

FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE

# DETAILED PROPOSAL OF THE STUDY PROGRAMME

GRADUATE UNIVERSITY STUDY IN MECHANICAL ENGINEERING

### 1.1. List of mandatory and elective courses

Module: Structures and Energy Technology - 261

	List of courses								
Year of study	Year of study: 1.								
Semester: I									
CTATUC	CODE	COLIDER	НО	URS	IN SE	MEST	ER	ГОТО	
STATUS	CODE	COURSE	L	S	AE	LE	DE	ECTS	
	FEML01	Mathematics – special topics	30	0	30	0	0	5	
	FESL01	Fluid flow	30	0	15	15	0	5	
	FESL10	Finite element method	30	0	15	0	15	5	
Mandatory	FESL12	Heat and mass transfer	30	0	30	0	0	5	
Mandatory	FETL18	Machine tools	45	0	0	15	0	5	
	FESL23	Heating and air conditioning	30	0	30	0	0	5	
	Total		195	0	120	30	15	30	
	* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise								

	List of courses								
Year of study	y: 1.								
Semester:	II.								
	CODE	COURSE	НО	URS	IN SE	MEST	ER	ECTS	
	CODE	COURSE	L	S	AE	Е	DE	ECIS	
	FESL05	Optimization methods	45	0	0	15	0	5	
STATUS	FETL25	Manufacturing process planning	45	0	0	0	15	5	
	FESL22	Renewable energy sources and sustainable development	30	0	30	0	0	5	
	* L = lecture	is, S = seminars, AE = auditoryexcercise, LE = laborato	ryexce	rcise, [	DE = de	esign e	xcercis	e	

	List of courses									
Year of study	Year of study: 2.									
Semester: I	II.									
STATUS	CODE	COURSE	НО	URS	IN SE	MEST	ER	ECTS		
SIAIUS	CODE	COURSE	L	S	AE	LE	DE	ECIS		
	FESL17	Computer aided design 1	30	0	0	0	30	5		
	FESL24	Energy efficiency in buildings	30	0	30	0	0	5		
Mandatory	FESL38	Aerotechnics and wind turbines	30	0	30	0	0	5		
	FETL01 Materials 3 30 0 0 30 0 5									
* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise										

# Module: Computer-Aided Design and Engineering - 262

	List of courses								
Year of study	/: 1.								
Semester: I									
STATUS	CODE	COURSE	НО	URS	IN SE	MEST	ER	ECTS	
SIAIUS	CODE	COURSE	L	S	AE	LE	DE	ECIS	
	FEML01	Mathematics – special topics	30	0	30	0	0	5	
	FESL01	Fluid flow	30	0	15	15	0	5	
Mandatory	FESL10	Finite element method	30	0	15	0	15	5	
	FETL05	Plant layout	30	0	0	15	15	5	
	* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise								

	List of courses								
Year of study	/: 1.								
Semester: I	I.								
STATUS	CODE	COURSE	НО	URS	IN SE	MEST	ER	ГСТС	
STATUS	CODE	COURSE	L	S	AE	LE	DE	ECTS	
	FESM15	Computer aided design 2	30	0	0	0	30	5	
	FESL05	Optimization methods	45	0	0	15	0	5	
	FETL07	Computer aided manufacturing	30	0	0	0	30	5	
	FESN19	Computational fluid dynamics	30	0	0	30	0	5	
	FESL42 Theory of plasticity and viscoelasticity 45 0 15 0 0 5								
	* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise								

	List of courses								
Year of study	y: 2.								
Semester:	III.								
STATUS	CODE	COLIBEE	НО	URS	IN SE	MEST	ER	ГСТС	
STATUS	TATUS CODE COURSE					LE	DE	ECTS	
	FETL06	Production planning and control	30	0	15	15	0	5	
Mandatory	FESL49	Numerical synthesis in engineering	45	0	0	0	15	5	
	FESL36	Introduction to information systemy	30	0	0	15	0	5	
	FESL23	Heating and air conditioning	30	0	30	0	0	5	
* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise									

# **Module: Production Mechanical Engineering - 263**

	List of courses									
Year of study	y: 1.									
Semester:										
	HOURS IN SEMESTER									
	CODE	COURSE	L	S	AE	LE	DE	ECTS		
	FETL18	Machine tools	45	0	0	15	0	5		
STATUS	FETL04	Engineering maintenance	45	0	0	15	0	5		
	FETL22	Nonconventional machining processes	45	0	0	15	0	5		
	FETL01 Materials 3 30 0 0 30 0 5									
	* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise									

	List of courses								
Year of study	y: 1.								
Semester:	II.								
STATUS	CODE	COURSE	НО	URS	IN SE	MEST	ER	ECTS	
STATUS	CODE	COURSE	L	S	AE	LE	DE	ECIS	
	FETL25	Manufacturing process planning	45	0	0	0	15	5	
Mandatory	FETL27	Material selection	30	0	30	0	0	5	
	FESL05	Optimization methods	45	0	0	15	0	5	
	FETL07	Computer aided manufacturing	30	0	0	0	30	5	
	* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise								

	List of courses								
Year of study	/: 2.								
Semester: I	II.								
STATUS	CODE	COURSE	НО	URS	IN SE	MEST	ER	ECTS	
STATUS	CODE	COURSE	L	S	AE	LE	DE	ECIS	
	FETL06	Production Planning And Control	30	0	15	15	0	5	
Mandatory	FESL01	Fluid flow	30	0	15	15	0	5	
	FESL10	Finite element method	30	0	15	0	15	5	
	FETL17	Hydraulic and pneumatic systems	30	0	0	15	15	5	
FETL26     Design for assembly   30   0   0   0   5									
* L = lectures, S = seminars, AE = auditoryexcercise, LE = laboratoryexcercise, DE = design excercise									

### 1.2. Course description

NAME OF THE COURSE	MATHEMATICS - SPECIA	L TOPICS								
Code	FEML01	Year of study	1							
Course teacher	Ivan Slapničar, Ph.D., Full Professor	Credits (ECTS)	5							
Associate teachers	Lana Periša, Teaching assistant Anita Carević, Teaching	Type of instruction (number of hours)	L 30	S 0	AE 30	LE 0	DE			
Chatus of the accuracy	assistant	Percentage of	15		00					
Status of the course	obligatory	application of e-learning	15							
	COURSE	DESCRIPTION								
Course objectives	Training students for:     - understanding concepts of selected advanced mathematical topics:     integrals depending on parameters, calculus of variations, and partiial     differential equations     - applications of the above concepts to mechanical engineering and other     technical sciences.									
Course enrolment requirements and entry competences required for the course										
	Students will be able to:									
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>derive and apply methods for solving integrals depending on parameters,</li> <li>explain the main idea of calculus of variations, derive the necessary condition and state sufficient conditions for extrema,</li> <li>reproduce solutions of classical problems of the shortest time and smallest surface area,</li> <li>define Sturm-Liouville problem and explain the structure of the solution, recognize and solve simpler problems,</li> <li>derive heat equation, Laplace equation and wave equationa, and state possibinitial and boundary conditions,</li> <li>prove the uniqueness of the solution and solve the equations with appropriate methods (using eigenfunctions or Fourier and Laplace transforms),</li> <li>solve simpler wave equations in the case of linear and nonlinear waves,</li> <li>recognize and solve Volterra and Fredholm integral equations,</li> <li>define and compute Green function for the Sturm-Liouvuille problems.</li> </ul>									
	Course content				or S		λE			
	Integrals depending on	narameters			nours 2	_	ours 2			
	Calculus of variations, n for extrema.	•	ndition	S	2		2			
Course content	3. Examples of calculus of variations, conditional extrema, Euler's method of finite differences.									
broken down in detail by weekly	4. Fourier and Laplace transform. 2 2									
class schedule	5. Sturm-Liouville problem				2	_	2			
(syllabus)	6. Diffusion equation.				2		2			
	7. Heat equation.				2		2			
	8. Laplace equation.				2	_	2			
	9. Wave equation - linear waves.				2		2			
	10. Wave equation – nonli				2		2			
	11. Volterra and Fredholm	integral equations.			2		2			

	12. Green's function						2	2
	13. D'Alembert solut		ne wave e	quation	٦.		2	2
	List of laboratory or o	desian e	xercises				•	LE or DE
								hours
Format of instruction	x lectures  □ seminars and wor x exercises □ on line in entirety □ partial e-learning □ field work	kshops		□ mult □ labo	imedia		ts	
Student responsibilities	Regular attendence	to and a	ctive part	icipatio	n in lect	ures and ex	cercises.	
Screening student work (name the	Class attendance	2	Research	h		Practical tra	aining	
proportion of ECTS	Experimental work		Report			Self stud	ly	2
credits for each activity so that the	Essay		Seminar	essay		(Oth	ier)	
total number of ECTS credits is	Tests	0.5	Oral exa	m		(Oth	ier)	
equal to the ECTS value of the course)	Written exam	0.5	Project			(Oth	ier)	
	During semester two weeks of lectures, at term exam students through assignement course is minimum 20 After semester, two f	nd the s can ge ts during 0 points inal exa	second in t 40 point g lectures on each n ms and tv	the we ts, while and ex mid-terr wo corre	eek follo e the re cercise n exams ection e	wing the lead emaining 20 s. The cond s and a total xams are he	ctures. At points ar dition for pof at least eld.	each mid- e attained assing the 50 points.
Grading and evaluating student work in class and at the final exam	during final exams.  Students which did comprehensive cours is 80. The condition and a total of at least 85 and more points - 75-84 points - very g 60-74 points - good (50-59 points - sufficients who did no	se conto for pas t 50 poin excelle ood (4), (3), and ent (2).	ent. In tha sing the c nts. The g nt (5),	at case, course i rade is	masim s minim formed	um number num 40 poin as follows:	s of availa	ble points nal exam
	Students who did no at leat 10 points, ca number of points is 8 of 40 points in the ex Mid-term exams, fina schedule.	an atten 0, and tl am and	d correcti ne minimu a total of	ions ex ım requ at leas	cam. Or iirement st 50 poi	n the correct for a passinnts.	ction exam ng grade is	n maximal s minimum

	Title	Number of copies in the library	Availability via other media
	I. Slapničar, Matematika 2, FESB, Split, 2002, chapters: Integrals depending on parameters and Calculus of variations.		http://www.fesb. unist.hr/mat2
Required literature (available in the library and via other media)	J. D. Logan, Applied Mathematics, 3rd Edition,		
modiay	Wiley and Sons, New York, 2006. Lecture materials on FESB e-learning portal.		httpd://elearning .fesb.unist.hr
Optional literature (at the time of submission of study programme proposal)	- P. duChateau, D. W. Zachmann, Partial Differential McGraw Hill, New York, 1986.	Equations, Scl	naum's Outline,
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>homework</li> <li>short tests</li> <li>quizzes</li> <li>mid-term exams</li> <li>final exam</li> <li>student questionnaires</li> </ul>		
Other (as the proposer wishes to add)	·		

NAME OF THE COURSE	FLUID FLOW									
Code	FESL01	Year of study			1					
Course teacher	Prof. Zoran Milas, PhD	Credits (ECTS)			5					
Associate teachers		Type of instruction	L	S	AE	LE	DE			
Associate teachers		(number of hours)	2		1	1				
Status of the course	Compulsory Percentage of application of e-learning									
	COURSE DESCRIPTION									
Course objectives	- understanding of stress-strain relationship in viscous fluids									

	- introduction into turbulence modelling								
Course enrolment requirements and entry competences required for the course	Mathematics 2, Fluid Mechanics 1,	Mathematics 2, Fluid Mechanics 1,							
COUISC	Students will be able to:								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	critically apply the available analytical solutions of Navier-Stokes equation for solving engineering problems associated with viscous fluid flow evaluate the pressure drop in porous media and the overflow rating of settling tanks.  understand the effect of viscosity on load-carrying capacity of bearings analyze the distribution of fluid pressure and shear stress around the body in parallel stream and to understand the effect of flow separation make use of the superposition of elementary potential flows for modelling complex flows  use experimental data on lift-drag of slender bodies and apply correction to the force coefficients for various aspect ratios understand the effect of turbulence model selection								
	Course content		L or S	AE					
	Stress in fluids, Navier equation, rota in fluids	tion and deformation rate	hours 2	hours 1					
		Stokes og	2	1					
	Stokes constitutive relations, Navier-Stagen-Poiseuill flow in circular pipe,			1					
	Carman eq. for porous media.		2	1					
	Couette flow, hydrodynamic lubrication	2	1						
	Stokes (sphere) flow, settling velocity Boundary layer theory, friction coeffice	2	1						
	Skan flow,	2	1						
	Separation of boundary layer, Karma	2	1						
Course content	Solution techniques for Karman integ	2	1						
broken down in	Potential flow, stream function, eleme	2	1						
detail by weekly class schedule	Kutta-Joukowsky theorem for isolated of profiles. Hydrodynamic mass.	2	1						
(syllabus)	Tip vortices, vortex sheet, effect of fir coefficients.	nite span on lift- drag	2	1					
	Introduction to turbulence modelling.		2	1					
	Prandtl mixing length model. Comple	x turbulence models.	2	1					
	List of laboratory or design exercises			LE or DE hours					
	Pressure drop in capillary tube			2					
	Porous media flow, fluidization			2					
	Bag house air filter and sand filter (fie	ld work)		2					
	Viscometry								
	Viscous damper			2					
	Airfoil drag			1,5					
	Leading edge pressure distribution		1,5						
	⊠ lectures	☐ independent assignme	nts						
Format of instruction	seminars and workshops	☐ multimedia							
	⊠ exercises	⊠ laboratory							
	☐ <i>on line</i> in entirety	□ work with mentor							

	<ul><li>□ partial e-learning</li><li>⋈ field work</li></ul>				(othe	er)			
Student responsibilities	Class room attendar completed.	nce min	. 70 % . <i>F</i>	II requir	red labo	ratory exercise	s and rep	orts	
Screening student	Class attendance	2,0	Research F		Practical traini				
work (name the proportion of ECTS credits for each	Experimental work		Report			Individual work for test and ex	am)	2,3	
activity so that the total number of	Essay		Semina essay	r		Laboratory exerciports	ercise	0,4	
ECTS credits is	Tests	0,2	Oral exa	am		(Other)			
equal to the ECTS value of the course)	Written exam	0,1	Project			(Other)			
Grading and evaluating student work in class and at the final exam	2-3 numerical proble 4 essay questions S the final exams. The book). The requirement for exercises/reports an completion of final o Grade (in percentag Grade(%) = 0,1 LE - the activities in percentag	weeks of lecturing and the second one 6 weeks later. Each midterm test contains 2-3 numerical problems and 12 short questions (incl. multiple choice questions) and 3 essay questions Students who did not pass the midterm tests exams take part in the final exams. The midterm and final exams are carried out as written tests (closed book).  The requirement for passing grade is the positive assessment of laboratory exercises/reports and 50 % points on each midterm test/ final exam and successful completion of final oral exam.  Grade (in percentage) is formed according to the formula:  Grade(%) = 0,1 LE + 0,4(M1 + M2) +0,1 FOE the activities in percentage:  LV – laboratory assessment, · M1, M2 – test results., FOE-final oral exam							
Required literature	Title				Number of copies in the library	Availabi other r	-		
(available in the library and via other media)	- Milas Z, Fluid Flow -authorized lectures, FESB, Split, 2015					5			
	- Virag Z., Mechanic	s of Flu	ids 2", FS	SB, Zagı	reb	5			
Optional literature (at the time of submission of study programme proposal)	White, F. M.: Vis	scous F	uid Flow	, McGra	w Hill, N	New York, 200	5		
Quality assurance methods that ensure the acquisition of exit competences	<ul><li>Evaluation of resulting</li><li>Feedback from stu</li><li>Self-evaluation of t</li><li>Institutional and no</li></ul>	dents vi eachers	ia survey	S		learning outcor	mes		
Other (as the proposer wishes to add)	s.ususiidi diid iid			<u> </u>					

NAME OF THE									
COURSE	FINITE ELEMENT METHO	OD							
Code	FESL10	Year of study	1.						
Course teacher	Željan Lozina, Ph. D., Full Professor	Credits (ECTS)	5						
	Damir Sedlar, Ph. D.,	T C C C	L	S	AE	LE	DE		
Associate teachers	Assistant Professor Ivan Tomac, Ph. D., Assistant Professor	Type of instruction (number of hours)	30	0	15	0	15		
Status of the course	Obligatory	Dbligatory Percentage of application of e-learning 0							
	COURSE	DESCRIPTION							
Course objectives	programs in a practica A student who has student who has student who has student who has student with the sensible modelling procession.  The course is also aimed background for more a structural mechanics.	background for more advanced studies within the field of finite elements and structural mechanics.							
Course enrolment requirements and entry competences required for the course	None								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	c) Basics of the a 2. Use the finite elem problems 3. Use a commercial	nd variational formulation pproximate solution of PI nent method for the soluti FE-package anced topics within the fie	DE on of p		_		ng		
	Course content				L		+DE		
	Introduction to basic conce extension of bar. Wave equ		hours 3		ours 2				
	Direct approach: Bar, bean				3		2		
	Virtual work principle.	·			3		2		
	Interpolation and approxim in one dimension.	ation of functions, shape for	unction	s	3		2		
Course content	Strong and weak formulation	on.			3		2		
broken down in detail by weekly	Virtual work approach to be				3		2		
class schedule (syllabus)	Two dimensional problems potential problems. First midterm exam	: strong and weak formula	tion of		3		2		
		I thron dimension			2		2		
	Shape functions in two and Virtual work principle for tw				3		2		
	CST element for two dimer				3	_	2		
					3		2		
	Finite elements in dynamic	er order elements in elasticity.					2		
	Finite elements in elastic st	·					2		
	Signification in classic si	www.			3		_		

	Second midterm exa	am							
	List of laboratory exe	ercises						LE	hours
Format of instruction	<ul> <li>☑ lectures</li> <li>☐ seminars and workshops</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☐ field work</li> <li>☐ independent and inde</li></ul>				entor				
Student responsibilities	The presence on led Performed all require				t least 7	0 % of the tin	nes sch	edul	ed.
Screening student	Class attendance	2,0	Researc			Practical trai	ning		
work (name the proportion of ECTS	Experimental work		Report			Individual wo	ork		2,9
credits for each activity so that the total number of ECTS credits is equal to the ECTS	Essay		Seminai essay	•		Laboratory e	xercises	6	0
	Tests	0	()ral avam		Preparation for laboratory exercises			0	
value of the course)	Written exam	0,1	Project			(Othe	r)		
Grading and evaluating student work in class and at the final exam	lecturing and the ser of 10 theoretical questions not pass the midtern as written tests. The exam or the final exa the activities in perce	, 1001.1004.101							
		Title	•			Number of copies in the library	Avail		lity via nedia
Required literature (available in the	Ž. Lozina: Autorizira	na pred	avanja, F	ESB				learr port	ning al
library and via other media)	Ž. Lozina: Metoda ko Split.	onačnih	elemena	ta, FES	6B,	5			
							+		
Optional literature (at the time of submission of study programme proposal)	KJ. Bathe: Finite Eld	ement P	rocedure	es, Pren	tice Hall	Inc., 1996.			
Quality assurance methods that ensure the acquisition of exit competences	<ul><li>Evaluation of res</li><li>Feedback from s</li><li>Self-evaluation o</li><li>Institutional and</li></ul>	students of teach	s via surv ers	eys		ve learning o	utcomes	3	

Other (as the		
proposer wishes to		
add)		

NAME OF THE COURSE	HEAT AND MASS TRANSFER								
Code	FESL12	Year of study	1						
Course teacher	Frano Barbir, Ph. D., Full Professor	Credits (ECTS)	5						
Associate teachers	Dario Bezmalinović, Ph. D., Teaching assistant	Type of instruction (number of hours)	S 0	AE 30	LE 0	DE 0			
Status of the course	Obligatory	Percentage of application of e-learning					•		
	COURSI	E DESCRIPTION							
Course objectives	Course objectives  Training students for: - Recognizing mechanisms of heat and mass transfer - Analytical and numerical approaches for solving heat transfer problems - Modeling and analyzing heat and mass transfer processes								
Course enrolment requirements and entry competences required for the course	Thermodynamics 2								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>Recognize and disting</li> <li>Apply analytical and not transfer</li> <li>Choose appropriate eddifferent cases of heat</li> <li>Break down and solve</li> <li>Analyze the heat trans</li> </ul>	Students will be able to:  Recognize and distinguish the basic mechanisms of heat transfer  Apply analytical and numerical methods on different cases of heat and mass transfer  Choose appropriate equations for calculating the heat transfer coefficient for different cases of heat transfer  Break down and solve different cases of heat and mass transfer  Analyze the heat transfer during evaporation processes  Calculate basic characteristics of cooling towers							
	Course content				or S		AE ours		
Course content broken down in	The course introduction. Calculation of heat transfer and temperature field for solid bodies. The control volume method (CVM) in one-dimensional steady state heat conduction.						2		
detail by weekly class schedule (syllabus)	Two-dimensional steady st volumes and methods for s Relaxation (iterative) meth equations.		2		2				
	Examples and overview of	the equations.			2		2		

	One-dimensional transient conduction of the CVM.	n – the explicit variation			
	Criteria of stability of solutions. Exam application for solving multi-dimensio		2	2	
	Examples and overview of the equation of the CVM. Examples and comparison variation. Accuracy of the CVM.	ons. The implicit variation	2	2	
	Fundamentals of the convection. Med for laminar flow.	2	2		
	2	2			
	First midterm exam		2	2	
	Link between the boundary layer and laminar flow. Laminar flow in pipes. E integral and the Nusselt number for la	inergy balance, its	2	2	
	Mechanism of turbulent flow. The Re Thickness of a turbulent boundary lay	2	2		
	ver for a flat plate. Heat over a flat plate and	2	2		
	2	2			
	Characterization of simultaneous headiagram. Link between cross flows armass. The Sherwood diagram.		2	2	
	Demanded characteristics and physic cooling tower. Thermodynamic limits		2	2	
	Second midterm exam		2	2	
	List of laboratory or design exercises			LE or DE hours	
Format of instruction	<ul> <li>☑ lectures</li> <li>☐ seminars and workshops</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☐ field work</li> <li>☐ independent assignments</li> <li>☐ multimedia</li> <li>☐ laboratory</li> <li>☐ work with mentor</li> <li>☐ (other)</li> </ul>				
Student responsibilities	To attend at least 70% of all the lectu	res and exercises			

Screening student	Class attendance	2	Research		Practical traini	ng		
work (name the proportion of ECTS	Experimental work		Report		Individual work	(	2,5	
credits for each activity so that the total number of	Essay		Seminar essay		(Other)			
ECTS credits is	Tests	0,5	Oral exam		(Other)			
equal to the ECTS value of the course)	Written exam		Project		(Other)			
Grading and evaluating student work in class and at the final exam	During the semester there are two midterm exams. The students that do not past the midterm exams (or are not happy with their grades) have two final exa opportunities at the end of the semester and additional two opportunities at the er of the academic year on pre-decided dates. The first midterm exam takes place aft the first 7 weeks of lecturing, while the second midterm exam takes place in aft additional 6 weeks of lecturing. All the exams are carried out as written tests. The requirement for a passing grade is >49% points. On the first two final exams (at the end of the semester), the students are required to pass only the part which they faile to pass on the midterm exams. On the second two final exams (at the end of the academic year), the students are required to pass the whole exam, regardless their success on the midterm exams.  The final average percentage is calculated as follows:  Points (%) = (M1+M2)/2; where M1 and M2 are percentage points of the first and second midterm test respectively.  The final grade depends on the final percentage and is calculated as follows:  50% to 61% - fair (2), 62% to 74% - good (3), 75% to 87% - very good (4) and 88% to 100% - excellent (5)  According to the Article 71 of the Faculty Statute, students are required to attend forms of lectures and exercises by at least 70%. Students who fail to comply with the regulation will not be allowed to take the exams.							
		Title	<b>)</b>		Number of copies in the library	Availabi other n	-	
Required literature (available in the	F. Barbir: Uvod u pri	•	pline i tvari, inter	na		e-lear	•	
library and via other	skripta, FESB, 2014 N. Ninić, Elementi pi		topling EESP 2	002		port	al	
media)	in. minic, ⊏iemenu pi	ijenosa	topilile, FESB 2	002				
Optional literature (at the time of submission of study programme proposal)	1. J.P. Holman, Hea 2. E. Ganić, Prijeno						005.	
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>Monitoring of students attendance during lectures and exams</li> <li>Annual analysis of the average exam success</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> </ul>							

Other (as the	Other (as the
proposer wishes to	proposer wishes to
add)	add)

NAME OF THE COURSE	MACHINE TOOLS									
Code	FETL18	Year of study 1								
Course teacher	Dražen Bajić, Ph. D., Full Professor Sonja Jozić, Ph. D., Assistant Professor	Credits (ECTS)	5							
Associate teachers	Mario Veić, Teaching assistant	Type of instruction (number of hours)	S 0	AE 0	LE 15	DE 0				
Status of the course	Obligatory	Percentage of application of e-learning	0							
	COURSI	E DESCRIPTION								
Course objectives	Training students for:     understanding of basic machine tool parts, types of machine tools and their possible application.     acquisition of knowledge about the modular construction of modern numerically controlled machine tools.									
Course enrolment requirements and entry competences required for the course	None									
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>characterize features of</li> <li>categorize features of</li> <li>examine the exploitation</li> <li>identify motives of high</li> </ul>	mechanisms and systems on characteristics of machi n speed and multi-operatio stems and mechanism in r	manaç ne tool n mach	gemen s nine to	t macl	velopn rding to	nent o			
	Course content  Introduction to machine too	ols. State of the art and ma	achine		L or S hours 3		\E ours			
Course content broken down in	tools development. Classif Basics of construction mad accuracy.		hine to	ols	3					
detail by weekly class schedule	Main parts of machine tool spindle bearings.		es,		3					
(syllabus)	Driving system of machine				3					
	Machine tools control syste	em.			3					
	Turning machines: Classification and basic concepts									
	Milling machines: Classific	ation and basic concepts			3					

	First midterm exam						
	Machine tools for dri Machines for gear w				, grinding.	3	
	Technical calculation	ns relate			e as the whole unit	3	
	and its particular par Automatic tool chan		matic wo	rkniece	change	3	
	Machine tools for high						
	Machining center. To					3	
	High Speed machine tools	e tools.	Parallel k	inemati	cs for machine	3	
	Basic concept of CNC programming. CAD/CAM introduction						
	Second midterm exa	am					
	List of laboratory or design exercises						LE or DE hours
	Movement, typical parts and mechanisms of machine tools instal the laboratory. Determination of degree of machine tool workspacefficency.						2
	Determination of gea						2
	Testing of geometric accuracy lathes and drills. Influence of mac on the machining accuracy.					chine tool	2
	Rigidity of the systen	n machi					2
	Determination of gea						2
	Zero point of the workpiece and zero point of the tool at vertical machining center.						2
	Automatic CNC prog 3D printer.	rammin	g. Prepar	ation ar	nd model productio	n using	2
Format of instruction	<ul> <li>☑ lectures</li> <li>☐ seminars and workshops</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☐ field work</li> <li>☑ independent assignmen</li> <li>☑ multimedia</li> <li>☑ laboratory</li> <li>☐ work with mentor</li> <li>☐ (other)</li> </ul>				ents		
Student	The presence on led				t least 70 % of the	times sche	eduled.
responsibilities	Performed all require						
Screening student work (name the	Class attendance	2	Researc	ch	Practical to		
proportion of ECTS credits for each	Experimental work	0.5	Report		Reports from laboratory		0.25
activity so that the total number of	Essay		Seminal essay	r	(Ot	her)	2.25
ECTS credits is equal to the ECTS	Tests		Oral exa	am	(Ot	her)	
value of the course)	Written exam		Project		(Ot	her)	
There are two midterms and final exams. The first midterm exam is after 7 lecturing and the second one is after the next 6 weeks. In the final exams that did not pass the midterm exams take part. In the makeup exam student the entire exam. The midterm, final and makeup exams are carried out tests. The requirements for passing grade is:  1. Positive assessment of laboratory exercises 2. 50 % points on each midterm exam or the final exam.  Grade (in percentage) is formed according to the formula:  Grade(%) = 0,5 (M1 + M2)  M1, M2 – test results of first and second midterm exam.						s students dents take	
	Final grade is deterr Percentage	nined ad Grade	ccording	to:			

	50% do 61% sufficient (2)		Ī			
	62% do 74% good (3)					
	75% do 87% very good (4)					
	88% do 100% excellent (5)					
	execute (e)					
	Title	Number of copies in the library	Availability via other media			
Required literature	Ekinović S., "Alatne mašine", Mašinski fakultet,					
(available in the library and via other	Zenica, 2004.					
media)	Lopez de Lacalle, Lamikiz "Machine tools for high					
	performance machining", Springer, 2008.					
	Bajić, D., Jozić, S., Predavanja objavljena na		eLearning			
	eLearning portalu, 2015.		portal			
Optional literature (at the time of submission of study programme proposal)	Cebalo, R., "Alatni strojevi – Odabrana poglavlja", Vla - Pahole, I., Balič, J., "Obdelovalni stroji", Univerza					
Quality assurance	- Evaluation of results in accordance with the above	e learning out	comes			
methods that ensure	- Feedback from students via surveys					
the acquisition of	- Self-evaluation of teachers					
exit competences	- Institutional and non-institutional evaluations					
Other (as the proposer wishes to add)						

NAME OF THE COURSE	HEATING AND AIR CONDITIONING							
Code	FESL23	Year of study	1					
Course teacher	Nižetić Sandro, Ph. D., Associate Professor	Credits (ECTS)	5					
	Ivan Tolj, Ph. D., Teaching assistant	Type of instruction	L	S	ΑE	LE	DE	
Associate teachers	Teaching assistant Dario Bezmalinović, Ph. D., Teaching assistant  Type of instruction (number of hours)		30	0	30	0	0	
Status of the course	Elective.	Percentage of application of e-learning						
	COURSE	DESCRIPTION						
Course objectives  Training students for:  - Categorization and description of the HVAC systems,  - Compute and general design of the elements inside the HVAC systems according to standards.								

	I		
Course enrolment	Thermodynamics 1, Mathematics 1, Mathematics 2.		
requirements and			
entry competences required for the			
course			
Codico	Students will be able to:		
	- Consider base terms and issues related to the thermal co	mfort	
Learning outcomes	- Analyse and compute heat losses and gains according to		rds
expected at the level	- Compare fuels in the HVAC systems, i.e. heating and coo		
of the course (4 to	elaborate their impact to the environment,	g «ppoc	
10 learning outcomes)	- Consider and compute base components of the heating/o	cooling, i.e.	HVAC
outcomes)	systems,		
	- Consider and compute ventilation systems.		_
	Course content	L or S	AE
		hours	hours
	Introduction and basic terms (issues) related to the thermal		
	comfort. External and internal design temperatures. Climate	2 hours	2 hours
	conditions.		
	Calculation of the heat losses.	2 hours	2 hours
	Calculation of the heat losses.	2 hours	2 hours
	Lighting alaments, characteristics, correction of the naminal	<del> </del>	1
	Heating elements, characteristics, correction of the nominal	2 hours	2 hours
	thermal load.		
	Central heating systems, calculation of the carbon dioxide		
	emissions.	2 hours	2 hours
	emissions.		
	Calculation and design of the pipelines in the heating		
	systems.	2 hours	2 hours
	, , , , , , , , , , , , , , , , , , , ,		
	Boilers, types, classification, boiler rooms.	2 hours	2 hours
Course content			
broken down in	Other equipment of the heating systems.	2 hours	2 hours
detail by weekly			
class schedule	Preparation of the hot water and calculation of the heating	2 hours	2 hours
(syllabus)	demands.	2 110410	2 1.00.0
		<b></b>	1
	Regulation of the heating systems.	2 hours	2 hours
	Coloulation of the heat goin	O b o uno	O haven
	Calculation of the heat gain.	2 hours	2 hours
	Fan coil devices, other cooling elements.	2 hours	2 hours
	an con devices, other cooling elements.	2 110013	2 110015
	Central water based air-conditioning systems, climate		
	chambers, coolants (refrigerants)	2 hours	2 hours
	( Singularity		
	Ventilation systems, components, calculation of the required	0 h	0
	airflow for ventilation purpose.	2 hours	2 hours
	· '		
	Heat pumps, absorption cooling devices.	2 hours	2 hours
	List of laboratory or design exercises		LE or DE
	,		hours

Format of instruction	<ul> <li>☑ lectures</li> <li>☑ seminars and workshops</li> <li>☑ exercises</li> <li>☑ on line in entirety</li> <li>☑ partial e-learning</li> <li>☑ field work</li> <li>☑ independent</li> <li>☑ multimedia</li> <li>☐ laboratory</li> <li>☐ work with me</li> <li>☐ (other</li> </ul> The presence on lectures in the amount of at least 7000000000000000000000000000000000000				nentor er)			
Student responsibilities	The presence on lec Performed all require					'0 % of the time	s sched	luled.
Screening student work <i>(name the</i>	Class attendance	2	Researc	:h	2	Practical training	ng	
proportion of ECTS credits for each	Experimental work		Report			(Other)		
activity so that the total number of	Essay		Seminai essay	ſ		(Other)		
ECTS credits is equal to the ECTS	Tests		Oral exa	ım		(Other)		
value of the course)	Written exam		Project		1	(Other)		
Grading and evaluating student work in class and at the final exam								
		Title	•			Number of copies in the library		bility via media
	S. Nižetić, Online pr dio I i dio II, 2011, F	edavanj		e i Klim	atizacija	copies in the library		-
Required literature (available in the library and via other media)	dio I i dio II, 2011, F Recknagel, Sprenge Grijanje i klimatizacij Zagreb, 2005 (Prijev	edavanj ESB. er, Schra ja 2005, vod sa n	a Grijanje amek, Če Energeti jemačkog	perkovi ka mar g)	ć: keting,	copies in the library		-
(available in the	dio I i dio II, 2011, Fl Recknagel, Sprenge Grijanje i klimatizacij Zagreb, 2005 (Prijev ASHRAE Handbook Systems and Equipr Atlanta, USA, 2001,	edavanj ESB. er, Schra ja 2005, vod sa n s: Funda ment, Re 2002, 2	a Grijanje amek, Če Energeti jemačkog amentals efrigeratio 003, 200	perkovi ka mar g) , Applic on, ASH 4	ć: keting, ations,	copies in the library		-
(available in the library and via other	dio I i dio II, 2011, Fl Recknagel, Sprenge Grijanje i klimatizacij Zagreb, 2005 (Prijev ASHRAE Handbook Systems and Equipr Atlanta, USA, 2001, Priručnik za Ventilad	edavanj ESB. er, Schra ja 2005, vod sa n s: Funda ment, Re 2002, 2	a Grijanje amek, Če Energeti jemačkog amentals efrigeratic 003, 200 natizaciju	perkovi ka mar g) , Applic on, ASH 4	ć: keting, ations,	copies in the library		-
(available in the library and via other media)	dio I i dio II, 2011, Fl Recknagel, Sprenge Grijanje i klimatizacij Zagreb, 2005 (Prijev ASHRAE Handbook Systems and Equipr Atlanta, USA, 2001, Priručnik za Ventilac Priručnik za grijanje,	edavanj ESB. er, Schra ja 2005, vod sa n s: Funda nent, Re 2002, 2 ciju I klim	a Grijanja amek, Če Energeti jemačkog amentals efrigeratic 003, 200 natizaciju 2005	perkovi ka mar g) , Applic on, ASF 4 , EGE,	ć: keting, cations, IRAE,	copies in the library		-
(available in the library and via other	dio I i dio II, 2011, Fl Recknagel, Sprenge Grijanje i klimatizacij Zagreb, 2005 (Prijev ASHRAE Handbook Systems and Equipr Atlanta, USA, 2001, Priručnik za Ventilac Priručnik za grijanje, Časopis: EGE, Ener Časopis: ASHRAE J	edavanj ESB. er, Schra ja 2005, vod sa n ss: Funda nent, Re 2002, 2 siju I klim EGE, 2 getika n	a Grijanja amek, Če Energeti jemačkog amentals efrigeratio 003, 200 natizaciju 2005 narketing	perkovi ka mar g) , Applic on, ASF 4 , EGE, , Zagre	ć: keting, ations, IRAE, 2003. b	copies in the library	othe	-
(available in the library and via other media)  Optional literature (at the time of submission of study programme	dio I i dio II, 2011, Fl Recknagel, Sprenge Grijanje i klimatizacij Zagreb, 2005 (Prijev ASHRAE Handbook Systems and Equipr Atlanta, USA, 2001, Priručnik za Ventilac Priručnik za grijanje, Časopis: EGE, Ener Časopis: ASHRAE J	edavanj ESB. er, Schra ja 2005, vod sa n s: Funda ment, Re 2002, 2 siju I klim , EGE, 2 getika n lournal, results ir m studen on of tead	a Grijanja mek, Če Energeti jemačkog amentals efrigeratic 003, 200 natizaciju 005 narketing ASHRAE	perkovi ka mar g) , Applic on, ASF 4 , EGE, , Zagre E, Atlant	ć: keting, cations, IRAE, 2003. b	copies in the library	othe	-

NAME OF THE	OPTIMIZATION METHO	ODS					
COURSE			l <sub>4</sub>				
Code	FESL05 Damir Vučina, Ph. D., Full	Year of study	1				
Course teacher	Professor	Credits (ECTS)	5				
	Igor Pehnec, Ph. D.,	Type of instruction	L	S	ΑE	LE	DE
Associate teachers	Teaching assistant, Ivo Marinić- Kragić, Teaching assistant	(number of hours)	45	0	0	15	0
Status of the course	Obligatory	Percentage of application of e-learning	0				
	COURSE	DESCRIPTION					
	Acquiring theoretical know-		ethods	and a	laorith	ms in	
Course objectives	engineering optimization.  Developing competences in optimization.  Acquire competences in ap	n applying computers in e	nginee	ring nu	meric	al	
Course enrolment	Completed pre-graduate st						r-
requirements and	aided analysis. Competend		•			•	
entry competences	development in C and MAT	ΓLAB	•				
required for the course							
course	After completing the course	e the students will be able	to:				
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	making - model the set of defor engineering promake flowcharts for apply gradient options apply non-gradient engineering problection apply evolutionary SA, NN) to engineering apply optimization tree, max. flow,	or different optimization me mization methods (HJ, NM coptimization methods (SI cms timization problems with co optimization methods and	ethods A) to end D, CG, onstrail I metah ems: m	excell gineer N, BF0 nts neuristi	ence fing programmed from the first section of the	functionoblema  A; ACC  a. span  LAB	ns s ), ning
	Course content				L		\E ours
	Introduction, basic theore examples of application.	etical concepts. Basic te	rms an		3		
	Basic concepts, theoretical	aspects, optimization mo	dels		3		
Course content	Linear programming, sta	indard model			3		
broken down in	Linear programming, sin	nplex method			3		
detail by weekly class schedule (syllabus)	Nonlinear programming, Fibonacci, Golden section reduction of nD problems	on, Interpolation method	•		3		
	Nonlinear programming, n-dimensional methods for unconstrained problems: direct methods (Random search, Hookee-Jeeves, Powell, Nelder-Mead, other)						

	Nonlinear programming, n-dimens unconstrained problems: gradier descent, Conjugate directions me Quasi- Newton methods)	nt methods (Steepest	3	
	First midterm exam			
	- Nonlinear programming, constrained n-dimensional method: transformation methods (external and internal penalty methods, other)			
	- Nonlinear programming, constra method: basic concepts in direct r directions, generalized reduced g	methods: (feasible	3	
	Basic concepts in evolutionary me chapters: simulated annealing, ge	<u> </u>	3	
	Basic concepts in evolutionary methods and special chapters: neural networks as approximators			
	Basic concepts and procedures: discrete variables, branch and boproblems shortest path, min. spar	3		
	Examples of setting-up physical a models for optimization for differe problems. Development of algorith progams in C and MATLAB.	nt engineering	3	
	Second midterm exam			
	List of laboratory exercises	ian .		LE hours
	Basic terms and examples of applicat Optimization models	ion.		1
	Linear programming, standard mo	dal avamnlas		1
	Linear programming, Standard mo			1
	Nonlinear programming, 3implex method	•		1
	Nonlinear programming, unconstrated examples		hods,	1
	Nonlinear programming, unconstra examples			1
	Nonlinear programming, (NLP) col methods, examples			1
	Nonlinear programming, (NLP) comethods, examples			1
	Examples of application of neural			1
	Examples in evolutionary methods			1
	Examples in evolutionary methods			1
	Examples of application in engine		nto	1
	☐ lectures	<ul><li>☐ independent assignme</li><li>☐ multimedia</li></ul>	1115	
Format of instruction	<ul><li>□ seminars and workshops</li><li>⋈ exercises</li></ul>	☐ multimedia ☑ laboratory		
i oimat oi mattuction	☐ on line in entirety	work with mentor		
	□ partial e-learning	□ (other)		
	1	1 ()		

	☐ field work							
Student responsibilities	The presence on lec Performed all require				least 7	0 % of the time	s schedu	led.
Screening student	Class attendance	3	Researc	h		Practical training	ng	
work (name the proportion of ECTS	Experimental work		Report			Individual work	(	2
credits for each activity so that the	Essay		Seminar essay	•		Laboratory exe		
total number of ECTS credits is equal to the ECTS	Tests		Oral exa	ım		Preparation for laboratory exe		
value of the course)	Written exam		Project			(Other)		
Grading and evaluating student work in class and at the final exam	There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of respective theoretical questions and numerical problems. The final tests consist of overall theoretical questions and numerical problems. In the final exams, students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:  Grade(%) = 0,5 (M1 + M2)  the activities in percentage:  M1, M2 – test results.							
	,							
		Title				Number of copies in the library	Availabi other n	-
Required literature (available in the	- D. Vučina, 'Metode optimizacije', Sveuči	<b>Title</b> inženje lište u S	erske num Splitu, FES	SB 2005		copies in		-
	- D. Vučina, 'Metode	<b>Title</b> inženje lište u S	erske num Splitu, FES	SB 2005		copies in		-
(available in the library and via other	- D. Vučina, 'Metode optimizacije', Sveuči - J. S. Arora, "Introdu	Title inženje lište u S uction to	erske num Splitu, FES O Optimun	SB 2005 n Desigr		copies in		-
(available in the library and via other	- D. Vučina, 'Metode optimizacije', Sveuči - J. S. Arora, "Introdu McGraw Hill, 1989	Title inženje lište u S uction to za labor  Numerio irch and T. R. Cha ce Hall, ering Openetic al	erske num Splitu, FES Optimun atorijske atorijske Developi andrupatla 1999 timizatior gorithms	SB 2005 n Design vježbe zation Toment, 19 a, "Optin n", Wiley in searc	echniqi 999 nizatior Intersc h, optin	ues for Engineer Concepts and	other n	ign", -
(available in the library and via other media)  Optional literature (at the time of submission of study programme	- D. Vučina, 'Metode optimizacije', Sveuči - J. S. Arora, "Introdu McGraw Hill, 1989 I.Pehnec, Materijali z - G. Vanderplaats, "I Vanderplaats Resea - A. D. Belegundu, T Engineering", Prenticus, S.S. Rao, "Engineering", "Ge Addison Wesley, 198	Title inženje lište u S uction to za labor  Numerio irch and T. R. Cha ce Hall, ering Openetic al 89 Network sults in a students of teach	erske num Splitu, FES Optimun atorijske v al Optimi Developi andrupatla 1999 timizatior gorithms  ks", Prent accordance s via surve	SB 2005 n Design vježbe zation Toment, 19 a, "Optin n", Wiley in search cice Hall ce with the	echnique 1999 mization Interso h, optin Interna he abou	copies in the library  ues for Engineer Concepts and cience, 1996 inization and mattional, 1999	ering Desi	ign", -

Course teacher  Associate teachers  Associate teachers  Associate teachers  Mikola Gjeldum, Ph. D., Assistant Professor  Marina Crnjac, Teaching assistant (number of hours)  Status of the course  Obligatory  Percentage of application of e-learning application of e-learning application of e-learning application of e-learning outcomes become and any competences required for the course of the c	NAME OF THE							
Associate teachers	NAME OF THE COURSE	MANUFACTURING PRO	CESS PLANNING					
Assistant Professor	Code	=	Year of study	1.				
Associate teachers assistant (number of hours) 45 0 0 0 15  Status of the course Obligatory Percentage of application of e-learning O  **COURSE DESCRIPTION**  Training students to: - select raw material and machine tools for specific production batch - design optimal manufacturing process - know how to measure, sort and analyze process times in manufacturing process - identify losses at work  **None**  Course enrolment requirements and entry competences required for the course of the cou	Course teacher		Credits (ECTS)	5				
Status of the course  Obligatory  Percentage of application of e-learning of a course enrolment requirements and entry competences required for the course  Learning outcomes expected at the level of the course (4 to 10 learning outcomes)  Learning outcomes expected at the level of the course (4 to 10 learning outcomes)  Learning outcomes expected at the level of the course (5 to 10 learning outcomes)  Learning outcomes expected at the level of the course (5 to 10 learning outcomes)  Learning outcomes expected at the level of the course (5 to 10 learning outcomes)  Learning outcomes expected at the level of the course (5 to 10 learning outcomes)  Learning outcomes expected at the level of the course (5 to 10 learning outcomes)  Learning outcomes expected at the level of the course (5 to 10 learning outcomes)  Learning outcomes expected at the level of the course (6 to 10 learning outcomes)  Learning outcomes expected at the level of technological and random production outcomes of the course (6 to 10 learning outcomes)  Learning outcomes expected at the level of technological and random production steps or reveal losses at work  Course content of the course of the course of the course outcomes of the course of	Associate teachers							
Course objectives  Course objectives  Course objectives  - select raw material and machine tools for specific production batch - design optimal manufacturing process - know how to measure, sort and analyze process times in manufacturing process - identify losses at work  None  Students will be able to: - analyze product design for manufacturing process design purposes - select optimal size and shape of raw material - determine type of production in relation to batch size of the course (4 to 10 learning outcomes)  - determine elements of process times for batch production - suggest contemporary manufacturing process and its ability - test objectivity and accuracy of time measurement personnel - detect cyclical, periodical and random production steps - reveal losses at work  Course content  Definition of production system, production and manufacturing process.  The basic elements of manufacturing processes: process, composed and group process steps, process steps, process design.  Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability.  The basic principles of manufacturing process design.  The basic principles of manufacturing process day naturacturing processes. Manufacturing process capability.  The basic principles of manufacturing process day naturacturing processes. Manufacturing process capability.  The basic principles of manufacturing processes and manufacturing processes. Manufacturing processes and manufacturing processes. Manufacturing processes and manufacturing processes. Manufacturing process capability.  The basic principles of manufacturing processes and manufacturing processes.  Selection of manufacturing process day.  2 Definition of technology and technology processes and manufacturing processes.  2 Definition of technology and technology processes and manufacturing processes.  2 Definiti	Status of the course	Obligatory			-		-	
- select raw material and machine tools for specific production batch - design optimal manufacturing process - know how to measure, sort and analyze process times in manufacturing process - identify losses at work  None  Students will be able to: - analyze product design for manufacturing process design purposes required for the course (4 to 10 learning outcomes) - select optimal size and shape of raw material determine type of production in relation to batch size determine elements of process times for batch production - suggest contemporary manufacturing process and its ability test objectivity and accuracy of time measurement personnel detect cyclical, periodical and random production steps reveal losses at work  Course content Definition of production system, production and manufacturing process. Fundamentals of material flow design in the production process. The basic elements of manufacturing processes: process, composed and group process seteps, process step. Definition of technology and technique. Cutting technologies. 3  Characteristics and levels of technologies and manufacturing processes. Manufacturing processes design. 3  The selection of raw material. 2  Optimal sequence of manufacturing processes and process steps. Feators influencing on errors in manufacturing processes. 2  Selection of manufacturing processes and process steps. 2  Selection of manufacturing processes in the enterprise. 2  The scale of business success in the enterprise. 1  Time standard. Components of working time. 4  Methods for determining the production (working) time. 6  Performance rating. 1  The work of a worker on multiple machines. 2  Types and analysis of losses during the work. 1  Implementation of better work method. 2		COURSE		•				
- select raw material and machine tools for specific production batch - design optimal manufacturing process - know how to measure, sort and analyze process times in manufacturing process - identify losses at work  None  Students will be able to: - analyze product design for manufacturing process design purposes required for the course (4 to 10 learning outcomes) - select optimal size and shape of raw material determine type of production in relation to batch size determine elements of process times for batch production - suggest contemporary manufacturing process and its ability test objectivity and accuracy of time measurement personnel detect cyclical, periodical and random production steps reveal losses at work  Course content Definition of production system, production and manufacturing process. Fundamentals of material flow design in the production process. The basic elements of manufacturing processes: process, composed and group process seteps, process step. Definition of technology and technique. Cutting technologies. 3  Characteristics and levels of technologies and manufacturing processes. Manufacturing processes design. 3  The selection of raw material. 2  Optimal sequence of manufacturing processes and process steps. Feators influencing on errors in manufacturing processes. 2  Selection of manufacturing processes and process steps. 2  Selection of manufacturing processes in the enterprise. 2  The scale of business success in the enterprise. 1  Time standard. Components of working time. 4  Methods for determining the production (working) time. 6  Performance rating. 1  The work of a worker on multiple machines. 2  Types and analysis of losses during the work. 1  Implementation of better work method. 2		Training students to:						
Course content before course  Students will be able to: - analyze product design for manufacturing process design purposes expected at the level of the course (4 to 10 learning outcomes)  Learning outcomes expected at the level of the course (4 to 10 learning outcomes)  - select optimal size and shape of raw material determine type of production in relation to batch size of determine elements of process times for batch production - suggest contemporary manufacturing process and its ability - test objectivity and accuracy of time measurement personnel - detect cyclical, periodical and random production steps - reveal losses at work  Course content Definition of production system, production and manufacturing process. Fundamentals of material flow design in the production process. Fundamentals of manufacturing processes: process, composed and group process steps, process step. Definition of technology and technique. Cutting technologies.  Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability.  The basic principles of manufacturing process design.  The selection of raw material.  Optimal sequence of manufacturing processes and process steps. First midter exam Group technology.  Factors influencing on errors in manufacturing processes.  2 Selection of manufacturing baselines.  The scale of business success in the enterprise.  Time standard. Components of working time.  Performance rating. The work of a worker on multiple machines.  2 Types and analysis of losses during the work.  Implementation of better work method.	Course objectives	<ul><li>design optimal manufaction</li><li>know how to measure, process</li></ul>	cturing process				ring	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)  - analyze product design for manufacturing process design purposes select optimal size and shape of raw material determine type of production in relation to batch size of the course (4 to 10 learning outcomes)  - determine elements of process times for batch production suggest contemporary manufacturing process and its ability test objectivity and accuracy of time measurement personnel detect cyclical, periodical and random production steps reveal losses at work  Course content  Definition of production system, production and manufacturing process. Fundamentals of material flow design in the production process. The basic elements of manufacturing processes: process, composed and group process steps, process step.  Definition of technology and technique. Cutting technologies.  Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability.  The basic principles of manufacturing process design.  3 characteristics and levels of technologies and manufacturing processes. Manufacturing process design.  The selection of raw material.  2 Optimal sequence of manufacturing processes and process steps.  3 Factors influencing on errors in manufacturing processes.  2 Selection of manufacturing baselines.  2 Course content broken down in detail by weekly class schedule (syllabus)  Course content broken down in detail by weekly class of Work and Time Study in production enterprise.  The selection of family processes and process steps.  3 Factors influencing on errors in manufacturing processes.  2 Selection of manufacturing baselines.  2 Course content broken down in detail by weekly class of Work and Time Study in production enterprise.  1 Time standard. Components of working time.  4 Definition of technology and technique cutting processes and process steps.  5 Definition of technology and technique cutting processes and process steps.  2 Definition of technology and technique cutting processes.  2 De	Course enrolment requirements and entry competences required for the course							
Definition of production system, production and manufacturing process. Fundamentals of material flow design in the production process. The basic elements of manufacturing processes: process, composed and group process steps, process step. Definition of technology and technique. Cutting technologies. Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability. The basic principles of manufacturing process design. The selection of raw material. Optimal sequence of manufacturing processes and process steps. Factors influencing on errors in manufacturing processes. Selection of manufacturing baselines. First midterm exam Group technology. Basics of Work and Time Study in production enterprise. Time standard. Components of working time.  Methods for determining the production (working) time. Performance rating. The work of a worker on multiple machines. 2 Types and analysis of losses during the work. Implementation of better work method.	expected at the level of the course (4 to	<ul> <li>analyze product design for manufacturing process design purposes</li> <li>select optimal size and shape of raw material</li> <li>determine type of production in relation to batch size</li> <li>determine elements of process times for batch production</li> <li>suggest contemporary manufacturing process and its ability</li> <li>test objectivity and accuracy of time measurement personnel</li> <li>detect cyclical, periodical and random production steps</li> </ul>						
Fundamentals of material flow design in the production process.  The basic elements of manufacturing processes: process, composed and group process steps, process step.  Definition of technology and technique. Cutting technologies.  Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability.  The basic principles of manufacturing process design.  The selection of raw material.  Optimal sequence of manufacturing processes and process steps.  Factors influencing on errors in manufacturing processes.  Selection of manufacturing baselines.  First midterm exam  Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.		Course content					Lh	ours
and group process steps, process step.  Definition of technology and technique. Cutting technologies.  Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability.  The basic principles of manufacturing process design.  The selection of raw material.  Optimal sequence of manufacturing processes and process steps.  Factors influencing on errors in manufacturing processes.  Selection of manufacturing baselines.  First midterm exam  Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.		Fundamentals of material f	low design in the production	on proc	ess.			
Course content broken down in detail by weekly class schedule (syllabus)  Course content (syllabus)  Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability.  The basic principles of manufacturing process design.  The selection of raw material.  Optimal sequence of manufacturing processes and process steps.  Factors influencing on errors in manufacturing processes.  Selection of manufacturing baselines.  First midterm exam  Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.		and group process steps, p	process step.			sed		
Course content broken down in detail by weekly class schedule (syllabus)  First midterm exam Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  Types and analysis of losses during the work.  Implementation of better work method.								3
Course content broken down in detail by weekly class schedule (syllabus)  The selection of raw material.  Optimal sequence of manufacturing processes and process steps.  Factors influencing on errors in manufacturing processes.  Selection of manufacturing baselines.  First midterm exam  Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.		processes. Manufacturing	process capability.		g 			
Course content broken down in detail by weekly class schedule (syllabus)  Optimal sequence of manufacturing processes and process steps.  Factors influencing on errors in manufacturing processes.  Selection of manufacturing baselines.  First midterm exam  Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.				٦.				
broken down in detail by weekly class schedule (syllabus)  Factors influencing on errors in manufacturing processes.  Selection of manufacturing baselines.  First midterm exam  Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.	Course content				-1			
Selection of manufacturing baselines.  First midterm exam  Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.	broken down in				steps.	•		
class schedule (syllabus)  First midterm exam Group technology.  Basics of Work and Time Study in production enterprise. The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating. The work of a worker on multiple machines. Types and analysis of losses during the work. Implementation of better work method.	detail by weekly	· ·	• 1	sses.				
Group technology.  Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.	class schedule		טמטלווו וכט.					
Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.	(syllabus)							
The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.		. 0,	Study in production enterna	rice				
Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.				13C.			_	
Methods for determining the production (working) time.6Performance rating.1The work of a worker on multiple machines.2Types and analysis of losses during the work.1Implementation of better work method.2								
Performance rating. 1 The work of a worker on multiple machines. 2 Types and analysis of losses during the work. 1 Implementation of better work method. 2				16				
The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.			o production (working) till					
Types and analysis of losses during the work.  1 Implementation of better work method. 2			ultiple machines				_	
Implementation of better work method. 2							_	
							_	
DEMONDUMENT CACITI		Second midterm exam	J 1110411041					2

	List of design exercises DE hours							DE hours
	Design example of m	nanufac						3
	Detailed elaboration tools selection and ca					naterial selectio	n,	3
	Autonomous student individual project tasl	s work (				entation for		7
Format of instruction	<ul> <li>☑ lectures</li> <li>☐ seminars and workshops</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☐ field work</li> <li>☑ independent</li> <li>☑ multimedia</li> <li>☑ laboratory</li> <li>☐ work with me</li> <li>☐ (other</li> </ul>				nentor			
Student responsibilities	The presence on led The presence exerci Individual project tas	ises in t	he amount					
Screening student work (name the	Class attendance	1	Research	ı		Practical training	ng	
proportion of ECTS	Experimental work		Report			Individual work	(	2,7
credits for each activity so that the total number of	Essay		Seminar essay			(Other)		
ECTS credits is	Tests	0,2	Oral exar	m		(Other)		
equal to the ECTS value of the course)	Written exam	0,1	Project		1	(Other)		
Grading and evaluating student work in class and at the final exam	Positive assessment represents minimal 50% points on each midterm exam or minimal 50% points on final exam. In the first two final exams students that did not pass at least one of the midterm exams take part. In the third and fourth final exams students take the whole exam regardless results of midterm exams. Final exams are conducted in written form. Midterm exams and final exams consist of theoretical questions and numerical problems.  Grade (%) = 0,4D + 0,6E  D – Individual project grade (%)  E – average points achieved on midterm exams expressed as a percentage or							
	number of points achieved on the final exam expressed as a percentage.  E = (M1 + M2)/2 M1, M2 – average points achieved on midterm exams expressed as a percentage.  Grade (%): Final mark: 50% - 60% sufficient (2) 61% - 75% good (3) 76% - 90% very good (4) 91% - 100% excellent (5)							
		Title				Number of copies in the library		bility via media
Required literature (available in the	Gjeldum, N.: "Tehno			oizvod	nje",			ernet
library and via other media)	lectures on e-learnin Gačnik, V., Vodenik,	F.: "Pro	ojektiranje		oških	10	(e-le	arning)
	procesa", Tehnička knjiga, Zagreb, 1990.  Taboršak, D., "Studij rada", Orgadata, Zagreb, 1994.				2			

	Car, M., Krznar, M., Šimon, K., "Studij rada – zbirka 1 zadataka i rješenja", Liber, Zagreb, 1983.
Optional literature (at the time of submission of study programme proposal)	<ol> <li>Toboršak, D., Gornik, B., Čala, I., "Priprema proizvodnje", Inženjerski biro, Zagreb, 1974.</li> <li>Buchmeister, B., Polajnar, A.: "Priprava proizvodnje za delo v praksi", Fakulteta za strojništvo, Maribor, 2000.</li> <li>Polajnar, A., "Študij dela", Univerza v Mariboru, Fakulteta za strojništvo, Maribor, 1999</li> <li>WEB catalogues</li> </ol>
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>keeping records of the attendance of students</li> <li>annual evaluation of teachers</li> <li>periodical evaluation of individual project advancement</li> <li>feedback from students via surveys</li> <li>self-evaluation of teachers</li> <li>institutional and non-institutional evaluations</li> </ul>
Other (as the proposer wishes to add)	

NAME OF THE COURSE	RENEWABLE ENERGY	SOURCES AND SUSTAIN	IABLE	DEVE	LOPI	/ENT		
Code	FESL22	Year of study	1					
Course teacher	Ivan Pivac, Ph. D., Assistant Professor	Credits (ECTS)	5					
Associate to achore	Jakov Šimunović,	Type of instruction	L	S	AE	LE	D	
Associate teachers	Teaching Assistant	(number of hours)	30		30			
Status of the course	Elective	Percentage of application of e-learning						
	COURSE D	ESCRIPTION						
The ability to interpret the role and significance of renewable energy sources in the modern energy system, and to critically evaluate their potential and limitations.  Acquaintance with the cutting edge technologies and systems for utilization of renewable energy sources. The ability to create simple engineering calculations for the dimensioning of components and systems in conjunction with renewable energy sources, and their impact on the environment. The ability to analyze the possibilities and critical judgment of various conceptual technical solutions of the system for utilization of renewable energy sources based on the analysis of								
Course enrolment requirements and entry competences required for the course	None							

	Students will be able	e to:							
	<ol><li>Explain the</li></ol>	importa	nce of rei	newable	e energy	sources, a	nd		
	critically eva	aluate th	neir advar	ntages a	and drav	/backs			
		4. Describe and apply suitable the cutting edge technologies in systems							
Learning outcomes	for utilization of renewable energy sources								
expected at the level of	Design and evaluate basic systems for utilization of renewable								
the course (4 to 10		energy sources							
learning outcomes)	6. Perform sim		inoorina .	calculat	ione for	cizing of co	mnononte		
	and system		_			-	•	1	
	7. Propose co		•					ation	
	•	•				•			
	of renewab					•	-		
	economic p	TOTILADIII	ty and an	alysis C	or their if	npact on the	environin	ieni	
	Course content						L or S	AE	
							hours	hours	
	Introduction, definiti	ons, cur	rent ener	gy syst	em prob	lems,	2	0	
	possible solutions, e						3	0	
	Solar energy, Solar	geomet	ry				2	4	
Course content	Photovoltaics						2	2	
broken down in	Solar thermal collect	tors					2	2	
detail by weekly	Solar powerplants						2	2	
class schedule	Wind energy, wind t	urbines					3	2	
(syllabus)	Hydropower, hydro	power p	lants, wa	ter turb	ines, tid	al power,	2	2	
	marine current power, wave power								
	Biomass, biofuels, geothermal energy and technologies for its						2	2	
	utilization  Energy storage: bydrogen energy technologies and their								
	Energy storage; hydrogen energy technologies and their						3	2	
	conjunction with renewable energy sources Greenhouse gas emissions; carbon footprint						1	2	
	Greenhouse gus enn	3310113,	our bon 10	otprint			·	_	
	Economic analysis of	of RES;	multi-crit	eria an	alysis		2	2	
	Energy return on ene	ergy inv	ested (ER	ROI); de	efinition	of emergy,	2	2	
	emergy analysis: fut	ure of R	ES						
	⊠ lectures	rkobono		⊠ inde	ependen	t assignmer	nts		
	⊠ seminars and wo	rksnops		⊠ mu	Itimedia				
Format of instruction	⊠ exercises			☐ labo	oratory				
	☐ on line in entirety			□ wor	k with m	entor			
	☐ partial e-learning				(othe	er)			
	☐ field work								
Student responsibilities	To attend at least 70	)% of all	the lectu	res and	d exercis	es			
Screening student	Class attendance	1,5	Researc	:h		Practical tra	aining		
work (name the proportion of ECTS	Experimental work		Report			Individual w	/ork	2,	
credits for each activity so that the total	Eccay		Seminar	•		/O+h	or)	<del>                                     </del>	
number of ECTS	Essay		essay			(Oth	<del>U</del> 1)		
credits is equal to the	Tests	1	Oral exa	ım		(Oth	er)		
ECTS value of the course)	Written exam		Project			(Othe	er)		

Grading and evaluating student work in class and at the final exam	After the first 7 weeks of lecturing, there will be the consist of the first part of the course content, while to content covered in the next 6 weeks of lecturing wisemester. Students who did not pass a certain part not satisfied with the grade they achieved), will have take the final and remedial exams according to the teaching calendar. All exams are conducted in writter for a passing grade is to obtain at least 50% of points content. The final achieved number of points represent the achieved points for each of the passed parts of the evaluation of the student's achievement on according to the final number of points achieved as from 50% to 61% - fair (2), 62% to 74% - good (3), 75% to 87% - very good (4) and 88% to 100% - excellent (5)  According to the Article 71 of the Faculty Statute, strall forms of lectures and exercises by at least 70%. with this regulation will not be allowed to take the example of the strain of the s	he second partill be taken at a of the course of the established en form, and the son both parts sents the arithme course contill the course collows:	t of the course the end of the content (or are portunities to I dates of the e requirement of the course metic mean of ent.  is determined
Required literature	Title	Number of copies in the library	Availability via other media
(available in the library and via other media)	Lj. Majdandžić, Solarni sustavi, Graphis, Zagreb, 2010.		
	B. Labudović, Obnovljivi izvori energije, Energetika marketing, Zagreb, 2002.		
	I. Pivac, authorized lectures		e-learning portal
Optional literature (at the time of submission of study programme	G. Boyle, Renewable Energy Power for a Sustainable Oxford University Press, 2004 (or newer edition)	e Future, 2nd	Edition,
proposal)			
	☐ Monitoring of students attendance during lecture	s and exams	
Quality assurance methods that ensure	☐ Annual analysis of the average exam success		
Other (as the proposer wishes to add)			

NAME OF THE COURSE	COMPUTER AIDED DES	SIGN 1							
Code	FESL17	Year of study	1						
Course teacher	Gojko Magazinović, Ph. D., Full Professor	Credits (ECTS)	5						
Associate teachers	Ivan Pivac, Teaching assistant	Type of instruction (number of hours)	L 30	S 0	AE 0	LE 0	DE 30		
Status of the course	Obligatory	Percentage of application of e-learning	50						
	COURS	E DESCRIPTION							
Course objectives	modeling, parametric	plication of basic terms and modeling, and geometric mo models, assemblies, and tec pol.	deling,	ı					
Course enrolment requirements and entry competences required for the course	-								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>explain fundamental pand feature based modescribe an important data between the difference explain the fundament surface definitions,</li> <li>use a computer aided construct simple geon</li> </ul>	use a computer aided design tool, construct simple geometric models and assemblies, determine the model cross-section properties,							
	Course content				or S		λE		
	Internalization to a service F			ŀ	nours	hc	urs		
		Description of an e-learning p			2				
	Introduction to CAD/CAM/	CAE systems, part I: basic t	terms. 2						
			-4!						
	Ithe expansion of 3D CAD	CAE systems, part II: applic technology.	ations;						
	the expansion of 3D CAD Elements of CAD/CAM/CA		ations;		2				
	Elements of CAD/CAM/CA Geometric modeling; feature	technology.	ations; vare.		2 2 2				
Course content broken down in	Elements of CAD/CAM/CA Geometric modeling; featu modeling. Introduction to graphics procoordinate systems; homo	technology. AE systems; hardware; softw	ations; vare. etric		2				
broken down in detail by weekly class schedule	Elements of CAD/CAM/CAGE Geometric modeling; featumodeling. Introduction to graphics procoordinate systems; homotransformations. Introduction to graphics promoval; rendering; shading	technology. AE systems; hardware; software based modeling; parametrogramming, part I: OpenGL ogeneous coordinates; coordin	ations; vare. etric ; dinate		2 2 2 2				
broken down in detail by weekly	Elements of CAD/CAM/CAGeometric modeling; featured modeling. Introduction to graphics procoordinate systems; homotransformations. Introduction to graphics proceeding in the systems of transformations. Introduction to graphics proceeding in the systems of the sy	technology. AE systems; hardware; software based modeling; parametrogramming, part I: OpenGL ogeneous coordinates; coordin	ations; vare. etric ; dinate ine		2 2 2 2 2				
broken down in detail by weekly class schedule	Elements of CAD/CAM/CAGE Geometric modeling; feature modeling.  Introduction to graphics procoordinate systems; homotransformations.  Introduction to graphics promoval; rendering; shading First midterm exam	technology.  AE systems; hardware; software based modeling; parame rogramming, part I: OpenGL ogeneous coordinates; coordinates; coordinates; ray-tracing.	ations; vare. etric ; dinate ine		2 2 2 2 2 2				
broken down in detail by weekly class schedule	Elements of CAD/CAM/CAGeometric modeling; feature modeling. Introduction to graphics procoordinate systems; homotransformations. Introduction to graphics proceeding in the systems of transformations. Introduction to graphics proceeding; rendering; shading First midterm exam CAD data structures; exchainferent CAD systems. Parametric curves, part I:	technology.  AE systems; hardware; software based modeling; parame rogramming, part I: OpenGL ogeneous coordinates; coordinates; coordinates; ray-tracing.	ations; vare. etric dinate ine en the		2 2 2 2 2 2				
broken down in detail by weekly class schedule	Elements of CAD/CAM/CAGeometric modeling; feature modeling. Introduction to graphics procoordinate systems; homotransformations. Introduction to graphics proceeding removal; rendering; shading First midterm exam CAD data structures; exchaifferent CAD systems. Parametric curves, part II: Parametric curves, part III: Continuity; NURBS curves	technology.  AE systems; hardware; software based modeling; parametrogramming, part I: OpenGL ogeneous coordinates; coordi	ations; vare. etric  dinate ine en the e. tric		2 2 2 2 2 2 2 2				
broken down in detail by weekly class schedule	Elements of CAD/CAM/CA Geometric modeling; feature modeling. Introduction to graphics preserved in transformations. Introduction to graphics premoval; rendering; shading First midterm exam CAD data structures; exchaifferent CAD systems. Parametric curves, part II: Parametric curves, part III: Parametric curves, part III: Continuity; NURBS curves Parametric surfaces: billing surface; NURBS surface.	technology.  AE systems; hardware; software based modeling; parame rogramming, part I: OpenGL ogeneous coordinates; coordi	ations; vare. etric  dinate ine en the e. tric	e	2 2 2 2 2 2 2 2 2 2				

	Second midterm exa	am						
	List of laboratory or	design e	exercises					LE or DE hours
	The environment of C						э.	2
	Sketch tool; extrude;		chamfer;	hole; pa	aramete	rs.		2
	Simple model editing							2
	Revolving of a closed	curve.						2 2
	Design planes. Sections; shells, cons	etrainte:	sketchin	a utilitie	· C			2
	Translation patterns;							2
	Radial patterns of se							2
	Radial patterns of bu			re copy	ing.			2
	Helical sweep.							2
	Making assemblies.							2
	Technical drawing pr							2 2
	Technical drawing pr  ⊠ lectures	eparatic	n, part ii					
		rkehone		☐ inde	epender	nt assignme	nts	
	□ seminars and workshops □ exercises □ multimedia							
Format of instruction	☐ on line in entirety			⊠ labo	•			
	□ partial e-learning		☐ work with mento					
	☐ field work			⊠ computer work (other)				
Student responsibilities	Attendance of at leas	endance of at least 70% lectures and all design exercises.						
Screening student work (name the	Class attendance	2	Researc	ch		Practical tra	aining	
proportion of ECTS credits for each	Experimental work		<u>'</u>		Individual work		0,8	
activity so that the total number of	Essay		Seminar essay		Computer work		2	
ECTS credits is equal to the ECTS	Tests	0,2	Oral exam		(Other)			
value of the course)	Written exam		Project			(Oth		
Grading and evaluating student work in class and at the final exam	and e-learning porta two design problems exams. The requir responsibilities and Grade (in percentage where M1 and M2 a grades from 50% to	There are two midterm exams during the semester (carried out by using computer and e-learning portal; 90 minutes duration; each exam: 25 theoretical questions and two design problems). The final exams attend students that didn't pass the midterm exams. The requirements for passing grade are the fulfillment of student responsibilities and at least 50% points on each midterm exam or the final exam. Grade (in percentage) is determined as follows:  Grade(%) = (M1 + M2)/2  where M1 and M2 are the midterm grades. The final grades are: satisfactory (2), grades from 50% to 61%; good (3), grades from 62% to 74%; very good (4), grades from 75% to 87%; and excellent (5), grades from 88% to 100%.						
		Title	1			Number copies i	n   Avail	lability via
Required literature		1100				the libra	I Oth	er media
(available in the library and via other	G. Magazinović, Bilje	eške uz	predavai	nja, FES	SB	-	e-l	learning portal
media)	R. Toogood: Creo Pa	arametr	ic 2 0 Tut	torial an	nd .			://books.go
	Multimedia DVD, SD					1	-	ogle.hr
Optional literature	- K. Lee: Principles					ddison-Wes		
(at the time of submission of study	- C. McMahon, J. E Management, Pre	Browne:	CADCA	M: Princ	ciples, P			
programme proposal)								

Quality assurance	- Evaluation of results by the above learning outcomes
methods that ensure	- Feedback from students via surveys
the acquisition of	- Institutional and non-institutional evaluations
exit competences	
Other (as the	
proposer wishes to	
add)	

NAME OF THE COURSE	ENERGY EFFICIENCY IN	BUILDINGS								
Code	FESL24	Year of study	2.							
			30	0	30	0	0			
Status of the course	Elective.	Percentage of application of e-learning								
	COURSE	DESCRIPTION								
Course objectives		energy consumption in the ic aspect of proposed ene			/ meas	sures	in			
Course enrolment requirements and entry competences required for the course	Thermodynamics 1, Mathe	matics 1, Mathematics 2.								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>Consider base terms a buildings as well as sure</li> <li>Analyse energy consure</li> <li>Elaborate existing legis</li> <li>Analyse and propose of</li> </ul>	tudents will be able to:  Consider base terms and concepts from the field of energy efficiency in buildings as well as sustainable development in general, Analyse energy consumption in buildings, Elaborate existing legislative related to the energy efficiency in buildings, Analyse and propose energy efficiency measures in buildings, Evaluate economic aspect of proposed energy efficiency measures.								
	Course content				or S ours		AE ours			
	Introduction to the energy e	efficiency in buildings.		_	ours	_	ours			
	Analysis of the energy con-	sumption for different build	lings.	2 h	ours	2 h	ours			
Course content broken down in	Legislative related to the er	nergy efficiency in building	S.	2 h	ours	2 h	ours			
detail by weekly class schedule (syllabus)	Introduction to the energy of (passive and nearly zero be performance buildings).	2 h	ours	2 h	ours					
	Energy efficiency measure (building thermal envelope elements, etc.)	2 hours 2 ho			ours					

	Energy efficiency measures in heating systems and hot water preparation.  2 hours								
	Energy efficiency me water preparation.	easures	in heatin	g syste	ms and	hot	2 hours	2 hours	
	Energy efficiency me systems.	easures	in coolin	g (air-co	ondition	ing)	2 hours	2 hours	
	Energy efficiency me systems.	easures	in coolin	g (air-co	ondition	ing)	2 hours	2 hours	
	Renewable energy s	sources	in buildin	gs (imp	lementa	ation).	2 hours	2 hours	
	Calculation technique	2 hours	2 hours						
	Energy audit.	2 hours	2 hours						
	Building energy cert	2 hours	2 hours						
	Introduction to the evaluation of the end	2 hours	2 hours						
	Economic evaluation measures.	2 hours	2 hours						
	List of laboratory or	design e	exercises					LE or DE hours	
Format of instruction	<ul> <li>☑ lectures</li> <li>☐ seminars and wo</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☐ field work</li> </ul>	·		⊠ mul □ labo	epender Itimedia oratory k with n (oth	nentor	nents		
Student responsibilities	The presence on lec Performed all require					70 % of th	e times sch	eduled.	
Screening student work (name the	Class attendance	2	Researc		2	Practical	l training		
proportion of ECTS	Experimental work		Report			(0	Other)		
credits for each activity so that the total number of	Essay		Semina essay	r		((	Other)		
ECTS credits is	Tests		Oral exa	am		(0	Other)		
equal to the ECTS value of the course)	Written exam		Project		1	(0	Other)		
Grading and evaluating student work in class and at the final exam									

	Title	Number of copies in the library	Availability via other media					
Required literature	S. Nižetić, Online predavanja; Energetska učinkovitost u zgradarstvu, 2011, FESB.							
(available in the library and via other media)	Energy Efficiency in Buildings" – Guide F, CIBSE, 2004.							
, modia,	Energy Efficiency Guide for Existing Commercial Buildings", Guide, ASHRAE, 2009.							
Optional literature (at the time of submission of study programme proposal)	-Skupina autora, "Tipske mjere", UNDP, Zagreb 2009	Skupina autora, "Priručnik za energetske savjetnike", UNDP, Zagreb 2008, Skupina autora, "Tipske mjere", UNDP, Zagreb 2009, Skupina autora, "Priručnik za ventilaciju i klimatizaciju", EGE, 2003, Skupina autora, "Priručnik za grijanje", EGE, 2005.						
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>Evaluation of results in accordance with the above</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> <li>Institutional and non-institutional evaluations</li> </ul>	e learning outco	mes					
Other (as the proposer wishes to add)								

NAME OF THE	AEROTECHNICS AND W	AEROTECHNICS AND WIND TURBINES									
Code	FESL38	ESL38 Year of study 1.									
Course teacher	Branko Klarin, Ph. D., Full Professor	j	5								
A i - t - t l	Goran Gašparović,	Type of instruction		S	ΑE	LE	DE				
Associate teachers	Teaching assistant	stant (number of hours)	30	0	30	0	0				
Status of the course	Elective	Percentage of application of e-learning	0								
	COURSE	DESCRIPTION									
Training students for: - explain and apply the basic properties of atmospheric currents, - recognize the effects of air currents in the facilities, especially wind turbines and choose the correct relations to solve them, - analyze and calculate air energy conversion and simple problems.											
Course enrolment requirements and entry competences required for the course											

Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - explain the genesis of the wind in the atmosphere and describe the main impacts on the atmospheric flow, - enumerate and describe the basic devices for monitoring the state of the atmosphere, - analyze the state of wind and specify its main features, - list the parts smaller and larger wind turbines and calculate the basic operating parameters, - to comment on the status and trends of offshore wind farms, - identify and describe the basic features of a rigid sail, - present and comment on the use of priletnika and drones.							
	Course content	ent on ti	ie use oi	priletiii	na aliu (	urones.	L or S	AE
	Introduction to aerot flow.	echnics	. Terms a	and con	ditions.	Relative	hours 2	hours 2
	The atmospheric flow the impact of the glo	2	2					
Course content broken down in	Atmospheric boundarimpacts on the air flotopography.	ary layer	and influ				2	2
	Condition monitoring measurements. Win			device	s and		2	2
	Opposing facilities. E surface. Lifting surfa	anih	2	2				
	The effect of air flow and gas at various facilities, transport facilities and Turbomachinery (wind turbines).							2
	Atmospheric singularities. The extreme effects to the objects and humans. Ways to protect people and the environment.							2
detail by weekly	Wind turbines and s						2	2
class schedule	Off-shore wind farms	S.					2	2
(syllabus)	The rigid sails and s	emi-rigio	d sails. W	/ind ass	isted sh	ips.	2	2
	Flow around cylinder and the turbulent wake.							2
	Introduction to fly. G vehicles.	2	2					
	Selected topics of a	erospac	e and wir	nd tunne	els.		2	2
	List of laboratory or	design e	exercises					LE or DE hours
Format of instruction	<ul> <li>☑ lectures</li> <li>☑ seminars and wo</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☑ field work</li> </ul>	·		⊠ mul ⊠ labo	epender timedia oratory k with m (othe		nts	
Ctudont		turos !	the con-	 	+ locat 7	O 0/ of the t	imaa aal-	مارياه ط
Student responsibilities	The presence on lec Performed all require				ı ieast /	u % of the t	iities sche	edulea.
Screening student work (name the	Class attendance	3,5	Researc	ch		Practical tra	aining	
proportion of ECTS	Experimental work		Report			Individual v	vork	

credits for each			Seminar				
activity so that the	Essay		essay	1,5	Laboratory exe		
total number of ECTS credits is	Tests		Oral exam		Preparation fo laboratory exe		
equal to the ECTS value of the course)	Written exam		Project		(Other)		
Grading and evaluating student work in class and at the final exam	There are two midte lecturing and the se of seminar essay pro exams take part. Tacceptance. The re essay. Grade (in per where in percentage • M1, M2 – se	cond on ogress. If the final quirementage of the contage of the co	ne is after the ne In the final examal al exams are cant for passing (e) is formed according (Grade(%) = 0,5	xt 6 wees studer arried cograde is ording to	eks. Each midtonts that did not pout as finished the positive go the formula:	erm test on the serminar	consists nidterm essay
		Number of copies in the library	Availabi other r	-			
	B. Klarin: Aerotehnik	ka i vjetr	oturbine, autoriz	irana		e-lear	_
Required literature	predavanja, FESB			por	tal		
(available in the	- Kuette, A.M. and C			boo	ok		
library and via other media)	Aerodynamics: base Wiley, 1997.	es of Aeı					
	- Dyrbye, C.; Hansel Structures, Wiley, 19		Wind Loads on			boo	ok
Optional literature (at the time of submission of study programme proposal)	- McCormick, B.W.: 1995.	Aerodyr	namics, Aeronau	tics, and	d Flight Mechar	nics, Wiley	/,
Quality assurance	- Evaluation of res	sults in a	accordance with	the abo	ve learning out	comes	
methods that ensure	- Feedback from	students	s via surveys				
the acquisition of	- Self-evaluation	of teach	ers				
exit competences	<ul> <li>Institutional and</li> </ul>						
Other (as the proposer wishes to add)	- Feedback from gra	iduate s	tudents about th	e course	e relevance		

NAME OF THE COURSE	MATERIALS 3						
Code	FETL01	Year of study	2				
Course teacher	Nikša Čatipović, Ph. D., Assistant Professor	Credits (ECTS)	5				
Associate teachers	Karla Grgić, Teaching assistant	Type of instruction (number of hours)	L 30	S	AE	LE 30	DE
Status of the course	Obligatory	Percentage of application of e-learning	0		ı		
	COURSI	E DESCRIPTION					
Course objectives	To offer students the bas materials types – metallic composites. Among non-fermetals and alloys – all manufacturing technologie depict the properties of mechanical and technolog It is the intention to learn sapplications.	c and non-metallic materi errous and special metals uminium, titanium and es and typical industrial ap modern materials used ical properties along with	als - permember of the control of th	oolyme asis is esium, ons. It ucture: les ot	ric, ce on lig their is the s with their t	eramic: ht stru propo intent acce ypical	s and actural erties, ion to nt on uses.
Course enrolment requirements and entry competences required for the course	Successfully accomplished undergraduate part of the study and passed exams of Materials 1, Materials 2, Technology 1 and Technology or adequate subjects.						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After successful completion .21 distinguish the advanta basic structures as a basis .22 analyse and evaluate r conditions on the propertie .23 recommend the heat tr alloys and to define the spe .24 identify the effects of e .25 critically evaluate the p various steels including stamaterials and recommend specific service condition, .26 combine and to apply t materials for manufacturing energetics, medical engine .27 assess the engineering and environment and to ap work.	ages and drawbacks of marger for assessment of certain main effects of manufactures of the engineering mater reatment procedure of precedifics and correlation of malectric arc welding on light possibilities of selection and ainless, nickel alloys, polyn suitable material according the acquired knowledge of grechnologies and applicate for and structural materials in grand structural materials in a serial serial according and structural materials in grand structural materials in a serial serial according and structural materials in grand structural materials in a serial s	in mat proper ing technicrostrumetals dapplineric, contentions in regardi	erial tyrties, chnologon hard ucture s, cation eramid e engir mporan n trans	dening with pof light cand cand cand cand cand cand cand cand	alumii ropert t meta compo g need ctural dustry	rice nium ies, ls, site s for
Course content	Course content					L h	ours
broken down in	Introduction, Construction,	Materials, Technologies					2
detail by weekly	Light metals, Magnesium,						2
class schedule Heat treatment of aluminium, Titanium 2						2	
(syllabus)	Polymers						2
	Ceramics					2	2

	Composites						2		
	Composites						2		
	Metal foams						2		
	Materials for working	at elev	ated tem	peratur	es		2		
	Alloyed tool steels, \						2		
	Surface technology,	PVD ar	nd CVD p	rocess	es		2		
	The influence of allo	ying ele	ments or	steel			2		
	Materials with shape		ry				2		
	List of laboratory exe						LE hours		
	Procedures for testir					materials	2		
	Non-destructive mat						2		
	Heat hardening of al	uminiur	n alloys E	N AW	2011 an	d EN AW 6063	2		
	The influence of heat treatment on the mechanical properties of						2		
	titanium alloys			11.00					
	Testing the mechanic				nt polyr	ner properties	2 2		
		Production of composites in a closed mold  Determination of the relative density of open-type metal foam							
			2						
	Determination of the relative density of closed type metal foam						2		
Examination of the influence of alloying elements on steel properties  Simulating an accelerated corrosion process  Copper and zinc electroplating						n steel properties	2		
							2		
						2			
	Production of mater   ⊠ lectures	als with	shape m	nemory	· 		2		
Format of instruction	<ul> <li>□ seminars and workshops</li> <li>☑ exercises</li> <li>□ on line in entirety</li> <li>□ partial e-learning</li> <li>□ field work</li> </ul>			⊠ lab	oratory k with n	nentor			
Student responsibilities	Mandatory minimum Approved reports fro				ne lectui	res and 100 % for lab	exercises.		
Screening student work (name the	Class attendance	1,5	Researc	h		Practical training			
proportion of ECTS	Experimental work	0,5	Report			Individual work	3		
credits for each activity so that the	Essay		Seminai essay	f		Laboratory exercises			
total number of ECTS credits is	Tests		Oral exa	am		(Other)			
equal to the ECTS value of the course)	Written exam		Project			(Other)			
Grading and evaluating student work in class and at the final exam	midterm exam is after classes. In the final in the midterm examinating 45 minutes. It grade is a positive grade is a positive grade is a positive grade is a positive achieved percentage.	er 7 wee exam, s ms. Eac consist rade fro interme e of ma	eks of cla tudents p ch interm s of test o m the lab diate exa aterial pa	sses, a eass pa ediate questior oratory m. The ssed ir	nd the serts of the exam is and to exercise final grant the in-	e exams (colloquiums) second after the next 6 e material that they dies conducted as a writes. The condition for es and all submitted reade is formed on the batermediate exams. Earade and reports on	weeks of d not pass tten exam a positive eports and asis of the ach of the		
	50% to 61% sufficient (2)								

	62% to 74% good (3) 75% to 87% very good (4)								
	8% to 100% excellent (5)								
	xam dates: according to the class calendar!								
	The final grade is determined after the second final exam using the absolute ECTS rading system in accordance with the Rulebook on studies and the study system of the University of Split. Students who did not pass the colloquia can write four dditional exams. After that, they have the dean's exam, where they write the part of the material that they have not passed until then.								
Required literature (available in the	Title	Number of copies	Availability via						
library and via other		in the	other media						
media)	N. Čatipović: Authorized lectures, FESB		MERLIN						
Optional literature (at the time of submission of study programme proposal)	Various web materials from subject matter								
Quality assurance	Encourage students to attend the lectures and ex								
methods that ensure		ning outcomes							
the acquisition of	Feedback from students via surveys								
exit competences	Self-evaluation of teachers								
Other (as the proposer wishes to add)									

NAME OF THE COURSE	PLANT LAYOUT							
Code	FETL05 Year of study 2.							
Course teacher	Ivica Veža, Ph. D., Full Professor	Credits (ECTS)	5					
A i - t - t l	Marko Mladineo, Ph. D.,	Type of instruction	Р	S	ΑV	LV	ΚV	
Associate teachers	Teaching assistant	(number of hours)	30	0	0	15	15	
Status of the course	Obligatory	Percentage of application of e-learning	0					
	COURSE	DESCRIPTION						
Course objectives  Educate students to be able to:  realize feasibility study in projecting a new production system, project of phases of production system (define macro and micro locations, surfaces, basic elements of building, basic production structures, work conditions), understand basics of material flow calculation, human factor, information and energy.								
Course enrolment requirements and entry competences	Course enrolment requirem	ents: None						

COURCE III COLLEGE IN THE COLLEGE IN		Required competences: Competences and skills achieved after finishing bachelor						
course studies of industrial engineering, mechanical engineering and naval a	studies of industrial engineering, mechanical engineering and naval architecture							
Students will be able to:  1. Analyse content of previous study realized,								
	Compare criteria in micro and macro location selection phase,							
	Define number of workplaces,							
expected at the 4. Create transport intensity chart,	! ! .	\						
level of the course 5. Compare layout according to processing type (Workshop prin	ncipie	) and						
<ul><li>(4 to 10 learning purpose groups,</li><li>outcomes)</li><li>purpose groups,</li><li>Define production surface with discontinuity coefficients meth</li></ul>	od							
7. Analyse functional surfaces (sketch machine with functional s		e unit						
field and height of factory hale),	Juliac	o, unit						
8. Apply achieved knowledge and skills on real example								
Course content F	)	AV						
hou	urs	hours						
Introduction. Term "system", system types. Production system.	2							
	2							
	2							
	2							
·	2							
·	_							
Location problems. Main factors for micro and macro location selection.	2							
	2							
Production surface calculation, defining of functional surfaces	_							
on workplace. Distances between machines and elements.	2							
Calculation of block scheme of surface layout. Flortion of basic	_							
building parameters.	2							
	2							
Course content Layout methods for cases with group by types.	2							
broken down in Production and accomply lines balancing	2							
detail by weekly	2							
(syllabus) fatigue. Work conditions.								
List of laboratory exercises		LV hours						
Introduction to spatial structures		2						
Layout according to purpose. Production line balancing		2						
Layout according to purpose. Modified triangle method		2						
Layout with fixed position. Hungary method		2						
Layout problem with predefined locations		2						
Transportation problems		2						
Program task setting  List of construction exercises		KV hours						
Capacity load calculation		2						
Transport units defining		2						
Defining of optimal spatial layout		2						
Storage calculation		2						
Required surface calculation		2						
Preparation of technical drawing of projected production system		2						
Handover of program task		1						
□ Lectures     □ Solo tasks								
☐ Seminary work and workshops ☐ Multimedia								
Format of X Exercise								
instruction								
☐ mixed e-learning ☐ Mentorship								
☐ fieldwork lectures ☐ (other)	I I (OTNET)							
Student Presence on lectures and auditory exercise minimally 70% in total. Al	II labo	ratory						
responsibilities exercise and project task realized.								

	T	1	1				1			
Screening student work (name the	Class attendance	1,0	Research		Practical traini	ng				
proportion of ECTS	Experimental work		Report		Individual worl	k	1,5			
credits for each activity so that the	Essay		Seminar essay		Laboratory ex	_aboratory exercises				
total number of ECTS credits is	Tests 0 Oral exam				Preparation fo laboratory exe					
equal to the ECTS										
value of the course)	Written exam		Project	2,0	(Other)					
Grading and evaluating student work in class and at the final exam	lectures, and second the curriculum on final has to be written as a theoretical questions and project task done. To students are intitiesides lectures, the they realizing product on colloquium and the KV – grade for KV – grade for M1, M2 – colloquium grade (in perce	o students are introduced phases of production system modelling. Therefore esides lectures, they are attending to laboratory exercises and according to them sey realizing production system modelling. Students presenting their project tasks in colloquium and those tasks are also included in grade forming (grade KV).								
		Number of copies in the library	Availabi other r	-						
Required literature	Veža, I., Bilić, B., Baj	jić, D., "l	Projektiranje			e-lear	ning			
(available in the library and via other	proizvodnih sustava"	, Fakulte	et elektrotehnike	,		por	tal			
media)	strojarstva i brodogra									
·					<u> </u>					
					1					
Optional literature	Aggteleky, B., "Fabril Band 1,2,3"., Carl Ha Schenk, M., Wurth, S wandlungsfähige und York, 2004.	anser Ve S., "Fabr	erlag, München, ikplanung und F	1990. abrikbet	trieb Methoden	für die				
Quality assurance	- Evaluation of res	ults in a	ccordance with t	he abov	ve learning outo	comes				
methods that	- Annual analysis			e exami	nations					
ensure the	<ul> <li>Feedback from s</li> </ul>		· ·							
acquisition of exit competences	- Self-evaluation o		_							
•	- Institutional and	non-inst	itutional evaluati	ons						
Other (as the proposer wishes to	Institutional and non-institutional evaluations									

NAME OF THE COURSE	COMPUTER AIDED DESIGN 2								
Code	FESM15	Year of study	1						
Course teacher	Gojko Magazinović, Ph. D., Full Professor	Credits (ECTS)	5						
Associate teachers	Ivan Pivac, Teaching assistant	Type of instruction (number of hours)	L 30	S 0	AE 0	LE 0	DE 30		
Status of the course	Obligatory	Percentage of application of e-learning	50						
	COURS	E DESCRIPTION							
Course objectives	design and manufacture performing engineering building geometric mo	e and significance of CAD/ouring systems, and calculations using a spreadels, generating its technicalyses using a contempora	adshee	et softv vings,	ware, and p				
Course enrolment requirements and entry competences required for the course	Completion of Computer A		.y 0/12	<u> </u>					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to:  - solve simple engineering calculation problems by using a spreadsheet tool, - draw a graph by using a spreadsheet tool, - use a computer aided design and analysis tool, - generate geometric models and assemblies of moderate complexity, - link geometric models with spreadsheet analyses, - determine the peak stress and deformation within the simple geometric models.								
	Course content				L or S	/	٩E		
	Literature Construction of E	No. 2010 10 10 10 10 10 10 10 10 10 10 10 10			hours	ho	ours		
	Introduction to a course. E History of computing and of numbers; engineering of	on	2						
	Graphical representation of	<u> </u>			2				
	Spreadsheet numerical in				2				
	Spreadsheet equation sol		2						
		software; references; desig	n inten	t.	2				
	Curve and surface modeli	ng.			2				
Course content	First midterm exam	1 2 1 . 1 . 190							
broken down in	Feature parent-child relati				2				
detail by weekly class schedule	definition.	ties; measurements; mater			2				
(syllabus)	surface finishes.	assemblies; geometric toler	ances;		2				
	Analysis as a feature; linki				2				
	Examples of models, anal Structural analysis: h-metl conditions; result analysis	hods; p-methods; boundary	/		2				
	Second midterm exam	•							
	List of laboratory or design	n exercises					or DE ours		
	Spreadsheet tool elements functions.	s; making a simple workshe	et; buil	t-in			2		
	Absolute and relative cell a	addressing; complex expre	ssions.				2		
	Working with data series; conditional formatting; graphing.						2		

	Numerical integration	n: trapez	oidal and	Simps	on's rule	).		2
	Equations; linear sys							2
	Basic modeling; para					simple parts.		2
	Curves and surfaces					' '		2
	Project, part II: advar	nced pa	rts.					2
	Project, part III: asse							2
	Project, part IV: techi		awing.					2
	Analysis feature.							2
	Modeling, analysis, a	nd optir	nization.					2
		tatic structural analysis of simple parts.						
	⊠ lectures					_	1	
	☐ seminars and wo	rkshops			•	t assignments		
	⊠ exercises				timedia			
Format of instruction	☐ <i>on line</i> in entirety			⊠ labo	ratory			
	□ on time in criticity     □ partial e-learning			□ worl	k with m	entor		
	☐ field work			⊠ com	puter w	ork		
	□ fleid work							
Student	Attendance of at lea	st 70%	lectures a	and all d	esian ex	kercises.		
responsibilities								
Screening student work (name the	Class attendance	2	Researc	h		Practical traini	ng	
proportion of ECTS credits for each	Experimental work		Report			Individual work	ζ	0,8
activity so that the total number of	Essay		Seminai essay			Computer worl	<	2
ECTS credits is equal to the ECTS	Tests	0,2	Oral exa	ım		(Other)		
value of the course)	Written exam		Project			(Other)		
Grading and evaluating student work in class and at the final exam	numerical and one of three design problem exams. The requires responsibilities and Grade (in percentage) where M1 and M2 and grades from 50% to	There are two midterm exams during the semester (carried out by using computer and e-learning portal; 90 minutes duration; first exam: five theoretical questions, two numerical and one design problems; second exam: five theoretical questions and three design problems). The final exams attend students that didn't pass the midtern exams. The requirements for passing grade are the fulfillment of student responsibilities and at least 50% points on each midterm exam or the final examed (in percentage) is determined as follows:  Grade(%) = (M1 + M2)/2  where M1 and M2 are the midterm grades. The final grades are: satisfactory (2 grades from 50% to 61%; good (3), grades from 62% to 74%; very good (4), grades from 75% to 87%; and excellent (5), grades from 88% to 100%.						ons and midterm student il exam. tory (2),
						Number of		
		Title	<u>,</u>			copies in	Availab	-
			-			the library	other	media
	G. Magazinović, Bilje	očko uz	prodovo	nio EES	PD	the herary	0 100	rning
Required literature	G. Magazinovic, Bilje	eske uz	predavai	ıja, res	DD .	-	e-lea	_
(available in the						_	poi	
library and via other	R. Toogood: Creo P					1	-	ooks.go
media)	Multimedia DVD, SD						ogle	e.hr
	B. Plazibat, i drugi: I	nformat	ika 1, Sve	eučilišni			Linl	k at
	studijski centar za st	ručne s	tudije, Sp	lit, 2010	).	-	e-lea	rning
							poi	tal
Optional literature (at the time of submission of study programme proposal)	- C. McMahon, J. E	portal  K. Lee: Principles of CAD/CAM/CAE Systems, Addison-Wesley, Reading, 1999. C. McMahon, J. Browne: CADCAM: Principles, Practice and Manufacturing Management, Prentice-Hall, Harlow, 1998.						
Quality assurance methods that ensure	<ul><li>Evaluation of res</li><li>Feedback from s</li></ul>				g outcor	nes		

the acquisition of	- Institutional and non-institutional evaluations
exit competences	
Other (as the	
proposer wishes to	
add)	

NAME OF THE								
COURSE	COMPUTER AIDED MAN	IUFACTURING						
Code	FETL07	Year of study	1.					
Course teacher	Dražen Bajić, Ph. D, Full Professor Sonja Jozić, PhD, Assistant Professor	Credits (ECTS)	5					
Associate teachers	Mario Veić, Teaching assistant	Type of instruction (number of hours)	L 30	S 0	AE 0	LE 0	DE 30	
Status of the course	Obligatory/Elective	Percentage of						
	COURSI	E DESCRIPTION	<u> </u>					
Course objectives	Training students for:     exploring the possibilities of computer application in production with an emphasis on programming CNC machine tools and additive technology.     mastering of manual programming and programming in CAD / CAM systems in machining of simple and complex workpiece.							
Course enrolment requirements and entry competences required for the course	None							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to:  - analyze interactions and need for a comprehensive approach to part design and their manufacturing  - apply acquired knowledge and skills to solve a specific task.  - apply acquired knowledge and skills in teamwork.  - consider role of CAD / CAM systems in modern design and manufacture  - generate program for the automatic parts production on CNC machine tools  - compare and highlight differences between manual programming and programming by CAD / CAM systems  - identify motives of applying computer controlled machine tools and systems for rapid prototyping  - comment advantages and disadvantages in development and manufacture of prototypes using CNC machining and additive technology.							
Course content broken down in	Course content  Introduction. Basic terms.	<u>'</u>			or S hours 2		AE ours /	
detail by weekly class schedule (syllabus)	Geometric modeling. Engling geometric models. 2D and	3D geometric models.			2		/	
(Syllabus)	Geometric modeling. Mode Parametric modeling. Disa				2		/	

	CNC machine tools Analysis of technical Programming methol programming.	drawing	gs. Techr	nological docur	nentation.	2	/
	CNC machine tools Measurement system tools. The structure	m. Refei	rence poi	nts. Defining c		2	/
	CNC turning. The pr turning. Selection of programming CNC t	2	/				
	Automatic programming of CNC lathes. Possibilities of software package CATIA. Associative database. Defining of machining. Machining simulation and CNC code generating.						
	First midterm exam CNC milling. Different tools. Tools clamping and workpiece.					2	/
	CNC milling. End mi	Iling. Fa	ce milling	a. Profile milling	 تا.	2	/
	CNC milling. Manually programming. Automatic programming in CATIA.						/
	Mill turning. Coaxial	and orth	nogonal n	nill turnina.		2	/
	Rapid prototyping. S				nating.	2	/
	Selective sintering.  Rapid prototyping. S	2	/				
	Hybrid procedure 3D	OP / SLA				_	ŕ
	Second midterm exa	am					
	List of laboratory or	design e	exercises				LE or DE hours
	Construction of simp						2
	Construction of comp				extrusion.		2
	Technical documentation - Drafting module.  CNC manual programming for lathes.						
	Module for machining - turning. Roughing and finishing, holes and threads						
	Module for machining	a - millin	a Rouah	nina			2
	Generating NC code	for mad	hining ce		cation betwe	een	2
	computers and machining center.  Machining on CNC vertical machining center Spinner VC560.						
	Module for machining				•		2
	Module for machining			<u> </u>		•	2
	Generating NC code for machining center.Communication between computers and machining center.  Machining on CNC vertical machining center Spinner VC560.						2
							2
	Rapid prototyping. STL files. 3D printing						
Format of instruction	<ul><li>□ seminars and wo</li><li>⋈ exercises</li><li>□ on line in entirety</li></ul>			<ul><li>⋈ multimedia</li><li>⋈ laboratory</li><li>⋈ work with n</li></ul>	nentor	nts	
Format of instruction  Student responsibilities	<ul> <li>□ seminars and wo</li> <li>⋈ exercises</li> <li>□ on line in entirety</li> <li>□ partial e-learning</li> </ul>	ctures in	the amo	□ multimedia     □ laboratory     □ work with n     □ (other  unt of at least 7	nentor er)		duled.
Student responsibilities Screening student	□ seminars and work □ exercises □ on line in entirety □ partial e-learning □ field work  The presence on led	ctures in	the amo	□ multimedia     □ laboratory     □ work with n     □ (other  unt of at least 7 ercises.	nentor er) 70 % of the t	times sche aining	
Student responsibilities	□ seminars and work □ exercises □ on line in entirety □ partial e-learning □ field work The presence on lector of the performed all requires	ctures in	the amo	□ multimedia     □ laboratory     □ work with n     □ (other  unt of at least 7 ercises.	nentor er) 70 % of the t	times sche aining ogramming	

	I	ı	T T					
total number of ECTS credits is	Tests	0,25	Oral exam		(Other)			
equal to the ECTS value of the course)	Written exam		Project		(Other)			
Grading and evaluating student work in class and at the final exam	There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students that did not pass the midterm exams take part. In the makeup exam students take the entire exam. The midterm, final and makeup exams are carried out as written tests.  The requirements for passing grade is:  3. Positively evaluated program task "Manually programming CNC turning"  4. 50 % points on each midterm exam or the final exam.  Grade (in percentage) is formed according to the formula:  Grade(%) = 0,2 L + 0,4 ( M 1 + M 2 )  L – grade of program task "Manually programming CNC turning"							
trie iiriai exam	M1, M2 – test results of first and second midterm exam.  Final grade is determined according to:  Percentage Grade  50% do 61% sufficient (2)  62% do 74% good (3)  75% do 87% very good (4)  88% do 100% excellent (5)  Examination terms: according to the timetable.							
					Number of	Availability via		
		Title			copies in the library	other media		
Required literature (available in the library and via other media)	Xun Xu: "Integrating Design, Manufacturi Principles and Imple Auckland, New Zeal Hoffmann M.: "CAD/	Advanding, and ementation and, 20 CAM m	eed Computer-Aide Numerical Control ons", University of 09.	l:	-	_		
(available in the library and via other	Design, Manufacturi Principles and Imple Auckland, New Zeal	Advanceng, and ementation and, 20 (CAM mode) 2005.	ed Computer-Aide Numerical Control ons", University of 09. it CATIA V5", Hans er aided	l:	-	_		
(available in the library and via other	Design, Manufacturi Principles and Imple Auckland, New Zeal Hoffmann M.: "CAD/ Verlag, Muenchen, 2 Bajić, D., Jozić, S., " manufacturing", lecturing Balič, J.: CAD/CAM McMahon, C., Brown management, Pears	Advance and, 20 (CAM moderns)	red Computer-Aide Numerical Control ons", University of 09. it CATIA V5", Hans rer aided Learning, 2015. i, Univerza v Marik ND CAM principles tice Hall, 1999.	ser	the library	eLearning portal		
(available in the library and via other media)  Optional literature (at the time of submission of study programme	Design, Manufacturi Principles and Imple Auckland, New Zeal Hoffmann M.: "CAD/Verlag, Muenchen, 2 Bajić, D., Jozić, S., "manufacturing", lector Balič, J.: CAD/CAM McMahon, C., Brown management, Pears  - Keeping records of Evaluation of results of Feedback from strength of the Self-evaluation of	Advance ng, and ementating and, 20 (CAM moderning, elementating) (CAM moderning, elementation) (CAM moderning)	red Computer-Aide Numerical Control ons", University of 09. it CATIA V5", Hans rer aided Learning, 2015. ii, Univerza v Marik ND CAM principles tice Hall, 1999. ttendance cordance with the ab	ser  boru, Ma , practic	aribor, 2002.	eLearning portal		

NAME OF THE	COMPUTATIONAL FLU	ID DYNAMICS						
COURSE								
Code	FESN19	Year of study	1					
Course teacher	Assistant professor Igor Pehnec	Credits (ECTS)	5					
Associate teachers	(number of hours)				AE	LE	CE	
	Nikola Mijalić, MEng	30	0	0	30	0		
Status of the course	Elective	Percentage of application of e-learning	0					
		COURSE DESCRIPTION						
Course objectives	Introduction to full Navier-Stokes equations, continuity and energy equation; physical meaning of the equation terms. Knowledge of discretization methods and numerical solving of discretized equations. Introduction to grid's properties. Main and common pre-processing, processing and post-processing procedures for CFD software.  Selection of the appropriate level of modeling and identification of the diminished physical representativness of CFD results.							
Course enrolment requirements and entry competences required for the course	Fluid mechanics							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to:  Describe the full Navier Stokes equations and energy eq. Explain the discretization procedures and numerical solution of discretized equations. Identify the main causes of reduced physicality CFD simulations. Apply CFD computer programs for calculating 2D flow (stress and changes of internal energy in the fluid). Model the problem of flow of viscous flows with heat exchange for use of commercial codes. Critically evaluate the results.							
Course content broken down in	Content					L hours	LE hours	
detail by weekly class schedule	The main flow equati	on.				2	2	
(syllabus)	Classification of the differential equations. 2 2							

	Boundary cond	ditions of	the equation.			2	2		
	Discretization (	of diff. ed	ղ. with Finite D	ifference M	ethod.	2	2		
	The method of	the final	volume. Erro	r discretizati	on.	2	2		
	The generation	networl	ks and networ	k types.		2	2		
	Stability.					2	2		
	Numerical diffi	usion.				2	2		
	Algorithms sol	ving of di	scretized equa	ations.		2	2		
	Installation of	2	2						
	Application of the potential flow incompressible fluid, flow of ideal fluid and viscous flow.								
	2	2							
	Application of fluid and visco	luid, flow of ideal	2	2					
Format of instruction	<ul><li>Iectures</li><li>Iectures</li><li>Image: seminars and</li><li>Image: exercises</li></ul>	workshop	S	<ul><li>☑ individual</li><li>☐ multimed</li><li>☐ laboratory</li></ul>					
Student responsibilities	Class attendan	ce.							
Screening student work (name the	Class attendance	2,0	Research		Practical training				
proportion of ECTS	Experimental work		Report		Individual work		2,0		
credits for each activity so that the	Essay		Seminar essay	0,5	Lab exercises		0,2		
total number of	Tests		Oral exam	0,3	(Other)				
ECTS credits is equal to the ECTS value of the course)	Written exam		Project		(Other)				
Grading and evaluating student work in class and at	and exercises. exams the stud The seminar es	The stud dents pre	ents submit th sent their hon	neir homewo neworks.	ks that are given wit orks on the next lect orally presented at t	ure. At m	id-		
the final exam	semester.  Total points (%) = 0.05 (HV + SV) + 0.45 (M1 + M2)								

	HV, SV -% points from homework and seminar work, M1, M2 -% points at mid-exams.  Corrective Exam: A student who does not pass the exam at the time of teaching and the associated exam period, but has collected at least 25% of the total points, orally explains the seminar work.					
Required literature (available in the library and via	Title	Number of copies in the library	Availability via other media			
other media)	- Virag Z. Džijan I. , "Računalna dinamika fluida", FSB, Zagreb					
Optional literature (at the time of submission of study programme proposal)	Anderson, Dale; Pletcher, Richard H.; Tannehill, John C, "Computational Fluid Mechanics and Heat Transfer", Hemisphere Pub. Corp. McGraw-Hill (1984)  - John Anderson, "Computational FLuid Dynamics the basic and applications", McGraw-Hill Science Engineering Math (1995)  - H. Versteeg, W. Malalasekra, "An Introduction to Computational Fluid Dynamics - The Finite Volume Method", Prentice Hall (2007)					
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>- Hirsch, C. "Numerical Computation of Internal and External Flows", Wiley, 1987</li> <li>Keeping records of his attendance. The annual analysis of the performance of the examination. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.</li> </ul>					
Other ()						

NAME OF THE COURSE	THEORY OF PLASTICITY AND VISCOELASTICITY							
Code	FESL42	Year of study	1.					
Course teacher	Vedrana Cvitanić, Ph. D., Associate Professor	Credits (ECTS)	5					
Associate teachers		Type of instruction (number of hours)	L 45	S 0	AE 15	LE 0	DE 0	
Status of the course	Elective	Percentage of application of e-learning	0				Ů	
	COURSI	EDESCRIPTION						
Course objectives	nonlinear (elastoplastic determination of stress elements under condit understanding concep	problems of structural ana c and viscoelastic) materia s and strain distributions fo ions of nonlinear material l ts of elastoplastic and visc ormulations that are used i alysis.	Il behav or simple behavio coelastic	iour, e load ur, cons	ing of	beam mode	els	
Course enrolment requirements and entry competences required for the course	None							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>compute stress and dis load and residual stress loading or bending load compute limit load for pexplain concepts and pathree dimensional stress explain algorithm for constitutive formulation hardening concept,</li> <li>explain characteristic constitution constitutive formulation hardening concept,</li> <li>explain characteristic constitution constitutive formulation hardening concept,</li> <li>explain characteristic constitution constitution concept,</li> <li>explain solving equation constitution constit</li></ul>	of mechanical behaviour of splacement distributions for sees and displacements for ding, plane beams and frames in principles of elastoplastic cossistates under conditions alculating state variables on based on isotropic yield of mechanical behaviour of pelastic model and Voigt-kes derive creep response a cons of viscoelastic models and of variable loading for bescoelastic constitutive form	or elastor beams on elastor constitut of smale function of smale function of viscoe (elvin's not stressed by Laple beams	plastic plastic plastic plastic n and lastic viscos s rela ace's by Bol	c state r axia c state rmulat ns, c proc isotro materi elastic xation transf zman's	es, limi I, torsides, ions for ess for pic als, model respo orm, s princ	on or I and nse, iple	
Course content  Course content  broken down in detail by weekly class schedule (syllabus)  Course content  Introduction to theory of plasticity. Experimental data about material plastic behaviour. Effect of temperature and strain rate on material plastic behaviour. Idealizations of one dimensional plasticity diagrams.  Rheological models of plasticity.  Plastic analysis of beams.  3							AE ours	
	Axial loading of beams in pla plastic model and elastic-linea	_	tic-perfe	ctly				

	Torsion loading of bea Limit state. Elastic-per model.				•	3		
	Pure and transverse perfectly plastic model	_	in plastic	region.	Limit state. Elastic-	3 2	2	
	Plastic analysis of bea		frames.			3 2	2	
	Yielding criteria for iso			resca y	ielding criterion, von	5		
	Mises yielding criteri Coulomb yielding crite Hill and Karafillis-Boyo	ion, Dru erion. Yic e yieldin	icker-Prag elding crite ig criterion	er yield eria for a	ing criterion, Mohr- nisotropic materials:			
	three dimensional stre	Concepts and principles of elastoplastic constitutive formulations for three dimensional stress states under conditions of small strains. Flow rule. Isotropic and kinematic hardening models for three dimensional						
	stress states.		3					
	Algorithms for calculat	ing state	variables	of elasto	pplastic process.	3		
	Examples of complex	body loa	ding in pla	stic state	Э.	1 :	3	
	Introduction to theor	-		-		3		
	viscoelastic materials		•					
	temperature and time						1	
	Rheological models of model. Generalized model.	odels.	-		-	3		
	Solving viscoelastic me principle of superpositi	ion.				3		
Principles of visoelastic constitutive formulations for three dimensional stress states.						3		
							Гьогио	
	List of laboratory exe	ercises				L	E hours	
Format of instruction	<ul> <li>☑ lectures</li> <li>☐ seminars and wo</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☐ field work</li> </ul>	·	3	⊠ mul □ labo	ependent assignme timedia oratory k with mentor (other)	nts		
Student responsibilities	The presence on lec	tures a	nd exerci	ses in th	ne amount of at leas	st 70 % of tl	ne times	
Screening student	Class attendance	1,7	Researc	ch	Practical tra	aining		
work (name the proportion of ECTS	Experimental work		Report		Individual v	work	3,0	
credits for each activity so that the	Essay		Semina essay	r	Laboratory	exercises		
total number of ECTS credits is equal to the ECTS	Tests	0,2	Oral exa	am	Preparation laboratory			
value of the course)	Written exam	0,1	Project		(Oth	ner)		
Grading and evaluating student work in class and at the final exam	exam terms, one conductording to schedule second one is after the test consists of the conductor gassing grade is 50%.	There are two midterm exams during the semester. After semester there are two final exam terms, one corrective exam term and one exam term held by commission according to schedule. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks of lecturing. Each midterm exam is written and test consists of theoretical questions and numerical problems. The requirement for passing grade is 50% points on each midterm exam. In the final exams students that did not pass the midterm exams take part. In the additional exam terms students take whole exam.						
	Final number of points is formed according to the formula: Points(%)= (M1 + M2)/2 M1, M2 – points on midexams.							

	Final grade is determined by absolute system of grading. Final grade is determed by he achived final number of points in the following manner: from 50% to 61% - grade sufficient (2), from 62% to 74% - grade good (3), from 75% to 87% - grade very good 4) and from 88% to 100% - grade excellent (5).  According to Article 71 of Faculty Statue, students are obligate to contribute in all education activities and to attend at least 70% of lecture and exercise lessons. Above conditions are necessary to access midterm and final exams.						
	Title	Number of copies in the library	Availability via other media				
Required literature	Alfirević, I.: "Uvod u tenzore i mehaniku kontinuuma",						
(available in the library and via other media)	Golden marketing, Zagreb, 2003.  Alfirević, I., Pustaić, D.: "Inženjerski priručnik IP1", poglavlje: Teorija plastičnosti, Školska knjiga, Zagreb, 1996.						
	Alfirević, I., Brnić, J.: "Inženjerski priručnik IP1", poglavlje: Teorija viskoelastičnosti, Školska knjiga, Zagreb, 1996.						
Optional literature (at the time of submission of study programme proposal)	Khan, A. S., Huang, S., "Continuum theory of plasticity", W Simo, J.C., Hughes, T.J.R., "Elastoplasticity and Viscoplas Springer-Verlag, 1988.  Bathe, K.J.: "Finite element procedures in engineering ana 1996.  Brnić, J.: "Elastomehanika i plastomehanika", Školska knjig	ticity - Computa	tional Aspects", Hall, New York,				
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>recording student's presence on lessons</li> <li>evaluation of results in accordance with the above learning outcomes</li> <li>feedback from students via surveys</li> <li>self-evaluation of teachers</li> <li>institutional and non-institutional evaluations</li> </ul>						
Other (as the proposer wishes to add)							

NAME OF THE	PRODUCTION PLANNIN	G AND CONTROL							
COURSE			1.						
Code	FETL06	Year of study	2.						
Course teacher	Boženko Bilić, Ph.D. Full Professor	Credits (ECTS)	5		•		T		
	Marko Mladineo, Ph. D.,	Type of instruction	L	S	ΑE	LE	DE		
Associate teachers	Teaching assistant	(number of hours)	30	0	15	15	0		
Status of the course	Obligatory	Percentage of application of e-learning	0						
	COURSI	E DESCRIPTION							
Course objectives  - Introduce students with the basic tasks of production management - Teach students the basic methods and tools for production management									
Course enrolment requirements and entry competences required for the course	Completed undergraduate mechanical engineering.	study industrial engineering	ng, nav	al arch	nitectu	re or			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to:  Explain the strategies of introducing new products to the market  Recommend organizational structure of the company  Plan the required production capacity  Develop basic layout of production equipment  Design a project network diagram and Gantt chart  Optimize the total cost of the project  Plan material inventory for the independent and dependent demand  Evaluate the quality management system.								
	Course content				L		ΑE		
	T. C. T.				hours	hc	ours		
	Introduction. Types of industructures		2		0				
	Production function and pr	2		0					
	Strategies for new product								
	product development.		3		3				
	Product lifecycle managem		2		1				
	Basis of production and ma		3		3				
	Types of production plans.		2		0				
	First midterm exam								
Course content	PROJECT MANAGEMENT				4		3		
broken down in	INVENTORY PLANNING	AND CONTROL: Inventori	es in ar	า	3		0		
detail by weekly class schedule	independent demand INVENTORY PLANNING /	AND CONTROL: Inventori	es in ar	n	2		3		
(syllabus)	dependent demand								
	QUALITY MANAGEMENT				3		0		
	Second midterm exam					<b>.</b>	1		
	List of laboratory exercises	<b>S</b>				LEI	hours		
	QFD metoda.						2		
	Project management: Project network diagrams (network planning techniques) and gantt chart. Project structure analysis - project phases and activities. Project time management using project network diagrams.						4		
	Project management: Projediagrams.	ect cost management usin	g proje	ct netv	vork		2		
	Project management: Reso	ource planning.					2		
	5S method	- · · · · · · · · · · · · · · · · · · ·					1		
Format of instruction	⊠ lectures	⊠ independen	t assior	ment	3				
	☐ lectures ☐ independent assignments								

Student responsibilities Screening student work (name the proportion of ECTS credits for each	Experimental work Report					nentor er) unt of at least 7 ual project tasks Practical traini Individual work	nt of at least 70 % of the times		
activity so that the total number of ECTS credits is	Tests Tests	0	essay Oral exa		0,5	Preparation fo laboratory exe	r	0,5	
equal to the ECTS value of the course)	Written exam	0	Project			(Other)			
Grading and evaluating student work in class and at the final exam	50% - 60% suffi 61% - 75% good 76% - 90% very	and the mexamed midter and midter	second of if he/she im exam and in written exact the final seminater mexam regard. They controlled is posints on final seminater mexam regard. They controlled is posints on final seminater mexam regard. They controlled is posints on final seminater mexam regard.	ne is a regula are: regula are: regula are: regula ten forr reseng grade  6) = 0,5 centage e. percula examar. In the ms take ess resunsist coright to tive assal examal on mid	fter the rly atter rly atter the rly atter ularly a tively even. They we the representage as are: a part. In sults of reference the resemble of theorem exterm exte	next 6 weeks. Inded classes. Inded classes yaluated individuated individuated individuated individuated individuated individuated individual ents minimal 50° M2)  achieved on the points achieved in the third and formidterm exams etical questions a final exams in in exam. Positions are the exams in the exams expressed as a perfect of the exams expressed as a perfect of the exams expressed in the exams expressed as a perfect of the exams in the exams in the exams in the exams in the exams expressed as a perfect of the exams expressed in the exams exams expressed in the exams expressed in the exams exams expressed in the exams exams expressed in the exams expressed in the exams exams expressed in the exams exams exams exams expressed in the exams exams example exams example e	The stude Requirements, at least ual seminoretical qui midterm en	ent can ents for 25% of ar eestions exam in on each did not exams ams are merical m. The ssment	
		Title	)			Number of copies in the library	Availabi other r	-	
Required literature (available in the library and via other	J. B. Dilworth: Opera value in goods and s College Pub, 1999.	services	, South-V	Vestern		0			
media)	Management, Irwin I R. G. Schroeder: Up	roduction/Operations Professional Publishing, 1998. pravljanje proizvodnjom: iji proizvodnje, MATE d.o.o.,			0				

Optional literature (at the time of submission of study programme proposal)	<ul> <li>B. Bilić: Predavanja postavljena na e-learning portalu</li> <li>****"Inženjerski priručnik IP4 – sv. 3", str. 195-236, Školska knjiga, Zagreb, 2002.</li> <li>A. Vila, A., Z. Leicher: Planiranje proizvodnje i kontrola rokova", Informator, Zagreb, 1983.</li> </ul>
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>Keeping records of the attendance of students</li> <li>Annual evaluation of results in accordance with the above learning outcomes</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> <li>Feedback from students who have already graduated related to the relevance of the course content</li> </ul>
Other (as the proposer wishes to add)	

NAME OF THE COURSE	NUMERICAL SYNTHESIS IN ENGINEERING								
Code	FESL49	Year of study							
Course teacher	Prof.dr.sc.Damir Vučina	Credits (ECTS)	5						
		Type of instruction (number of hours)	L	S	AE	LE	DE		
		(Hulliber of Hours)	45			15			
Status of the course	elective	Percentage of application of e-learning							
	COURSI	E DESCRIPTION							
Course objectives	<ul> <li>Acquire theoretical foundations, methods and algorithms related to shape synthesis for given functionality by applying geometric modelling and multi-objective optimization</li> <li>Develop competences in applying computers in numerical synthesis in engineering</li> <li>Acquire capacity to competently apply numerical tools to engineering problems</li> </ul>								
Course enrolment requirements and entry competences required for the course	Optimization methods. Con analysis and program deve	Succesfully completed courses equivalent to Computer-aided analysis and Optimization methods. Competences related to basic methods of engineering analysis and program development in C and MATLAB							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	optimization - Model the problem functions - Model the exceller - Develop flowchart modelling, simulat	nulate the engineering problem as a parametric model for shape mization lel the problem as a set of decision variables, constraints and excellence tions lel the excellence using valuation methods elop flowcharts for numerical workflows involving modula for geometric lelling, simulation (e.g.FEA) and optimization related to constrained non-linear							

	<ul><li>Apply surrog</li><li>Develop and</li></ul>	<ul> <li>Apply evolutionary optimization methods and metaheuristics</li> <li>Apply surrogate models replacing simulators,</li> <li>Develop and test complex models and numerical computational processes using advanced integral tools</li> </ul>							
	Course content						AE		
	Inraductory concent					hours	hours		
	Inroductory concepts		oficuratio	<u> </u>		3			
	Modelling 2D shape and configuration  Modelling 3D shape								
		ity and a	ovaellana			3			
	Modelling functionality and excellence  Modelling project value of project elements								
	Shape optimization	ide oi p	roject ele	mems		3			
	Multi-objective optim	vization				3			
	Evolutionary algorith		operator	· c		3			
Course content	Metaheuristics	iiis aiiu	operator	5		3			
broken down in	Model reduction and	Leurroa	ate mode	le		3			
detail by weekly	Parameterization an				and topology	3			
class schedule	Numerical workflows				and topology	3			
(syllabus)	Engineering applicat		рс оршин	Zation		3			
							LE or DE		
	List of laboratory or	design (	exercises				hours		
	Introductory application examples								
	Modelling 2D and 3D				n		3		
	Modelling project val		oject eler	nents			1		
	Multi-objective optim		•				1		
		Evolucijski algoritmi i operatori Metaheuristics							
	Surrogate models								
	Numerical workflows	in shap	e optimiz	ation			3		
	Engineering applicat						1		
	v lectures			v inde	oendent assignmen	ite			
	☐ seminars and wo	rkshops	;		timedia	113			
Format of instruction	v exercises			v laboi					
1 cilliat of illott dottor	☐ <i>on line</i> in entirety				k with mentor				
	☐ partial e-learning				(other)				
0	☐ field work								
Student responsibilities									
Screening student work (name the	Class attendance	3	Researc	h	Practical tr	aining			
proportion of ECTS credits for each	Experimental work		Report		Project wo	rk	2		
activity so that the	Essay		Semina essay	r	(Oth	ner)			
total number of ECTS credits is	Tests		Oral exa	am	(Oth	ner)			
equal to the ECTS value of the course)	Written exam		Project (Ot		(Oth	ner)			
	Exam: theoretical ar	nd pract	ical or pro	oject					
Grading and evaluating student work in class and at the final exam  Exam: theoretical and practical or project  Grade(%) = 0,5*M1 + 0,5*M2  M1, M2 – percentage at mid-term exam and final exam respectively  50% do 61% (2)						ively			
	62% do 74% (3)								

	75% do 87% (4) 88% do 100% (5)					
Required literature (available in the library and via other media)	Title	Number of copies in the library	Availability via other media			
	-D. Vučina, 'Metode inženjerske numeričke optimizacije', Sveučilište u Splitu, FESB 2005					
	K. Deb, Multi-objective optimization using Evolutionary Algorithms, Wiley, 2001					
	S. Haykin, "Neural Networks", Prentice Hall International, 1999					
	D. Rogers, An Introduction to NURBS, Morgan Kaufmann Publishers, 2000					
	-D. Vučina, 'Metode inženjerske numeričke optimizacije', Sveučilište u Splitu, FESB 2005					
Optional literature (at the time of submission of study programme proposal)	J. S. Arora, "Introduction to Optimum Design", McGra S.S. Rao, "Engineering Optimization", Wiley Interscie G. Farin, Curves and Surfaces for Computer Aided G Guide, Morgan Kaufmann Publishers/ Academic Pres A. Saxena, B. Sahay, Computer-aided engineering d	ence, 1996 Seometric Des ss, 2002				
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.					
Other (as the proposer wishes to add)	In English or Croatian language.					

NAME OF THE COURSE	INTRODUCTION TO INFORMATION SYSTEMS							
Code	FESL36	Year of study	2					
Course teacher	Damir Vučina, Ph. D. Full Professor	Credits (ECTS)	5					
Associate teachers	Igor Pehnec, Ph. D. Teaching assistant Ivo Marinić- Kragić, Teaching assistant Milan Ćurković, Ph. D., Teaching assistant	Type of instruction (number of hours)	0	AE 0	15	DE 0		
Status of the course	Elective	application of e-learning	0					
	COURSI	EDESCRIPTION						
Course objectives	Acquiring knowledge an	puters in building informatio d application skills: HTML L, script languages, activ	_, basi	c terr		3		
Course enrolment requirements and entry competences required for the course	Completed pre-graduate studies which include courses equivalent to Computeraided analysis. Competences in basic engineering analysis methods and program development in MATLAB							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After completing the course, students will be able to:  Describe information systems, specify architecture and functionality, elements, technologies  Develop sets of HTML files for the IS  Develop simple client scripts in Vbscript  Create simple databases  Develop simple SQL queries  Build simple dynamic web pages using ASP							
	Course content			ŀ	L		\E ours	
	processing	usiness processes, inforr	nation		2			
	Information systems IS,	IIS, elements of IS 2						
	architecture of IS	functional specifications	of IS,		2			
	Infrastructure and devices	for the IS, protocols			2			
	Internet, services, www				2			
Course content	Development of content fo	r the web			2			
broken down in	Basics of HTML				2			
detail by weekly	Basics of programming, ba	sic elements of programs			2			
class schedule	Script languages, Vbscript				2			
(syllabus)	Databases: basic terms an	d elements of design			2			
	First midterm exam	<del>-</del>						
	Databases: basics of SQL,	IS and databases			2			
		Basic concepts of web app	lication	ıs	2			
	Integration of IS elements				2			
	Second midterm exam							
	List of laboratory exercises					IF	nours	
	_	nodeling, functional speci	ification	ns of	IS		1	
	Develop sets of HTML files		oatiO	13 01			-	
	11.5.5p 55.65 5.11.11.2 11100						2	

	Scripting and Vbscript examples							2
	Databases, modelling	g, norma	alization					2
	SQL							2
	Active pages, ASP, a	ipplication	ons					2
	Integration of IS  ⊠ lectures							
Format of instruction	□ seminars and workshops □ seminars and workshops □ exercises □ on line in entirety □ partial e-learning □ field work □ independent □ multimedia □ laboratory □ work with me □ (other			nentor				
Student responsibilities	The presence on lec				t least 7	0 % of the times	s sche	duled.
Screening student	Class attendance	3	Researc			Practical trainir	ng	
work (name the proportion of ECTS	Experimental work		Report			Individual work		2
credits for each activity so that the	Essay		Seminai essay	-		Laboratory exe	rcises	
total number of ECTS credits is equal to the ECTS	Tests		Oral exa	ım		Preparation for laboratory exer		
value of the course)	Written exam		Project			(Other)		
Grading and evaluating student work in class and at the final exam	There are two midterms and final exams. The first midterm exam is after 7 weeks lecturing and the second one is after the next 6 weeks. Each midterm test consist of respective theoretical questions and numerical problems. The final tests consist overall theoretical questions and numerical problems. In the final exams, studer that did not pass the midterm exams take part. The midterm and final exams a carried out as written tests. The requirement for passing grade is the positi assessment of laboratory exercises and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:  Grade(%) = 0,5 (M1 + M2)  the activities in percentage:  • M1, M2 – test results.						consist of , students exams are e positive	
		Title				Number of copies in the library		ability via er media
Required literature (available in the	D. Vučina, M. Šušnja informacijske sustav Steven Alter, 'Inform	e', interi	nal mater	ial	ion of			
library and via other media)	E-Business	allon Sy	stems. r	ouridati	IOIT OI			
	Ch J. A. O'Brien, 'Management Information Systems', Irwin Inc. Online skripts: w3schools - 'HTML', 'VBScript', 'ASP', 'SQL'							
Optional literature (at the time of submission of study programme proposal)	<ul> <li>NCSA, 'A Beginn</li> <li>HTML - An Intera</li> <li>MS VBScript Tutt</li> <li>MS ASP pages</li> <li>R. Leinecker, 'Using</li> </ul>	ctive Tu urial	itorial for	Beginn	ers'			
Quality assurance methods that ensure the acquisition of exit competences	R. Leinecker, 'Using ASP.net', Que, 2002  - Evaluation of results in accordance with the above learning outcomes  - Feedback from students via surveys  - Self-evaluation of teachers  - Institutional and non-institutional evaluations							

Other (as the			
proposer wishes to			
add)			

NAME OF THE COURSE	HEATING AND AIR CON	DITIONING						
Code	FESL23	Year of study	1					
Course teacher	Nižetić Sandro, Ph. D., Associate Professor	Credits (ECTS)	edits (ECTS) 5					
Associate teachers	Ivan Tolj, Ph. D., Teaching assistant Dario Bezmalinović, Ph. D., Teaching assistant	Type of instruction (number of hours)  L  30		S 0	AE 30	LE 0	DE 0	
Status of the course	Elective.	Percentage of application of e-learning						
	COURSI	E DESCRIPTION						
Course objectives	- Compute and general according to stand				VAC s	system	s	
Course enrolment requirements and entry competences required for the course	Thermodynamics 1, Mathe	Thermodynamics 1, Mathematics 1, Mathematics 2.						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>Analyse and compute</li> <li>Compare fuels in the Felaborate their impact</li> </ul>	e base components of the h	ording t and co	to the poling	standa applic	ations		
	Course content	•			or S		λE	
Course content broken down in	Introduction and basic tern comfort. External and inter conditions.	,			ours ours	2 ho	ours	
detail by weekly class schedule	Calculation of the heat loss	ses.		2 h	ours	2 h	ours	
(syllabus)	Calculation of the heat loss	ses.		2 h	ours	2 ho	ours	
	Heating elements, characteristics, correction of the nominal thermal load.			2 h	ours	2 ho	ours	

	Central heating systems, calculation of the carbon dioxide emissions.							2 hours
	Calculation and desi systems.	gn of th	e pipeline	es in the	e heatin	g	2 hours	2 hours
	Boilers, types, class	ification	, boiler ro	oms.			2 hours	2 hours
	Other equipment of	the heat	ing syste	ems.			2 hours	2 hours
	Preparation of the hot water and calculation of the heating demands.						2 hours	2 hours
	Regulation of the he	ating sy	stems.				2 hours	2 hours
	Calculation of the he	at gain.					2 hours	2 hours
	Fan coil devices, oth	er cooli	ng eleme	ents.			2 hours	2 hours
	Central water based chambers, coolants		-	system	s, clima	te	2 hours	2 hours
	Ventilation systems, components, calculation of the required airflow for ventilation purpose.						2 hours	2 hours
	Heat pumps, absorp	tion coc	ling devi	ces.			2 hours	2 hours
	List of laboratory or	design e	exercises					LE or DE hours
								110010
	□ lectures							
Format of instruction	□ seminars and work □ exercises □ on line in entirety □ partial e-learning □ field work	•		⊠ mul □ labo	epender Itimedia oratory k with n (oth	nentor	nents	
Student responsibilities	The presence on led Performed all require					70 % of th	e times sch	eduled.
Screening student work (name the	Class attendance	2	Researc		2	Practical	training	
proportion of ECTS credits for each	Experimental work		Report			(0	Other)	
activity so that the total number of	Essay		Seminal essay	<b>T</b>		(0	Other)	
ECTS credits is equal to the ECTS	Tests		Oral exa	am		(0	Other)	
value of the course)	Written exam		Project		1	(0	Other)	
Grading and evaluating student								

work in class and at the final exam			
	Title	Number of copies in the library	Availability via other media
Required literature (available in the library and via other media)	S. Nižetić, Online predavanja Grijanje i Klimatizacija dio I i dio II, 2011, FESB.		
	Recknagel, Sprenger, Schramek, Čeperković: Grijanje i klimatizacija 2005, Energetika marketing, Zagreb, 2005 (Prijevod sa njemačkog)		
	ASHRAE Handbooks: Fundamentals, Applications, Systems and Equipment, Refrigeration, ASHRAE, Atlanta, USA, 2001, 2002, 2003, 2004		
	Priručnik za Ventilaciju I klimatizaciju, EGE, 2003. Priručnik za grijanje, EGE, 2005		
Optional literature (at the time of submission of study programme proposal)	Časopis: EGE, Energetika marketing, Zagreb Časopis: ASHRAE Journal, ASHRAE, Atlanta, USA		
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>Evaluation of results in accordance with the above</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> <li>Institutional and non-institutional evaluations</li> </ul>	e learning outco	mes
Other (as the proposer wishes to add)			

NAME OF THE COURSE	MACHINE TOOLS						
Code	FETL18	Year of study	1				
Course teacher	Dražen Bajić, Ph. D., Full Professor Sonja Jozić, Ph. D., Assistant Professor	Credits (ECTS)	5				
Associate teachers	Mario Veić, Teaching	Type of instruction	L	S	AE	LE	DE
	assistant	(number of hours)	45	0	0	15	0
Status of the course	Obligatory	Percentage of application of e-learning	0				
	COURSE	DESCRIPTION					
Course objectives	Training students for: - understanding of basic machine tool parts, types of machine tools and their						

Course enrolment	None				
requirements and entry competences required for the					
course					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to:  - present the principles of operation - characterize features of machine - categorize features of mechanism - examine the exploitation character - identify motives of high speed and - designing of driving systems and machine tool construction.	tools  ns and systems managemeristics of machine tools d multi-operation machine	ent machii tools deve	elopment	
	Course content		L or S	AE	
			hours	hours	
	Introduction to machine tools. State of tools development. Classification of n		3		
	Basics of construction machine tools. accuracy.	3			
	Main parts of machine tools. Bearing spindle bearings.	elements, guides,	3		
	Driving system of machine tools.		3		
	Machine tools control system.		3		
	Turning machines: Classification and	3			
	Milling machines: Classification and b	asic concepts	3		
	First midterm exam				
	Machine tools for drilling, broaching, s Machines for gear wheels manufactu		3		
	Technical calculations related to the r	machine as the whole unit	3		
Course content	and its particular parts.				
broken down in detail by weekly	Automatic tool change. Automatic wo Machine tools for high performance n	3			
class schedule	Machining center. Turning center. Gri	-			
(syllabus)	High Speed machine tools. Parallel k tools	3			
	Basic concept of CNC programming.	CAD/CAM introduction	3		
	Second midterm exam				
	List of laboratory or design exercises			LE or DE	
	Movement, typical parts and mechani	eme of machine tools insta	lled in	hours	
	the laboratory. Determination of degree efficency.			2	
	Determination of gearbox efficiency or	n drilling machine.		2	
	Testing of geometric accuracy lathes a conthe machining accuracy.	and drills. Influence of mac	hine tool	2	
	Rigidity of the system machine-tool-wa	oorkpiece.		2	
	Determination of gearbox efficiency or			2	
	Zero point of the workpiece and zero prachining center.	point of the tool at vertical		2	
	Automatic CNC programming. Preparation and model production using 3D printer.				
	⊠ lectures		nte		
	☐ seminars and workshops	⊠ multimedia			
Format of instruction	⊠ exercises	□ Inditinedia     □ Iaboratory			
Format or Instruction	☐ <i>on line</i> in entirety	□ work with mentor			
	<ul><li>□ partial e-learning</li><li>□ field work</li></ul>	□ (other)			

Student responsibilities	The presence on lec			t least 7	70 % of the time	es schedul	led.
Screening student	Class attendance	2	Research		Practical traini	ng	
work (name the proportion of ECTS credits for each	Experimental work	0.5	Report		•	Reports from the laboratory exercises	
activity so that the total number of	Essay		Seminar essay		(Other)		2.25
ECTS credits is	Tests		Oral exam		(Other)		
equal to the ECTS value of the course)	Written exam		Project		(Other)		
Grading and evaluating student work in class and at the final exam	that did not pass the the entire exam. The tests. The requirements. Positive ass 6. 50 % points.  Grade (in percentag Grade(%) = 0,5.  M1, M2 – test results. Final grade is determore the percentage 50% do 61% succession of the percentage 50% do 74% grade is do 74% grade	50% do 61% sufficient (2) 62% do 74% good (3) 75% do 87% very good (4)					
		Title	)		Number of copies in the library	Availabi other n	-
Required literature (available in the	Ekinović S., "Alatne	mašine	", Mašinski fakul	tet,			
library and via other	Zenica, 2004. Lopez de Lacalle, La	amikiz "l	Machine tools fo	r hiah			
media)	performance machin			i iligii			
	Bajić, D., Jozić, S., Predavanja objavljena na eLearn eLearning portalu, 2015.						•
Optional literature (at the time of submission of study programme proposal)		Cebalo, R., "Alatni strojevi – Odabrana poglavlja", Vlastito izdanje, Zagreb, 2001 Pahole, I., Balič, J., "Obdelovalni stroji", Univerza v Mariboru, Maribor 2003.					
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>Evaluation of results in accordance with the above learning outcomes</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> <li>Institutional and non-institutional evaluations</li> </ul>						
Other (as the proposer wishes to add)							

Upon completion the	Year of study Credits (ECTS)  Type of instruction (number of hours)  Percentage of application of e-learning COURSE DESCRIPTION e student will be able to critic echnical system life assess	2 5 L 45 0	S 0	AE 0	LE 15	CE 0		
Jani Barle, Ph. D., Full Professor Stipe Perišić, Feaching assistant Obligatory Upon completion the concepts related to t	Credits (ECTS)  Type of instruction (number of hours)  Percentage of application of e-learning  COURSE DESCRIPTION  e student will be able to critic	5 L 45 0						
Full Professor Stipe Perišić, Teaching assistant Obligatory Upon completion the concepts related to t	Type of instruction (number of hours)  Percentage of application of e-learning  COURSE DESCRIPTION estudent will be able to critical contents.	L 45						
Teaching assistant Obligatory Upon completion the concepts related to t	(number of hours)  Percentage of application of e-learning  COURSE DESCRIPTION  e student will be able to critic	45 0						
Upon completion the concepts related to t	of e-learning COURSE DESCRIPTION e student will be able to critic					<u>I</u>		
Upon completion the concepts related to t	student will be able to critic	cally eva						
concepts related to t		cally eva						
None		ment, us						
<ol> <li>Evaluate different</li> <li>Comment mainter</li> <li>Link different relia</li> <li>Estimate availabili</li> </ol>	<ul> <li>Evaluate different actions and suggest maintenance strategy.</li> <li>Comment maintenance procedures and risks associated with usage.</li> <li>Link different reliability and availability modeling concepts.</li> <li>Estimate availability and maintenance costs.</li> </ul>							
Course content					L	LE hours		
The role and scope of the maintenance engineering. Historical aspects, principles and applications of maintenance actions (corrective, preventive, predictive, proactive). RCM and TPM strategies. Bathtub curve.						nouro		
						1		
Standards (IEC EN 61508). Maintenance assets register. Technical performance indicators. Failure, failure cause, failure mode and consequence. Failure Mode and Effect Analysis (FMEA) and Root Cause Analysis (RCA).								
FMEA examples.	7					1		
An overview of the failure modes. Human errors in maintenance.  Nonparametric life estimate procedures and parametric life models.								
						1		
			data.		3			
						1		
Parametric reliability models of component. Constant and time-dependent failure models (Exponential, Weibull, Log-normal).  Probability plots, Maximum likelihood, Confidence interval.								
Parametric life data	analysis - 1.					1		
configuration and red	dundancy models.	(RBD):	serial		3	1		
		factore t	hat			1		
influences maintaina	bility.	1401013 1	. 101		3	1		
Repairable items. Markov model fundamentals. Load-sharing. System deterioration models with and without repair. Counting								
	1. Evaluate different 2. Comment mainter 3. Link different relia 4. Estimate availabili 5. Compare impacts Course content The role and scope of aspects, principles and corrective, preventions at the strategies. Bathtub of Maintenance-related Standards (IEC EN Coperformance indicate consequence. Failur Cause Analysis (RC) FMEA examples. An overview of the factor of	2. Comment maintenance procedures and risks 3. Link different reliability and availability modeli 4. Estimate availability and maintenance costs. 5. Compare impacts on technical system endurations of course content  The role and scope of the maintenance engineer aspects, principles and applications of maintenance (corrective, preventive, predictive, proactive). Restrategies. Bathtub curve.  Maintenance-related case studies.  Standards (IEC EN 61508). Maintenance assets performance indicators. Failure, failure cause, factors analysis (RCA).  FMEA examples.  An overview of the failure modes. Human errors nonparametric life estimate procedures and part Nonparametric life data analysis procedures - 1. Reliability and availability data sources, standard recommendations. Analysis of component. Condependent failure models (Exponential, Weibull, Probability plots. Maximum likelihood. Confidence Parametric life data analysis - 1.  Reliability of systems. Reliability block diagrams configuration and redundancy models.  Parametric life data analysis - 2.  Maintainability and Availability. Overview of the influences maintainability.  Maintainability case studies.  Repairable items. Markov model fundamentals.	1. Evaluate different actions and suggest maintenance so 2. Comment maintenance procedures and risks associa 3. Link different reliability and availability modeling conc 4. Estimate availability and maintenance costs. 5. Compare impacts on technical system endurance. Course content  The role and scope of the maintenance engineering. His aspects, principles and applications of maintenance acti (corrective, preventive, predictive, proactive). RCM and strategies. Bathtub curve.  Maintenance-related case studies.  Standards (IEC EN 61508). Maintenance assets register performance indicators. Failure, failure cause, failure modes and effect Analysis (FMEA Cause Analysis (RCA).  FMEA examples.  An overview of the failure modes. Human errors in main Nonparametric life estimate procedures and parametric Nonparametric life data analysis procedures - 1.  Reliability and availability data sources, standards and recommendations. Analysis of complete and censored of Nonparametric life data analysis procedures - 2.  Parametric reliability models of component. Constant and dependent failure models (Exponential, Weibull, Log-no Probability plots. Maximum likelihood. Confidence interversametric life data analysis - 1.  Reliability of systems. Reliability block diagrams (RBD): configuration and redundancy models.  Parametric life data analysis - 2.  Maintainability and Availability. Overview of the factors to influences maintainability.  Maintainability case studies.  Repairable items. Markov model fundamentals. Load-sh System deterioration models with and without repair. Coprocesses (HPP and NHPP).	1. Evaluate different actions and suggest maintenance strategy 2. Comment maintenance procedures and risks associated with 3. Link different reliability and availability modeling concepts. 4. Estimate availability and maintenance costs. 5. Compare impacts on technical system endurance. Course content  The role and scope of the maintenance engineering. Historical aspects, principles and applications of maintenance actions (corrective, preventive, predictive, proactive). RCM and TPM strategies. Bathtub curve. Maintenance-related case studies. Standards (IEC EN 61508). Maintenance assets register. Technoerformance indicators. Failure, failure cause, failure mode and consequence. Failure Mode and Effect Analysis (FMEA) and RcCause Analysis (RCA). FMEA examples. An overview of the failure modes. Human errors in maintenance Nonparametric life estimate procedures and parametric life mode. Nonparametric life data analysis procedures - 1. Reliability and availability data sources, standards and recommendations. Analysis of complete and censored data. Nonparametric life data analysis procedures - 2. Parametric reliability models of component. Constant and timedependent failure models (Exponential, Weibull, Log-normal). Probability plots. Maximum likelihood. Confidence interval. Parametric life data analysis - 1. Reliability of systems. Reliability block diagrams (RBD): serial configuration and redundancy models. Parametric life data analysis - 2. Maintainability and Availability. Overview of the factors that influences maintainability. Maintainability case studies. Repairable items. Markov model fundamentals. Load-sharing. System deterioration models with and without repair. Counting processes (HPP and NHPP).	1. Evaluate different actions and suggest maintenance strategy. 2. Comment maintenance procedures and risks associated with usage. 3. Link different reliability and availability modeling concepts. 4. Estimate availability and maintenance costs. 5. Compare impacts on technical system endurance.  Course content  The role and scope of the maintenance engineering. Historical aspects, principles and applications of maintenance actions (corrective, preventive, predictive, proactive). RCM and TPM strategies. Bathtub curve.  Maintenance-related case studies.  Standards (IEC EN 61508). Maintenance assets register. Technical performance indicators. Failure, failure cause, failure mode and consequence. Failure Mode and Effect Analysis (FMEA) and Root Cause Analysis (RCA).  FMEA examples. An overview of the failure modes. Human errors in maintenance. Nonparametric life data analysis procedures - 1.  Reliability and availability data sources, standards and recommendations. Analysis of complete and censored data.  Nonparametric life data analysis procedures - 2.  Parametric reliability models of component. Constant and time-dependent failure models (Exponential, Weibull, Log-normal).  Probability plots. Maximum likelihood. Confidence interval.  Parametric life data analysis - 1.  Reliability of systems. Reliability block diagrams (RBD): serial configuration and redundancy models.  Parametric life data analysis - 2.  Maintainability and Availability. Overview of the factors that influences maintainability.  Maintainability and Availability. Overview of the factors that influences maintainability.  Maintainability case studies.  Repairable items. Markov model fundamentals. Load-sharing.  System deterioration models with and without repair. Counting processes (HPP and NHPP).	1. Evaluate different actions and suggest maintenance strategy. 2. Comment maintenance procedures and risks associated with usage. 3. Link different reliability and availability modeling concepts. 4. Estimate availability and maintenance costs. 5. Compare impacts on technical system endurance. 5. Course content  The role and scope of the maintenance engineering. Historical aspects, principles and applications of maintenance actions (corrective, preventive, predictive, proactive). RCM and TPM strategies. Bathtub curve.  Maintenance-related case studies.  Standards (IEC EN 61508). Maintenance assets register. Technical performance indicators. Failure, failure cause, failure mode and consequence. Failure Mode and Effect Analysis (FMEA) and Root Cause Analysis (RCA).  FMEA examples. An overview of the failure modes. Human errors in maintenance. Nonparametric life data analysis procedures - 1.  Reliability and availability data sources, standards and recommendations. Analysis of complete and censored data.  Nonparametric life data analysis procedures - 2.  Parametric reliability models of component. Constant and time-dependent failure models (Exponential, Weibull, Log-normal).  Probability plots. Maximum likelihood. Confidence interval.  Parametric life data analysis - 1.  Reliability of systems. Reliability block diagrams (RBD): serial configuration and redundancy models.  Parametric life data analysis - 2.  Maintainability and Availability. Overview of the factors that influences maintainability.  Maintainability case studies.  Repairable items. Markov model fundamentals. Load-sharing.  System deterioration models with and without repair. Counting processes (HPP and NHPP).		

Reliability data sources - examples.  The role and applications of technical diagnostics. Procedure, types, indicators and sersors.  Technical diagnostics case studies.  Physical reliability models. Accelerated testing and burn-in procedures.  Covariate damage models.  Planning, purchasing and storage of maintenance-related actions and inventory.  Width and depth of spare parts stock.  Optimal preventive maintenance scenarios and models.  Maintenance information system, documents and organization 3 structure.  Numerical analysis of optimal preventive maintenance model.  I covariate damage models.  Planning, purchasing and storage of maintenance-related actions and inventory.  Width and depth of spare parts stock.  Optimal preventive maintenance scenarios and models.  Maintenance information system, documents and organization 3 structure.  Numerical analysis of optimal preventive maintenance model.  I covariate damage models.  I did inventory.  I did inventory individual assignments and structure.  Student responsibilities  Screening student work (name the book in the total number of total number of total number of textors and the total number of total number of the total number of to		Data sources a formal safety a			s. Burn-In.	Bayes	sian analysis i	in 3	
indicators and sensors.  Technical diagnostics case studies.  Physical reliability models. Accelerated testing and burn-in procedures.  Covariate damage models.  Planning, purchasing and storage of maintenance-related actions and inventory.  Width and depth of spare parts stock.  Optimal preventive maintenance scenarios and models.  Maintenance information system, documents and organization structure.  Numerical analysis of optimal preventive maintenance model.  1									1
Physical reliability models. Accelerated testing and burn-in 3 procedures.  Covariate damage models. 1 Planning, purchasing and storage of maintenance-related actions and inventory.  Width and depth of spare parts stock. 1 Optimal preventive maintenance scenarios and models. Maintenance information system, documents and organization structure.  Numerical analysis of optimal preventive maintenance model. 1    Coptimal preventive maintenance model. 1		indicators and	sensors.		diagnostic	s. Pro	cedure, types	3	
procedures.  Covariate damage models.  Planning, purchasing and storage of maintenance-related actions and inventory.  Width and depth of spare parts stock.  Optimal preventive maintenance scenarios and models.  Maintenance information system, documents and organization structure.  Numerical analysis of optimal preventive maintenance model.  I numerical and organization structure.  I numerical analysis of optimal preventive maintenance model.  I numerical analysis of optimal preventive maintenance model.  I numerical and organization structure.  I number of partial elearning individual assignments multimedia.  I number of partial elearning individual project (other)  I number of practical training elaboratory.  I number of practical training elaboratory.  I numerical analysis of optimal preventive maintenance preventive maintenance elaboratory.  I number of partial elearning individual assignments multimedia.  I number of partial elaboratory.  I numerical elaboratory.  I number of partial elaboratory.  I numerical ela									1
Planning, purchasing and storage of maintenance-related actions and inventory. Width and depth of spare parts stock.   1		procedures.			d testing a	and bur	rn-in	3	
and inventory.   Width and depth of spare parts stock.   Optimal preventive maintenance scenarios and models.   Maintenance information system, documents and organization   Structure.   Numerical analysis of optimal preventive maintenance model.   1									1
Optimal preventive maintenance scenarios and models. Maintenance information system, documents and organization structure. Numerical analysis of optimal preventive maintenance model. 1		and inventory.			naintenan	ce-rela	ited actions	3	
Maintenance information system, documents and organization structure.									1
Format of instruction    Student responsibilities   Class attendance, tests, project presentation and oral exam.		Maintenance ir						3	
Format of instruction		Numerical ana	lysis of or	otimal prevent	ive mainte	nance	model.		1
Format of instruction    Description of instruction   Description of instruction   Description of instruction   Description of ECTS credits for each activity so that the total number of activity so that the total number of total number of classes and the seemed one is after the next 6 weeks. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam.  Grading and evaluating student work in class and at the final exam  Grading and evaluating student work in class and at the final exam  For individual project (other)    Class attendance   2,0   Research   Practical training			d worksh	ops			signments		
instruction	Format of								
Student responsibilities    Glass attendance, tests, project presentation and oral exam.		☐ on line in entirety				-			
Student responsibilities  Class attendance, tests, project presentation and oral exam.  Class attendance, tests, project presentation and oral exam.  Class attendance attendance attendance attendance attendance activity so that the total number of ECTS credits is equal to the ECTS value of the course)  There are two midterms and final exams. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam. The final score is:  Score (%) = 0,35′ A₁ + 0,35′ A₂ + 0,20′ A₃ + 0,10′ A₄  • midterm 1: A₁ = 50 - 100 %, • midterm 2 (seminal paper): A₂ = 50 - 100 %, • class attendance: A₃ = 50 - 100 %, • class attendance  Title  Report  O,5  Individual work  2,0  Class  (Other)  There are two midterms and final exams. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam.  The final score is:  Score (%) = 0,35′ A₁ + 0,35′ A₂ + 0,20′ A₃ + 0,10′ A₄  • midterm 1: A₁ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 100 %, • crade xam: A₃ = 50 - 1		•	ning						
Class attendance   2,0   Research   Practical training   Practical tra		☐ field work							
attendance			ice, tests,	project prese	ntation an	d oral	exam.		
work Report 0,3 Individual work 2,0  Seminar essay Lab exercises 0,3  Tests 0,2 Oral exam (Other)  Written exam Project (Other)  There are two midterms and final exams. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (s-49%) or the final exam.  The final score is:  Score (%) = 0, 35′ A <sub>1</sub> + 0, 35′ A <sub>2</sub> + 0, 20′ A <sub>3</sub> + 0, 10′ A <sub>4</sub> • midterm 1: A <sub>1</sub> = 50 – 100 %, • midterm 2 (seminal paper): A <sub>2</sub> = 50 – 100 %, • oral exam: A <sub>3</sub> = 50 – 100 %. • class attendance: A <sub>4</sub> = 70 – 100 %. Score Grade 50% - 62% sufficient (2) 63% - 76% good (3) 77% - 88% very good (4) 89% - 100% excellent (5)  Required literature (available in the library and via other media)  Barle, J.: Reliability in maintenance e-learning portal		attendance	2,0	Research		F	Practical traini	ng	
total number of ECTS credits is equal to the ECTS value of the course)  Written exam  There are two midterms and final exams. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam. The final score is:    Score (%) = 0,35′ A₁ + 0,35′ A₂ + 0,20′ A₃ + 0,10′ A₄	proportion of ECTS			· ·	0,5	lı	ndividual wor	k	2,0
equal to the ECTS value of the course)  Written exam  Project  (Other)  There are two midterms and final exams. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam.  The final score is:  Score (%) = 0, 35′ A₁ + 0, 35′ A₂ + 0, 20′ A₃ + 0, 10′ A₄  • midterm 1: A₁ = 50 - 100 %, • midterm 2 (seminal paper): A₂ = 50 - 100 %, • oral exam: A₃ = 50 - 100 %.  • class attendance: A₄ = 70 - 100 %.  Score Grade  50% - 62% sufficient (2)  63% - 76% good (3)  77% - 88% very good (4)  89% - 100% excellent (5)  Required literature (available in the library and via other media)  Barle, J.: Reliability in maintenance  Barle, J.: Reliability in maintenance  Project  (Other)  (Other)  (Other)  (Other)	total number of	Essay		essay					0,3
There are two midterms and final exams. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam.  The final score is:  Score (%) = 0, 35′ A₁ + 0, 35′ A₂ + 0, 20′ A₃ + 0, 10′ A₄  • midterm 1: A₁ = 50 - 100 %, • midterm 2 (seminal paper): A₂ = 50 - 100 %, • oral exam: A₃ = 50 - 100 %. • class attendance: A₄ = 70 - 100 %. Score Grade 50% - 62% sufficient (2) 63% - 76% good (3) 77% - 88% very good (4) 89% - 100% excellent (5)  Required literature (available in the library and via other media)  Barle, J.: Reliability in maintenance  Barle, J.: Reliability in maintenance  The first midterm exam is after 7-week session. The second midterm is carried out as written test on basic issues covered within the first session. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is carried out as written test on basic issues covered within the first session. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is carried out as written test on basic issues covered within the first session. The second midterm is carried out as written test on basic issues covered within the first session. The second midterm is carried out as written test on basic issues covered within the first session. The second midterm is carried out as written test on basic issues covered within the first session. The second midterm is carried out as written test on basic issues covered within the first session. The second midterm is carried out as written test on basic issues covered within the first session. The first midterm exam (>49%) or			0,2				·		
classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam. The final score is: $Score \ (\%) = 0, 35' \ A_1 + 0, 35' \ A_2 + 0, 20' \ A_3 + 0, 10' \ A_4$ • midterm 1: $A_1 = 50 - 100 \ \%$ , • midterm 2 (seminal paper): $A_2 = 50 - 100 \ \%$ , • oral exam: $A_3 = 50 - 100 \ \%$ . • class attendance: $A_4 = 70 - 100 \ \%$ . Score Grade 50% - 62% sufficient (2) 63% - 76% good (3) 77% - 88% very good (4) 89% - 100% excellent (5)  Required literature (available in the library and via other media)  Barle, J.: Reliability in maintenance e-learning portal	value of the course)	Written exam		Project		(	Other)		
Required literature (available in the library and via other media)  Number of copies in the library  Barle, J.: Reliability in maintenance  Number of copies in the library  e-learning portal	evaluating student work in class and at	classes and the as written test seminal paper with respect to assessment or The final score  • midterm 1 • midterm 2 • oral exame • class attered score 50% - 62% 63% - 76% 77% - 88%	classes and the second one is after the next 6 weeks. The first midterm is carried out as written test on basic issues covered within the first session. The second midterm is seminal paper on selected and more advanced topic. Selected topic must be discussed with respect to the course framework. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam. The final score is: $Score \ (\%) = 0, 35' \ A_1 + 0, 35' \ A_2 + 0, 20' \ A_3 + 0, 10' \ A_4$ • midterm 1: $A_1 = 50 - 100 \ \%$ , • midterm 2 (seminal paper): $A_2 = 50 - 100 \ \%$ , • oral exam: $A_3 = 50 - 100 \ \%$ . • class attendance: $A_4 = 70 - 100 \ \%$ . Score Grade 50% - 62% sufficient (2) 63% - 76% good (3)						
library and via other media)  Barle, J.: Reliability in maintenance  e-learning portal		2070 10070		, ,		сор	ies in the		-
THICHCUEUE LANGER HARDOOK II CHOMAN I	library and via other		•		oation:		iibrary	e-learning	portal

	Pouzdanost u funkciji održavanja tehničkih sustava), FESB, Split, 2009.
Optional literature (at the time of submission of study programme proposal)	Rausand, M.; Høyland, A., "System Reliability Theory: Models, Statistical Methods, and Applications", 2nd ed., Wiley-Interscience, 2003.  Ebeling, C., "An Introduction To Reliability and Maintainability Engineering", McGraw-Hill, 1996.  Rausand, M., "Reliability of Safety-Critical Systems: Theory and Applications", Wiley, 2014.
Quality assurance methods that ensure the acquisition of exit competences Other (as the proposer wishes to	<ul> <li>Evaluation of results in accordance with the above learning outcomes</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> <li>Institutional and non-institutional evaluations</li> </ul>
add)	

NAME OF THE COURSE	NONCONVENTIONAL MA	CHINING PROCESSES						
Code	FETL22	Year of study	1					
Course teacher	Sonja Jozić, Ph. D., Assistant Professor	Credits (ECTS)	5					
Associate teachers		Type of instruction	L	S	AE	LE	DE	
		(number of hours)	45	0	0	15	0	
Status of the course	Elective	Percentage of application of e-learning	0					
	COURSE DESCRIPTION							
Course objectives	<ul> <li>acquisition of basic machining.</li> <li>acquisition of tech</li> </ul>	<ul> <li>Training students for:         <ul> <li>acquisition of basic knowledge of nonconventional methods in the field of machining.</li> <li>acquisition of technical knowledge about possibilities of nonconventional machining processes in order to solving engineering problems in this area</li> </ul> </li> </ul>					nal	
Course enrolment requirements and entry competences required for the course	None							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>analyze the role of differencesses</li> </ul>	identify nonconventional machining processes and their application analyze the role of different types of energy in nonconventional machining						

				1		
	<ul> <li>from the viewpoint of workpiece r</li> <li>create a diagram of nonconvention</li> <li>power source, working fluid and i</li> </ul>	onal machining processes				
	<ul> <li>present machining system and the processes</li> </ul>	e effects of nonconvention	al machin	ing		
	- combine nonconventional machin	ning processes according to	o the prod	uct		
	requirements - present application of nonconver	tional machining processe	s in mode	rn		
	industries		_			
	Course content		L or S hours	AE hours		
	Introduction. Main terms, definitions a nonconventional machining processe		3	Hourd		
	Mechanical processes. Ultrasonic machining. Abrasive jet machining.		3			
	Mechanical processes. Abrasive water machining. Magnetic abrasive finishing.		3			
	Chemical processes. Chemical millin Electropolishing.		3			
	Electrochemical processes. Electrochemical drilling.	nemical machining.	3			
	Thermal processes. Electrodiscarge material removal. The machining sys		3			
	Thermal processes. Electrodiscarge machining. Application of EDM.	3				
	First midterm exam					
Course content broken down in	Thermal processes. Laser beam machining.Introduction in LBM. Types of industrial laser. Interaction with workpiece material.					
detail by weekly class schedule	Thermal processes. Laser beam mac material removal. Application of the L		3			
(syllabus)	Thermal processes. Electron beam machining. Plasma beam machining. Ion beam machining.					
	Comparison of different nonconventional machining					
	processes. Surface quality and effect nonconventional machining processes					
	Hybrid nonconventional machining processes		3			
	Thermal assisted conventional mach		3			
	of development of nonconventional m					
	Second midterm exam					
	List of laboratory or design exercises			LE or DE hours		
	Mechanical processes - organized stu Brodosplit	idents visit to the Shipyard		3		
	Thermal processes - organized stude	nts visit to the Shipyard Bro	odosplit	3		
	Chemical processes - demonstration			2		
	Electrochemical processes - demonst			2		
	Determining of the parameters of ultra			2		
	Determining of the parameters of elect machining	trochemical and electrodis	charged	2		
	⊠ lectures	⊠ independent assignme	nte			
	$\square$ seminars and workshops	<ul><li>☑ independent assignme</li><li>☑ multimedia</li></ul>	iilo			
Format of instruction	⊠ exercises	<ul><li>☑ Inditiffedia</li><li>☑ laboratory</li></ul>				
roimal of instruction	□ on line in entirety	□ work with mentor				
	☐ partial e-learning					
	☐ field work ☐ (other)					
Student	The presence on lectures in the amount of at least 70 % of the times scheduled.					
responsibilities	Performed all required laboratory exe					

Screening student	Class attendance	2	Research		Practical traini	ng	
work (name the proportion of ECTS credits for each	Experimental work	0,25	Report		Reports from t laboratory exe (Other)		0,25
activity so that the total number of	Essay		Seminar essay		Preparation fo lecturing	r	0,25
ECTS credits is equal to the ECTS	Tests		Oral exam		Individual work	(	2,25
value of the course)	Written exam		Project		(Other)		
Grading and evaluating student work in class and at the final exam	8. 50 % points  Grade (in percentag     Grade(%) = 0,8  M1, M2 – test results Final grade is determ Percentage 50% do 61% 62% do 74% 75% do 87%	cond or e midter e midter r passir essmer on each e) is for 5 ( M 1 - s of first nined acorde ufficient cod (3) ery good ccellent	ne is after the nemeron exams take purm, final and manager grade is:  and of laboratory examinated according to:  and second mideccording to:  (2)  (4) (5)	xt 6 were art. In the akeup exercises or the for the foretheld in	eks. In the final he makeup exa xams are carries and exam.	exams stams stam studen	tudents its take
		Title	e		Number of copies in the library	Availabi other n	-
Required literature	S. Jozić: "Nonconve lecturing, eLearning,		0	eLear port	•		
(available in the library and via other media)	H.A.G. El-Hofy, "Adv McGraw-Hill, 2005.	/anced	0				
	Walker, J., R., "Mack Goodheart-Willcox C Illinois, 2000.	_			0		
Optional literature (at the time of submission of study programme proposal)	Hocheng H., Tsai H. Machining", Springe - Čuš, F., "Postop Maribor, 2009.	r Scienc	•	edia Ne	w York, 2013.		ništvo,
Quality assurance methods that ensure the acquisition of exit competences	<ul><li>Evaluation of res</li><li>Feedback from s</li><li>Self-evaluation of</li></ul>	<ul> <li>Keeping records of class attendance</li> <li>Evaluation of results in accordance with the above learning outcomes</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> <li>Feedback information from graduated students</li> </ul>					

Other (as the		
proposer wishes to		
add)		

NAME OF THE COURSE	MANUFACTURING PRO	CESS PLANNING						
Code	FETL25	Year of study	1.					
Course teacher	Nikola Gjeldum, Ph. D., Assistant Professor	Credits (ECTS)	5					
Associate teachers	Marina Crnjac, Teaching assistant	Type of instruction (number of hours)	AE 0	LE 0	DE 15			
Status of the course	Obligatory	Percentage of application of e-learning	0				l	
	COURS	E DESCRIPTION						
Course objectives	- design optimal manufac	machine tools for specific cturing process sort and analyze process				ring		
Course enrolment requirements and entry competences required for the course	None							
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>select optimal size and</li> <li>determine type of production</li> <li>determine elements of</li> <li>suggest contemporary</li> <li>test objectivity and accumulated detect cyclical, periodic</li> <li>reveal losses at work</li> </ul>	for manufacturing process shape of raw material uction in relation to batch sprocess times for batch promanufacturing process and uracy of time measuremental and random production	ize oductio d its ab t perso	n ility	oses			
	Course content  Definition of production sys				cess.		ours 2	
Course content	Fundamentals of material flow design in the production process.  The basic elements of manufacturing processes: process, composed and group process steps, process step.							
broken down in detail by weekly	Definition of technology an	<u> </u>					3	
class schedule (syllabus)	Characteristics and levels of technologies and manufacturing processes. Manufacturing process capability.							
(Gyllabas)	The basic principles of ma	<u> </u>	١.				3	
	The selection of raw mater						2	
	Optimal sequence of manufacturing processes and process steps.  Factors influencing on errors in manufacturing processes.						3	
	ractors inlinencing on erro	ors in manufacturing proces	sses.				2	

Selection of manufaction First midterm exam	cluring	Jaseillies	•				2
I list illiatellii exalli							2
Group technology.							2
					1100.		2
							2
					ne		6
	ining tine	producti	011 (1101	<u>.</u>			1
	r on mu	Iltiple mad	chines.				2
				ζ.			1
							2
							2
List of design exercise	ses					DE	hours
Design example of m	anufac	turing pro	cess.				3
				s, raw r	naterial selection,		2
tools selection and ca	alculatio	on of prod	ess tim	e.			3
Autonomous students	s work (	on manuf	acturing	docum	entation for		7
individual project tasl	KS						<i>'</i>
			   ⊠ inda	nondor	nt accianments		
☐ seminars and wor	rkshops	;		•	ii assigiiiiieiiis		
⊠ exercises							
☐ <i>on line</i> in entirety				•	nontor.		
☐ partial e-learning							
☐ field work				(otne	er)		
The presence on lec	tures in	the amo	unt of a	t least 7	'0 % of the times sch	edule	-d
				00.01.00	70 01 11.0 11.11.00 00.110		•
Class attendance	1	Researc	·h		Practical training		
Class atteridance		Nescare	<i>,</i> 11		Tractical training		
Experimental work		Report			Individual work		2,7
_		Semina	r		(Oth a r)		
Essay					(Otner)		
Tests	0.2	Oral exa	am		(Other)		
	0,2				(0)		
Written exam	0,1	Project		1	(Other)		
are positive assess Positive assessmen minimal 50% points pass at least one of students take the wh conducted in writter	ment of it repre- on final the mid lole exa n form.	f individu sents mii l exam. Ir term exai m regard Midterm	al projection al	ect and 0% poi st two fi part. In sults of r	positive assessments on each midternal exams students the third and fourth midterm exams. Final	nt in exa that d final e exam	exam. am or lid not exams as are
<ul> <li>E – average points achieved on midterm exams expressed as a percentage number of points achieved on the final exam expressed as a percentage.</li> <li>E = (M1 + M2)/2</li> <li>M1, M2 – average points achieved on midterm exams expressed as a percentage</li> <li>Grade (%): Final mark:</li> </ul>							
	Basics of Work and The scale of busines Time standard. Com Methods for determi Performance rating. The work of a worke Types and analysis Implementation of be Second midterm exalist of design exercise Design example of moteral design exercises seminars and worked seminars and worked the partial e-learning field work the presence exercised class attendance experimental work the presence exercised worked the presence exercised worked the presence exercised class attendance experimental work the presence exercised worked the presence exercised	Basics of Work and Time State The scale of business succe Time standard. Components Methods for determining the Performance rating.  The work of a worker on mutypes and analysis of losse Implementation of better wo Second midterm exam  List of design exercises  Design example of manufact Detailed elaboration of manutools selection and calculation Autonomous students work of individual project tasks  I lectures  seminars and workshops exercises  on line in entirety  partial e-learning  field work  The presence on lectures in The presence exercises in tendividual project tasks com Class attendance  Class attendance  1  Experimental work  Essay  Tests  0,2  Written exam  0,1  During semester there are that are positive assessment of Positive assessme	Basics of Work and Time Study in profithe scale of business success in the Time standard. Components of working Methods for determining the producting Performance rating.  The work of a worker on multiple many Types and analysis of losses during the Implementation of better work method Second midterm exam  List of design exercises  Design example of manufacturing producting tools selection and calculation of process. Autonomous students work on manufindividual project tasks.  I lectures  I seminars and workshops  Exercises  I on line in entirety  I partial e-learning  I field work  The presence on lectures in the amount Individual project tasks completed.  Class attendance  Class attendance  I Researce  Experimental work  Report  Essay  Tests  O,2  Oral examulation of individual Positive assessment of individual Positive assessment of individual Positive assessment represents min minimal 50% points on final exam. In pass at least one of the midterm exam students take the whole exam regard conducted in written form. Midterm exams students take the whole exam regard conducted in written form. Midterm questions and numerical problems.  Grade (%)  E – average points achieved on the final exam of points achieved on th	Basics of Work and Time Study in production The scale of business success in the enterprine standard. Components of working time Methods for determining the production (wor Performance rating. The work of a worker on multiple machines. Types and analysis of losses during the work Implementation of better work method. Second midterm exam List of design exercises Design example of manufacturing process. Detailed elaboration of manufacturing process tools selection and calculation of process time Autonomous students work on manufacturing individual project tasks I lectures Seminars and workshops Exercises On line in entirety Partial e-learning Ifield work  The presence on lectures in the amount of at Individual project tasks completed.  Class attendance  Experimental work  Report  Essay  Tests  O,2  Oral exam  Written exam  O,1  Project  During semester there are two midterm exar are positive assessment of individual project positive assessment represents minimal 5 minimal 50% points on final exam. In the first pass at least one of the midterm exams take students take the whole exam regardless resconducted in written form. Midterm exams questions and numerical problems.  Grade (%) = 0,  D - Individual project grade (%)  E - average points achieved on midterm number of points achieved on the final exam  E = (M1 + M2)/2  M1, M2 - average points achieved on midterm number of points achieved on the final exam  E = (M1 + M2)/2  M1, M2 - average points achieved on midterm number of points achieved on the final exam  E = (M1 + M2)/2  M1, M2 - average points achieved on midterm number of points achieved on the final exam  E = (M1 + M2)/2  M1, M2 - average points achieved on midterm number of points achieved on the final exam  E = (M1 + M2)/2  M1, M2 - average points achieved on midterm number of points achieved on midterm number of points achieved on the final exam  E = (M1 + M2)/2  M1, M2 - average points achieved on midterm number of points achieved on midterm number of points achieved on midterm number of points achiev	Basics of Work and Time Study in production enterp. The scale of business success in the enterprise. Time standard. Components of working time. Methods for determining the production (working) tin Performance rating. The work of a worker on multiple machines. Types and analysis of losses during the work. Implementation of better work method. Second midterm exam List of design exercises  Design example of manufacturing process. Detailed elaboration of manufacturing process, raw reports tools selection and calculation of process time. Autonomous students work on manufacturing documentarion individual project tasks  I lectures I lectures I lectures I multimedia I laboratory I work with machine in entirety I partial e-learning I field work The presence on lectures in the amount of at least 70 molividual project tasks completed. Class attendance  I Research Experimental work Report Essay Seminar essay Tests O,2 Oral exam Written exam O,1 Project  During semester there are two midterm exams. The are positive assessment of individual project and Positive assessment represents minimal 50% points on final exam. In the first two finass at least one of the midterm exams take part. In students take the whole exam regardless results of ronducted in written form. Midterm exams and final questions and numerical problems.  Grade (%) = 0,4D + 0,0D - Individual project grade (%) E - average points achieved on midterm exams number of points achieved on the final exam exprese E = (M1 + M2)/2 M1, M2 - average points achieved on midterm exams number of points achieved on the final exam exprese E = (M1 + M2)/2 M1, M2 - average points achieved on midterm exams number of points achieved on the final exam exprese	Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.  Second midterm exam  List of design exercises  Design example of manufacturing process.  Detailed elaboration of manufacturing process, raw material selection, tools selection and calculation of process time.  Autonomous students work on manufacturing documentation for individual project tasks  □ lectures □ seminars and workshops □ sexercises □ on line in entirety □ partial e-learning □ field work  The presence on lectures in the amount of at least 70 % of the times sche Individual project tasks completed.  Class attendance  1 Research  Report  Individual work  Essay  Seminar  Experimental work  Report  Report  Individual work  Essay  O,2 Oral exam  O(ther)  Written exam  O,1 Project  1 (Other)  During semester there are two midterm exams. The requirements for pas are positive assessment represents minimal 50% points on each midtern pass at least one of the midterm exams take part. In the third and fourth students take the whole exam regardless results of midterm exams consist of questions and numerical problems.  Grade (%) = 0,4D + 0,6E  D − Individual project grade (%)  E − average points achieved on midterm exams expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on the final exam expressed as a per number of points achieved on t	Basics of Work and Time Study in production enterprise.  The scale of business success in the enterprise.  Time standard. Components of working time.  Methods for determining the production (working) time.  Performance rating.  The work of a worker on multiple machines.  Types and analysis of losses during the work.  Implementation of better work method.  Second midterm exam  List of design exercises  Design example of manufacturing process.  Detailed elaboration of manufacturing process, raw material selection, tools selection and calculation of process time.  Autonomous students work on manufacturing documentation for individual project tasks  Lectures  seminars and workshops  seminars and workshops  seminars and workshops  multimedia  laboratory  multimedia  la

	91% - 100% excellent (5)		
	Title	Number of copies in the library	Availability via other media
Required literature	Gjeldum, N.: "Tehnološka priprema proizvodnje", lectures on e-learning, FESB Split		Internet (e-learning)
(available in the library and via other media)	Gačnik, V., Vodenik, F.: "Projektiranje tehnoloških procesa", Tehnička knjiga, Zagreb, 1990.	10	
media)	Taboršak, D., "Studij rada", Orgadata, Zagreb, 1994.	2	
	Car, M., Krznar, M., Šimon, K., "Studij rada – zbirka zadataka i rješenja", Liber, Zagreb, 1983.	1	
Optional literature (at the time of submission of study programme proposal)	<ol> <li>Toboršak, D., Gornik, B., Čala, I., "Priprema proi Zagreb, 1974.</li> <li>Buchmeister, B., Polajnar, A.: "Priprava proizvoc Fakulteta za strojništvo, Maribor, 2000.</li> <li>Polajnar, A., "Študij dela", Univerza v Mariboru, Maribor, 1999</li> <li>WEB catalogues</li> </ol>	dnje za delo v	praksi",
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>keeping records of the attendance of students</li> <li>annual evaluation of teachers</li> <li>periodical evaluation of individual project advance</li> <li>feedback from students via surveys</li> <li>self-evaluation of teachers</li> <li>institutional and non-institutional evaluations</li> </ul>	ment	
Other (as the proposer wishes to add)			

NAME OF THE COURSE	MATERIAL SELECTION						
Code	FETL27	Year of study	1				
Course teacher	Dražen Živković, Ph. D., Full Professor	Credits (ECTS)	5				
A i - t - t b	Nikša Čatipović, mag.ing.	Type of instruction	L	S	AE	LE	DE
Associate teachers	Zvonimir Dadić mag.ing.	(number of hours)	30	16	14	0	0
Status of the course	Obligatory	Percentage of application of e-learning	30				
	COURSE	DESCRIPTION					
Course objectives	Introducing students with:						

- diagrams of material properties,	
<ul> <li>selecting materials according to legal, technical, economic, human an aesthetic conditions,</li> <li>material selection methods,</li> <li>optimization methods for materials selection,</li> </ul>	nd
- selection of production processes.	
Course enrolment requirements and entry competences required for the course	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)  Students will be able to:  - determine the selecting methodology for real products materials,  - chose the methods for selecting materials both from the point of view of production processes,  - analyze the life cycle of the product,  - describe and identify the factors that influence the selection of materials products.	duct
	hours
Lifecycle of material. Materials and energy. Ecological factors in materials selection. Materials and industrial design. Development of engineering materials.	2
Surfaces and their contacts. The basics of friction theory.	2
Significance of wear mechanisms in material selection. Selection Materials selection according with tribological principles.	2
Functional connection: material-shape-processing. Product development technologies. Original shape. Adaptive - developmental design. Design tools and material data.	2
Engineering materials. Material properties (mechanical, thermal, electrical, optical, ecological).	2
Materials property diagrams: thermal conductivity - thermal capacity; thermal expansion - thermal conductivity; thermal expansion - Young-module; strength - maximum working temperature;	2
Materials property diagrams: tear and wear; friction coefficient; consistency of wear - hardness; material cost chart; Young's module - cost of materials; strength - cost of materials	2
Course content broken down in The basics of material selection. Selection principles. Harmonization of shape requirements. Selection of appropriate material groups according to the shape limitation.	2
detail by weekly class schedule (syllabus)  Selection ranking using the goal function. Searching for detailed information. Material Indexes. Material selection procedure.	2
Materials selection by computer program. Structure indexes. Selection of production procedure. Classification of production procedures. Shaping procedures. Joining procedures. Finishing operations.	2
Systematic selection process for material processing. Selection process diagram. Diagrams: materials - processes; process - shape; processes - mass area; processes - wall thickness; processes - tolerances; processes - surface roughness.	2
Ranking the cost-cutting process. Economic criteria for selection of producing processes. Cost forming. Search and selection of producing process using a computer program.	2
Material selection in case of multi-criteria limitations. Usability and constant conversion function.	2
Materials selection and shapes. Factors of shape. Micro structural factors of shape. Shapes usability limits.	2
Materials and industrial design. Pyramid requirement. Product characterization. Use of materials and producing processes to achieve product uniqueness.	2
	hours
List auditory exercises AE	110010

	Concept - developm	ent - de	tailed ela	boratio	n.			2
	Material selection pr					-		2
	Application of material property diagrams.							
	Multiple limitations and contradictory goals. Solving computer tasks using CES-EduPack - demo software							2
	<u> </u>							2
		election of material handling procedures. Materials selection and hapes. Economic criteria for process selection.						2
	Ecological principles				J. 1011.			_
	⊠ lectures						<u>,                                      </u>	
	<ul> <li>☑ independent assignments</li> <li>☑ multimedia</li> </ul>							
					oratory			
Format of instruction	☐ <i>on line</i> in entirety				k with m	nentor		
	□ partial e-learning				(othe			
	☐ field work				(01110)	<i>51)</i>		
Student responsibilities	The presence in lect	ures an	d exercis	es in th	e amou	nt of at least 70	%.	
Screening student work (name the	Class attendance	1	Researc	h		Practical training	ng	
proportion of ECTS credits for each	Experimental work		Report			Self-directed le	earning	2,5
activity so that the total number of	Essay		Seminar essay		0,53	Auditory exerc	ises	0,47
ECTS credits is equal to the ECTS	Tests	0,5	Oral exa	ım		(Other)		
value of the course)	Written exam		Project			(Other)		
Grading and evaluating student work in class and at the final exam	During the semeste after 7 weeks of cla final exam students test is carried out as evaluation are: positie earned on each test term exams.  Percentage - Rating 50% to 61% - suff 62% to 74% - good 75% to 87% - very 88% to 100% - excended the students who did not final exam in the aut the whole lectures. Tobtain it on an addities	sses an have to written of tively events. The first ficient (2 od (3) by good (ellent (5 otermine trass the example of the exa	d the sectake partexam last raluated shall grade  4)  4) d at the element period man period masts 90	cond aft mater ing 45 seminar is bas end of the state of	ter the idial that communities in the examination of the examination o	next 6 weeks of did not pass the standard least 5 and at least 5 are resulting per mination deadlinexam period has am the student	f classe e mid-ter ents for a 0% of th centage es. The ve a cor ts have	s. At the m. Each positive to points on mid-
Described literature						Number of	Availab	ility via
Required literature (available in the		Title	•			copies in the library		media
library and via other media)	D. Živković, the auth	or's lect	ure, FES	В				arning
Ontional literature	4 Filatio T. Inhanin	otor::-!-	nri ra-:	lıı p==:-	n rode - C	CD Zograh 00	•	rtal
Optional literature (at the time of submission of study programme proposal)	<ul> <li>1.Filetin, T., Izbor materijala pri razvoju proizvoda, FSB, Zagreb, 2000.</li> <li>2.Ashby, M.F., Materials Selection and Mechanical Design, 5<sup>th</sup> edition, Elsevier Science &amp; Technology Books, 2016.</li> </ul>							
Quality assurance	- Evaluation of res	sults in a	accordan	ce with	the abo	ve learning out	comes	
methods that ensure	- Feedback from s			eys				
the acquisition of	- Self-evaluation of	of teach	ers					
exit competences	- Institutional and non-institutional evaluations							

Other (as the	
proposer wishes to	
add)	

NAME OF THE	HYDRAULIC AND	PNEUMATIC SYSTEMS							
COURSE									
Code	FETL17	Year of study	1						
Course teacher	Jani Barle, Ph. D., Full Professor	Credits (ECTS)	5						
Associate teachers	Alen Kovač, Teaching assistant	Type of instruction (number of hours)	L 30	S 0	AE 0	LE 15	CE 15		
Status of the course	Elective	Percentage of application of e-learning	0			ı			
		COURSE DESCRIPTION	<u> </u>						
Course objectives	hydraulic or pneuma schematic diagram a system elements by solving.	e student will be introduced tic systems. They will be at and to demonstrate ability to symbol and function and to	ole to dra o identify	aw, expl hydrau	ain and lic or pn	assemb eumatio	ole ;		
Course enrolment requirements and entry competences required for the course	None								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	pneumatics.  2. Identify componer  3. Arrange and asse  4. Combine various  5. Critically assess of systems.	e to: concepts associated with i ints of the system and draw emble simple hydraulic and pelements with respect to siz workability and supportability cor pneumatic system.	related s pneumat ze and de	symbols tic syste esign co	ems. oncept.	and pne	eumatic		
	Course content				L	LE	CE		
Course content		d scope of hydraulics and p matics. Basic physical princ		CS.	hours 2	hours	hours		
broken down in	down in Typical pneumatic systems demonstrations.  Compressed air generation and distribution. Standards and Symbols  Symbols								
detail by weekly class schedule									
(syllabus)	Compressed air gen	eration and distribution.					2		
	Basic elements of proceedings of proceedings of proceedings of the control and direction of the control	neumatic systems (check, p al control valves).	ressure		2				
	Methods for develop	ment of pneumatic systems	5.				2		

	Basic elements	of nneu	matic systems	s ( directional c	rontrol	_			
	valves, valve a	•	•	`	ontroi	2			
	More complex				oratory			2	
	exercises).								
	Basic elements of pneumatic systems (cylinders and motors). 2								
	Circuit assembling on pneumatic didactic table (guided).						2		
	Electric valves pneumatics.				ortional	2			
	Circuit assemb	ling on p	neumatic dida	ctic table.			2		
	Introduction to hydraulics, oils of hydraulic systeleanness, tem evacuation.	and theo stems. Fu	retical backg indamental h	round. Energy ydraulic proble	efficiency ms:	2			
	Typical hydrau	lic systen	ns demonstra	tions.			2		
	Hydraulic elem and motors wit	ents for e	energy conver	sion: cylinders		2			
	Hydraulic elem						2		
	Basic control e				direct	2			
	Hydraulic elem						2		
	Basic control e operated direct control valves.					2			
	Hydraulic cyling Synchronizing							2	
	Typical design conversion (cy	solutions linders, p	of hydraulic of umps and mo	elements for er		2			
	adjustable disp Typical hydrau unloading, bral	lic circuits	s: accumulato					2	
	Pressure contr					2			
	Flow control cir							2	
	Closed flow hy	•			,	2			
	Hydraulic didacthrottle valve.	ctic mode	I. Motor spee	d adjustment w	vith		2		
	control valves.  ⊠ lectures								
Format of instruction	<ul> <li>□ seminars an</li> <li>□ exercises</li> <li>□ on line in en</li> </ul>		ops	<ul><li>⋈ individual a</li><li>⋈ multimedia</li><li>⋈ laboratory</li></ul>	a -	S			
	<ul><li>□ partial e-lear</li><li>□ field work</li></ul>	ning		<ul><li>□ work with I</li><li>□ individual I</li></ul>		er)			
Student	Minimum of 70	percent	ecture attend	ance Complet	ing all the r	equired	laborati	orv	
responsibilities	exercises.	POTOGIT			9 4.1 1110 1	-quii ou	iaborati	J. y	
Screening student work (name the	Class attendance	2,0	Research		Practical t	raining			
proportion of ECTS credits for each	Experimental work		Report		Individual			2,0	
activity so that the total number of	Essay		Seminar essay		Preparation exercises			0,8	
ECTS credits is equal to the ECTS	Tests	0,2	Oral exam		(Other)				
value of the course)	Written exam		Project		(Other)				
Grading and evaluating student	There are two r			ns. The first mid ne next 6 week					

		_			
The oral exam is focused on the student's interpassing grade is the positive assessment on exem.  The final score is: $Score (\%) = 0, 35' A_1 + 0, 35' A_2$ • midterm 1: $A_1 = 50 - 100 \%$ ,  • midterm 2: $A_2 = 50 - 100 \%$ ,  • oral exam: $A_3 = 50 - 100 \%$ .  • class attendance: $A_4 = 70 - 100 \%$ .  Score Grade  50% - 62% sufficient (2)  63% - 76% good (3)  77% - 88% very good (4)	erpretation skills. T ach midterm exam	he requirement for (>49%) or the final			
Number of Availa copies in the other					
Barle, J.: Hydraulics and pneumatics, (student handbook and workbook in Croatian: Hidraulika i pneumatika), FESB, Split, 2010.  Nikolić, G.: Pneumatika, Školske novine, Zagreb, 1994.  Koroman, V.; Mirković, R.: Hidraulika i pneumatika, Školska knjiga, Zagreb, 1991.		e-learning portal			
, , , , , , , , , , , , , , , , , , , ,					
Lang, R.A. (ed.): Hydraulic Trainer 1; Planning and Design of Hydraulic Power Systems, Mannesmann Rexroth AG, 1998. Rabie, M.: Fluid Power Engineering, McGraw-Hill, 2009.					
<ul> <li>Evaluation of results in accordance with the above learning outcomes</li> <li>Feedback from students via surveys</li> <li>Self-evaluation of teachers</li> <li>Institutional and non-institutional evaluations</li> </ul>					
	The oral exam is focused on the student's interpassing grade is the positive assessment on exam.  The final score is:  Score (%) = 0,35′ A₁ + 0,35′ A₂  midterm 1: A₁ = 50 - 100 %, midterm 2: A₂ = 50 - 100 %, midterm 2: A₂ = 50 - 100 %.  class attendance: A₄ = 70 - 100 %.  Score Grade 50% - 62% sufficient (2) 63% - 76% good (3) 77% - 88% very good (4) 89% - 100% excellent (5)  Title  Barle, J.: Hydraulics and pneumatics, (student handbook and workbook in Croatian: Hidraulika i pneumatika), FESB, Split, 2010.  Nikolić, G.: Pneumatika, Školske novine, Zagreb, 1994.  Koroman, V.; Mirković, R.: Hidraulika i pneumatika, Školska knjiga, Zagreb, 1991.  Lang, R.A. (ed.): Hydraulic Trainer 1; Planning a Systems, Mannesmann Rexroth AG, 1998.  Rabie, M.: Fluid Power Engineering, McGraw-H  - Evaluation of results in accordance with the absence of the students via surveys - Self-evaluation of teachers	The final score is:  Score (%) = 0, 35′ A₁ + 0, 35′ A₂ + 0, 20′ A₃ + 0, 10′  midterm 1: A₁ = 50 - 100 %, midterm 2: A₂ = 50 - 100 %, class attendance: A₄ = 70 - 100 %. class attendance: A₄ = 70 - 100 %. Score Grade 50% - 62% sufficient (2) 63% - 76% good (3) 77% - 88% very good (4) 89% - 100% excellent (5)  Number of copies in the library  Barle, J.: Hydraulics and pneumatics, (student handbook and workbook in Croatian: Hidraulika i pneumatika), FESB, Split, 2010.  Nikolić, G.: Pneumatika, Školske novine, Zagreb, 1994.  Koroman, V.; Mirković, R.: Hidraulika i pneumatika, Školska knjiga, Zagreb, 1991.  Lang, R.A. (ed.): Hydraulic Trainer 1; Planning and Design of Hydr Systems, Mannesmann Rexroth AG, 1998. Rabie, M.: Fluid Power Engineering, McGraw-Hill, 2009.  - Evaluation of results in accordance with the above learning outcol-Feedback from students via surveys - Self-evaluation of teachers			

NAME OF THE COURSE	DESIGN FOR ASSEMBLY						
Code Course teacher	FETL26 Year of study 2  Nikola Gjeldum, Ph. D., Assistant Professor Credits (ECTS)  5						
Associate teachers	Marina Crnjac, Teaching assistant. Ivan Peko, Teaching assistant.	Type of instruction (number of hours)  L S 30 0			AE 0	LE 0	DE 30
Status of the course	Elective Percentage of 0 %						
	COURSE	application of e-learning  DESCRIPTION					
Course objectives	Objectives:  Understanding and application of Design for Assembly basic principles  Teach students to design a product with its elements in Siemens NX CAD software  Teach student to design a product taking into account a simplicity and suitability of assembly process						
Course enrolment requirements and entry competences required for the course	None						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to:  - design a product elements in Siemens NX CAD software ("part design")  - connect designed product elements in assembly ("assembly design")  - generate designed product drawings ("drawing")  - redesign a product according to assembly process requirements  - make an assembly process plan for designed product						
	Course content					L h	ours
Course content broken down in detail by weekly class schedule (syllabus)	Introduction and basic principles. Historical development of product assembly process						
	Product architecture						2
	Product design for assembly						2
	Methods of product design for assembly						3
	Measures and tolerances in assembly process						2
	Product design modifications						1
	Assembly process						2
	First midterm exam						2
	Making a plan for manual assembly process						2
	Chart of assembly process traceability						2
	Organizational structures in manual assembly process						<u> </u>
	Lean methods for assembly processes						2
	Development from primary labor division phase to autonomous working groups						2
	Balancing of assembly process workstations						2
	Second midterm exam						2
	List of design exercises					DE ŀ	nours
	Introduction in Siemens NX CAD software						2

	Part design in Siemens NX 8					8		
	Assembly design in Siemens NX 10				10			
	Generating product drawings in Siemens NX					4		
	Simulation in Siemens NX					2		
Format of instruction	<ul> <li>☑ lectures</li> <li>☐ seminars and workshops</li> <li>☑ exercises</li> <li>☐ on line in entirety</li> <li>☐ partial e-learning</li> <li>☐ field work</li> <li>☐ independent assignr</li> <li>☑ multimedia</li> <li>☑ laboratory</li> <li>☐ work with mentor</li> <li>☐ (other)</li> </ul>			entor r)				
Student responsibilities	The presence on le scheduled.	ctures a	and exercis	es in the	e amoun	nt of at least 70	) % of the	times
Screening student work (name the	Class attendance	1	Research		l	Practical traini	1	
proportion of ECTS credits for each	Experimental work		Report		Individual wor		2,7	
activity so that the total number of	Essay		Seminar e	essay		(Other)		
ECTS credits is	Tests	0,2	,2 Oral exam			(Other)		
equal to the ECTS value of the course)	Written exam	0,1	Project			(Other)		
Grading and evaluating student work in class and at the final exam	During semester there are two midterm exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the first two final exams students that did not pass at least one of the midterm exams take part. In the third and fourth final exams students take the whole exam regardless results of midterm exams. The requirements for passing grade are positive assessment of individual project and positive assessment in exam. Positive assessment represents minimal 50% points on each midterm exam or minimal 50% points on final exam. Final exams are conducted in written form. Midterm exams and final exams consist of theoretical questions and numerical problems.  Grade (%) = (D + E) / 2  D – Individual project grade (%)  E – average points achieved on midterm exams expressed as a percentage or number of points achieved on the final exam expressed as a percentage.  E = (M1 + M2)/2  M1, M2 – average points achieved on midterm exams expressed as a percentage.  Grade (%): Final mark: 50% - 61% sufficient (2) 62% - 74% good (3) 75% - 87% very good (4) 88% - 100% excellent (5)							
	Title				Number of copies in the library	Availabi other r	nedia	
Required literature (available in the library and via other media)	Gjeldum, N.: "Dizajn za montažu", lectures on e- learning, FESB Split					Interne learn	•	
	Marinescu, I., Boothroyd, G.: "Product design for manufacture and assembly", Marcel Dekker, New York, 2002.							
	Whitney Daniel E.: "Mechanical Assemblies – Their 1 Design, Manufacture, and Role in Product							

	Development", Massachusetts Institue of Technology, Oxford University Press, 2004.			
Optional literature (at the time of submission of study programme proposal)	<ol> <li>A.J.D.Lambert Surendra M. Gupta: "Disassembly Modeling for Assembly, Maintenance, Reuse, and Recycling", CRC Press, 2000.</li> <li>Molloy, O., Tilley, S., Warman, E.: "Design for manufacturing and assembly – Concepts, architectures and implementation, Springer Science + Bussines Media, 1998.</li> <li>WEB publications on DFA</li> </ol>			
Quality assurance methods that ensure the acquisition of exit competences	<ul> <li>keeping records of the attendance of students</li> <li>annual evaluation of teachers</li> <li>periodical evaluation of individual project advancement</li> <li>feedback from students via surveys</li> <li>self-evaluation of teachers</li> <li>institutional and non-institutional evaluations</li> </ul>			
Other (as the proposer wishes to add)				