Foals, development objectives         The student should have an encyclopaedic knowledge of casting technologies, be able to select the technology and moulding methods required to cast a given metal part, be familiar vith moulding materials, production equipment and industrially important casting alloys.         Presentation       ppt slide, using a projector         Practice							
Requiremer learning ou	Requirements (expressed in terms of earning outcomes)			Knowledge Knowledge detailed kno Ability Apply the te principles ar Attitude You have th He/she has procedures t Autonomy a Directs the	of the bas wledge of echnical sp ad the econ e stamina a creative ised. and respo work of th	sic technolog the principl pecifications nomic contex and tolerand approach to <b>nsibility</b> ne staff assig	gies for related xt of sett ce for mo the co gned to l	the production eration of foun to the operation ting up and ope onotony neede ntinuous impro-	n of metals dry machin on of manu rating mac d to carry ovement o	s and their alloys, and nery and equipment facturing systems, the chinery and equipment. out practical activities. f the technologies and peration of machinery		
Short descr.	iption of th	e subject co	ontent	The role of moulding m foundry. All Light and no casting. Mo foundries. I products. P machines, te	foundry i foundry i nethods, so loys in iro con-ferrous dern casti Role of p owder pro- conologie	arious produ sout quality in industry. blidification n and steel metal casti ng technolo bowder meta oduction. Pres and finishe	Fundam Fundam of meta casting, ng alloy gies (sq allurgy, ressing ed produ	cks the quality ement of the sulternation of t	of the wor <u>o-tasks.</u> of foundry quipment ng method hniques, m rapid pro s, typical of metals	k phases specific to the (moulding materials, and energy sources in ls, melting equipment. nelting equipment. Die totyping). Cleaning of powder metallurgical s. 3D metal printing,		
Types of stu	udent activ	ities		Attending le carrying out	ctures and laboratory	l taking note y measureme	s, solvir ents.	ng calculation p	oroblems in	n exercises and		
Required lit	terature and	d contact de	etails	• Je Ái	nő Dúl: D pád:Die C	ie Casting (e Casting (man	ebook), l uscript)	National Book Dr. Pál Jónás:	Publisher Light Met	Árpád Németh al Casting (ebook)		
Recommended literature and contact details				<ul> <li>Dr. László Kovács. Foundry technology. Technical publishing house. Bpest, 1991. Departmental library Dr. F. Varga: Horticultural manual, Technical publishing house, Bp., 1985. Departmental library H. Reuter - P. Schneider. P. P. Reuter, P. Reuter, Technical Book Publisher, Bp. 1995. Departmental library R. Schneider: Kokilla foundry. Technical Publishing House. Bpest, 1982.</li> </ul>								
Description of tasks to be submitted/measurement reports												
Description and timetable of the workshops												

#### Up-to-date casting technologies

Name of the subject in Hungarian				Műszeres an	alitikai ké	émia	Level	BSc			
Name of th	e subject	in English	1	Instrumental	l analytica	l chemistry			Code	DUEN(L)-MST-212	
Responsibl	e education	nal unit		Institute of 7	Fechnolog	y, Departme	ent of Me	echanical Engi	neering an	d Energy	
Name of co DUEN(L)-	mpulsory	prior learni	ng								
Туре		Presentati	on	Practice		Laboratory		Requirement	Credit	Language of education	
Full time Part time	150/39 150/15	per week per term	1	per week per term	0	per week per term	2 10	М	5	english	
Teacher res	sponsible f	or the subie	ect	Name		Imre Kovác	s. PhD		schedule		
Teacher responsible for the subject         Fraining objective and justification of he course (content, output, location in he curriculum)         Fypical delivery methods         Requirements (expressed in terms of earning outcomes)			on of ion in	Goals, deve Materials en testing meth instrumental independent on his/her ov Presentation Practice Laboratory Other Knowledge You will hav Ability	lopment of igineers n ods. At the chemica ly. The st wn, buildi A prese analytic ve theoretic	bjectives ust be fami le end of the l analysis a udent will be ng on the ex ntation for a al measuren ical and prac	liar with module and to e able to isting ba ll studer hents tical kno	n chemical lab s, students are of be able to pe carry out analy ssic knowledge tts. Use of proj	oratory op expected to erform ana ytical instru- of chemis ector, over	perations and materials to know the methods of alytical measurements umental measurements stry. rhead projector	
Requirement learning ou	Requirements (expressed in terms of earning outcomes)		Ability to per Attitude Develops the Autonomy a Takes response	Ability to perform tasks related to the subject of the course. Attitude Develops the necessary attitude to solve technical problems. Autonomy and responsibility Takes responsibility for its work							
Short descr	iption of th	he subject c	ontent	Concepts and steps of chemical analysis; Sampling and its characteristics; Sampling, Sampling design; Sample preparation methods Advanced exploration methods Enrichment and separation methods; Classification of methods of material analysis; Analytical tests, Corrosion tests; Classical analytical methods: Gravimetry, Titrimetry Instrumental analytical methods Grouping of methods; Electroanalytical methods Molecular spectroscopy; Atomic spectroscopy methods: Absorption methods; Emission						racteristics; Sampling, exploration methods; of material analysis; Gravimetry, Titrimetry roanalytical methods; on methods; Emission emission spectrometry.	
Types of student activities Processing heard text by taking notes and recording the material using your own note and those available electronically 40%						ing your own notes					
Required li	terature an	d contact d	etails	I] Dr. János Kristóf - Dr. Erzsébet Horváth: Chemical Analysis I. Veszprém University Publishing House, Veszprém, 2002.							
Recommended literature and contact details				<ul> <li>Dr. János Inczédy:Basic Methods of Chemical Analysis,University note, Veszprém, 1992.</li> </ul>							
Description submitted/r	ı of tasks to neasureme	o be ent reports									
Description workshops	1 and timet	able of the									

#### Instrumental analytical chemistry

#### Life cycle of plastics

in Hungarian			Milanua - 1-	álatailti	2	Laval	DCo					
Name of th	e subject	in Hungar	ian		eleicikius	ä		Cede	DUENIL MOT 251			
D '11	1	In English		Life cycle of	plastics	D		1 . 1	Code	DUEN(L)-MST-251		
Kesponsibl	e education	nal unit		institute of '	echnolog	y, Departme	ent of M	echanical Engi	neering an	a Energy		
Name of co DUEN(L)-	ompulsory	prior learni	ng			1		1	1	1		
Туре		Presentatio	on	Practice		Laboratory	Laboratory		Credit	Language of education		
Full time	150/39	per week	1	per week	0	per week	2	Е	5	english		
Teacher res	nonsible f	or the subje	<u>s</u>	Name	0	Imre Kovác	s PhD		schedule			
reaction rea	sponsible i	or the subje	ci	Goals deve	lonment d	hiectives	.s, 1 mD		senedule			
Training of the course the curricul	raining objective and justification of the course (content, output, location in the curriculum)		on of ion in	The student plastic produces know the find Learn and managemen	<b>Soals, development objectives</b> The student will learn to apply plastics manufacturing technology in order to produce a plastic product suitable for a given application under economical conditions. He/she will mow the final properties of polymers and be able to adapt them to the specific application. Learn and apply moulding, welding and refining techniques. Learn about waste management processes and recycling of used products back into production.							
	unical delivery methods			Presentation	projecto moodle	or, ppt lectur	es 1 hou	ir per week, lea	rning mate	erials available in		
Typical delivery methods		Practice           Laboratory         laboratory exercise, introduction to and use of Ansys Granta EDUPACK software										
				Knowledge								
				You will have theoretical and practical knowledge of the subject.								
				Ability								
Requireme	nts (expres	sed in term	s of	Ability to pe	Ability to perform tasks related to the subject of the course.							
learning ou	tcomes)			Attitude								
				Develops th	e necessar	y attitude to	solve te	chnical proble	ms.			
				Autonomy	and respo	onsibility						
				Takes respo	nsibility fo	or its work						
Short descr	iption of tl	ne subject c	ontent	Moulding of compression treatment of Biodegradat technologies	of plastics mouldin f injection ole polymo s and recy	<ul> <li>moulding</li> <li>g, injection</li> <li>moulded</li> <li>ers, 3D print</li> <li>cling techno</li> </ul>	g proces mouldi products ting and logies in	ses, dipping ng, extrusion, s, Plastic bond printed product manufacturing	processes, heating o ling by w cts, Waste g technolog	rotational moulding, f hollow bodies. Post elding and adhesives, processing, Separation gies.		
Types of st	udent activ	vities		Processing h and those av	neard text railable ele	by taking no ectronically	otes and 40%	recording the n	naterial us	ing your own notes		
Required li	terature an	d contact d	etails	W. Schaaf - A.Hahnemann: Processing of Plastics, Technical Publishing House, Budapest, 1974.						ical Publishing		
Recommended literature and contact details												
Description of tasks to be												
submitted/measurement reports												
Description	and timet	able of the										
vorkshops												

#### Micro and nano structures

NI C.I	1.	in Hungarian	Mikro és nar	10 struktú	rák		Level	BSc	
Name of th	ie subject	in English	Micro and na	ano struct	ures		Code	DUEN(L)-MST-252	
Responsibl	le education	nal unit	Institute of T	echnolog	y, Departme	nt of Str	uctural Integri	ty	
Name of co DUEN(L)-	ompulsory j	prior learning			J			<u>.</u>	
Туре		Presentation	Practice		Laboratory		Requirement	Credit	Language of education
Full time Part time	150/39 150/15	per week 1 per term 5	per week	0	per week per term	2 10	Е	5	english
Teacher re	sponsible fo	or the subject	Name	0	Judit Pázmá	n. PhD		schedule	Associate Professor
Training ol the course the curricu	bjective and (content, ou lum)	l justification of atput, location in	Goals, devel Materials eng are produced composite m properties of Presentation	opment of gineers ne d and the aterial for micro an projecto	bbjectives eed to know t eir application r a given tec d nano comp or, ppt lectur	he prope ons. The hnical p posites. es 1 hou	erties of differe e student shou rocess. Optima r per week, lea	nt compos ild be abl il material rning mate	ite materials, how they e to select a suitable selection based on the erials available in
Typical de	livery meth	ods	Practice Laboratory Other	laborate	ory exercise, Granta EDUI	compos PACK so	site specimen f	abrication	and testing
Requirements (expressed in terms of learning outcomes)			Knowledge production te Knowledge of manufacturin Ability Ability to app and process of Ability to se appropriate r Understand typical of his Attitude It takes a cre It strives to the environment Strive to use Autonomy a It determines specific to th Assess and ra	of the ba echnologi of micro- ng technol ply the rel design. elect the of nanufactu and use of /her field ative appruse enviro energy an of respon- the properties of the proper- etechnol- ationalise	sic types of es, including and nanostr logies. ated comput optimum ray ring technol online and p of specialis. roach to com onmentally s nd material-s <b>nsibility</b> erties of the o ogy and perf the energy of	ational a v materi ogy for rinted l ation.	als (metals, po site materials. used in electro and modelling p als for a give the production iterature in H y improve the t chnologies and rocesses and te products, chec ality managem tion related to	lymers an nics, their principles a n applicati of a comp ungarian a ecchnologies chnologies eks the qua tent of the the produc	d ceramics) and their typical properties and and methods of product ion and to specify the oosite product. and foreign languages es and processes used. et the built and natural s. lity of the work phases sub-tasks. ction of materials
Short description of the subject conten			Types of engineering materials (metals and alloys, ceramics, polymers, semiconductors). Fibre reinforced, fibre reinforced, layered composites, their manufacturing technologies, properties, applications and development potential. Sandwich structures, wood. Analysis of the properties of metals and other engineering materials and trends in their changes. Polymer matrix and ceramic matrix composite materials. Materials for micro and nance electronics. Coating technologies, electronic thin films (lithography, etching, chemical mechanical polishing). Scanning Probe Technologies. Fabrication of nanocomposites, fullerene, graphite and carbon nanotubes, ceramic nanotubes and particles. Logic Devices (MOSFETs, Ferroelectric Field Effect Transistors. Quantum Transport Devices, Single Electron Devices, Superconducting Digital Devices Quantum Computing using Superconductors, Carbon Nanotubes for Data Processing Molecular Electronics)						ers, semiconductors). cturing technologies, ctures, wood. Analysis ends in their changes. ls for micro and nano ohy, etching, chemical n nanotubes, ceramic ield Effect Transistors, for Data Processing,
Types of st	tudent activ	ities	Processing o and those available Independent Completion of Solving test	f heard te ailable ele performa of a mid-t problems	xt by taking ectronically nce of labora erm assignn 20%	notes ar 40% atory exe hent 20%	nd recording the ercises 20%	e material	using your own notes
Required li	iterature and	d contact details	Solving test problems 20%         • [1] Dr. Tamás Tóth: Composite materials, Főiskolai publisher, 2000.         • [2] Zoltán Gácsi, Andrea Simon, Judit Pázmán.         • [3] Imre Mojzes, Milán Molnár László: Nanotechnology, Műegyetemi Kiadó, 2007         • [4] Rainer Waser: Nanoelectronics and Information technology, Wiley-VCH, 2005. chapters II-III - pages 187-498.						

Recommended literature and contact details	•
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	

#### Space ceramics

Name of the subject in Hungarian			Űripari kerá	ímiák			Level	BSc					
Name of the	e subject	in English		Space ceran	nics				Code	DUEN(L)-MST-253			
Responsible	e education	al unit		Institute of	Technolog	y, Departme	nt of Stu	uctural Integri	ty				
Name of co	mpulsorv	prior learnin	g			, parante							
DUEN(L)-	inpulsory [		<i>ъ</i>			1		[	1	r c			
Туре		Presentation	n	Practice		Laboratory		Requirement	Credit	Language of education			
Full time Part time	150/39	per week	$\frac{2}{10}$	per week per term	0	per week per term	1	Е	5	english			
Teacher res	ponsible fo	or the subject	t	Name	÷	Judit Pázmá	in. PhD		schedule	Associate Professor			
	P		<u>.</u>	Goals, deve	elopment o	objectives	,						
				The aim of	the cours	e is to fami	liarise s	tudents with the	he raw ma	aterials needed for the			
	• .• .	1	c	production of ceramics, their sources and their possible uses. In the course of the subject,									
I raining ob	jective and	1 justificatio	n of	students will learn about silicate chemistry. The aim of the course is to provide prospective									
the course (	content, of	itput, locatio	on in	materials er	igineers wi	ith a knowle	dge of th	e physical, che	emical and	mechanical properties			
the curricul	um)			and applica	tions of ce	ramics, with	a focus	on application	s in the cer	ramics industry, which			
				is essential	for unde	erstanding th	ne chem	ical composit	ion-structu	re-material properties			
				relationship									
				Presentation	Presentation projector, ppt lectures 1 hour per week, learning materials available in moodle								
Typical del	ivery meth	ods		Practice									
J1	, , , , , , , , , , , , , , , , , , ,			Laboratory	laborato	ory exercise							
				Other	Ansys (	Granta EDU	PACK so	oftware familia	risation ar	nd application			
				Knowledge	, <u>, , , , , , , , , , , , , , , , , , </u>					**			
				Knowledge	of the stru	cture of silic	cates, the	formation of	rocks.				
					of the phy	sical, chemio	cal and n	nechanical prop	perties of c	eramics and their uses.			
				Knowledge	of the ma	in ceramics	used in	the ceramic in	dustry, the	ir main properties and			
				the methods	he methods of testing materials for their classification.								
				Ability	Ability								
			The ability	The ability to select the ideal ceramics for specific applications.									
			Ability to select the appropriate production technology for the ceramic.										
D:			- <b>f</b>	Ability to decide whether or not a given ceramic can be processed with the selecte									
Requirement	its (express	sed in terms	OI	production	technology	/.	-		-				
learning ou	(comes)			Attitude									
				It takes a cr	It takes a creative approach to continuously improve the technologies and processes used.								
				It strives to use environmentally sound technologies and to protect the built and natural									
				environmen	ıt.								
				Strive to us	Strive to use energy and material-saving processes and technologies.								
				Autonomy	and respo	onsibility							
				It determine	es the prop	erties of the	different	products, chec	cks the qua	lity of the work phases			
				specific to t	he technol	ogy and perf	forms qu	ality managem	ent of the	sub-tasks.			
				Assess and	rationalise	the energy of	consump	otion related to	the produc	ction of materials			
				Mineralogio	cal overvi	ew. Basic c	oncepts	of crystallog	raphy. Cr	ystalline chemistry of			
				silicates. Ra	aw materia	als for the s	llicate ir	dustry. Rocks	, their for	mation, properties and			
				applications	S. Basic Kn	iowledge of	colloid	chemistry. Phy	sical and	chemical properties of			
				Sedimentar	rocks	Exermation	numera	as of sodimor	s TOCKS, (	Main minerals of			
Short descr	iption of th	e subject co	ntent	sedimentar	y rocks.	Technologic	ulu type	racteristics an	d uses	SiO2 Agglomerates			
				mineralogic	al and che	mical proper	ties	acteristics an	u uses.	5102. Aggiometates,			
				Materials us	sed in the a	aerospace in	dustry c	eramics Cerar	nic matrix	composites grouping			
				structure, st	ructure-pr	operty relation	onship. (	Ceramic comp	onents and	stresses of spacecraft.			
				Classificatio	on and app	lications of a	aerospac	e ceramics, the	eir main pr	operties, recyclability			
				Processing	of heard te	xt by taking	notes ar	nd recording th	e material	using your own notes			
				and those a	vailable ele	ectronically -	40%	e		0,			
Γypes of student activities				Independen	t performa	nce of labor	atory ex	ercises 20%					
51				Completion of a mid-term assignment 20%									
				Solving test problems 20%									
Required lit	terature and	d contact de	tails	• ASM Handkbook Volume 21 – Composites 39-64 old.; 1400-1442 old.;									
Recommen	ded literatu	are and conta	act	_		-			· · · ·				
details				•									
Description of tasks to be													
submitted/n	neasureme	nt reports											
Description and timetable of the													
workshops													

#### Material testing

N	1. :	in Hungarian Mechanikai anyagvizsgálat						Level	BSc			
Name of th	ie subject	in English		Material testing						Code	DUEN(L)-MUA-212	
Responsib	le education	nal unit		Institute of 7	Technolog	y, Departme	ent of	Stru	uctural Integrit	ty		
Name of c DUEN(L)-	ompulsory <sub> </sub> -	prior learni	ng									
Туре		Presentati	on	Practice		Laboratory		I	Requirement	Credit	Language of education	
Full time Part time	150/39	per week per term	1 5	per week per term	0	per week per term	2 10	)	М	5	english	
Teacher re	sponsible fo	or the subje	ct	Name	Ŭ	Zsolt Csepe	li. Ph	D		schedule	College professor	
Training o the course the curricu	bjective and (content, ou llum)	l justificati utput, locat	on of ion in	Goals, deve Students of r ceramics, po determined l able to carry Students wil interpret resu	lopment of naterials e alymers an by testing. out simp l also be a alts for mo	bbjectives engineering l ad composite . By underst able tests on t able to selec pre complex	earn a es, the anding heir o t the a tests.	abou e tes g th own appr	at the wide ran, ting instrument operation of and evaluate opriate test tea	ge of meth nts and the f the equip the results chnique, d	ods used to test metals, properties that can be ment, students will be of the measurements. esign experiments and	
				Presentation	Presentation Projector, ppt lectures, learning materials available in moodle.							
Typical de	livery meth	ods		Practice								
r y prour de		045		Laboratory	Tableto	p exercise a	nd/or ]	labo	oratory measur	rement. Us	se of projector.	
				Other								
Requireme learning ou	Requirements (expressed in terms of learning outcomes)			Knowledge mathematica kinetics. A b methods for processes tha of the occup of specialisa <b>Ability</b> Understands requirement: <u>Understands</u> <b>Attitude</b> Strive to keee professional activities. St natural envir <b>Autonomy a</b> Specific to th	of the ba al descript road know the study at give rise ational hea tion, and w and appl s of the and uses p their sel goals Ha rive to us conment. and respon the character	sic physico ion, with pay wledge of the of structure to structure to structure alth and safe with the releving ies the environity field, and online and pay and the state the environity ensibility eristics of the ogy and carrier	-chem articul e atom and the es. He/ ty, fire vant e vant e is ab orinted n mate mina entally e diffe	nical lar 1 nic, he p /she e pr envi enta ole d lite and y sc eren qua	I processes in reference to the micro- and material principles of op- e is familiar wi- to the technologies of the e is familiar wi- to the technologies of the technologies of technologies of the technologies of technologies of technologi	material ne laws of acro-struct peration o th the requ afety areas tection red l health a rocesses t garian and olerance t gies and te eck the qua	systems, their (basic) f thermodynamics and ture of solids, the basic f basic devices and the tirements and demands a related to his/her field quirements. Ind safety and security to meet expectations. I foreign languages. s and in line with their to carry out practical p protect the built and dity of the work phases sub-tasks	
Short desc	ription of th	ie subject c	ontent	The subject covers the most common techniques for the testing of metals, ceramics, polymers and composites. Students will be introduced to creep and fatigue testing, the operation of electron microscopes, non-destructive testing and some special testing methods for non-metallic materials. By learning the standards for the different tests, students will gain knowledge that can be directly applied in practice. When introducing testing techniques, special attention will be paid to make students aware of the specificities of testing different twees of materials.								
Types of s	tudent activ	ities		Processing of Conducting Evaluation of	of heard te material te of measure	xt with anno ests 30%. ements, prep	otation aratio	n 50 on of	%. f report 20%.			
Required literature and contact details				<ul> <li>[1] Imre Pozsgai: Fundamentals of scanning electron microscopy and electron beam microanalysis Bp., 1995 [2] Zoltán Gácsi: Stereology and image analysis, Miskolc 2001 [3] Miklós Tisza: Material analysis, Miskolc University Publishing House, 2005 [4] Géza Bodor, László M. Vass: Polymer materials structure, University of Technology Publishing House, 2002</li> </ul>								
Recommended literature and contact				• [5]	] Tamás T	óth: Mecha	nical p	prop	perties of mate	rials and n	nethods of their	
details				in	vestigation	n, Főiskolai	Kiadó	5, D	unaújváros, 20	004		
Description of tasks to be submitted/measurement reports				The student shall 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.								

#### Production technologies of space ceramics

		in Hungaria	in	Űripari kerá	miák gvár	tástechnológ		Level BSc				
Name of the	e subject	in English		Production t	echnologi	es of space of		Code DUEN(L)-MST-111				
Responsible	e education	nal unit		Institute of T	Technolog	y, Departme	nt of Str	uctural Integri	ty			
Name of co DUEN(L)-	mpulsory	prior learning	g			27 1						
Туре		Presentatior	1	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	) 		111-	A		
Teacher res	ponsible i	or the subject	ι <u> </u>	Casha dama			in, PhD		schedule	Associate Professor		
Training ob the course ( the curricul	jective and content, or um)	1 justificatior utput, locatio	1 of n in	The aim of t of ceramics engineers to as the speci aerospace ap	he course for differe master th fic manuf pplications	is to familia ent application e grinding, pr facturing pr s.	rise stuc ons. The oressing ocesses	dents with the operation of the contract of th	different pr urse is to e echnologie plications	roduction technologies enable future materials es of ceramics, as well such as products for		
				Presentation	projecto moodle	or, ppt lectur	es 1 hou	r per week, lea	rning mate	erials available in		
Typical deli	very meth	ods		Practice								
				Laboratory	laborato	ory exercise	A CT	<u> </u>	• •	1 1' .'		
					Ansys C	iranta EDU	PACK se	ottware familia	risation ar	nd application		
				Knowledge the methods Knowledge the equipme Knowledge industry, the Translated w	of the main of materia of the diff nt required of the pr ir equipm vith DeepI	in ceramics al testing rec ferent produced. oduction tec ent and their 2.com (free	used in juired fo ction tec chnologi operation version)	the ceramic induction of their qualific chnologies for ies of speciali ng principles.	dustry, the ation. ceramics, t sed ceram	ir main properties and their various steps and tics for the aerospace		
Requirements (expressed in terms of learning outcomes)		Ability The ability to select the ideal production technology for a given application. Ability to select the appropriate production technologies for specific applications. Ability to decide whether or not ceramics with a given property and speciality can b processed with the selected production technology <b>Attitude</b> It determines the properties of the different products, checks the quality of the work phase specific to the technology and performs quality management of the sub-tasks. Assess and rationalise the energy consumption related to the production of materials										
				Autonomy and responsibility It determines the properties of the different products, checks the quality of the work phases specific to the technology and performs quality management of the sub-tasks. Assess and rationalise the energy consumption related to the production of materials								
Short descri	Short description of the subject conten				Assess and rationalise the energy consumption related to the production of materials Traditional and modern ceramic materials. Overview of the main properties and applications of modern technical ceramics. Technology of ceramic materials. Ceramic products: structure, properties and uses of classical ceramics, bricks and tiles, refractories. Relationship between chemical composition, microstructure and properties. Requirements for raw materials. Synthesis of ceramic raw materials by physical and chemical processes. Production of solid ceramic bodies. Moulding and heat treatment (sintering, sintering) processes. Sintering under special conditions (thermal plasma, blasting, etc.). Post- processing of solid ceramics, Manufacturing technologies for specific aerospace applications. Equipment for the production of space ceramics. Manufacturing processes,							
Types of student activities				Processing of heard text by taking notes and recording the material using your own notes and those available electronically 40% Independent performance of laboratory exercises 20% Completion of a mid-term assignment 20% Solving test problems 20%								
Required literature and contact details				• A\$	SM Handk	book Volun	ne 21 – 0	Composites, Cl	MC materi	als		
Recommended literature and contact details												
Description of tasks to be												
submitted/n	neasureme	nt reports										
Description workshops	and timet	able of the										

#### Heat Treatment

Name of the subject in Hungarian				Hőkezelés			Level	BSc					
Name of th	e subject	in English		Heat Treatm	ent				Code	DUEN(L)-MUA-113			
Responsibl	e education	nal unit		Institute of 7	Fechnolog	y, Departme	nt of Me	echanical Engi	neering an	d Energy			
Name of co DUEN(L)-	ompulsory p	prior learnin	ng	MUA-213									
Туре		Presentatio	n	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	141	5	english			
Teacher res	sponsible fo	or the subject	ct	Name		Péter Berec	zki, PhD	)	schedule				
Training of the course the curricul	ojective and (content, ou lum)	l justificatio utput, locatio	on of on in	Goals, deve The aim of treatment pr treatment or Presentation	the course ocesses us surface tr Projecto	bjectives is to familiated in industried in industrie eatment to a pr, ppt preserver	arise stu y, and to chieve the tation n	dents with the o enable them t he desired prop naterials, white	basic heat to independ perties.	treatment and surface dently propose the heat			
				Practice	ractice								
Typical del	ivery meth	ods		Laboratory	Laboratory Laboratory practice, carrying out heat treatments and simple surface treatments, and structural testing of materials								
				Other	ther								
Requireme learning ou	nts (express tcomes)	sed in terms	s of	The student polymers/pl. temperature the physical polymers). T for a given treatment an <b>Ability</b> Ability to aj appropriate economy. A the combina the heat treas <b>Attitude</b> Strive to kee line with th Strive to app <b>Autonomy</b> = Define the l control the managemen	will know astics, the On the ba , chemical Chey will t application d surface pply the p from the bility to s tion of pro- timent equ ep their sel eir profess bly energy and responent treatm quality of t of the sul	the basic phir behaviour is behaviour asis of this ku l and mecha hus be able t treatment. principles of point of vie elect the app operties to be ipment. If-training in sional goals and materia <b>nsibility</b> nent technol the work p b-tasks.	ysical a in corre- nowledg nical pro- o propos nt will 1 heat tre w of bo propriate achieve materia . Strive l saving ogy to e hases sp	nd chemical prosive media ar e, students will operties of diff se and apply ap be familiar wi atment design th structural a e heat treatment ed and to propo- lls engineering to apply envir processes and ensure the pro- pecific to the t	roperties of ad their sti I learn heat ferent type opropriate I th the basi to ensure nd surface tt technolo ose the type /heat treatr ronmentall technolog perties of echnology	f metals and alloys and ructural changes under t treatments to improve is of materials (metals, heat treatment methods ic technologies of heat that the technology is e quality, integrity and gy taking into account e and characteristics of nent continuous and in ly sound technologies. ies. the different products, and carry out quality			
Short descr	iption of th	e subject co	ontent	Hőkezelési eljárások részletes bemutatása, a hozzájuk kapcsolódó technológia és tervezési elvek ismertetése : acélok ausztenitesítése, edzése, nemesítése; alumínium-ötvözetek homogenizálása, lágyítása, nemesítése. Felületi réteg kialakítása, karbonizálás, nitridálás, karbonitridálás, nitrocementálás									
1 ypes of st	udent activ	ities		measurements and drawing up a report (20%)									
Required li	terature and	d contact de	tails	•									
Recommended literature and contact details			•										
Descriptior submitted/1	n of tasks to <u>neasurem</u> e	be nt reports											
Descriptior workshops	and timeta	able of the											

#### Welding

NI C.I	1. (	in Hungari	ian	Hegesztés			Level	BSc				
Name of the	e subject	in English		Welding				Code	DUEN(L)-MUA-210			
Responsible	e educatior	nal unit		Institute of 7	Fechnolog	y, Departme	nt of Str	uctural Integri	ty			
Name of co DUEN(L)-	mpulsory	prior learni	ng	MUA-116								
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	1	per week	1	per week	1	М	5	english		
Teacher res	nonsible f	or the subie	oct	Name	5	Per term Béla Palotá	s PhD		schedule	Professor emeritus		
reacher res	polisible it	J lie subje		Goals, deve	lopment o	biectives	5, 1 IID		senedule	Tiolessor emeritus		
Training ob the course ( the curricul	jective and content, of um)	l justificatio utput, locati	on of ion in	Students sho parameters, procedure m Know the w managemen	buld be fa their effect anual and eld defect t, the basic	miliar with ets and the r welding pla s, their effec es of welding	the basi ules for n, the ba ts and he g safety	ics of welding their selection. asic welding to ow to repair the and environme	and relat Learn the ols and the em, the ba ental protect	ed processes, welding basics of the welding ir selection principles. sics of welding quality ction.		
				Presentation	Presentation All students in lecture, presentation on the blackboard. Use of a computer projector.							
Typical del	ivery meth	ods		Practice Laboratory	For each (Works)	n student in hop) lab exe	lecture, e rcise, us	example solution e of projector.	on. Using a	a computer projector.		
				Other								
Requirements (expressed in terms of learning outcomes)			s of	Knowledge Know the v knowing the prepare the n Ability Ability to pa carry out ind the field o managemen Attitude You have th approach to strives to use Autonomy a Directs the machinery a the quality managemen	variations rules for manufactu erform the dependent f speciali t. e stamina the contin e energy a <b>and respo</b> work of nd equipm of the w t of the su	of joining t making flaw rer's welding job accordi learning. A sed technol and monoto uous improv nd material- <b>nsibility</b> the personi nent. Detern york phases b-tasks.	echnolog less join g instruc ng to yo bility to ogy, in ny tolera vement o saving p nel assig ines the specific	gies, be able to de tis, be able to de tions. pur qualificatio o manage and c accordance ance to carry o of the technolog processes and to gned to him/h characteristics c to the technolog	to apply wessign the wessign the wessign the wessign the wessign the wessign the wessign and precedence of the wess of the value of the	velding procedures by velding technology and v to plan, organise and production process in principles of quality and activities. A creative rocedures used. He/she iss.		
Short descr	iption of th	ne subject c	ontent	management of the sub-tasks.         The physical principles of welding.         The technology of the main bulk welding processes.         The technology of the main pressure welding processes.         Fundamentals of weldability.         Basics of welding quality management.         Welding technology documents and their preparation.         Welding safety at work; fire and environmental protection. Welding economics, environmentally friendly selection of welding processes and materials.								
Types of st	udent activ	ities		Active partie	cipation in	lectures, cla	assroom	exercises and	laboratory	exercises.		
Required li	terature and	d contact de	etails	• [1] (W po Bu	] Downloa Velding pr ocket book 1dapest 20	dable lectur ocedures), C II. (Welding 23	e notes f okom N g produc	from www.duf lérnökiroda K1 tion technolog	.hu, [2] Wo ît., Budape y), Cokorr	elding pocket book I. st 2023, [3] Welding n Mérnökiroda Kft.,		
Recommen details	ded literatu	are and con	tact	• [4] Welding and related technologies, GTE Budapest, 2007.								
Description submitted/r	of tasks to neasureme	b be nt reports										
Description and timetable of the workshops Test 1. at Week 6: from the material of weeks 1 - 5, and Test 2. at week 12: from week 7 - 11, Test 3. (optional) in week 13, to make up or correct any failed and unwritten final exa						inwritten final exams.						

Name of the subject in Hungarian			ian	Roncsolásm	entes anya	agvizsgálat	Level	BSc					
Name of	the subject	in English		Non-Destru	ctive Mate	erial Testing			Code	DUEN(L)-MUA-215			
Responsil	ble education	nal unit		Institute of 7	Fechnolog	y, Departme	nt of Stu	ructural Integri	ty				
Name of	compulsory	prior learning	ng										
DUEN(L)	)-												
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	analish			
Part time	150/15	per term	5	per term	0	per term	10	IVI	5	english			
Teacher r	esponsible f	or the subje	ct	Name		Gábor Pór,	PhD		schedule				
				Goals, deve	lopment o	objectives							
Training of the course the curric	objective and e (content, o ulum)	d justificatio utput, locati	on of ion in	By masterin processes of complicated student will simulate an production a	ng the con- crucial in , from the be able, d manipu	urse materia portance for atomic leve using the to the process lify their par	I, stude r materia el to the ols of n ses to c ameters	ents will be all als science, ofte e mega-level approaches and change the pr	ble to sime en very com- pproach of computer operties o	ulate phenomena and nplex and increasingly the virtual plant. The simulation, to discuss, f materials and their			
				Presentation	A prese	mation for a	II studer	its. Use of proj	ector, over	nead projector			
Typical d	elivery meth	nods		Practice	laborata	mianaica							
				Laboratory Other	laborato	bry exercise							
				Uner Knowlodge									
				Students wil	nowledge								
			A bility	Ability									
Doquiror	Requirements (expressed in terms of		c of	Ability to p	Ability to perform tasks related to the subject of the course.								
learning			\$ 01	Attitudo		ks leialeu lu	the subj	ect of the cours	sc.				
icanning (	Jucomes)			Develops th	a necessar	v attitude to	solve te	chnical proble	me				
				Autonomy and responsibility									
				Takes respo	nsihility fo	or its work							
-				As in other	As in other disciplines, modelling plays a crucial role in the process of cognition in								
Short description of the subject conter				materials sc the possibili for materials level approa process of m cover therm equilibrium different lev application. on finite ele and the pro- simulation materials sc in parallel, mathematica course also	ience. Wit ty of comp s science, ach to the bodel build and non-e els of app Describes ment met cesses of c cools. In tence, stud to the s ally analog includes a	th the rapid puter simular often very co- mega-level ling and the r c and kineti equilibrium p proach (atom the most co- hods. In add changing the the context lents will be simulation of gous way. In section on n	develop tions of approa- relations c mode processe- tic, micr mmon s lition, it propert of the introduc of diffu additior modellin	ment of inform phenomena and and increasing ch of the virtu- hip of modellin ls and simular s. It presents m o, meso, macro- simulation tech discusses the ties of material process model ced to VEM me sion processes to heat and ma g and simulation	in all processes d processes ly sophisti al plant. 7 ang to comp tion softw nodels and b) and spe iniques, wi processes is using m lling and ethods of t s, which ass transpo	incloses of ecgnition in inclose, we now have is of crucial importance cated, from the atomic The course covers the uter simulation. It will are for characterising simulation software at cific examples of their ith particular emphasis of material production odelling and computer process simulation in hermal simulation and, can be treated in a ort in the solid state, the flow.			
Types of	student activ	vities		Working un	der superv	vision or perf	forming	independent co	omputer ta	sks			
Required	literature an	nd contact de	etails	•									
Recommended literature and contact details				•									
Description of tasks to be													
submitted/measurement reports													
Description and timetable of the workshops													

#### Non-Destructive Material Testing

#### Forming of Metals

In Hungarian				Fémek képlé	kenyalaki	tása	Level	BSc				
Name of th	ie subject	in English		Forming of N	Metals				Code	DUEN(L)-MUA-251		
Responsibl	le education	al unit		Institute of T	echnolog	y, Departme	nt of Sti	ructural Integri	ty	· · · ·		
Name of co	ompulsory p	orior learning	g		0	// I			<u> </u>			
DUEN(L)-								•				
Туре		Presentation	1	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	1	per week	1	per week	1	F	5	english		
Part time	150/15	per term	5	per term	5	per term	5	L	5	english		
Teacher res	sponsible fo	or the subject	t	Name		Krisztián W	'izner, P	hD	schedule	Senior lecturer		
Training of	hiective and	liustificatio	1 of	Goals, devel	opment o	objectives						
the course	(content_or	tput locatio	n in	The student	will lear	n the basic	concep	ots of the plas	sticity of	metals. Based on the		
the curricu	(content, ot lum)	itput, iocatio	11 111	knowledge of	of the bas	ic concepts	, the stu	ident is able t	o operate	and design the actual		
uie cuiffeu	iuiii)			forming tech	nologies.							
				Presentation	For all s or on-li	tudents, in a ne using MS	i large le Teams,	ecture, presenta using a compu	tion on a v ter networ	whiteboard, projector rk.		
Typical del	livery meth	ods		Practice	Practice Group work presentations							
				Laboratory								
				Other								
				Knowledge								
				You will kno	w the the	oretical and	practica	l aspects of the	plasticisat	tion of metals and their		
				alloys and th	e basic te	chnological	methods	3.	-			
				He/she know	vs the rec	juirements a	ind stan	dards in the fi	elds of oc	cupational health and		
				safety, fire p	rotection	and environ	nental p	rotection.				
				Ability								
				Ability to app	ply the rel	ated comput	ational a	and modelling p	principles a	and methods of product		
				and process	design. U	Jnderstands	and app	plies the envir	onmental,	health and safety and		
				accident prevention requirements specific to his/her area of specialisation, and is able t								
Requireme	ents (express	sed in terms	of	adapt processes to meet requirements.								
learning ou	Requirements (expressed in terms of earning outcomes)	Understands	and uses	the online ai	id printe	ed literature in	Hungarian	and foreign languages				
U	,			specific to hi	s/her field	1 of specialis	sation.					
				Attitude		1 (	. 1					
				He/she strives to use environmentally friendly technologies and to protect the built and								
				He/sne strives to use environmentally friendly technologies and to protect the built and natural environment.								
				natural environment. Tends to use energy and material-saying processes and technologies.								
				I ends to use energy and material-saving processes and technologies.								
				Autonomy and responsibility								
				specific to th	e technol	ogy and perf	orms au	ality managem	ient of the	sub-tasks.		
				Assess and ra	ationalise	the energy of	consump	tion related to	the produc	ction of materials.		
				Assess and s	eek to red	uce the envi	ronmen	tal impact of p	roduction.			
				Basic knowle	edge of du	ictile metal	forming.	. Structural asp	ects of pla	stic deformation.		
				Classification	n of form	ning process	ses. Met	trics of deform	nation. C	cold and hot forming.		
				Friction relat	ions. Plas	sticity of me	tals. Stre	ess state, flow	conditions	. Rolling. Geometry of		
				the rolling cr	ack. Hot 1	olling. Clas	sification	n of rolled proc	lucts. Stru	cture and main units of		
				rolling mills	. Hot rol	ling of flat	product	ts. Bending. P	re-stretchi	ng and finish rolling.		
				Rolling of sh	aped proc	lucts (profile	es). Moc	lern versions o	f rolling te	chnologies (CSP, ISP,		
<b>a</b> 1 . 1				etc.). Cooling	g, coiling,	finishing. C	old rolli	ng. Preparation	n of the star	rting product. Pickling.		
Short desci	ription of th	e subject co	ntent	Reversing an	nd one-wa	y cold rolli	ng. Prop	berties of rolled	1 products	. Coating technologies		
				for plates (pl	astic, met	allic layers,	etc.). R	olling of bars,	tubes. Bar	drawing technologies.		
				Forging tech	notogies.	forming D	cal princ	tion of the h	t lorging.	Typical patent lorging		
				forming mag	bing mag	lorging. De	n Eorm	ing perometers	asic paran	receiper of the required		
				Drawing tec	nne, mae	Wire dr	m. rom	Pipe pulling	with wall	thinning Pullability		
				conditions F	Surther pr	ocessing of	flat pro	ducts plates (	with wan	nding deep drawing		
				Production of welded tubes.								
Types of student activities				Attend lectures and take notes, solve problems, process in-formation.								
Types of student activities At				Attend lectures and take notes, solve problems, process in-formation.								
Required literature and contact details				2023								
1				• Hardback ISBN: 9781774670224 eBook ISBN: 9781774670231								
				•								
Recommended literature and contact			• NORBERT A. J. PLATZER, EDMUND H. IMMERGUT, HERMAN F.									
details			MARK, M. C. SHEN, A. V. TOBOLSKY, KURT UEB				RT UEBE	RREITER, ROBERT				
			KC	OSFELD,	S. J. FUSCO	), R. C.	MAGGART, V	W. F. OVE	RBERGER, L. O.			

	<ul> <li>RAETHER, H. R. GAMRATH, ALFRED COENEN, HEINRICH HOPFF, DIETRICH BRAUN, D. H. ROTENBERG, M. C. SHEN, A. V. TOBOLSKY, H. BREUER, , Norbert A. J. Platzer, Plasticization and Plasticizer, American Chemical Society, ISBN</li> <li>9780841222281</li> </ul>
Description of tasks to be submitted/measurement reports	Last lecture of the term.
Description and timetable of the	
workshops	

#### Environmental policy and protection against radioactivity

in Hungarian		Környezetpo	olitika és s	ugárvédelen	Level	BSc					
Name of the subject	in English		Environmen radioactivity	tal policy	and protection	Code	DUEN(L)-MGT-210				
Responsible education	al unit		Institute of Technology, Department of Mechanical Engineering and Energy								
Name of compulsory j DUEN(L)-	prior learni	ng									
Туре	Presentatio	on	Practice	Practice La		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	5	DI D	1 1 1	0 1 4		
l eacher responsible fo	or the subje	ct	Name Eva Kovacs-Bokor, PhD schedule Senior lecturer								
Training objective and justification of the course (content, output, location in the curriculum)			The student carbon dioxi the 3 E's h production environment intensity of t	The student will learn about the most important environmental issues, global warming, carbon dioxide emissions, carbon dioxide emissions and ways to reduce global warming; the 3 E's harmonisation. In addition, learn about renewable energy sources, energy production (fossil, nuclear, renewables), the basics of environmental management, environmental policy. Learn about types of radioactive radiation, methods of reducing the intensity of radiation and its effects on the human body.							
			Presentation	For all s of proje	students in a ctor or overl	large lee head pro	cture hall with jector	a blackboa	ard presentation. Use		
Typical delivery meth	ods		Practice				5				
			Laboratory	Laborat	ory demonst	trations a	and experimen	ts			
			Other								
Requirements (express learning outcomes)	sed in term	s of	Knowledge relationships Knowledge field. Comprehens in the main t Comprehens Knowledge Has an appli fire protecti his/her speci Comprehens assurance pr field. <b>Ability</b> The ability to pl Ability to pl Ability to pl Ability to pl Ability to ap Ability to	of the basis of the gends s and process of the ter sive knowl heories of sive knowl of measure ed knowle on, safety alisation. sive knowl inciples, if o analyse l field, to s an, organi lentify rou- trations in derstand a ply the ac- ply and en- ormmunica- uage in a tion.	ic facts, direct eral and spect edures necess minology, the ledge of the field. The field field field edge of basis ement proce edge of the r and health fieldge of the r and health fieldge of the their limits a at a basic less practice) the and use litera quired IT kn force safety te orally and professional about, emb ment and im learning a m as in comple- hical standar s, preferably if-developmed re problems pervisors, pro-	ctions ar cific mat ssary for ne most methods ic econo dures at equirem at work e manag and requ evel the e lationsh uct indep ional pre- theoret: ture, con nowledge y, fire sai l in writi ly appro- pracing a novation neans to ex and real to ex and mathematical provention neans to ex and respectively pracing a novation neans to ex and respectively protopention theoret in the and mathematical protopention the sai theoret in the and mathematical protopention the sai theoret in the and mathematical protopention the sai the	ad limits of the hematical, scie the operation important cor s of knowledge mic, business a an applied lev ents and stand d, and environ gement, environ gement, environ gement, environ disciplines that ips and to mak pendent learnin oblems, to ide ical and practic mputer and libr e to the solution fety and hygier ing in his/her r opriate manner and authentica in engineering achieve its pro- unexpected de peration with o ne field on an ake manageme in cooperatior	subject ar entific and a of the field atexts and acquisitio and legal ru- el. ards of hea- mental pro- onmental pro- ary resource n of proble ne rules an mother ton , in accord lly commu- g. fessional g ecision-ma thers. ongoing pro- ent decision. carry out pro- one of proble	ea of engineering. social principles, rules, l of engineering. theories related to the n and problem-solving ules and tools. Ith and safety at work, tection in the field of protection and quality insically linked to the the knowledge base of ate evaluations. ulate and solve (using bund necessary to solve ces specific to the field. ems in the field. d regulations. gue and in at least one ance with his/her field unicating professional, goals. king situations in full basis and in line with ns by listening to the practical activities.		

	Open and receptive to the application of new, modern and innovative practices and methods related to organic farming and health awareness. In the course of his/her work, he/she observes and complies with the relevant safety, health, environmental protection, quality assurance and control requirements.						
	Autonomy and responsibility						
	Responsibly upholds and represents the values of the engineering profession, and is open						
	to professionally informed critical comment.						
	In the performance of his/her professional duties, he/she will cooperate with qualified						
	professionals from other disciplines (primarily technical, economic and legal).						
	Identify shortcomings in the technologies used, process risks and take the initiative to mitigate them.						
	Monitor legislative, technical, technological and administrative changes in the field.						
	Under the direction of the line manager, manages the work of the staff assigned to him/her and supervises the operation of machinery and equipment.						
	Assesses the efficiency, effectiveness and safety of the work of subordinates.						
	Supervises the professional development of his/her subordinates.						
	Sharing his/her experience with his/her colleagues in order to support their development.						
	Takes responsibility for the consequences of his/her technical analyses, the proposals						
	he/she makes and the decisions he/she takes.						
	Translated with www.DeepL.com/Translator (free version)						
	The main environmental issues of the moment are global warming, carbon dioxide						
	emissions and sequestration, the impact of human activity on global warming, carbon						
	dioxide emissions and ways to reduce global warming. The 3 E harmonisation. Life						
	expectancy and polluting emissions of fossil fuels and nuclear feedstocks. Accounting for						
Short description of the subject content	renewable energy sources and the significance of their environmental emissions. Energy production options, combined fossil, nuclear and renewable energies, basics of environmental management, environmental policy. Radioactivity and the interaction of						
	different materials, absorption of radiation. Reduction of radiation intensity by different walls, thin film walls. Effects of radiation on the human body, decontamination procedures.						
Types of student activities	Processing of heard text by taking notes and recording the material using your own notes and those available electronically 80% Development of test questions 20%						
Required literature and contact details	Endre Kiss: Environmental protection and energy management (electronic note)						
	Martin James E: Physics for radioactivity, Wiley-VCM Verlag GMBH, 2013						
details	Nikjoo Mooshang: Interaction of radiation with Matter, Taylor and Francis 2019						
Description of tasks to be							
submitted/measurement reports							
Description and timetable of the	Week 7: I. Test						
workshops	Week 12: II. Test						

#### **Coating Processes**

Name of the subject		in Hungarian 🛛 F		Felületi és v	ékonyréte	g technikák		Level	BSc			
Name of th	ie subject	in English		Coating Proc	cesses				Code	DUEN(L)-MST-254		
Responsibl	le education	al unit		Institute of 7	Technolog	y, Departme	nt of Str	uctural Integri	ty			
Name of co DUEN(L)-	ompulsory p	orior learnir	ng	MST-210	MST-210							
Туре		Presentatio	n	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/52	per week	1	per week	2	per week	1	E	5	english		
Teacher re	sponsible fo	or the subject	-t	Name	10	Andrea Sza	bó PhD		schedule	Senior lecturer		
reaction rea	sponsible ic	n uie subjec		Goals deve	lonment (	hiectives	00,111		seneaure	Semor recturer		
				Students should be familiar with coatings commonly used in industry and their								
				providents should be raminar with coatings commonly used in industry and their manufacturing technologies. They should know the behaviour of metals and metal allows								
Training of	Training objective and justification of		on of	inanuiacium g technologies. They should know the behaviour of metals and metal alloys to acids and alkalis and to weathering, and thus he able to select the appropriate prevention.								
the course	(content, ou	itput, locati	on in	and coating	design bas	sed on their of	corrosio	n behaviour.		appropriate provention		
the curricu	lum)	1 /		The student	will kno	w the atom	ic and s	tructural struc	ture of m	etals and alloys, their		
				chemical pro	operties, t	heir behavio	our to ac	ids and alkali	s, and will	be able to select and		
				formulate co	atings on added val	the surface ue of certain	of meta	ls to avoid the	ese corrosi surface co	ve failures. It can also atings.		
				Presentation	Projecto	or, ppt prese	itation			8		
		1		Practice								
Typical de	livery metho	ods		Laboratory	Laborat	ory presenta	tions and	d experiments				
				Other		21		•				
				Knowledge								
				Understand	the purp	ose of surfa	ice treat	ment, the cla	ssification	of surface treatment		
				methods. Kn	methods. Knowledge of the causes of corrosion. reactions of metals with acids, oxygen and							
			alkalis.	U								
			Understands the electrochemical basis of corrosion.									
				Knowledge of the basic concepts and technical terminology of corrosion. Understands the								
				types of corrosion.								
				Knowledge of the corrosive effects of chemicals.								
				Understands	the rules	for material	selection	n according to	corrosion	criteria.		
				Identifies corrosion damage in highly alloved steels, including stainless steels.								
				Understands the corrosion behaviour of aluminium alloys and its relationship to the method								
				of manufacture								
				Understand standard methods of corrosion testing and the basic context for the evaluation								
				of test results.								
				Understands surface contamination and macro and micro surface cleaning methods.								
				Understands the processes of electroplating, chemical metal deposition, electroless nickel								
				plating.								
Requireme	ents (express	sed in terms	s of	Knowledge Ability	of physica	and chemi	cal vapo	ur deposition t	echnologie	es.		
icarining of	iteomes)			The ability to distinguish between the different forms of corrosion.								
				Ability to plan the sequence and work order of corrosion tests.								
				Carry out a c	complete o	corrosion ins	pection	of a product.				
				Interpret the	results of	a corrosion	test.					
				Propose imp	rovement	s to previous	ly used o	coating technol	ogy in the	light of the test results.		
				Attitude								
				Collaborate	with class	mates and th	e teache	er to develop ki	nowledge.			
				Strive to con	tinuously	improve the	ar know	ledge of surfac	e treatmen	it techniques.		
				Strives for a	ning and a	appiying mo	ical and	laboratory ave	jues.			
				$\Delta$ creative	approach	to the co	ntinuous	improvemen	t of annl	ied technologies and		
				procedures	approach		mmuous	mprovemen	t of appi	ieu technologies and		
		Autonomy a	and respo	nsibility								
				Independent	ly carry of	ut experime	ntal des	ign tasks base	d on the g	uidance and resources		
				provided.	J	1			B			
		Assesses the	environm	ental pressu	res assoc	ciated with pro-	duction and	d seeks to reduce them.				
				Assesses and	l rationali	ses energy u	se relate	d to material p	roduction.			
				Performs occupational health and safety duties.								
				The student	will be fa	miliar with a	nd be al	ole to apply coa	ating techn	ologies, the properties		
Short descr	rintion of th	e subject co	ontent	of different	types of	coatings an	d their a	applications. T	The studen	t will learn about the		
	-puon or u	- subject et		behaviour o	f metals i	n corrosive	media a	nd different n	netal depo	sition techniques. Gas		
				phase metal	depositio	on technique	es (PVD	, CVD). Meta	al depositi	on from liquid phase		

	(electroplating, chemical metal deposition). Solid phase deposition (plating). Anodising of aluminium. Surface hardening. Wear resistant surface coating (nitriding, boriding, carbonising, carbonitriding, cementation). Painting techniques, paint coating test methods.
Types of student activities	Active participation in lectures and laboratory exercises.
Required literature and contact details	<ul> <li>Modern metal surface treatment and waste management methods (PHARE HU-0008-02-01-0062). University of Miskolc Centre for Continuing Education, 2004.</li> <li>Endre Berecz: Chemistry for Technicians, ISBN 963 18 6825 7</li> </ul>
Recommended literature and contact details	<ul> <li>Peter M. Martin: Introduction to Surface Engineering and Functionally Engineered Materials, Wiley &amp; Sons, 2011.</li> <li>Mahmood Aliofkhazrai: Modern Surface Engineering Treatments; In Tech, 2013. ASM Handbook, Surface treatment Volume</li> </ul>
Description of tasks to be submitted/measurement reports	1 Report during the semester (examination of paint layers, examination of chemical nickel layer)
Description and timetable of the workshops	

#### Thesis Project 1.

in Hungarian			Castrdalaar	+ 1 Vintat	ó ann á darranta	Laval	DCo				
Name of the	e subject	in Fnglish		Szakuolgoza	$\frac{111}{11}$ ct 1	asmouszerta	In MUT		Code	DUEN(L)-MUG-090	
Perpensible	aducation	al unit		Institute of 9	Ct I.	ancas Danar	tmonto	fEconomics	Coue	DUEN(L)-INIUU-090	
Neme of co	mulcor	nrior loornin	a	institute of a		ences, Depai	tillent 0	I Economics			
DUEN(L)-	Inpuisory		g			1		1			
Туре		Presentation	n	Practice	Practice		Laboratory		Credit	Language of education	
Full time	150/26	per week	2	per week	0	per week	0	c		onglish	
Part time	150/10	per term	10	per term	0	per term	0	3		english	
Teacher res	ponsible f	or the subjec	t	Name		Tamás Zaho	ola		schedule		
				Goals, deve	lopment	objectives					
Training ob	Training objective and justification of			The aim of	the cours	se is to prep	oare futi	ure economists	to identit	fy the problems to be	
the course (content, output, location in			researched a	and to app	ply the result	lts in pi	ractice. The stu	ident shou	ild be able to observe		
the curricul	um)			professional	ly, to pre	pare object	ive data	collection in	struments	and questionnaires to	
				monitor his/	her observ	vations and to	o record	his/her experie	nces in tex	tual or numerical form.	
				Presentation							
				Practice	small g	roup tabletop	o exercis	ses, guided gro	up work		
Typical deli	very meth	iods		Laboratory				,			
				Other							
				Knowledge							
			Knowledge of the key contexts and theories of farming and the terminology that undersing								
			hem.								
			A bility	Ability							
			Ability to or	alvea at	a hasia laval	the eet	aganta that mal	ra un tha l	monuladaa haaa of tha		
				Addinty to al	lalyse at a	a Dasic level	loto or	ntepts that that	internalet	knowledge base of the	
				nianagemen	lustions	ie, to form	nate sy	indically die	Interretat	ionships and to make	
Doquiromor	te (overes	and in terms	of	Ability to use and understand the literature, computer and library resources specific to the							
looming out	ns (expres	seu in terms	01	field of management.							
learning out	comes)										
				Autume He is onen to authantically communicate the overall thinking and accordial fortunes of his							
				He is open to authentically communicate the overall thinking and essential features of his							
				profession.							
				rie is commuted to continuous self-education in the field of economics.							
				Autonomy and responsibility							
				Independently think through broad, underpinning policy questions and resources.							
				Collaboration and responsibility with qualified professionals in the field.							
Short descri	ption of th	ne subiect co	ntent								
	1	J									
				Text interpre	etation						
				- Processing	informati	on individua	ally and	in groups			
Types of sti	ident activ	vities		- Clashing o	pinions						
rypes or su	ident detiv	lites		- Debate and	l argumen	tation skills					
				- Working in	n a group						
				- Mastering forms of advocacy							
Required lit	erature an	d contact de	tails	•							
Recommend	ded literati	ure and conta	act								
details											
Description	of tasks to	o be									
submitted/n	<u>neasurem</u> e	nt reports									
Description	and timet	able of the									
workshops											

#### Entrepreneurship

Name of the subject in Hungarian			Vállalkozást	an		Level	BSc						
Name of the	subject	in English		Entrepreneu	rship		Code	DUEN(L)-TVV-122					
Responsible	education	al unit		Institute of S	Social Scie	ences, Depar	tment of	f Management	and Entrep	oreneurship			
Name of cor DUEN(L)-	mpulsory j	prior learnir	ng										
Туре		Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education			
Full time	150/39	per week	1	per week	2	per week	0	М	5	english			
Part time	$\frac{150/15}{2000}$	per term	3 ot	per term Name	10	per term Odorige Ca	U tháring I	Inorédia	schadula	-			
Teacher resp		Ji ule subjet		Name Udorige Catherine Enoredia Schedule									
Training objective and justification of the course (content, output, location in the curriculum)			on of on in	The curricul creation, o management corporate m law and oth material and the activities corporate co theoretical k	The curriculum provides a comprehensive knowledge of entrepreneurship, including the creation, operation, transformation, liquidation, financial management and the management of assets and liabilities. The student will be able to review the essence of corporate management, its procedures and to understand and apply corporate (business) law and other regulations. They will be familiar with the economic, financial, human, material and property characteristics and components of companies, the risks inherent in the activities of companies, their types, the characteristics of international and domestic corporate cooperation and will be able to apply these at a skill level. In addition to								
				Presentation	In a clas	sroom for le	ectures ( ard	100-150 people	e) using a	computer, projector,			
Typical delivery methods				Practice	In a clas compute forms of	sroom suita er, projector, f peer work.	ble for p flipcha	project work (2 rt or whiteboar	0-30 stude d. Group v	nts), using a vork and various			
				Laboratory	Laboratory								
Requirements (expressed in terms of learning outcomes)			Other Knowledge										
			s of	Understand the concepts of business management. Understand the mechanisms of action of a company. Knowledge of the legal background of companies, their internal and external environment. Knowledge of the management systems, objectives and strategies of companies. <b>Ability</b> Ability to use the terminology of the field in a professional manner. Ability to identify and define the resources of companies. Ability to implement the basics of business management. Ability to understand the steps of corporate objectives and strategy. Ability to understand and use relevant literature. <b>Attitude</b> Open to actively interpreting changing communication communities and social situations. Sensitive to solving problems arising from the functioning of relationships. Receptive to seizing opportunities for development. <b>Autonomy and responsibility</b> Take responsibility for your own development. Cooperates with others, looking for ways to solve problems. Takes responsibility for the development of his/her working									
Short description of the subject content				The emergence of companies, their concept, the regar background of their operation. The macro and micro, external and internal environment of the company. The company as an economic system, characteristics of economic systems, basic concepts of their operation. The purpose of the enterprise, its objectives and strategy. Economic decisions of companies. Description of corporate resources and activity system. Assets and liabilities of the company, financing of the company. Organisation and management of companies. Resource management of companies. Introduction to corporate production, services, material processes. Internal and external logistics of the company. Human resource management in the company. Sources and role of corporate information. Corporate innovation. Corporate revenue and cost management. The concept of quality, total quality management and control (TQM). Corporate strategy, strategic guiding principles, strategic management, strategy development, implementation and control. Controlling. The role of business planning, presentation. Corporate ethics, responsibility, culture in the operation of companies. Outsourcing, its development, types, ways of implementation. Corporate									
Types of stu	dent activ	ities		Individual and group activities: participation in individual and small group exercises, participation in guided company role-play, analysis of case studies, analysis of complex company simulations									
Required lite	erature and	d contact de	etails	•									

Recommended literature and contact details	•
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	

#### **Research Thesis**

Name of the subject		in Hungarian S		Szakdolgoza	ut - ANYE	BSC		Level	BSc			
Name of th	le subject	in English		Research Th	esis				Code	DUEN(L)-MUA-091		
Responsibl	e education	al unit		Institute of 7	Fechnolog	y, Departme	nt of Stu	ructural Integri	ty			
Name of co DUEN(L)-	ompulsory p	prior learnin	ıg	1-6 félév minden tárgyának teljesítése								
Туре		Presentatio	n	Practice		Laboratory	Laboratory		Credit	Language of education		
Full time	150/156	per week	0	per week	12	per week	0	s	15	english		
Part time	150/60	per term	0	per term	60	per term	0	~				
Teacher res	sponsible fo	or the subject	et	Name		Andrea Sza	bó, PhD		schedule	Senior lecturer		
Training objective and justification of the course (content, output, location in the curriculum)		on of on in	Building on enables him detection, m he/she will knowledge, systematic s	Building on previous subjects, the student has acquired a comprehensive knowledge that enables him/her to solve an engineering problem (heat treatment, plastic forming, failure detection, materials testing). To demonstrate this, the student will prepare a thesis, in which he/she will transform the knowledge acquired in each subject into a complex body of knowledge, and will be able to see the engineering problem, solve it and produce a systematic summery of it								
				Presentation								
Typical del	livery meth	ods		Practice	The solution the cont	ution and su text of consu	pport of ltation	theoretical and	l practical	tasks of the thesis in		
				Laboratory								
				Other								
Requirements (expressed in terms of learning outcomes)			<ul> <li>Knowledge</li> <li>Knowledge of the basic physico-chemical processes in material systems, their (basic) mathematical description, with particular reference to the laws of thermodynamics and kinetics. A broad knowledge of the atomic, micro- and macro-structure of solids, the basic methods for the study of structure and the principles of operation of basic devices and the processes that give rise to structures. Detailed knowledge of the principles of operation of machinery and equipment used in the production of materials, basic technologies for the production and shaping of metals and their alloys (plastic forming and casting). Knowledge of the basic techniques of heat treatment and surface treatment. Knowledge of basic technologies for the production of ceramics (including glass and binders) and composite materials. Knowledge of basic technologies for the production and processing of polymers. Systematic knowledge of the energy characteristics, energy efficiency requirements and energy supply options of the technologies in the field.</li> <li>Ability</li> <li>Ability</li> <li>Ability to apply the related computational and modelling principles and methods of product and process design. Ability to interpret and characterise the structure and function of the structural units and elements of mechanical systems, the design and interrelationship of the system elements used. Understand and use online and printed literature in Hungarian and foreign languages typical of his/her field of specialisation.</li> <li>Attitude</li> <li>The student takes a creative approach to continuously improve the technologies and processes and technologies</li> <li>Autonomy and responsibility</li> <li>It determines the properties of the different products, checks the quality of the work phases specific to the technology and performs quality management of the sub-tasks. Assesses and technologies</li> </ul>									
Short descr	ription of th	e subject co	ontent	Within the framework of the course, the student prepares the tasks required in the thesis (draft), which are both theoretical, i.e. a theoretical study of the literature on the given topic, and the evaluation of practical experiments and experimental results of the engineering task and the comparison of the test results with the literature data.								
Types of student activities			literature research consultation laboratory exercises									
Required li	Required literature and contact details			Interature research, consultation, laboratory exercises								
Recommended literature and contact			act									
details	6	,										
Descriptior submitted/1	n of tasks to measureme	be nt reports										
Descriptior workshops	n and timeta	able of the										

#### **Professional Internship**

in Hungarian				Szakmai gya	akorlat - A	NYBSC	Level	BSc			
Name of th	e subject	in English		Professional	Internshi	р	Code	DUEN(L)-MUA-093			
Responsibl	e education	al unit		Institute of 7	Technolog	y, Departme	ent of Sta	ructural Integri	ty	·	
Name of co DUEN(L)-	ompulsory [	prior learni	ng								
Туре		Presentatio	on	Practice	Practice Laboratory Requirement			Credit	Language of education		
Full time	150/0	per week	0	per week	0	per week	0	S		english	
Teacher res	sponsible fo	or the subie	ect	Name	0	Andrea Sza	bó. PhD	)	schedule	Senior lecturer	
Training objective and justification of the course (content, output, location in the curriculum)			on of ion in	Goals, deve Building on enables him detection, m he/she will knowledge, systematic s Presentation	Goals, development objectives Building on previous subjects, the student has acquired a comprehensive knowledge that enables him/her to solve an engineering problem (heat treatment, plastic forming, failure detection, materials testing). To demonstrate this, the student will prepare a thesis, in which he/she will transform the knowledge acquired in each subject into a complex body of knowledge, and will be able to see the engineering problem, solve it and produce a systematic summary of it.						
Typical delivery methods				Practice	The solution the cont	ution and su text of consu	pport of iltation	theoretical and	l practical	tasks of the thesis in	
				Other							
Requirements (expressed in terms of learning outcomes)			s of	Knowledge of the basic physico-chemical processes in material systems, their (basic) mathematical description, with particular reference to the laws of thermodynamics and kinetics. A broad knowledge of the atomic, micro- and macro-structure of solids, the basic methods for the study of structure and the principles of operation of basic devices and the processes that give rise to structures. Detailed knowledge of the principles of operation of machinery and equipment used in the production of materials, basic technologies for the production and shaping of metals and their alloys (plastic forming and casting). Knowledge of the basic techniques of heat treatment and surface treatment. Knowledge of basic technologies for the production of ceramics (including glass and binders) and composite materials. Knowledge of basic technologies for the production and processing of polymers. Systematic knowledge of the energy characteristics, energy efficiency requirements and energy supply options of the technologies in the field. <b>Ability</b> Ability to apply the related computational and modelling principles and methods of product and process design. Ability to interpret and characterise the structure and function of the system elements used. Understand and use online and printed literature in Hungarian and foreign languages typical of his/her field of specialisation. <b>Attitude</b> It takes a creative approach to continuously improve the technologies and processes used. It strives to use energy and material-saving processes and technologies <b>Autonomy and responsibility</b> It determines the properties of the different products, checks the quality of the work phases specific to the technology and performs quality management of the sub-tasks. Assesses and seeks to reduce the environmental impact of production. Assess and rationalise energy consumption related to the production of materials.							
Short desci	ription of th	e subject c	ontent	necessary te	sts, evalua	ites the test i	results a	nd summarises	them in at	e least 20 pages.	
Types of st	Types of student activities			Consultation	n, laborato	ry exercises	, tasks ir	n an industrial e	environme	nt	
Required literature and contact details			•								
Recommen details	ided literatu	are and con	tact	•							
Description submitted/1	n of tasks to measureme	be nt reports									
Description workshops	n and timeta	able of the									

#### Management

in Hungarian		Menedzsmer	nt		Level	BSc						
Name of the subject	in English		Managemen	t		Code	DUEN(L)-TVV-114					
Responsible education	nal unit		Institute of S	Social Scie	ences, Depar	tment of	f Management	and Entrep	oreneurship			
Name of compulsory p DUEN(L)-	prior learnii	ng										
Туре	Presentatio	on	Practice		Laboratory		Requirement	Credit	Language of education			
Full time 150/39 Part time 150/15	per week	1	per week	2	per week	0	М	5	english			
Teacher responsible for	r the subject		Name	10		0		schedule	Associate professor			
	or the subje		Goals, deve	Coals development objectives								
			The aim of	the cours	e is to famil	iarise st	udents with th	e most in	portant aspects of the			
			management	t of work	organisation	s, to pro	vide an overvie	ew of the "	special" dimensions of			
Training objective and	l justificatio	on of	management	t and the	factors that	determ	ine them. To	o develop	students' professional			
the course (content, ou	utput, locati	on in	competences	s and theo	retical know	ledge, th	ne course provi	des an ove	rview of management-			
the curriculum)			organisation	al concep	ts and their	main n	nodels. Throug	gh the kno	owledge imparted, the			
			course will e	enable stud	lents to anal	yse and	develop work o	organisatio	ons; to develop skills in			
			the applicati	on of the r	nanagement	techniqu	ues and method	ls taught. F	Practical examples help			
			to interpret t	heoretical	knowledge	and to ic	lentify relevan	t contexts.				
				Teacher	presentation	n, with e	explanations an	d practical	examples. Students			
			Presentation	teacher'	s summary	All stud	naring their ex	perferices,	large lecture with			
				projecto	or and preser	All stud	chnique	genner in a	large lecture with			
Typical delivery meth	ods			Max In	classrooms	of 30 st	udents using i	iteractive	methods small groups			
i j picur deniver j medi	045		Practice	of 5-6 s	tudents and	individu	al work. projec	tor. overh	ead projector and			
				presenta	ation techniq	ues.	, r . j .	, , , , , , , , , , , , , , , , , , , ,	I J			
			Laboratory									
			Other									
			Knowledge									
			Knowledge	of the bas	sic factors, k	ey conc	epts, requirem	ents, conte	exts and procedures of			
			management and organisation science. Acquires the theoretical and methodological									
			foundations	for the p	performance	of man	agement tasks	and the	exercise of functions.			
			minowiedge of the procedures and methods frequently used in planning, organisation and management. Knowledge of leadership style models and their role in effective leadership									
			hehaviour Knowledge of methods of understanding and analysing management and									
			penaviour. Knowledge of methods of understanding and analysing management and decision-making systems in work organisations, their athical limitations and their potential									
			for improvement. Understand and identify with the importance of corporate social									
			responsibility. Understands the ethical responsibilities of management and its role in the									
			effective functioning of the firm.									
			Ability									
			Ability to	demonstr	ate and e	xercise	managerial f	unctions.	Distinguish between			
			management	t styles on	the basis of	advanta	age and disadv	antage and	l apply the appropriate			
			style as nec	essary. I	Distinguish l	between	long and sho	rt-term tas	sks and consequences.			
Requirements (expres	sed in terms	s of	Ability to c	reatively a	analyse the	purpose	process and	organisatic	onal system of a work			
learning outcomes)			organisation	. Ability	to organise	own and	l others' work e	effectively	and humanely, and to			
			the compan	allis. Adi v's mater	ial and info	ge, orga	$\Delta$ processes $\Delta$		are the development of			
			assessment (	self-asses	sment) anal	vsis and	synthesis	i good se	inse of responsionity,			
			Attitude	0011 40000	, and	joio una	synthesist					
			He is open a	ind able to	accept diffe	erent opi	inions, which a	re not his	own. Willing and able			
			to work in a	team and s	share knowle	dge witl	n others. Intere	st and com	mitment to continuous			
			professional	developn	nent. Strive	s to mal	ke decisions in	full respe	ct of legal and ethical			
			standards. Sl	he has a c	omprehensiv	ve systen	ns approach.					
			Autonomy a	and respo	onsibility							
			It builds and	initiates	new areas of	knowle	dge and new p	ractices w	ith creative autonomy.			
		He/she is able to take a leading role and to engage in a high level of cooperation in the										
		formulation	formulation of practical issues affecting the future of his/her work and organisation. He/she									
		nakes respon	takes responsibility for the consequences of his/her actions and decisions. Ability to									
		periorini aut	the enterr	y use mana	manager	ment of operati	ons Has a	sense of responsibility				
			for sustainal	le develo	pment.	munage	ment of operation	5115. 11a5 a	sense of responsionity			
			The world	of husing	ess organie	ations	husinesses and	1 compan	ies Business and ite			
			environment	. Busines	s and man	agemen	t. organisation	al and m	anagement functions			
Short description of th	ne subject co	ontent	Managemen	t, leadersh	nip, governa	nce and	how they relate	e to each c	other. Managerial roles			
			and levels. H	listorical o	overview of 1	nanager	nent. Managen	nent trends	, schools and concepts.			

	Similarities and differences. Planning: hierarchy of organisational objectives and levels of
	planning, long, short term and operational planning, methods of planning. Organisation:
	structural change, processes, understanding of organisations, division of labour and the
	arrangement of divisions, creating process and organisational structures, structural
	characteristics of organisations, types of organisations and their characteristics.
	Management: enforcement of authority, setting standards, measurement, evaluation and
	correction, managing day-to-day problems, monitoring and controlling, tools for strategic
	management. Personal leadership: leadership behaviour and leadership style, identities and
	differences in theories of leadership style and conclusions to be drawn. Politics and ethics
	in organisational life. Interpretation, areas and sources of business ethics. Characteristics
	of ethical behaviour and ethical business. The concept of a responsible company, an
	introduction to corporate social responsibility. Ethical responsibilities of management
	within the company.
	Guided and independent study of theoretical material, Problem solving with guidance and
Types of student activities	independently. Analysis of case studies, group work. Solving complex problems,
	cooperation in team work. Collecting, processing and presenting information related to
Required literature and contact details	•
Recommended literature and contact	•
details	•
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

#### Product management and value analysis

NT 0.1		in Hungarian		Termékmene	dzsment	és értékelem	Level	BSc						
Name of the	he subject	in English		Product mana	agement a	and value an	Code	DUEN(L)-TVV-118						
Responsib	le education	nal unit		Institute of Social Sciences, Department of Management and Entrepreneurship										
Name of c DUEN(L)·	ompulsory	prior learnin	ıg			· •		×						
Type Presentation		n	Practice		Laboratory	Laboratory		Credit	Language of education					
Full time	150/39	per week	2	per week	1	per week	0	М	5	english				
Teacher re	sponsible f	or the subject	10 rt	Name	5		0		schedule					
Training of	biective and	1 instificatio	on of	Goals, develo	onment o	hiectives			seneaure					
the course	(content. or	utput. locatio	on in	Goais, uevelopment objectives										
the curricu	(lum)													
	,			Presentation										
	1º .1			Practice										
Typical de	livery meth	lods		Laboratory										
				Other										
				Knowledge										
				Knowledge a	and unde	rstanding of	f the to	ols and metho	ods of cor	nputer modelling and				
				simulation ir	n the fie	ld of mech	anical e	engineering -	Broad the	oretical and practical				
				knowledge, r	nethodol	ogical and p	ractical	skills for the	design, m	anufacture, modelling,				
				operation and	manager	ment of com	plex me	chanical system	ns and proo	cesses. Comprehensive				
				knowledge o	f machin	e, system a	nd proce	ess design met	thods in th	ne field of mechanical				
				engineering.										
				Ability										
				Ability to master the global design of complex systems based on a systems and process-										
				oriented thinking. o Ability to plan and manage the use of technical, economic,										
				environmental and human resources in a complex way. o Ability to apply and develop										
				procedures, models and information technologies used in the design, organisation and										
				operation of engineering systems and processes. Skills in quality assurance, metrology and										
				process control of engineering systems, technologies and processes. Ability to deal creatively with problems, to solve complex problems in a flexible manner and to engage										
				in lifelong learning and commitment to diversity and value-based approaches										
Requireme	ents (expres	sed in terms	of	Attitude										
learning of	utcomes)			It strives to improve its own knowledge and that of its staff through continuous self- and										
C	·			further training. Strive to respect and enforce ethical principles of work and organisational										
				culture. Striv	e to meet	t and enforce	quality	standards. Stri	ve to orga	nise and carry out their				
				tasks in acco	ordance v	with environ	mental,	health and su	ıstainabilit	y standards. Strive to				
				acquire a broa	ad and co	mprehensiv	e literac	y. Strive to imp	olement su	stainability and energy				
				efficiency rec	quirement	ts. Strive to	plan and	l carry out task	s to a high	professional standard,				
				either indepe	ndently o	or in a team.	Strive	to carry out th	eir work i	n a complex approach				
				based on a sy	ystems ai	nd process-o	riented	thinking. In th	e course c	of his/her work, he/she				
				will explore the possibility of setting research, development and innovation objectives and										
				strive to achieve them. Using his/her technical knowledge, he/she seeks to gain a better										
				understanding of observable phenomena and to describe and explain their laws.										
				Autonomy and responsibility										
				It takes its decisions independently, in consultation with other disciplines (mainly legal,										
				it takes accor	unt of th	e principles	and an	plication of er	vironmen	tal protection quality				
				consumer pro	otection.	product liabi	lity. equ	al access. hea	th and saf	etv at work, technical.				
				economic and legal regulation and engineering ethics										
				The basic cor	ncept of v	alue analysi	s, its ma	ain characterist	ics, tools,	types of value analysis				
				(Value Ana	lysis, V	alue Engin	eering,	Value Contr	ol, Value	Investment, Value				
				Management	). Method	is of produc	t selection	on, principles o	of selecting	g team members, main				
Short desc	ription of th	ne subject co	ontent	steps of the	value an	alysis proce	ss, defi	nition of prod	uct functi	ons, steps of function				
L J				costing, methods of designing and testing variants, philosophy and rules of Total Product										
				Management, environmental aspects, basic features of life cycle analysis, principles of life										
				cycle manage	ement, ma	aintenance e	xpectati	ons.		004 Q				
Types of s	tudent activ	vities		Processing w you've learne	hat you'v <u>d 20% S</u> o	e heard 40% olving test pa	Process apers 20	sing published	material 2	0% Organising what				
Required 1	iterature an	d contact de	tails	•										
Recommen	nded literati	ure and cont	act											
details				•										
Descriptio	n of tasks to	o be												
submitted/	measureme	nt reports												

Description and timetable of the	
workshops	

#### **Basics of nuclear safety**

in Hungarian				Nukleáris bi	ztonság al	apjai	Level	BSc				
in English				Basics of nu	clear safe	ty	Code	DUEN(L)-MGT-117				
Responsible	education	al unit		Institute of 7	Technolog	y, Departme	neering an	d Energy				
Name of con DUEN(L)-	mpulsory p	prior learnin	ıg			<u>, , , , , , , , , , , , , , , , , , , </u>			<u></u>			
Туре		Presentatio	n	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	<u>150/15</u>	per term	10	per term	0	per term	5	D	111-	Callana and		
Teacher resp	ponsible ic	or the subject	31	Name		WIIKIOS HOP	vain, Ph	D	schedule	College professor		
Training obj	iactiva and	linstificatio	n of	Goals, deve	ntroducto	njecuves	o givo th	a student en o	uorniom of	f the history of nuclear		
the course (	content of	i justificatio	on in	A series of I	vnes of ni	i y lectules u	nlante c	urrently in one	verview of	planned for the future		
the curricult	im)	iipui, iocaii		the journey	of uraniur	n ore from r	nining to	burial and tr	ends and t	to anticipate what they		
and curricure	)			will learn in more detail in each subject.								
				Presentation	For all s	students in a	large le	cture hall with	a blackboa	ard presentation		
		1		Practice	For all s	students in a	lecture	room with proj	ector.			
Typical deli	very meth	ods		Laboratory				• •				
				Other								
				Knowledge								
				Have a com	prehensiv	e knowledge	e of the l	basic facts, trea	nds and lir	nits of the subject area		
				of engineerin	ng.							
				Knowledge	of the gen	eral and spec	cific mat	hematical, scie	ntific and	social principles, rules,		
				contexts and	procedur	es necessary	for the	operation of th	e technica	field.		
				You know the	ne termino	ology, key co	oncepts a	and theories rel	lated to yo	ur field.		
				in your field	You have a comprehensive knowledge of the main theories and problem-solving methods							
				in your field.								
				He has a thorough knowledge of the structural materials used in the field of mechanical								
				engineering, the methods of their manufacture and the conditions of their application.								
				Basic knowledge of machine design principles and methods, machine manufacturing								
				technology, control procedures and operating processes.								
				Comprehensive knowledge of the operating principles and structural units of the								
				machinery, power tools, mechanical equipment and tools used.								
				He/she knows the measuring procedures used in mechanical engineering, their instruments,								
				Instruments and measuring equipment.								
				He/sne knows the expectations and requirements of the occupational safety, fire protection, safety and occupational health areas related to his/her field of specialisation, as well as the								
				salety and occupational nearin areas related to his/ner field of specialisation, as well as the relevant environmental protection regulations.								
				Comprehensive knowledge of the basics, limits and requirements of logistics. management.								
Requiremen	ts (express	sed in terms	of	environmental protection, quality assurance, information technology, law and economics, which are integrally related to the field of engineering								
learning out	comes)		5 01	In-depth knowledge of learning, knowledge acquisition, data collection methods, their								
iouning out	•••••••			ethical limitations and problem-solving techniques in mechanical engineering.								
				Knowledge of the methods and tools of business economics and cost-benefit analysis based								
				on technical principles.								
				Understand, characterise and model the structure and operation of the structural units and								
				elements of mechanical systems, the design and interrelationship of the system components								
				used. Apply the related computational and modelling principles and methods of anginagring								
				product, pro	cess and to	echnology d	esign.	dennig princip	nes and m	culous of engineering		
				A bility								
				The ability t	o analyse	at a basic le	evel the	disciplines that	t make up	the knowledge base of		
				the technical	field, to s	synthesise re	lationsh	ips and to mak	e appropri	ate evaluations.		
			Ability to ap	ply the m	ost importa	nt termir	nology, theorie	s and proc	edures of the technical			
			field in the performance of related tasks.									
				Ability to pl	an, organi	se and carry	out inde	ependent learni	ng.	1, 1, 1, 1, 1		
				Ability to id	ientity rou	une protess	sional pi	coblems, to ide	entity, forr	nulate and solve them		
				(using stand	aru opera	and use lite	rature a	gainst a theory	ibrary reco	practical background.		
				field	idei Stallu	and use file	1au1e, C	omputer and I	iorary lest	succes specific to them		
				The acquired	l IT know	ledge can be	e applied	l to the solution	ı of tasks i	n the field.		
				Ability to bu	ild basic	models of te	chnical s	systems and pr	ocesses.			
				The ability t	o use thei	r knowledge	e in a cre	ative way to n	nanage the	ir workplace resources		
			effectively.				-					

	In the course of his/her work, he/she is able to apply and enforce safety, fire safety and
	hygiene rules and regulations.
	Ability to communicate in a professionally appropriate manner, orally and in writing, in your mother tongue and at least one foreign language.
	Ability to apply the technical specifications related to the operation of mechanical systems
	the principles and economic context of setting up and operating machinery and mechanical
	equipment.
	The ability to manage and control the production processes of specialised technology, with
	a view to quality assurance and quality control.
	Ability to diagnose mechanical failures, select troubleshooting operations, solve repair
	tasks
	Autuate It assumes and authentically represents the social role of its profession and its fundamental
	relationship with the world
	It is open to learning about, embracing and authentically communicating professional,
	technological development and innovation in engineering.
	You strive to make your self-training a means to achieve your professional goals.
	Make decisions in complex or unexpected decision-making situations, taking full account
	of legal and ethical standards.
	It tries to solve problems in cooperation with others, where possible.
	their professional goals.
	It strives to solve its tasks and make management decisions by listening to the opinions of
	the colleagues it manages, preferably in cooperation.
	You have the stamina and tolerance for monotony needed to carry out practical activities.
	You are open to the use of IT tools, you strive to learn and use software in the field of
	mechanical engineering, and you know and use at least one of these programs to a
	proficient level.
	farming and health awareness
	Using his/her technical knowledge, he/she strives to understand the observable phenomena
	as thoroughly as possible, to describe and explain their laws.
	In the course of his/her work, he/she observes and complies with the relevant safety, health,
	environmental, quality assurance and control requirements.
	Autonomy and responsibility
	In unexpected decision situations, he/she independently thinks through and develops
	Responsibly unholds and represents the values of the engineering profession, and is open
	to professionally informed critical comment.
	In the performance of his/her professional duties, he/she will cooperate with qualified
	professionals from other disciplines (primarily technical, economic and legal).
	Identify shortcomings in the technologies used, process risks and take the initiative to
	mitigate them.
	Information registrative, technical, technological and administrative changes in the field.
	and supervises the operation of machinery and equipment
	Assesses the efficiency, effectiveness and safety of the work of subordinates.
	He/she shall ensure that the professional development of his/her subordinates is promoted,
	and shall manage and support their efforts in this direction, applying the principle of equal
	access.
	Sharing his/her experience with his/her colleagues in order to support their development.
	he/she makes and the decisions he/she takes
	The evolution of security philosophy. The basics of modern security philosophy Risk and
	security. Technical aspects of security philosophy, implementing defence in depth.
	International security requirements. IAEA and EU security standards. Domestic regulatory
Short description of the subject content	requirements, Nuclear Safety Regulations. Safety functions. Safe heat removal from the
	reactor active zone. Safe heat removal from the spent fuel pool. Safety systems. Reliability
	and safety. Verification of design safety, safety reports and safety analyses. Safety
	Processing of heard text by note-taking and recording of material using own notes and
Types of student activities	electronically available notes 80% Development of test questions 20%
	• • Fundamentals of Nuclear Safety (electronic note. rapporteur's note)
Dequired literature and enstrated at "	• • Elter J., Gadó J., Holló E., Lux I. (eds.): Safety of Nuclear Reactors,
Required interature and contact details	ELTE Eötvös Kiadó, ISBN 978-963-312-180-1, Budapest, 2013
	Materials on MOODLE
Recommended literature and contact	Nuclear Safety Regulations Volumes 1-10 and Guides (OAH website)
details	

	• IAEA Safety Standards (Safety Fundamentals, Safety Standards, Safety Guides) (IAEA website)
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	Week 7: I final examination
Description and timetable of the	Week 12: II final examination
workshops	Week 13: any paper can be substituted

#### **Basics of Atomenergetics**

in Hungarian			an	Atomenerge	tikai alapi	Level	BSc					
Name of the subject in English Basics of Atomenerge			tics			Code DUEN(L)-MGT-118						
Responsible	e education	al unit		Institute of 7	Technolog	y, Departme	ent of Me	echanical Engi	neering an	d Energy		
Name of co DUEN(L)-	mpulsory p	prior learnin	ıg			5/ 1			0			
Туре		Presentatio	n	Practice	Practice Laboratory Requirement			Credit	Language of education			
Full time	150/39 150/15	per week per term	2 10	per week	1	per week per term	0	М	5	english		
Teacher res	ponsible fo	or the subject	t	Name	5	Miklós Hor	váth. Ph	D	schedule	College professor		
		j.		Goals, deve	lopment o	bjectives	,					
Training ob	jective and	l justificatio	n of	A series of i	ntroductor	ry lectures to	o give th	ne student an o	verview of	the history of nuclear		
the course (content, output, location in			energy, the t	ypes of nu	clear power	plants c	currently in ope	ration and	planned for the future,			
the curricul	um)			the journey	of uraniun	n ore from r	nining to	o burial, and tr	ends, and t	to anticipate what they		
				will learn in	more deta	il in each su	ıbject.					
				Presentation	For all s of proje	tudents in a ctor or over	large le head pro	cture hall with viector.	a blackboa	ard presentation. Use		
Typical deli	very meth	ods		Practice	Practice	, example		<u></u>				
51	j			Laboratory		· ·						
				Other								
				Knowledge								
				Have a comp	prehensive	e knowledge	e of the	basic facts, trei	nds and lin	nits of the subject area		
				of engineerin	ng.							
				Knowledge	of the gene	eral and spec	cific mat	hematical, scie	ntific and	social principles, rules,		
				contexts and	procedure	es necessary	for the	operation of th	e technical	field.		
				You know the	You know the terminology, key concepts and theories related to your field.							
				You have a comprehensive knowledge of the main theories and problem-solving methods in your field								
				Ability								
				The ability to analyse at a basic level the disciplines that make up the knowledge base of								
				the technical field, to synthesise relationships and to make appropriate evaluations.								
				Ability to apply the most important terminology, theories and procedures of the technical								
				field in the performance of related tasks.								
				Ability to plan, organise and carry out independent learning.								
				Ability to identify routine professional problems, to identify, formulate and solve them								
				(using standard operations in practice) against a theoretical and practical background. Ability to understand and use literature computer and library resources specific to their								
				Ability to understand and use literature, computer and library resources specific to their field								
				The acquired IT knowledge can be applied to the solution of tasks in the field.								
				Ability to build basic models of technical systems and processes.								
				The ability to use their knowledge in a creative way to manage their workplace resources								
Requiremen	ts (express	sed in terms	of	effectively.								
learning out	comes)			In the course of his/her work, he/she is able to apply and enforce safety, fire safety and								
U U				hygiene rules and regulations.								
				Attitude It assumes and authentically represents the social role of its profession and its fundamental								
				it assumes and authentically represents the social role of its profession and its fundamental relationship with the world.								
				It is open to learning about, embracing and authentically communicating professional.								
				technological development and innovation in engineering.								
				You strive to	o make yo	ur self-train	ing a me	eans to achieve	your profe	essional goals.		
				Make decisi	ons in con	nplex or une	expected	decision-maki	ing situatio	ons, taking full account		
				of legal and	ethical sta	ndards.		·				
				It tries to solve problems in cooperation with others, where possible.								
				Strive to keep their self-training in mechanical engineering continuous and in line with								
			Autonomy a	and respo	nsibility							
				In unexpect	ed decisio	on situation	s, he/sh	e independent	ly thinks	through and develops		
				comprehensi	ive, subst	antiating pr	ofession	al questions	on the ba	sis of given sources.		
				Responsibly	uphold ar	nd represent	the valu	es of the engin	eering prot	fession, and be open to		
				professional	ly informe	ed critical co	mments					
				In carrying	out his/h	er professio	nal duti	ies, he/she wil	Il also coo	operate with qualified		
				protessional	s irom oth	er nelds (pr	imarily f	tecnnical, econ	omic and l	egal).		
				measures to	reduce the	ngs of the to	cennolog	sies useu, life I	isks of the	processes and initiate		
			Monitor legislative, technical, technological and administrative changes in the field.									

	Directs the work of the personnel assigned to him/her, supervises the operation of machinery and equipment based on the instructions of the workplace manager
Short description of the subject content	The history of nuclear reactors. The Bomb 1939-1945,-47; The first atomic bomb. Accidents Nuclear power plant generations. From the uranium vein to the graveyard. The safety principles. The entire uranium life cycle Uranium ore mining. Fuel cell production. Nuclear power plant use (source: npp.hu). Temporary storage. Reprocessing. Waste management. Final disposal. Reactor physics. Fundamentals of nuclear physics. Criticality (four and six factor formulae). Point kinetics. Building blocks of reactors. Reactor calculations. From transport equation to point kinetics backwards. Reactor kinetics equations with late neutrons Solutions to the transport equation, critical reactor state. Multiplication factor, concept of reactivity. Diffusion approximation. Space dependence calculations. Treatment of reactor ores in reactor physics. Mechanical engineeringThe main components of the primary circuit. Other main equipment of the primary circuit. Elements of the primary circuit safety protection system. The secondary circuit heat cycle processes. Thermohydraulics of the reactor plant. Main factors to increase the safety of nuclear power plants.
Types of student activities	Taking notes on what you have heard and recording the material using your own notes and those available electronically 80% Developing test questions 20%
Required literature and contact details	<ul> <li>Gábor Pór:Nuclear Energy Basics textbook</li> <li>Materials on MOODLE</li> <li>International Atomic Energy Agency textbook, https://www-pub.iaea.org/MTCD/Publications/PDF/P082_scr.pdf</li> <li>Gyula Csom:Nuclear Power Plant Operation I Fundamentals of Reactor Physics and Technology (Technical University of Budapest, 1997)</li> <li>Gyula Csom:Nuclear Power Plants Operation II/1 - Operation of Energetic Nuclear Reactors (Műegyetemi Kiadó, Budapest, 2005) By: Operational knowledge (University of Dunaúiyáros, university note, in progress)</li> </ul>
Recommended literature and contact details	<ul> <li>Zoltán Szatmáry: Introduction to Reactor Physics, (Akadémiai Kiadó, Budapest, 2000)</li> <li>Duderstadt, J and Hamilton, L.: Nuclear Reactor Analyses (Wiley, New York, 1976)</li> <li>Bell, G. I., and Glasstone, S.: Nuclear Reactor Theory (American Nuclear Society, 1970)</li> <li>Dénes Bódizs:Measurement Techniques for Nuclear Radiation (Typotex, Budapest, 2009)</li> <li>G. F. Knoll, Radiation Detection and Measurement, 3rd Edition (John Wiley &amp; Sons. Inc. 2000.)</li> </ul>
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the workshops	

#### Ensuring the integrity of equipment

Nama of the contribut	an	Berendezésel	c integrita	Level	BSc						
Name of the subject	in English		Ensuring the	integrity	of equipmer	Code	DUEN(L)-MGT-119				
Responsible education	al unit		Institute of Technology, Department of Mechanical Engir				neering an	d Energy			
Name of compulsory p DUEN(L)-	prior learnii	ng									
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		
Part time 150/15	per term	10	per term	5	per term	0	IVI	5	english		
Teacher responsible for	or the subje	ct	Name		Péter Tramp	us, PhD		schedule	Professor emeritus		
			Goals, devel	opment o	objectives						
Training objective and	l justificatio	on of	the goals of	ensuring	g equipment	integri	ty encompass	safety, re	eliability, compliance,		
the course (content, ou	itput, locati	on in	quality, asse	et manag	gement, env	vironme	ntal protection	n, and ri	sk management. By		
the curriculum)			prioritizing e	equipmen	t integrity,	organiza	tions can safe	eguard the	ir people, assets, and		
			reputation while enhancing operational performance and sustainability.								
			Presentation	For all s	students in a	large lee	ture hall with	a blackboa	ard presentation. Use		
Trunical daliyany math	oda		Prostico	of proje	ctor or overi	lead pro	jector				
i ypical delivery meur	ous		Laboratory	Measur	aments and e	vamnla	2				
			Other	wiedsuit	ements and e	xample	5				
			Knowlodge								
			Have a comr	rehensiv	e knowledge	of the	basic facts dir	ections an	d limits of the subject		
			area of engin	eering	e kilowieuge	or the	Dasie Taets, un	ections an	a minis of the subject		
			Knowledge o	of the gen	eral and spec	ific mat	hematical scie	ntific and s	social principles rules		
			contexts and	procedur	es necessarv	for the	operation of th	e technical	field.		
			You know th	e termino	ology, key co	ncepts a	nd theories rel	ated to you	ır field.		
			You have a c	omprehe	nsive knowle	dge of t	he main theori	es and pro	blem-solving methods		
			in your field.	•		0			0		
			Comprehensive knowledge of basic economic, business and legal rules and tools.								
			He/she has a thorough knowledge of the structural materials used in the field of mechanical								
			engineering, the methods of their manufacture and the conditions of their application.								
			Basic knowledge of machine design principles and methods, machine manufacturing								
			technology, control procedures and operating processes.								
			Comprehensive knowledge of the operating principles and structural units of the machinery power tools mechanical aquinement and tools used								
			machinery, power tools, mechanical equipment and tools used.								
			He/sne knows the measuring procedures used in mechanical engineering, their instruments,								
			Ability								
			· ·								
			The ability to analyse at a basic level the disciplines that make up the knowledge base of								
			the technical field, to synthesise relationships and to make appropriate evaluations.								
Requirements (expres	sed in terms	s of	Ability to apply the most important terminologies, theories and procedures of the technical								
learning outcomes)			field in the performance of related tasks.								
			Ability to plan, organise and carry out independent learning.								
			(using standard operations in practice) against a theoretical and practical background								
			Ability to understand and use literature, computer and library resources specific to their								
			field.								
			The acquired IT knowledge can be applied to the solution of tasks in the field.								
			Ability to build basic models of technical systems and processes.								
			The ability to	o use their	r knowledge	in a cre	ative way to m	nanage thei	ir workplace resources		
			effectively.								
			Attitude								
			It assumes an	d authent	tically repres	ents the	social role of i	ts professi	on and its fundamental		
			relationship	with the	world. It trie	s to sol	ve problems in	i cooperati	on with others, where		
		possible.	n thair	lf training - '	n ma-1	nicol andire	ing sent	wowe and in line and			
			their professi	p uter se	su-uaming 1	n mecha	uncar engineer	ing contin	and in the with		
			It strives to s	olve its ta	sks and mak	e manao	ement decisio	ns by liste	ning to the oninions of		
			the colleague	s it mana	ges, preferal	ly in co	operation.		ing to the opinions of		
			It is open to	learning	about, emb	racing a	and authentical	lly commu	inicating professional.		
			technological	l develop	ment and inr	ovation	in engineering		C 1		
			You strive to	make yo	ur self-traini	ng a me	ans to achieve	your profe	essional goals.		
			Make decisio	ons in con	nplex or une	xpected	decision-maki	ng situatio	ns, taking full account		
			of legal and e	ethical sta	ndards						

	Autonomy and responsibility
	Autonomy and responsibility In unexpected decision situations, he/she independently thinks through and develops comprehensive, substantiating professional questions on the basis of given sources. Responsibly uphold and represent the values of the engineering profession, and be open to professionally informed critical comments. In carrying out his/her professional duties, he/she will also cooperate with qualified professionals in other fields (primarily technical, economic and legal). Identify the shortcomings of the technologies used, the risks of the processes and initiate measures to reduce them. Monitor legislative, technical, technological and administrative changes in the field. Directs the work of the personnel assigned to him/her, supervises the operation of machinery and equipment, based on the instructions of the workplace manager. Assesses the efficiency, effectiveness and safety of the work of subordinates, to meaned a supporting the professional development of his/her subordinates, to
	equal access.
Short description of the subject content	The concepts of functional and structural integrity and a coherent system for ensuring them. Their role in safety and availability. Tools: maintenance, monitoring, inspection and testing. Ageing processes and effects, ageing management. Purpose and system of maintenance. Modern maintenance strategies and techniques (condition-based, reliability-centred, risk-based). Optimisation of maintenance. Purpose and system of periodic inspection. Elements of an effective periodic inspection (performance, risk aspects). The role of non-destructive testing in periodic inspection. Oualification of inspection systems.
Types of student activities	Processing of heard text by note-taking and recording of material using own notes and electronically available notes 80% Development of test questions 20%
Required literature and contact details	<ul> <li>Lecture notes in Moodle</li> <li>Safety of Nuclear Power Plants II (eds.: J. Elter, J. Gadó, E. Holló, I. Lux), ELTE Eötvös Kiadó, Budapest, 2013</li> <li>Gyula Csom:Nuclear Power Plant Operation I Fundamentals of Reactor Physics and Technology (Technical University of Budapest, 1997)</li> <li>Gyula Csom:Nuclear Power Plants Operation II/1 - Operation of Energetic Nuclear Reactors (Műegyetemi Kiadó, Budapest, 2005) By: Operational knowledge (University of Dunaújváros, university note, in progress)</li> </ul>
Recommended literature and contact details	<ul> <li>Zoltán Szatmáry: Introduction to Reactor Physics, (Akadémiai Kiadó, Budapest, 2000)</li> <li>Duderstadt, J and Hamilton, L.: Nuclear Reactor Analyses (Wiley, New York, 1976)</li> <li>Bell, G. I., and Glasstone, S.: Nuclear Reactor Theory (American Nuclear Society, 1970)</li> <li>Dénes Bódizs:Measurement Techniques for Nuclear Radiation (Typotex, Budapest, 2009)</li> <li>G. F. Knoll, Radiation Detection and Measurement, 3rd Edition (John Wiley &amp; Sons, Inc., 2000.)</li> </ul>
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the workshops	

#### **Equipments of Nuclear Power Plants**

Name of the subject	an	Atomerőművek berendezései						BSc			
Name of the subject	in English		Equipments	of Nuclea	Code	DUEN(L)-MGT-152					
Responsible education	nal unit		Institute of Technology, Department of Mechanical Engir						d Energy		
Name of compulsory	prior learnin	ıg			5/ 1			0			
Туре	Presentatio	n	Practice		Laboratory		Requirement	Credit	Language of education		
Full time 150/39	per week	2	per week	1	per week 0 E		5	english			
Part time $150/15$	per term	10	per term	5	per term	0		1 1 1			
Teacher responsible for	or the subject	ct	Name         Péter Trampus, PhD         schedule         Professor emeritus								
			Goals, deve								
Training objective and	d justificatio	on of	After completing the subject, the student should know the engineering technology systems								
the course (content. or	utput. locatio	on in	and equipm	ent of the	e pressurize	d water	nuclear powe	er plant, tl	he task, structure and		
the curriculum)			operation of	the main	equipment.	In poss	ession of this l	knowledge	e, he should be able to		
, , ,			perform ind	ependent	engineering	or man	agement and c	coordinatio	n work in the design,		
			operation, m	aintenanc	e and inspec	tion of e	equipment.				
			Presentation	Lectures	s with black	board an	d projector.				
Typical delivery meth	shou		Practice								
i ypicai delivery meth	lous		Laboratory	Carrying	g out experi	ments an	d calculation.				
			Other								
			Knowledge								
			has extensi	ve theore	tical and	practical	preparation,	methodo	logical and practical		
			knowledge f	or the plan	nning and op	beration	of complex en	ergy conve	ersion, supply and user		
			systems and	processes	0 1		1	05	, 11.2		
			Ability	•							
			In solving a	problem. i	it is able to c	organise	cooperation w	ith experts	in related fields.		
			In solving a problem, it is able to organise cooperation with experts in related fields.								
			the-art know	ledge acq	uisition and	data col	lection method	s.			
			It is able to use information and communication technologies and methods to solve								
			technical problems.								
			Prepared to conduct publication, presentation and discussions in your field, in your native								
			language and in at least one foreign language.								
			Attitude								
			Constantly monitors his work, results, and conclusions. Expands your knowledge of energy								
Requirements (expres	sed in terms	of	management and sustainability through continuous learning. The student is open to the use								
learning outcomes)			of information	on technol	ogy tools. S	trives to	get to know a	nd routine	ly use the tools needed		
<i>U ,</i>			for energy n	anageme	nt and econo	mic pro	blem-solving.	Develops	your ability to provide		
			accurate and error-free problem solving engineering precision and accuracy. Applies the								
			accurate and error-free problem solving, engineering precision, and accuracy. Applies the principles of energy efficiency, sustainability, and environmental awareness in solving								
			energy management tasks. Monitors changes in nower plant technologies. Publishes his/her								
			results following his/her professional rules. Publishes his/her opinions and views without								
			offending others.								
			Autonomy and responsibility								
			Collaborates with the instructor and fellow students to expand knowledge. Accepts well-								
			founded professional and other critical remarks. As part of a team, you work with his/her								
			fellow students to solve tasks in some situations. With his knowledge, he makes a								
			responsible, well-founded decision based on his analysis. Feels responsible for energy, the								
			problems of energy management, and the sustainable use of the environment, as well as								
			present and future generations. The student is committed to the principles and methods of								
			systematic thinking and problem-solving.								
			The main tec	chnologica	al systems of	the pres	surized water	nuclear po	wer plant (primary and		
			secondary circuits).								
			Primary cir	cuit equip	oment: reac	tor equi	ipment (reacto	or tank, re	eactor cover, internal		
			structures),	reactor co	oling circu	it equip	ment (main ci	irculation	line, main circulation		
Short description of th	ne subject co	ntent	pump), pressure control system equipment (volume compensation tank), steam generator,								
Short description of t	ie subject ce	mem	zone failure	cooling s	system equip	oment, c	other safety system	stem equip	oment, primary circuit		
			auxiliary system equipment.								
			Secondary c	ircuit equi	pment: feed	water p	reheating syste	m equipm	ent, turbine, generator.		
			Condensate	system eq	uipment (tui	bine cor	ndenser).				
			Heating eler	nent transf	ter, spent he	ating ele	ment treatmen	t equipmer	nt		
			Understandi	ng and ass	imilation of	the topi	cs of presentat	ions 50%			
Types of student activ	vities		Testing of m	aterials 30	)%						
			Laboratory e	exercises 2	20%						
Required literature an	d contact de	tails	• [1]	] Atomerő	művek üzen	ntana, II	. kötet, Az ener	rgetikai rea	aktorok üzemtana,		
Required merature and contact details			Budapest, 2012.								

Recommended literature and contact details	<ul> <li>[2] Csom Gyula, Atomerőművek üzemtana, Műegyetemi Kiadó, Budapest 2005</li> </ul>
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	

in Hungarian			Hidrogéntec	hnológia k	Level	BSc					
Name of the	ne subject	in English		Basic Pricip	les of Hyd	Code	DUEN(L)-MGT-257				
Responsib	le educatior	nal unit	nit Institute of Technology, Department of Mechanical Engineering and Energy							d Energy	
Name of c DUEN(L)	ompulsory <sub>]</sub> -	prior learnii	ng								
Туре	Type Presentation		on	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 5	per week per term	0	Е	5	english	
Teacher re	sponsible fo	or the subje	ct	Name		Imre Kovác	s, PhD	·	schedule	College associate professor	
Training o the course the curricu	bjective and (content, ou llum)	l justificatio utput, locati	on of on in	Goals, deve Students will the productio purity hydro solid-gas int processes in	lopment of l learn abo on of hydro ogen. Stud erface, dif materials For all s	bjectives but the chemi- bogen in labor lents will al fusion throu containing a students in a	cal and atory an so learn gh solid ctive hy large lea	physical prope ad industrial set about elemen s (metals) and drogen. cture hall with	rties of hyd ttings, and ttary adsor membrane a blackboa	drogen, its compounds, the production of high- ption processes at the s, and electrochemical ard presentation. Use	
Typical de	livery meth	ods		Practice Laboratory	of proje For all s of proje	ctor. students in a ctor.	large le	cture hall with	a blackboa	ard presentation. Use	
				Other							
Requirements (expressed in terms of learning outcomes)			s of	The student The student The student and the econ <b>Ability</b> The student through exan The student environment <b>Attitude</b> At the end of including hy responsible The student of the natura <b>Autonomy a</b> decides inde takes respon	will learn will unde will recog iomy-socie is able to c mples; will be ab t. f the course drogen, to way. will assur and respo pendently sibility	about the ele erstand the ink ety. consider soci le to explore e, the studen o protect the me responsite ment, and for nsibility	ements of knowled s betwee al, econe t the sys t will be enviror vility for cooper	of knowledge r lge required to en the resource omic and energ temic links bet committed to u ment and to u : his/her own a ating with the	elated to h o work wi s associate gy choices a tween ener the use of g ase energy activities an social envi	ydrogen; th this energy storage d with such a chemical and their consequences gy, economics and the greener energy sources, in an environmentally nd for the preservation ronment.	
Short desc	ription of th	ne subject co	ontent	This course aims to introduce the basics of inorganic and physical chemistry in relation to hydrogen. Its production, physical and chemical properties, and future uses.							
Types of s	tudent activ	ities		Presentation theoretical n	: Processin naterial 20	ng of lecture %, preparati	s with n on of la	otes 40%, inde b notes 40%	ependent p	rocessing of	
Required l	iterature an	d contact de	etails	• Cs	epeli-Kov	acs: Chemis	try and	Materials Scie	nce notebo	ook	
Recommendet and the details	nded literatu	are and con	tact	•							
Description of tasks to be submitted/measurement reports				Full-time: A total of 3 assignments to be submitted during the semester. By correspondence: A total of 2 papers to be written during the semester.							
Descriptio workshops	n and timeta	able of the		At the end o	f the seme	ster, in the 1	3th wee	ek of the semes	ter, a 100-	point essay.	

#### **Basic Priciples of Hydrogen Technology**
### **Engineering construction**

		in Homen	·	C /	+ <u>(</u> -				T1	DC -			
Name of the	e subject	in Hungar	ian	Uepszerkesztes Level BSC Engineering construction Code DUEN(L) MGT 1									
Deenensible	advastia	III English						pooring and Energy					
Responsible		nal unit		Institute of Technology, Department of Mechanical Engineering and Energy									
Name of co DUEN(L)-	mpulsory	prior learni	ng	MGT-111									
Туре		Presentati	on	Practice	Practice I			Requirement	Credit	Language of education			
Full time	150/39	per week	1	per week	2	per week	0	М	5	english			
Part time	150/15	per term	5	per term	10	per term	0						
Teacher res	ponsible for	or the subje	ect	Name		Robert Sant	a, PhD		schedule	Associate professor			
Training ob	jective and	d justificati	on of	Goals, deve	lopment o	bjectives	1.		1 .	1			
the curricul	(content, o	utput, locat	ion in	and their in	eractions.	In neating,	cooning	, ventilation al	id air con	autioning, the systems,			
	uiii <i>)</i>			Presentation	For all s	tudents, in a	large le	cture, presenta	tion on a v	whiteboard, projector			
T:		- 1-		Dreatice	Or on-III	ie using MS	Teams,	using a compt	iter networ	гк.			
i ypical del	lvery meth	loas		Laboratory	Group v	vork present	ations						
				Other									
				Knowledge									
				You know t	ne termino	logy key co	ncents a	and theories rel	ated to vo	ur field			
				Comprehens	ive knowl	edge of the	methods	of knowledge	acquisitio	n and problem-solving			
				in the main	heories of	the field.		8-					
				Has a thore	ough unde	erstanding of	of mach	ine design pr	inciples a	nd methods, machine			
				technology,	technology, control procedures and operational processes.								
				Comprehens	Comprehensive knowledge of the operating principles and structural units of the machinery								
				and power tools, mechanical equipment and tools used.									
				Understand, characterise and model the structure and operation of the components and elements of mechanical engineering systems, and the design and interrelationship of the									
				system components used.									
				Apply the related computational and modelling principles and methods of mechanical									
Requiremen	nts (exnres	sed in term	sof	product, process and technological design.									
learning ou	tcomes)	sed in term	3 01	Ability									
				Perform the job according to your qualifications.									
				Ability to plan, organise and carry out independent learning.									
				Ability to identify, formulate and solve (through the practical application of standard									
				the practical application of standard operations) the theoretical and practical background									
				necessary for their solution.									
				Attitude									
				Open to learning and absorbing knowledge related to mechanical engineering related to									
				his/her qualifications and area of expertise. Interested in new methods and tools related to									
				the field.									
				Autonomy and responsibility									
				Taking resp	onsibility i	or your own	work a	nd the work of	others.	tion of allows he dies			
				I ypical surfaces and bodies of engineering practice. Plane intersection of plane bodies.									
Short descr	intion of th	ne subiect c	ontent	Plane section of curved bodies. Passing through flat bodies. Passing of curved bodies. The									
Short deser	iption of u	ie subject e	ontent	how they are	iso tolerance system. Tolerances for length dimensions. Fits, Surface quality metrics and how they are specified. Typical design of cast, welded and machined parts. Reconstruction								
				of machine parts (reverse engineering).									
				Processing theoretical material with guidance 20 % Independent processing of theoretical									
Types of stu	udent activ	vities		material 20	% Problen	n solving wi	th guida	nce 20 % Inde	pendent pr	ocessing of tasks 40			
			% Laboratory measurements with guidance - Preparation of laboratory reports -										
Required lit	terature an	d contact d	etails	• M	oodle								
Recommen	ded literati	ure and con	itact	• Ro	obert L. No	orton: Mach	ne Desig	gn - An Integra	ted Appro	ach, 2006, Pearson			
details				Pr	entice Hal	I Upper Sad	dle Rive	er NJ Franz F	Coenigsber	ger, Machine tool			
	6. 1	1		sti	ucture,ISI	3N 10: 0080	13405X						
Description	of tasks to	be obe											
Description	and timet	an reports											
workshops													

Hydrogenstorage	technologies
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in Hungarian		Hidrogéntár	olási techi	Level	BSc						
Name of the subject	in English		Hydrogensto	orage tech	Code	DUEN(L)-MGT-155					
Responsible educational unit			Institute of Technology, Department of Mechanical Engineering and Energy								
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	Е	5	english		
Teacher responsible f	or the subject	10	Name	0	Róbert Sánt	a PhD		schedule			
reacher responsible r	or the subject		Goals deve	lonment d	hiectives	a, 1 IID		senedule			
Training objective and the course (content, o the curriculum)	d justification utput, locatior	of 1 in	Gas storage course inclu based matrix	options, des. Elect	including m rochemical a	ethods on the state of the stat	of hydrogen s nical hydrogen	torage. Th storage. H	e main content of the Hydrogen storage in C-		
			Presentation	For all s Projecto	students in a or use	large le	cture hall with	a blackboa	ard presentation.		
Typical delivery meth	ods		Practice								
			Laboratory	All stud	lents particip	ate in a	metrology lab	demonstra	tion		
			Other								
Requirements (expressed in terms of learning outcomes)			You will learn about the possibilities of storing hydrogen. In addition to traditional storage technologies, you will learn about modern storage methods such as Metal-H systems and electrochemical hydrogen storage methods <b>Ability</b> <b>Attitude</b> Open to learning and absorbing knowledge related to the subject Hydrogen Storage Technologies related to his/her qualification and area of expertise. Interested in new methods and tools related to the field <b>Autonomy and responsibility</b> <b>Felelősséovállalás saját munkája és társaj munkája jránt</b>								
Short description of t	ne subject con	tent	Hydrogen storage is seen as a key technology for both stationary and mobile power generation. In this course, students will learn about the most common gas storage technologies, including new technologies for efficient storage and distribution of hydrogen.								
Types of student activities			Presentation: Processing of heard text with notes 60%, independent processing of theoretical material 30%, independent research 10%. Lecture: Processing of heard text with notes 60%, independent processing of theoretical material 30%, independent research								
Required literature an	d contact deta	uls	<ul> <li>Hydrogen Storage Technologies, Mehmet Sankir (Editor), Nurdan Demirci Sankir (Editor) 2018</li> <li>Solid-State Hydrogen Storage Walker Gavin (University of Nottingham UK) 2008</li> </ul>					ir (Editor), Nurdan Iniversity of			
Recommended literat details	ure and contac	ct	• H	ydrogen S	torage Tech	nology F	Klebanoff Lenr	ie Taylor	and Francis, 2016		
Description of tasks to submitted/measureme	o be ent reports										
Description and timet workshops	able of the										

#### Industrial knowledge

Name of the subject in Hungarian				Üzemtani isi	meretek		Level BSc						
Name of th	ie subject	in English		Industrial kn	Industrial knowledge				Code	DUEN(L)-MGT-213			
Responsibl	le educatior	nal unit		Institute of T	Fechnolog	y, Departme	neering an	d Energy					
Name of co DUEN(L)-	ompulsory j -	prior learnin	ng										
Туре		Presentatio	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	0	per term	5		111-	Maatan in structure			
Teacher re	sponsible fo	or the subject	31	Name		Gabor Lada	nyı		schedule	Master Instructor			
				Goals, deve	lopment o	objectives			1.4 1	1 1			
Training of	bjective and	l justificatio	on of	The student	will unde	rstand the b	asic read	ctor physics an	d thermoh	ydraulics processes in			
the course	(content, or	utput, location	on in	the reactor a	ctive zone	. Understand	the fact	ors that influen	ce reactivi	ty. Recognise the links			
the curricu	lum)	1 . ,		between the	technolog	ical systems	and the	behaviour of t	the active a	zone. Be able to assess			
	,			the role of a	n engineei	ing system	in the sa	fety of the acti	ve zone. U	Inderstand how design			
				and safety and	nalysis are	linked through	ugh an 1	terative process	5.				
				Presentation	Lecture	s with black	board ar	id projector.					
Typical de	liverv meth	ods		Practice									
- J F				Laboratory	Carryin	g out experin	ments ar	nd calculation.					
				Other									
				Knowledge									
				Have a com	prehensiv	e knowledge	e of the	basic facts, dir	ections an	d limits of the subject			
				area of engin	neering.								
				Knowledge	of the gen	neral and sp	ecific n	nathematics reg	quired to o	operate in the field of			
				engineering,	principle	s, rules, cont	exts and	l procedures of	natural an	d social sciences.			
				Knowledge	of the tern	nnology, the	e most ir	nportant relation	onships and	theories related to the			
				field.	• • •	1 1 64	• 4	· · ·	11 61	1.1			
				comprehension and	ving and	redge of the	luing r	eories in the fit	rohonoivo	knowledge of basic			
				problem solving and problem-solving methods. Comprehensive knowledge of basic									
				economic, business and legal rules and tools. Thorough knowledge of structural materials									
				used in engineering, their production methods and conditions of use.									
				rias a basic knowledge of the principles and methods of machine design, machine construction technology control procedures and operating processes									
				construction technology, control procedures and operating processes.									
				Comprehensive knowledge of the operating principles and structural units of the machinery power tools mechanical equipment and tools used. Knowledge of mechanical									
				machinery, power tools, mechanical equipment and tools used. Knowledge of measuring									
				procedures, their tools, instruments and measuring equipment used in mechanical engineering.									
				Has an working knowledge of occupational health and safety and fire prevention related to									
				his/her area of specialisation, safety. health and safety at work and environmental									
				protection requirements in the field of the activity.									
				Comprehensive knowledge of the basics, limits and requirements of logistics, management.									
л ·		1.	C	environmental protection, quality assurance, information technology, law and economics.									
Requireme	ents (expres	sed in terms	5 01	which are integrally related to the field of engineering.									
learning of	ucomes)			In-depth knowledge of the learning, knowledge acquisition, data collection and									
				management of the mechanical engineering discipline.									
				methods of learning, learning, research and data collection, their ethical limitations and									
				problem-solving techniques.									
				Knowledge of the methods and tools of business economics and engineering-based cost-									
				benefit analysis.									
				Understand, characterise and model the structure and operation of the components and									
				elements of	enginee	ring system	is, the	design and 1	nterrelatio	nship of the system			
				components used. Apply the related computational and modelling principles and methods									
				of mechanical product, process and process design.									
				Ability		:			4 <b>1</b>	41 11 - 1			
				Ability to carry out a basic analysis of the disciplines that make up the knowledge system									
				Ability to u	nderstand	the main to	ng allu e	valuating cont	and proce	dures of the technical			
				discipline in	the perf	ormance of	hatelat	tasks Ability	to nlan	organise and conduct			
				independent	learning	Ahility to	identify	routine tech	nical prob	lems and to identify			
				formulate an	d solve (h	v the practic	al applic	cation of standa	rd operatio	ons) the theoretical and			
				practical hac	kground r	equired to se	olve the	m.	o operation	, ale alcoretical alla			
				Ability to	understand	d and use	literatur	e specific to	his/her fi	eld of specialisation			
				computing	ibrary res	ources. Abil	ity	-r-inte to					
				Ability to ca	rry out a l	basic analysi	s of the	disciplines that	t make un	the knowledge system			
				of the techni	cal field.	to synthesisi	ng and e	evaluating cont	exts.				
L					of the technical field, to synthesising and evaluating contexts.								

Ability to understand the main terminologies, theories and procedures of the technical
discipline in the performance of related tasks. Ability to plan, organise and conduct
independent learning. Ability to identify routine technical problems and to identify,
formulate and solve (by the practical application of standard operations) the theoretical and
practical background required to solve them.
Ability to understand and use literature specific to his/her field of specialisation,
computing, library resources.
Ability to apply the acquired knowledge in the field of information technology to the
solution of problems in the field apply the knowledge and skills acquired in the field Ability
to construct basic models of technical systems and processes.
Ability to use knowledge in a creative way, using the resources of the workplace effectively
manage their workplace effectively. Addity to apply and comply with safety, fire safety
Ability to apply orally and in writing in a professionally appropriate mapper in
Ability to apply, orany and in writing, in a professionary appropriate mainer, in accordance with the area of competence communicate in his/her mother tongue and at least
one foreign language
Ability to apply the technical specifications relating to the operation of mechanical
systems, the the principles of setting up and operating machinery and mechanical
equipment, and the principles of economic efficiency
the economic context. Ability to manage and control technical production processes, taking
into account the elements of quality assurance and quality control.
Ability to diagnose mechanical breakdowns and to select remedial actions, solve repair
technology problems.
Attitude
It assumes and authentically represents the social role of its profession and its fundamental
relationship with the world.
Open to professional, technological development and innovation in the field of engineering
and innovation in the technical field.
strives to make self-learning a means of achieving professional goals.
Takes decisions in complex or unexpected decision-making situations, taking full account
of legal and ethical standards.
Seek to solve problems, preferably in cooperation with others.
He/sne shall endeavour to pursue continuous and professional development in the field of
in line with his professional goals
He/she strives to solve problems and make management decisions by listening to the
opinion of his/her supervisor, preferably in cooperation.
Possesses sufficient stamina and tolerance of monotony to carry out practical activities
have the ability to perform tasks with.
Open to the use of information technology tools and has a good knowledge and application
of software in the field of engineering, with at least one such program at a proficiency level.
Open and receptive to the application of new, modern and innovative practices and methods
related to organic farming and health awareness.
Applies his/her acquired technical knowledge to gain a better understanding of observable
phenomena and to describe and explain their laws.
In the course of his/her work, he/she shall apply the relevant safety, health, environmental
and quality assurance and control requirements.
Autonomy and responsibility
in unexpected decision situations, he/she independently thinks through and develops
comprehensive, substantiating professional questions on the basis of given sources.
Responsibly upholds and represents the values of the engineering profession, and is open to professionally informed aritical comment
to professionary informed critical comment.
no fessionals from other disciplines (primarily technical economic and legal)
Identify shortcomings in the technologies used process risks and take the initiative to
mitigate them.
Monitor legislative, technical, technological and administrative changes in the field.
Under the direction of the line manager, manages the work of the staff assigned to him/her
and supervises the operation of machinery and equipment.
Assesses the efficiency, effectiveness and safety of the work of subordinates.
He/she shall ensure that the professional development of his/her subordinates is promoted,
and shall manage and support their efforts in this direction, applying the principle of equal
access.
Sharing his/her experience with his/her colleagues in order to support their development.
He/she is responsible for the consequences of his/her technical analyses, the proposals
he/she makes and the decisions he/she takes.

Short description of the subject content	Beam decay, NAA. Basic concepts in reactor physics: transport equation, diffusion approximation, cross section, neutron spectrum, reactivity coefficients. Moderation. Inherent safety. Reactor physics framework parameters and their derivation. Charge design. Zone thermohydraulics: heat conduction from fuel to moderator, DNBR. RIA analyses flow. Fuel behaviour. Relationship between framework parameters-safety analyses-technical design. Manoeuvring: reactor control modes, rod, boric acid, steam generator, Xe process. In-core, ex-core measurements.
Types of student activities	Laboratory and simulator exercises
Required literature and contact details	<ul> <li>Gábor Pór:Nuclear Energy Basics textbook</li> <li>Materials on MOODLE</li> <li>International Atomic Energy Agency textbook, https://www-pub.iaea.org/MTCD/Publications/PDF/P082_scr.pdf</li> <li>Gyula Csom:Nuclear Power Plant Operation I Fundamentals of Reactor Physics and Technology (Technical University of Budapest, 1997)</li> <li>Gyula Csom:Nuclear Power Plants Operation II/1 - Operation of Energetic Nuclear Reactors (Műegyetemi Kiadó, Budapest, 2005) By: Operational knowledge (University of Dunaújváros, university note, in progress)</li> </ul>
Recommended literature and contact details	<ul> <li>Zoltán Szatmáry: Introduction to Reactor Physics, (Akadémiai Kiadó, Budapest, 2000) • Bell, G. I., and Glasstone, S.: Nuclear Reactor Theory (American Nuclear Society, 1970)</li> <li>Dénes Bódizs:Measurement Techniques for Nuclear Radiation (Typotex, Budapest, 2009)</li> <li>G. F. Knoll, Radiation Detection and Measurement, 3rd Edition (John Wiley &amp; Sons, Inc., 2000.)</li> </ul>
Description of tasks to be	
submitted/measurement reports	
Description and timetable of the workshops	

#### NPP measurements and NDT

Name of the subject in Hungarian				Üzemi mérés	sek és any	ragvizsgálat	Level	BSc			
Iname of the s	subject	in English		NPP measure	ements an	d NDT	Code	DUEN(L)-MGT-256			
Responsible educational unit				Institute of Technology, Department of Structural Integrity							
Name of com DUEN(L)-	npulsory [	prior learning									
Туре		Presentation		Practice		Laboratory		Requirement	Credit	Language of education	
Full time	150/39 150/15	per week 2 per term 1	2 10	per week per term	1 5	per week per term	0	Е	5	english	
Teacher respo	onsible fo	or the subject		Name		Gábor Pór,	PhD		schedule	Professor emeritus	
Training objective and justification of the course (content, output, location in the curriculum) Typical delivery methods			of in	Goals, devel Students lea measuremen important nu get an overv nuclear powe Presentation Practice Laboratory Other Knowledge	opment of rn the m t of reactor clear pow riew of m er plants. Projecto	objectives odern mod- or parameter ver plant-spe naterial testi or, ppt prese	el-based rs that ca ecific, pri ing techn ntation r	measurement innot be measu imarily primary niques used in naterials	philosoph red directl v circuit mo destructiv	iy, which enables the y, learn about the most easurement chains, and re and non-destructive	
Requirements (expressed in terms of learning outcomes)		f	<ul> <li>Knowledge</li> <li>Students get to know the primary circuit measurement methods and typical data collection and evaluation systems of nuclear power plants. He knows the measuring tools and methods used in the primary circuit of nuclear power plants.</li> <li>Ability</li> <li>Students are able to set up a suitable measuring device in a nuclear power plant environment, think through its consequences and proper operation, develop the measurement procedure and measurement evaluation</li> <li>Attitude</li> <li>Forms cooperation with his/her group mates and the instructor during the expansion of knowledge.</li> <li>Autonomy and responsibility</li> <li>Able to independently learn nuclear power plant measurement procedures and prepare a</li> </ul>								
Short description of the subject content			ent	Neutron flux measurements; Temperature measurements; In-zone neutron detectors, DPZ transmitters (KNI chains); Pressure measurements; Traffic measurements; Vibration measurements. Reactivity coefficients, heating element temperature: Measurement philosophy model-based measurements. Nuclear power plant data collection systems. Hungarian data collector VERONA. Human-machine communication. Built-in reactor physics calculations in the new Verona. ALPS (Advanced Loose Part. System) is the modern acoustic system for searching for loose parts. Destructive and non-destructive tests: the six most important non-destructive methods and their role in nuclear power plants.							
Types of stud	lent activ	ities		Participation in lectures, preparation of an independent study based on literature							
Required liter	rature and	d contact detai	ils	• IA	EA relatii	ng materials	from in	ternet or on Mo	oodle		
Recommende details	ed literatu	ire and contact	t	IAEA relating materials from internet or on Moodle							
Description o submitted/me	of tasks to easureme	be ht reports		Presentation and study of nuclear power plant systems based on pre-agreed literature: 1 ppt presentation approx. 20 slides and an essay describing it							
Description a workshops	and timeta	able of the									

#### Metrology

In Hungarian			Gépészeti m	éréstechni	Level	BSc					
Name of the subject	in English		Metrology Code DUEN(L)-MUG-2								
Responsible education	al unit		Institute of 7	Fechnolog	y, Departme	ent of Me	echanical Engi	neering an	d Energy		
Name of compulsory	prior learnir	ng	MUG-257								
DUEN(L)-		0	MUG-222				k c				
Туре	Presentatio	n	Practice	tice		Laboratory F		Credit	Language of education		
Full time150/39Part time150/15	per week	2	per week per term	0	per week per term	1	М	5	english		
Teacher responsible fo	or the subject	nt I	Name	0	Gábor Pór	PhD		schedule	Professor emeritus		
Training objective and justification of the course (content, output, location in the curriculum)			Name Goals, deve The attendar load data, h tribological have to plan They have t structures, t configuratio Presentation Practice Laboratory Other Knowledge Knows and understand a	lopment of the must be have to be propertiese and run o learn the hermal pen. In a class Flipchas rooms se uses the and uses he	Gábor Pór, Gábor Pór, objectives e able to ana e able to ana e able to ic . The life the tribological e different fright rime mover ssroom with rt, blackboar uitable for g	PhD lyse the lentify t me and t systems fields of ;), as w the use rd and ot roup wo	tribology syste he mayor wea hird body mos on the basis of the applied tr ell as the rel of projector or her multimedia rk firing technon istion theory i	schedule ems, detern aring proc st be deter of properti ibology (p ated supp computer a equipment ology in p n environ	Professor emeritus mine the structural and esses in the wave of mined generally. They es of lubrication state. rocessing, mechanical lier systems run and in each lecture. nt in smaller seminar		
Requirements (expressed in terms of learning outcomes)		student know interprets th student know The student know The student know The student know construction the compress spark ignitic possibilities and disadvan <b>Ability</b> Performs the Ability to pl The ability to pl Student striv health and su Using student observable p	ws the pro- e structure ws the stru- understan npressor a of a gas t sor refrige- on engine, of increas ntages. e job accor an, organi o manage ality assur- ves to mee ves to org ustainabili nt's techni ohenomena and respo	t and enforc anise and codes consibility	her quality arry out . lge, Stud	stion inteory i e in domestic a m turbine, the a steam turbine gas turbine for tudent is awar on. The studen nderstands the ake place in the of internal com- fications. ependent learni action processes trol	nd industr way of ei e, the way energy pu re of the t informed structure of em. The s bustion en ng. es of specia accordance to gain a b	alised technology, with e with environmental,			
Short description of the subject content			The mechanical tools of the direct linear dimensioning. The mechanical tools of the relative linear dimensioning. Optical linear dimensioning instruments. Gauge blocks. Coordinate measuring instrument. Angular measurement. Extension and strength measuring. The operation principle, the main sources of errors and the application techniques of the dynamometer, extensometer and the dislocation-meter. Mechanical examinations, the application possibilities of the stressing examinations. Processing of measuring results with statistical methods. The estimation of								
Types of student activ	ities		Processing heard text with notes 60% Task-based organisation of information 10% Independent processing of tasks 30%.								
Required literature and	d contact de	tails	<ul> <li>Materials on MOODLE</li> <li>GUM (Guide of Uncertainty of Measurement</li> </ul>								
Recommended literatı details	are and cont	act	<ul> <li>Jay L. Bucher, The Metrology Handbook Hardcover – April 1, 2004, springer, ISBN-13: 978-0873896207</li> <li>Heather A. Wade, The ASQ Metrology Handbook, Third Edition (eBook) Published 2023 ISBN: 9781636940205 Item Number: E1506</li> </ul>								

Description of tasks to be	
submitted/measurement reports	
Description and timetable of the	
workshops	

#### **Production Technology**

Name of the subject in Hungarian in English		Gyártástechnológia						BSc				
		Production 7	Technolog	у	Code	DUEN(L)-MUG-252						
Responsible	education	al unit		Institute of T	Technolog	y, Departme	nt of Me	echanical Engi	neering an	d Energy		
Name of con DUEN(L)-	npulsory p	prior learnin	g	MUG-152	MUG-152							
Туре		Presentation	n	Practice		Laboratory		Requirement	Credit	Language of education		
Full time	150/39	per week	2	per week	1	per week	0	Е	5	english		
Teacher resp	onsible fo	r the subjec	10 t	Name	5	Gábor Vizi	PhD		schedule	Associate professor		
Training objective and justification of the course (content, output, location in the curriculum)		Goals, devel Understandi Understandi technologies and implicat and selection Understandi	lopment of ng the ba ng the the s, producti ions of ma n of proce ng other n	sics of mar eoretical bas on equipment chining - Un ss data - Ca nachining pr	ufacturi sis of pl nt and to derstand lculation occesses	ng technology lastic forming. ools. CUTTING ding the basic n of machine ti	FORMU Knowled G - Unders nachining me and st	LAR FORMATIONS ge of plastic forming standing the principles processes - Calculation andard time and cost -				
Typical deliv	very metho	ods		Presentation Practice Laboratory Other	For all s overhea Small ta	tudents, in a d projector ble top exer	large le	ecture, using a v	whiteboard le	l, projector or		
Requirements (expressed in terms of learning outcomes)			of	Knowledge         Basic knowledge of machine design principles and methods, machine manufacturing technology, control procedures and operating processes.         Apply the related computational and modelling principles and methods of engineering product, process and technology design.         Ability         Performs the job according to his/her qualifications.         Ability to plan, organise and carry out independent learning.         The ability to manage and control the production processes of specialised technology, with a view to quality assurance and quality control.         Attitude         He/she is open to learning and absorbing knowledge related to engineering technology related to his/her qualification and area of expertise. Interested in new methods and tools related to the field.         Autonomy and responsibility								
Short description of the subject content			ntent	THE FORMAL FORMATION PROCEDURES The theoretical basis of metal formation. Classification of non-ferrous forming processes. Forging, stamping, rolling technologies, production equipment and tools. Seamless tube manufacturing technology, production equipment. Plate forming technologies. Punching and blanking technologies, equipment and tools. Bending theory, technology, machines and tools. Theory, technology and tools for deep drawing. Techniques, tools and machinery for cold heading and cold flow. Casting technology, processes and tools. CHIPPING PROCEDURES Chipping methods and characteristics of chipping. Turning, planing, drilling, milling, grinding. Optimum determination of the number of passes, feeds and cycles for each type of machining. Calculation of the main machine time. Selection of the appropriate machine. Calculation of the standard time. Cost analysis. Non-conventional procedures. Other machining processes (hobbing saving serrations etc.) Determination of the prefabrication.								
Types of stud	Types of student activities			Processing theoretical material with guidance 5 % Independent processing of theoretical material 40 % Task solving with guidance 15 % Independent processing of tasks 40 %								
Required lite	ed literatu	l contact def	tails	• Du gu • • Du • • (cl 20	Dr inaújváros Dr ide (TU1) Zs inaújváros Zs nipless for 08. 111/	Stevan Firs College Pu Firstner Sta - note. First oltné Fülöp, College Pu oltné Fülöp, ming proces	atner: Ma blishing evan: Ma Engine Metal to blishing Study C ses) (TU achine M	anufacturing te Office, 2007. anufacturing T ering Technolo echnology (chij Office, 2008. Guide for the su J2) Dunaújváro	chnology echnology ogy (TU T) pless form bject "Me os College Technolog	(machining) note (J1). (machining) study U). ing processes) (J2) tal Technology" Publishing Office,		
details	cu meratu		uct	11.	ivercity D	ublishing U	$\frac{1}{2}$	n	1 connoiog	y 1.(OIVI), WIISKOIC		
actuito				01	mononty I	sononing H	5 <b>450</b> , 20					

	<ul> <li>Gál Gaszton-Kiss Antal-Sárvári József-Tisza Miklós: Plastic Cold Formation, Tankönyvkiadó, Budapest, 1981. p. 360. Ziaja György: Plastic Formation, Tankönyvkiadó, Budapest, 1978. p. 396</li> </ul>
Description of tasks to be submitted/measurement reports	
Description and timetable of the workshops	