S V E U Č I L I Š T E U S P L I T U

FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE

DETAILED PROPOSAL OF THE STUDY PROGRAMME

UNDERGRADUATE UNIVERSITY STUDY IN INDUSTRIAL ENGINEERING

SPLIT, May 2025

1.1. List of mandatory and elective courses

List of								
Year of study: 1.								
Semester: I.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	D	
	FETE04	Materials 1	30	0	0	30	0	4
	L = Lectures, S = Seminar, AE = Auditory Exercises, LE = Laboratory Exercises, DE = Design Exercises							
	There are no elective courses.							

List of courses								
Year of study: 1.								
Semester: II.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
	FETE05	Materials 2	30	0	0	30	0	4
	L = Lectures, S = Seminar, AE = Auditory Exercises, LE = Laboratory Exercises, DE = Design Exercises							
	There are no elective courses.							

List of courses								
Year of study: 2.								
Semester: III.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
	FETE01	Technology 1	45	0	0	30	0	6
	FEEE11	Computer Aided Design 1	30	0	0	0	30	5
	L = Lectures, S = Seminar, AE = Auditory Exercises, LE = Laboratory Exercises, DE = Design Exercises							

List of courses								
Year of study: 2.								
Semester: IV.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
Mandatory	FESE02	Mechanics of Materials	45	0	30	0	0	7
	FETE02	Technology 2	45	0	0	30	0	6
	FENE01	Electrical Engineering	30	0	15	15	0	6
	FESE17	Computer - Aided Analysis	30	0	0	30	0	5
	L = Lectures, S = Seminar, AE = Auditory Exercises, LE = Laboratory Exercises, DE = Design Exercises							

List of courses								
Year of study: 3.								
Semester: V.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
	FESE05	Thermodynamics	45	0	30	0	0	6
	FESE06	Introduction to Information Systems	30	0	0	15	0	4
	FESE03	Machine Elements	45	0	0	0	30	6
	L = Lectures, S = Seminar, AE = Auditory Exercises, LE = Laboratory Exercises, DE = Design Exercises							

1.2. Course description

NAME OF THE COURSE	MATERIALS 1						
Code	FETE04	Year of study	1				
Course teacher	Nikša Čatipović, Ph. D., Assistant Professor	Credits (ECTS)	4				
Associate teachers	Karla Grgić, Teaching assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	30	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	- Present basic knowledge about material structures, - Introduce students with mechanical properties and their relationship to the structure of the material. - Explain the mechanical properties testing, both to materials and completed construction, - Provide knowledge about basic methods of detection of errors in materials and metal structures. - Present basic alloys phase diagrams, especially Fe - C alloys phase diagrams, as well as the properties of iron alloys		
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 the processes of crystallization and the specifics of metastable and stable crystallization of Fe-C alloy - Explain the second test procedures basic mechanical properties of materials - Characterize polymer and composite materials - Analyze properties and areas of application of steel, casting and non-ferrous metals - Use the principles of optical microscopy - Explain methods of testing materials and structures without damage		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	The types of materials, recognition of materials, atomic structures, atomic bonds	2	0
	Crystal lattice, crystalline lattice inperfections	2	0
	The crystallization process, the rate of crystal formation and crystal growth, resolution (micro and macro), allotrope modification, Curie point	2	0
	The deformation (elastic, plastic), sliding deformation, twins process, speed and degree of deformation, deformation in hot and cold condition, isotropy, anisotropy	2	0
	Alloy cooling curves, Solubility - complete solubility diagram	2	0
	Eutectic phase diagram, Peritectic phase diagram	2	0
	Fe- C alloy phase diagrams	2	0
	Mechanical properties, Tensile strength test	2	0
	Dynamic strength, Hardness test methods	2	0
	Toughness, Creep, Non-destructive material testing (visual, penetrating liquids)	2	0
	Magnetic method testing, Ultrasound testing	2	0

	X and Y-ray testing, Chemical composition examination	2	0
	Steels, Fe casts	2	0

List of laboratory or design exercises	LE hours
The types of materials, recognition of materials	2
Pure metal heating and cooling curve	2
Complete solubility diagram, Allotrope modification	2
Eutectic phase diagram	2
Stable Fe-C phase diagram	2
Metastable Fe-Fe3C phase diagram, Curie point	2
Comparison Fe-C – Fe3C phase diagrams, Metallography of Fe alloys	2
Mechanical properties, Tensile strength test	2
Dynamic strength testing, Toughness testing, Sparks testing	2
Hardness testing (Brinell, Vickers, Rockwell)	2
Hardness testing (Poldy, Shore, Leeb)	2
Magnetic method testing, Penetrating liquid testing	2
Ultrasonic testing, X and Y ray testing	2

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence in lectures and exercises in the amount of at least 70%. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1,5	Research	-----	Practical training	-----
	Experimental work	-----	Report	-----	Self-directed learning	3,5
	Essay	-----	Seminar essay	-----	Laboratory exercises	1,0
	Tests	-----	Oral exam	-----	(Other)	**-----**
	Written exam	**-----**	Project	-----	(Other)	-----

Grading and evaluating student work in class and at the final exam	During the semester there will be two mid-term exams (tests). The first mid-term, after 7 weeks of classes and the second after the next 6 weeks of classes. At the final exam students have to take part material that did not pass the mid-term. Each test is carried out as written exam lasting 45 minutes. Usually it consists of 10 test questions and the two tasks. The requirements for a positive evaluation are: positive assessment of laboratory exercises and 50% points on each test. The final grade is based on the resulting percentage on mid-term exams. Percentage - Rating 50% to 61% - sufficient (2) 62% to 74% - good (3) 75% to 87% - very good (4) 88% to 100% - excellent (5) Examinations according to the Faculty schedule! The final grade is determined after the second final exam using the absolute ECTS grading 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 additional exams. After that, they have the dean's exam, where they write that part of the material that they have not passed until then.

Required literature (available in the library and via other	**Title**	**Number of copies in the library**	**Availability via other media**

media)	D. Živković, the author's lecture, FESB		E-learning portal
	R. Deželić, Meterijali (I dio), FESB Split, 1998.	10	
	F. Kovačiček, Đ. Španiček, Materijali – osnove znanosti o mmaterijaliam, FSB Zagreb, 2000	2	
	M. Franz, Svojstav materijala 2005.	5	
	B. Anzulović, Materijali, Split, 1993.	3	
Optional literature (at the time of submission of study programme proposal)	T.Filetin, F.Kovačiček, J. Indof, Svojstva i primijena materijala, FSB Zagreb, 2002.		
Quality assurance methods that ensure the acquisition of exit competences	• 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	**MATERIALS 2**						
Code	FETE05	Year of study	1				
Course teacher	Nikša Čatipović, Ph. D., Assistant Professor	Credits (ECTS)	4				
Associate teachers	Karla Grgić, Teaching assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	30	0
Status of the course	Obligatory	Percentage of application of e-learning	0				
COURSE DESCRIPTION							
Course objectives	Provide an overview and explanation: - Basic principles of heat treatment processing, - Chemical diffusion surface treatment and application of surface protective coating, - Presents the basic methods of mechanical surface protection.						
Course enrolment requirements and entry competences required for the course	Basic knowledge about structure and properties of materials. This knowledge can be obtained in the prerequisite course Materials 1. In order to be able to follow news within this area students have to be fluent in technical English reading.						

<table>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="4">Students will be able to:
9. Select the appropriate surface heat treatment,
10. Combine heat treatment procedures,
11. Compare the surface heat treatment,
12. Analyze to the basic features of surface heat treatment,
13. Set priorities to protect the surface,
14. Propose possible chemical diffusion heat treatment for surface protection</td></tr>
<tr><td rowspan="19">Course content broken down in detail by weekly class schedule (syllabus)</td><td>Course content</td><td>L hours</td><td colspan="2">AE hours</td></tr>
<tr><td>Introduction; The purpose of the heat treatment; Types of heat treatment</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Phase transformations during faster cooling of austenite; TTT diagrams for isothermal and continuous cooling</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Heating devices, Cooling media</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Heat treatment; Heat treatment of the entire cross-section; Hardening procedures (typically, isothermal)</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Influential parameters on the results of quenching; Tempering; Tempering of martensite; Tempering of hardened steel</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Annealing procedures; Recrystallization annealing</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Normalization; Softened by annealing; Annealing for tension relaxation</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>High temperature annealing; Homogenization annealing; Aging</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Heat treatment of the surface layers; Direct surface hardening; Induction hardening and flame tempering</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Thermo-chemical heat treatment</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Ntriding; Boroning; Diffusion metallization</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Hardening by annealing and aging, Heat treatment of aluminium alloys, Steel hardening</td><td>2</td><td colspan="2">0</td></tr>
<tr><td>Heat Treatment of High-Speed Steel</td><td>2</td><td colspan="2">0</td></tr>
<tr><td colspan="3">List of laboratory or design exercises</td><td colspan="2">LE hours</td></tr>
<tr><td colspan="3">Iron alloy metallography, Steel grades according to HR norms</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Non-ferrous metals Metallography, Non-ferrous metals by HR norms</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Hardness after quenching</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Testing of hardenability by the Grossman method</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Grossman task</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Testing by the Jominy method of hardenability</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Jominy task</td><td colspan="2">2</td></tr>
<tr><td colspan="3">TTT - diagram verification, TTT - diagram of the steel Č4731</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Tempering</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Normalization, Annealing</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Hardening of aluminium alloys</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Heat-treated steel metallography</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Exam preparation</td><td colspan="2">2</td></tr>
<tr><td>Format of instruction</td><td colspan="2">☒ lectures
☐ seminars and workshops
☒ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="2">☐ independent assignments
☒ multimedia
☒ laboratory
☐ work with mentor
☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="4">The presence in lectures and exercises in the amount of at least 70%. Performed all required laboratory exercises.</td></tr>
<tr><td>Screening student</td><td>Class attendance</td><td>1,0</td><td>Research</td><td>-----</td><td>Laboratory exercises</td><td>1,0</td></tr>
</table>

work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS*	Experimental work	-----	Report	-----	Self-directed learning	3,0
	Essay	-----	Seminar essay	-----	(Other)	-----
	Tests	-----	Oral exam	-----	(Other)	**-----**
	Written exam	**-----**	Project	-----	(Other)	-----

Grading and evaluating student work in class and at the final exam	During the semester there will be two mid-term exams (tests). The first mid-term, after 7 weeks of classes and the second after the next 6 weeks of classes. At the final exam students have to take part material that did not pass the mid-term. Each test is carried out as written exam lasting 45 minutes. Usually it consists of 10 test questions and the two tasks. The requirements for a positive evaluation are: positive assessment of laboratory exercises and 50% points on each test. The final grade is based on the resulting percentage on mid-term exams. Percentage - Rating 50% to 61% - sufficient (2) 62% to 74% - good (3) 75% to 87% - very good (4) 88% to 100% - excellent (5) Examinations according to the Faculty schedule! The final grade is determined after the second final exam using the absolute ECTS grading 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 additional exams. After that, they have the dean's exam, where they write that part of the material that they have not passed until then.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	D. Živković, Autorizirana predavanja,		E-learning portal
	R. Deželić, Metali 2, FESB Split, 1998.	10	
	F. Kovačiček, Đ. Španiček, Materijali – osnove	2	
	znanosti o materijaliam, FSB Zagreb, 2000.		
	M. Stupnišek, F.Cajner: Osnove toplinske obrade metala, Sveučilište u zagrebu, FSB, 1996.	5	

Optional literature (at the time of submission of study programme proposal)	G.E. Totten, Steal heat treatment – metallurgy and technologies, Portland, Oregon, USA, 2006
Quality assurance methods that ensure the acquisition of exit competences	5. Evaluation of results in accordance with the above learning outcomes 6. Feedback from students via surveys 7. Self-evaluation of teachers 8. Institutional and non-institutional evaluations
Other (as the proposer wishes to add)	

NAME OF THE COURSE	TECHNOLOGY 1							
Code	FETE01	Year of study	2					
Course teacher	Nedjeljko Mišina, Ph.d. full professor Dražen Živković, Ph.d. full professor	Credits (ECTS)	6					
Associate teachers	Nikša Čatipović, Teaching assistant, Zvonimir Dadić, Teaching assistant	Type of instruction (number of hours)	L	S	AE	LE	DE	
			45	0	0	30	0	
Status of the course	Obligatory	Percentage of application of e-learning	0					

COURSE DESCRIPTION

Course objectives	Training students to: - Understand the physical changes in welding, brazing and soldering, bonding,metallisation and thermal cutting of metal. - Explain of the basic welding processes and their application. - Accept the standards in welding, certification of the welding procedures and welders. - Understand the basic foundry processes, as well as the advanced techniques of casting metal. - recognize the primary smelting aggregates, the newer materials casting process, such as metal foams, - Overview of casting defects		
Course enrolment requirements and entry competences required for the course	Passed exams form: Materials 1 and Materials 2		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Select the appropriate welding process, filler material and welding parameters, - Develop welding technology, - Calculate the preheating temperature of the welded joint, - Propose measures to reduce deformations and residual stresses in welded joints, - Recognise the process of metal casting, - Distinguish casting mould type, - Analyse the quality of castings based on foundry defects - Explain the fundamental principles of smelting aggregates		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction. Basic terms. Welding processes. The properties of welded joints. Power sources for welding.	3	0
	Deformations and residual stresses of welded joints. Electric arc. Metal transfer in the electric arc.	3	0
	SMAW welding process. TIG welding process. Plasma.	3	0
	MIG / MAG welding process. EPP welding process.	3	0
	Resistance welding. Gas welding. Special welding processes. Welding devices. Robots.	3	0
	Welding defects. Brazing and soldering. Gas and plasma cutting. Oxyarc. Arcair.	3	0
	Certification of the welding procedures and welders. Regulations in welding. Welding technology. Preheating welds. Weldability of: carbon steels, irons, Al and Ti alloys, stainless steels.	3	0
	First midterm exam		
	Introduction to casting technology. Casting models	3	2

	Casting moulds. Disposable moulds - mould materials	3	2
	Mould cores, design, materials, moulds manufacturing control	3	2
	Multiple purposes moulds. Casting procedures - Continuous casting	3	2
	Casting procedures - Centrifugal casting. Precision casting in the disposable moulds. Precision Casting in permanent moulds	3	2
	Castability. Casting technological tests. Basics of the solidification process. Casting defects, Smelting aggregates, Metal foam casting.	3	2
	Second midterm exam		
	List of laboratory or design exercises		LE
	Basic concepts of welding. The division of welding processes.		3
	The impact of coated electrodes on the stability of the electric arc. SMAW welding process. MIG / MAG welding process		3
	EPP welding process. EO welding. Friction welding.		3
	TIG welding process. Gas welding. Brazing and soldering.		3
	Gas and plasma cutting. Oxyarc. Arcair. Metallisation		3
	First midterm exam		
	Second midterm exam		

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence in lectures and exercises in the amount of at least 70%. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1,5	Research		Practical training	
	Experimental work		Report		Self-directed learning	3,5
	Essay		Seminar essay		Laboratory exercises	1,0
	Tests		Oral exam		(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	During the semester there will be two mid-term exams (tests). The first mid-term, after 7 weeks of classes and the second after the next 6 weeks of classes. At the final exam students have to take part material that did not pass the mid-term. Each test is carried out as written exam lasting 45 minutes. The requirements for a positive evaluation are: positive assessment of laboratory exercises and 50% points on each test. The final grade is based on the resulting percentage on mid-term exams. Percentage - Rating 50% to 61% - sufficient (2) 62% to 74% - good (3) 75% to 87% - very good (4) 88% to 100% - excellent (5) Examinations according to the Faculty schedule! The final grade is determined after the second final exam, applying the absolute ECTS grading system in accordance with the study rules and study system of the University of Split. Students who did not pass the exam after two final exams have the last chance to pass exam in the autumn period. Overall material has to be passed at last possible exam.The exam lasts 90 minutes.

	Title	Number of copies in the library	Availability via other media
Required literature (available in the library and via other media)	N. Mišina: the author's lecture, FESB		E-learning
	D. Živković, the author's lecture, FESB		E-learning
Optional literature (at the time of submission of study programme proposal)	- S. Kralj, Š. Andrić: Zavarivanje i srodni postupci, FSB, Zagreb, 1999. - M. Gojić: Tehnika spajanja i razdvajanja materijala, Metalurški fakultet , Sisak, 2003. - D.Živković, Lijevanje metala, Interna skripta, 2006. - Z.Bonačić, I. Budić, Osnove tehnologije kalupljenja – Jednokratni kalupi I dio. Strojarski fakultet u Slavonskom brodu, 2001.		
Quality assurance methods that ensure the acquisition of exit competences	- 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	**COMPUTER AIDED DESIGN 1**						
Code	FEEE11	Year of study	2				
Course teacher	Gojko Magazinović, Ph. D., Full Professor	Credits (ECTS)	5				
Associate teachers	Ivan Pivac, Teaching assistant.	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	0	30
Status of the course	Obligatory	Percentage of application of e-learning	50				
COURSE DESCRIPTION							
Course objectives	Training students for: - understanding and application of basic terms and principles of feature-based modeling, parametric modeling, and geometric modeling, - ability to build simple models, assemblies, and technical drawings by using a geometric modeling tool.						
Course enrolment requirements and entry competences required for the course	-						
Learning outcomes expected at the level	Students will be able to:						

<table>
<tr><td>of the course (4 to 10 learning outcomes)</td><td colspan="3">- explain fundamental principles of geometric modeling, parametric modeling, and feature based modeling,
- describe an importance and available approaches to the exchange of design data between the different CAD systems,
- explain the fundamental principles of the parametric curve and parametric surface definitions,
- use a computer aided design tool,
- construct simple geometric models and assemblies,
- determine the model cross-section properties,
- determine the model mass properties.</td></tr>
<tr><td rowspan="28">Course content broken down in detail by weekly class schedule (syllabus)</td><td>Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td>Introduction to a course. Description of an e-learning portal.</td><td>2</td><td></td></tr>
<tr><td>Introduction to CAD/CAM/CAE systems, part I: basic terms.</td><td>2</td><td></td></tr>
<tr><td>Introduction to CAD/CAM/CAE systems, part II: applications; the expansion of 3D CAD technology.</td><td>2</td><td></td></tr>
<tr><td>Elements of CAD/CAM/CAE systems; hardware; software.</td><td>2</td><td></td></tr>
<tr><td>Geometric modeling; feature based modeling; parametric modeling.</td><td>2</td><td></td></tr>
<tr><td>Introduction to graphics programming, part I: OpenGL; coordinate systems; homogeneous coordinates; coordinate transformations.</td><td>2</td><td></td></tr>
<tr><td>Introduction to graphics programming, part II: hidden line removal; rendering; shading; ray-tracing.</td><td>2</td><td></td></tr>
<tr><td>First midterm exam</td><td></td><td></td></tr>
<tr><td>CAD data structures; exchange of design data between the different CAD systems.</td><td>2</td><td></td></tr>
<tr><td>Parametric curves, part I: Hermite curve.</td><td>2</td><td></td></tr>
<tr><td>Parametric curves, part II: Bezier curve; B-Spline curve.</td><td>2</td><td></td></tr>
<tr><td>Parametric curves, part III: interpolation curve; geometric continuity; NURBS curves.</td><td>2</td><td></td></tr>
<tr><td>Parametric surfaces: bilinear surface; Bezier surface; B-Spline surface; NURBS surface.</td><td>2</td><td></td></tr>
<tr><td>Modeling and analysis (A brief on structural analysis).</td><td>2</td><td></td></tr>
<tr><td>Second midterm exam</td><td></td><td></td></tr>
<tr><td>List of laboratory or design exercises</td><td colspan="2">LE or DE hours</td></tr>
<tr><td>The environment of CAD design tool; extrusion of a closed curve.</td><td colspan="2">2</td></tr>
<tr><td>Sketch tool; extrude; round; chamfer; hole; parameters.</td><td colspan="2">2</td></tr>
<tr><td>Simple model editing.</td><td colspan="2">2</td></tr>
<tr><td>Revolving of a closed curve.</td><td colspan="2">2</td></tr>
<tr><td>Design planes.</td><td colspan="2">2</td></tr>
<tr><td>Sections; shells, constraints; sketching utilities.</td><td colspan="2">2</td></tr>
<tr><td>Translation patterns; one- and two-dimensional.</td><td colspan="2">2</td></tr>
<tr><td>Radial patterns of set features.</td><td colspan="2">2</td></tr>
<tr><td>Radial patterns of built features; feature copying.</td><td colspan="2">2</td></tr>
<tr><td>Helical sweep.</td><td colspan="2">2</td></tr>
<tr><td>Making assemblies.</td><td colspan="2">2</td></tr>
<tr><td>Technical drawing preparation, part I.</td><td colspan="2">2</td></tr>
<tr><td>Technical drawing preparation, part II.</td><td colspan="2">2</td></tr>
<tr><td>Format of instruction</td><td>☒ lectures
☐ seminars and workshops
☒ exercises
☐ on line in entirety
☒ partial e-learning
☐ field work</td><td colspan="2">☐ independent assignments
☒ multimedia
☒ laboratory
☐ work with mentor
☒ computer work (other)</td></tr>
</table>

<table>
<tr><td>Student responsibilities</td><td colspan="6">Attendance of at least 70% lectures and all design exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>0,8</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Computer work</td><td>2</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">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%.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">G. Magazinović, Bilješke uz predavanja, FESB</td><td>-</td><td>e-learning portal</td></tr>
<tr><td colspan="3">R. Toogood: Creo Parametric 2.0 Tutorial and Multimedia DVD, SDC Publications, Mission, 2013.</td><td>1</td><td>https://books.google.hr</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">- 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.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results by the above learning outcomes
- Feedback from students via surveys
- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE	MECHANICS OF MATERIALS						
Code	FESE02	Year of study	2.				
Course teacher	Frane Vlak, Ph. D., Associate Professor	Credits (ECTS)	7				
Associate teachers	Marko Vukasović, Ph. D., Teaching assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			45	0	30	0	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - understanding and application of basic laws of solid body mechanics, - introducing to stress and strain distribution in the beams under different types of loading (axial, torsion, bending, shear and combined loading).		
Course enrolment requirements and entry competences required for the course	Statics (Mechanics 1)		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - explain plane stress, plane strain and stress-strain relationship (Hooke's law), - analyse plane stress using Mohr's circle, - calculate geometrical properties of cross sections, - determine stress and displacements of beams under tension/compression, torsion and bending, - apply developed procedures to analyse and design simple structures (allowable stress and strain design), - solve statically indeterminate problems using the method of integration of the deflection curve and the method of equating displacements , - analyse beams under combined loadings using failure theories, - solve simple problems of buckling of columns.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to mechanics of materials. Problems and methods of mechanics of materials. Modelling of structures. Stress vector, normal and shear stress. Stress tensor. Stress transformation.	3	2
	Principal stresses. Mohr's circle for plane stress. Strain, normal strain, shear strain and dilatation. Strain tensor. Strain transformation. Mohr's circle for plane strain.	3	2
	Stress-strain relationship. Experimental data for technical materials.Hooke's law for uniaxial stress state. Plane stress state. Relationship between elasticity constants. Relationship between internal force components and stress components. General approach to problems of mechanics of materials.	3	2
	Geometrical properties of plane areas, first and second moment of area. Parallel axis theorem. Transformation of second moments of area under rotation of coordinate system. Mohr's circle for second moments of area. Radius of gyration.	3	2
	Tension/compression. Prismatic beams and beams with varying cross sectional area. Displacement diagram. Stress concentration.	3	2
	Torsion of circular beams. Assumptions and constraints. Shear stress and strain. Allowable stress design. Bending. Assumptions and constraints.	3	2
	Pure bending. Transverse bending. Allowable stress design. Unsymmetric bending.	3	2

	First midterm exam		
	Differential equation of the deflection curve. Moment-area method. Stresses and strains of beams with nonuniform cross sections.	3	2
	Shear. Statically indeterminate problems in tension/compression. Thermal effects, misfits and prestrains.	3	2
	Statically indeterminate problems in torsion. Statically indeterminate problems in bending.	3	2
	Strain energy. Failure theories.	3	2
	Failure theories for combined loading problems.	3	2
	Buckling of columns. Elastic and inelastic buckling. Design formulas for columns.	3	2
	Second midterm exam		

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2,6	Research		Practical training	
	Experimental work		Report		Individual work	4,1
	Essay		Seminar essay		Laboratory exercises	
	Tests	0,2	Oral exam		Preparation for laboratory exercises	
	Written exam	0,1	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. The midterm and final exams are carried out as written tests. 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**	**Availability via other media**
Required literature (available in the library and via other media)	Alfirević, I: Nauka o čvrstoći I, Tehnička knjiga, Zagreb, 1989.	5	
	F. Vlak: Autorizirana predavanja, FESB		e-learning portal

Optional literature (at the time of submission of study programme proposal)	Craig, R., R.: Mechanics of Materals, John Wiley & Sons, New York, 2000.
Quality assurance methods that ensure	- Evaluation of results in accordance with the above learning outcomes - Feedback from students via surveys - Self-evaluation of teachers

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

NAME OF THE COURSE	**TECHNOLOGY 2**						
Code	FETE02	Year of study	2				
Course teacher	Dražen Bajić, Ph. D., Full Professor Branimir Lela, Ph. D., Assistant Professor	Credits (ECTS)	6				
Associate teachers	Sonja Jozić, Ph.D., Assistant Professor, Jure Krolo, Teaching assistant Mario Veić, Teaching assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			45	0	0	30	0
Status of the course	Obligatory	Percentage of application of e-learning	10%				
COURSE DESCRIPTION							
Course objectives	Training students for: - acquisition of basic knowledge of manufacturing processes by means of metal forming processes and metal removal processes, - understanding basic features of various processes that are based on shaping of the product without and with chip removals.						
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: - categorize metal forming processes and metal removal processes - discuss the use of machining and metal forming technologies - outline procedures and machines used in metal forming processing - comment conditions of flow and flow rules - derive expressions to calculate forces, stresses, strains and strain rates in metal forming processes - analyse the flow of materials, friction factor, flow stress, work and power in metal forming processes - discuss expressions to calculate the cutting speed, material removal volume, cutting force, torque, power, theoretical roughness and the main machine time for particular machining operations - analyze the mechanics of orthogonal and oblique cutting - discuss the mechanisms and forms of tool wear in machining - examine the economic aspect of machining with respect to various criteria						

Course content broken down in detail by weekly class schedule (syllabus)	Course content				L hours	AE hours
	Introduction. Classification of metal-removal processes. Basic features particular machining procedures.				3	/
	Parameters of cutting. Basic principles, tool and workpiece motion.				3	/
	Basic tool geometry. Models of chip formation, shape and size of chip. Chips compression, compression rate. Conditions of occurrence of build up edge.				3	/
	Cutting forces, power, vibrations during machining. Thermal phenomena in cutting.				3	/
	Tribology of machining process				3	/
	Integrity of machined surface.				3	/
	Cutting-tool materials. High speed machining.				3	/
	First midterm exam					
	Introduction; Classification of deformation processes; Concept of plastic deformation;				3	/
	Material plasticity indicators; Changes in the material caused by deformation; Anisotropy;				3	/
	Deformation strain and strain rate; Flow stress and flow curves; Yield criteria;				3	/
	Upsetting processes; Forging processes; Drawing processes				3	/
	Extrusion processes; Rolling processes;				3	/
	Sheet metal bending; Deep drawing and spinning processes; Stamping processes;				3	/
	Second midterm exam					
	List of laboratory exercises					LE hours
	Turning, Tool and workpiece geometry, Chip shapes, Cutting-tools materials, 1st part					2
	Turning, Tool and workpiece geometry, Chip shapes, Cutting-tools materials, 2nd part					2
	Planing and slotting, compression rate measurement					2
	Drilling, sinking, and reaming. Measuring the axial force and torque for drilling					2
	Sawing, broaching. Measuring the main cutting force for turning using the power consumption.					2
	Milling. Measuring the surface roughness in relation with cutting parametars.					2
	Grinding, honing, superfinishing. Measuring the cutting forces using three component dynamometer					2
	Deformation influence on material mechanical properties					2
	Material flow investigation					2
	Friction coefficient determination by ring and cylinder upsetting					2
	Flow stress determination by strip and cylinder upsetting					2
	Testing of material formability by upsetting and forging					2
	Investigation of material formability by extrusion; Material springback effect determination during bending					2
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work			☐ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)		
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.					
	Class attendance	2,5	Research		Practical training	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Experimental work	0,5	Report		Individual work	3
	Essay		Seminar essay		(Other)	
	Tests		Oral exam		(Other)	
	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: 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. 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

	Title	Number of copies in the library	Availability via other media
Required literature (available in the library and via other media)	Duplančić, I.: “Obrada deformiranjem”, Sveučilište u Splitu, FESB, Split 2007.	5	
	Bajić, D. “Obrada odvajanjem”, autorizirana predavanja.		e-learning portal
	Ekinović S.: “Postupci obrade rezanjem”, Univerzitet u Sarajevu, Mašinski fakultet u Zenici, 2003.		

Optional literature (at the time of submission of study programme proposal)	- Povrzanović, A. “Obrada metala deformiranjem – odabrana poglavlja”, Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje, Zagreb, 1996. - Math M., “Uvod u tehnologiju oblikovanja deformiranjem”, Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje, Zagreb, 1999. - Lange K.: "Lehrbuch der Umformtechnik I, II, III", Springer - Verlag Berlin, Heidelberg, New York, 1974. - Kalpakjian, S., Schmid S.R., “Manufacturing Engineering & Technology”, Prentice Hall, 2013. - Grote, K.H., Antonsson, G., “Handbook of Mechanical Engineering“, Springer, 2008.
Quality assurance methods that ensure the acquisition of exit competences	- Keeping records of class attendance - Evaluation of results in accordance with the above learning outcomes - Feedback from students via surveys - Self-evaluation of teachers - Feedback information from graduated students

Other (as the proposer wishes to add)	

NAME OF THE COURSE	**ELECTRICAL ENGINEERING**						
Code	FENE01	Year of study	2.				
Course teacher	Ivica Jurić-Grgić, Ph. D., Associate Professor	Credits (ECTS)	6				
Associate teachers	Nedjeljka Grulović – Plavljanić, Senior Lecturer Ivan Krolo, Teaching Assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	15	15	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - application of basic principles and laws of electrical engineering, - setting up and solving simple electrical circuits, - permanent adoption of basic knowledge in the field of electrical machines.		
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: - define the fundamental phenomena, the quantities and the laws of electrical engineering, - apply fundamental laws of electrical engineering for the calculation of electromagnetic quantities, - analyse simple electrical networks, - measure basic electrical values (current, voltage, resistance). - describe basic principles of electrical machines.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Basic terms. Electrostatics:electricity and physical property of matter. Coulomb's law; Electric field; Electric flux density, Gauss's law.	2	1
	Electrostatics:Electrical work, electrostatic voltage, electrostatic potential, capacitance, capacitance of the capacitors.	2	1
	Electrostatics: Matter in electrical field, capacitors; static electricity; lightning protection.	2	1
	DC currents: Electric circuits; electrical property of matter; Electrical conductivity and electrical resistance; voltage and current sources; Ohm's law; temperature dependence of electrical resistance; series, parallel and combination circuits.	2	1
	DC currents: Kirchhoff's Laws; power and energy of DC current.	2	1

	DC currents: Current and voltage measurements; electrical resistance measurement; Wheatstone bridge; Wye–Delta transformation; circuit analysis techniques; electrolysis and chemical sources of electric current.	2	2
	Magnetism: Basics of magnetism; natural magnet and *electromagnet; magnetic flux; Faraday's law; magnetic forces on moving charges and on a current-carrying wire; magnetic force between two parallel current-carrying wires; Biot–Savart law; Ampere's Law; toroidal solenoid.*	2	1
	Magnetism: Mutual and self inductance; leakage of magnetic flux; ferromagnetism; magnetic hysteresis;	2	1
	magnetic circuit; magnetic energy; magnetic force.		
	AC currents: Current and voltage sinusoidal waveform; form and crest factor; generation of a voltage sinusoidal waveform; Euler's formula for complex numbers; phase relationships in AC Circuits; Ohm's law in complex form; resistive and reactive impedance in AC Circuits; series, parallel and combination AC circuits.	2	2
	AC currents: Power and energy of AC current; circuit analysis techniques using complex numbers; three-phase AC circuits.	2	2
	Transformers	2	0
	Synchronous machines	2	0
	Induction motors	1	0
	DC motors; universal motors.	1	0

List of laboratory exercises	LE hours
Series, parallel and combination DC circuits	3
Kirchhoff's Laws and Thévenin's theorem	3
Resistive and reactive impedance in AC Circuits	3
Power of AC current	3
Open circuit test on transformer	3

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Studentresponsibilities	The presence on lectures in the amount of at least 70% of the times scheduled. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1	Research		Practical training	
	Experimental work		Report		Individual work	4
	Essay		Seminar essay		Laboratory exercises	0,5
	Tests	0,2	Oral exam		Preparation for laboratory exercises	0,2
	Written exam	0,1	Project		(Other)	

<table>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="3">During the semester there will be two midterm tests. The first test will be at the eighth week of classes, the second at the first week of the exam period. Student can pass the entire exam by midterm tests.
At the two final exams, students take parts of the curriculum that did not pass by midterm tests. If at the first final exam student passes one of the two parts of curriculum that part of curriculum the student does not have to take on another final exam.
The condition for positive assessment is that the student has at least 50% of each part of the curriculum at the midterm tests or at the final exams. The final grade (in percent) is formed on the basis of all activities according to the formula:

Rating (%) = 0.1 * LV + 0.45 * (G1 + G2)

wherein the activity is expressed in percentage according to:

LV -percentage obtained by laboratory exercises,
G1, G2 - percentage obtained by midterm tests or final exams of the parts of curriculum given in lectures.</td></tr>
<tr><td></td><td colspan="3">Students who did not pass the exam after two final exams can pass the exam at the last week of August or the first week of September. Last chance to take the exam in this school year is a so-called commission exam. In a so-called commission exam all students take the entire curriculum, and the condition for positive assessment is that the student has at least 50% of entire curriculum.

The final score (in percentage) is formed on the basis of all activities according to the formula:

Rating (%) = 0.1 * LV + 0.9 * G

wherein the activity is expressed in percentage according to:

LV -percentage obtained by laboratory exercises,
G - percentage obtained by exams of the entire curriculum given in lectures.

The final grade is determined as follows:

Rating Grade
50% to 61% sufficient (2)
62% to 74% good (3)
75% to 87% very good (4)
88% 100% excellent (5)</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the</td><td>Availability via other media</td></tr>
<tr><td>I. Jurić-Grgić: Lectures, FESB</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">A. Maletić: Osnove elektrotehnike, ELMAP, Split, 1993.
R. Wolf: Osnove električnih strojeva, Školska knjiga, Zagreb, 1985.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Evaluation of students presence on lectures
- Evaluation of results in accordance with the above learning outcomes
- Feedback from students via surveys
- Self-evaluation of teachers
- Institutional and non-institutional evaluations</td></tr>
</table>

Other (as the proposer wishes to add)	

NAME OF THE COURSE	**COMPUTER- AIDED ANALYSIS**						
Code	FESE17	Year of study	2				
Course teacher	Damir Vučina, Ph. D., Full Professor	Credits (ECTS)	5				
Associate teachers	Igor Pehnec, Ph. D., Assistant Professor Ivo Marinić- Kragić, Teaching assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	30	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Acquiring theoretical know-how in basic numerical methods in engineering. Developing competences in modeling engineering problems for numerical methods. Developing practical skills in developing Matlab code for engineering problems.		
Course enrolment requirements and entry competences required for the course	Competences acquired in courses Mathematics I, Mechanics I		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After completing the course, students will be able to: • Explain the basic setup of computers, • Describe the procedure of developing programs, • MATLAB language: characterize the properties of syntax elements • Categorize the properties of numerical procedures • Develop flowcharts for simpler problems • Numerically model simpler engineering problems • Create and apply basic methods of numerical analysis for: solving linear systems, nonlinear equations, integration, differentiation, interpolation, approximation • Develop and test own programs in MATLAB		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to computers, binary system, logic functions. Introduction to computer-aided analysis.	2	
	Basics of numerical procedures and analysis, simple algorithms.	2	
	MATLAB - language programming part 1	2	
	MATLAB -language programming part 2	2	
	Developing flowcharts and pseudo-code, part 1	2	
	Developing flowcharts and pseudo-code, part 2	2	

	Elementary numerical procedures and engineering applications (mechanics, fluid mechanics, thermodynamics)	2	
	Engineering application of numerical methods: Solving linear systems	2	
	Engineering application of numerical methods: Solving nonlinear equations and systems.	2	
	Engineering application of numerical methods: Interpolation by polinomials and piecewise polynomials	2	
	First midterm exam		
	Engineering application of numerical methods: Approximation using polinomials.	2	
	Engineering application of numerical methods: Numerical differentiation and integration. Search and optimization-basics.	2	
	Examples of setting up physical and mathematical models for different engineering problems. Development of corresponding algorithms and computer programs in MATLAB.	2	
	Second midterm exam		
	List of laboratory exercises		LE hours
	MATLAB, workspace, compiler, linker. Basic terms of MATLAB, Types, operators, expressions.		2
	Declaring variables, formatted output, data input.		2
	Conditional expressions. Branching, if, if-else, if-else if-...-else		2
	Loops, while(), do-while(), for().		2
	Files, fopen(), fprintf(), fscanf(), load(), dlmread(), dlmwrite()…		2
	Matrix operations. Operators at the level of elements		2
	Functions, declaration, definition, passing arguments		2
	2D and 3D graphics in MATLAB		2
	Introduction to numerical methods. Linear systems		2
	Introduction to numerical methods. Non-linear equations, successive halving and Newton's method		2
	Introduction to numerical methods. Integration, trapezoid quadrature, Simpson's method.		2
	Introduction to numerical methods. Approximation and interpolations.		2
	Numerical methods in MATLAB		2

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	3	Research		Practical training	
	Experimental work		Report		Individual work	2
	Essay		Seminar essay		Laboratory exercises	
	Tests		Oral exam		Preparation for laboratory exercises	
	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

<table>
<tr><td></td><td colspan="3">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.</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>D. Vučina, "Primjena računala u inženjerskoj analizi", Sveučilište u Splitu, FESB, Split, 2007</td><td></td><td></td></tr>
<tr><td>I. Pehnec, materijali za vježbe</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">Željan Lozina, 'Uvod u programiranje', Sveučilište u Splitu, 2005
S. C. Chapra, R.P. Canale, "Numerical Methods for Engineers", McGraw-Hill 2006
G. Lindfield, J. Penny, "Numerical Methods using MATLAB ", Ellis Horwood 1995
W.Cheney, D. Kincaid, ‘Numerical mathematics and computing’, Brooks/Cole 2008</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Evaluation of results in accordance with the above learning outcomes
- Feedback from students via surveys
- Self-evaluation of teachers
- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">THERMODYNAMICS</td></tr>
<tr><td>Code</td><td>FESE05</td><td>Year of study</td><td colspan="5">3</td></tr>
<tr><td>Course teacher</td><td>Frano Barbir, Ph. D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">6</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Ivan Tolj, Ph. D., Teaching assistant</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>45</td><td>0</td><td>30</td><td>0</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5"></td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:
- understanding of the basic concepts and laws of thermodynamics
- application of the concepts and laws of thermodynamics to energy processes and systems</td></tr>
<tr><td>Course enrolment requirements and entry competences</td><td colspan="7">Mathematics 2</td></tr>
</table>

<table>
<tr><td>required for the course</td><td colspan="3"></td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="3">Students will be able to:
- explain the basic concepts and laws of thermodynamics
- apply the concepts and laws of thermodynamics to the different types of a simple technical energy process
- calculate the mass balance and simple balance of different types of energy flows
- calculate the efficiency of the process and energy systems
- link effects of all studied processes by changes in the environment</td></tr>
<tr><td rowspan="19">Course content broken down in detail by weekly class schedule (syllabus)</td><td>Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td>The subject of thermodynamics, two external impacts (work, heat) and pressure, volume and temperature as state functions. State equation of ideal gas.</td><td>3</td><td>2</td></tr>
<tr><td>Two ways to express quantity of the substances. Mixture of ideal gases. Thermal expansion of solids and liquids.</td><td>3</td><td>2</td></tr>
<tr><td>The first law of thermodynamics, internal energy and its connection with measurable state functions. Caloric state equation of ideal gas. Application of the first law on ideal gas.</td><td>3</td><td>2</td></tr>
<tr><td>Isobaric, isochoric, isothermal and adiabatic processes. Polytropic processes. Cycle processes. Otto, Diesel and Carnot cycle. Internal and external non-equilibrium processes.</td><td>3</td><td>2</td></tr>
<tr><td>The second law of thermodynamics. Two consequences of the second law. The analytical expression of the second law for equilibrium processes. Connection of entropy with measurable state functions of ideal gases. The analytical expression of the second law of nonequilibrium processes.</td><td>3</td><td>2</td></tr>
<tr><td>Flow processes. Enthalpy and technical work. The first law of thermodynamics for flow processes. The term for steady work flow process. Damping. Typical technical flow processes with heat exchange without work. The processes with work and without heat.</td><td>3</td><td>2</td></tr>
<tr><td>Real gases – p-V diagrams instead of the state equation Molière h-s diagram and T-s diagram. Using charts and tables. Rankine Clausius cycle with and without steam overheating. The concept of regeneration, efficiency and simplified schemes of steam - power plants.</td><td>3</td><td>2</td></tr>
<tr><td>Knowledge test – first midterm exam</td><td>3</td><td></td></tr>
<tr><td>Cooling power plants cycles and coefficient of performance. The main properties of refrigerants. Heat pumps.</td><td>3</td><td>2</td></tr>
<tr><td>Humid air and h-x diagram. Humid air typical processes.</td><td>3</td><td>2</td></tr>
<tr><td>Fuel combustion. Numerical characterization of the fuel and combustion: heat of combustion, adiabatic combustion temperature and ignition temperature of the fuel. Required air amount. Determination of air excess from the composition of the combustion products.</td><td>3</td><td>2</td></tr>
<tr><td>Heat transfer: three different mechanisms. Heat conduction.</td><td>3</td><td>2</td></tr>
<tr><td>Convective heat transfer. The physical mechanism of convection, heat transfer coefficient and Nu number. The process of determining the heat transfer coefficient</td><td>3</td><td>2</td></tr>
<tr><td>Heat transfer by radiation. The term black body and "black" radiation. Overall heat transfer coefficient, ribs surface. Heat exchangers. Heat exchanger calculations.</td><td>3</td><td>2</td></tr>
<tr><td>Knowledge test – second midterm exam</td><td>3</td><td></td></tr>
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<tr><td>Format of instruction</td><td>☒ lectures
☐ seminars and workshops
☒ exercises</td><td colspan="2">☐ independent assignments
☐ multimedia
☐ laboratory</td></tr>
</table>

	☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ work with mentor ☐ (other)
Student responsibilities		

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research		Practical training	
	Experimental work		Report		Individual work	3
	Essay		Seminar essay		(Other)	
	Tests	1	Oral exam		(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	During semester there are two midterm exams. Upon completion of the semester the first and second final exam are held as well as corrective and commission exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. The midterms are carried out as written tests. The requirement for passing grade is 50 % points on each midterm exam. Grade (in percentage) is formed according to the formula: Grade(%) = (M1+M2)/2 M1, M2 – test results The final grade is determined by applying an absolute way of evaluation. The final grade is determined according to the points as follows: from 50% to 61% of the points score mark (2), from 62% to 74% mark (3), from 75% to 87% of the points mark (4) , from 88% to 100% mark (5) Under Article 71 of the Faculty Statute, the student is required to participate in all forms of teaching and attend lectures and exercises at least 70%. If students do not meet these requirements they will not be allowed to write exams.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	O. Fabris, Osnove Inženjerske termodinamike, Pomorski fakultet Dubrovnik, 1994		

Optional literature (at the time of submission of study programme proposal)	- I. Ninić, Uvod u termodinamiku i njene tehničke primjene, Sveučilište u Splitu, 2007. - F. Bošnjaković, Nauka o toplini I dio, Školska knjiga Zagreb, 1976.
Quality assurance methods that ensure the acquisition of exit competences	- 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	INTRODUCTION TO INFORMATION SYSTEMS						
Code	FESE06	Year of study	3				
Course teacher	Damir Vučina, Ph. D. Full Professor	Credits (ECTS)	4				
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)	L	S	AE	LE	DE
			30	0	0	15	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Capability of applying computers in building information systems. Acquiring knowledge and application skills: HTML, basic terms in databases, basics of SQL, script languages, active web pages, IS
Course enrolment requirements and entry competences required for the course	Completed pre-graduate studies which include courses equivalent to Computer-aided 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 broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction. systems, business processes, information processing	2	
	Information systems IS, MIS, elements of IS	2	
	Information systems IS, functional specifications of IS, architecture of IS	2	
	Infrastructure and devices for the IS, protocols	2	
	Internet, services, www	2	
	Development of content for the web	2	
	Basics of HTML	2	
	Basics of programming, basic elements of programs	2	
	Script languages, Vbscript	2	
	Databases: basic terms and elements of design	2	
	First midterm exam		
	Databases: basics of SQL, IS and databases	2	
	Simple active pages, ASP. Basic concepts of web applications	2	
	Integration of IS elements	2	
	Second midterm exam		
	List of laboratory exercises		LE hours
	Information systems IS modeling, functional specifications of IS		1
	Develop sets of HTML files for the IS		2

	Scripting and Vbscript examples	2
	Databases, modelling, normalization	2
	SQL	2
	Active pages, ASP, applications	2
	Integration of IS	2

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	3	Research		Practical training	
	Experimental work		Report		Individual work	1
	Essay		Seminar essay		Laboratory exercises	
	Tests		Oral exam		Preparation for laboratory exercises	
	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.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	D. Vučina, M. Šušnjar, M. Uvodić 'Uvod u informacijske sustave', internal material		
	Steven Alter, 'Information Systems: Foundation of E-Business		
	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)	• NCSA, 'A Beginner's Guide to HTML', ili ' • HTML - An Interactive Tutorial for Beginners' • MS VBScript Tuturial • MS ASP pages R. Leinecker, 'Using ASP.net', Que, 2002
Quality assurance methods that ensure the acquisition of exit competences	- 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	**MACHINE ELEMENTS**						
Code	FESE03	Year of study	3				
Course teacher	Srdjan Podrug, Ph.D., Associate Professor	Credits (ECTS)	6				
Associate teachers	Vjekoslav Tvrdić, Teaching assistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			45	0	0	0	30
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - understanding of machine elements operation principles and designing basis.	
Course enrolment requirements and entry competences required for the course	Engineering graphics 1 and Engineering graphics 2	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Identify the loads imposed on the machine elements. - Evaluate and apply the necessary safety factor. - Select the criteria for sizing and design of machine elements. - Select machine elements based on the criteria. - Compare fasteners, springs and shafts. - Compare power transmissions.	
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours
Course content broken down in detail by weekly class schedule	Conception and classification of machine elements. Load, stress and strain. Safety factor and allowable stress. Static strength.	3
	Fatigue strength. S-N (Wohler) diagram. Fatigue (Smith) diagram.	3
	Welded joints: conception, procedures, types, labeling, quality, design, calculation	3
	Threaded fasteners: conception and classification, Standard thread forms, materials. Design of the threaded fasteners. Forces and torque acting in bolted joints.	3
	Strength calculation of the threaded fasteners. Pin bolts and dowel pins. Spline shaft connections. Cylindrical and tapered shaft connections.	3
	Springs: classification, stiffness, work and calculation.	3
	Shafts: conception, materials, design, dimensioning, strength calculation.	3

(syllabus)	Bearings. The theory of hydrodynamic lubrication. Journal slider bearings. Design and calculation of journal slider bearings. Materials for bearings. Thrust slider bearings.	3
	Roller bearings. Types and labels. Dynamic and static load rating. Couplings and clutches. Classification. Rigid couplings. Flexible couplings. Friction clutches.	3
	Power transmissions and mechanical drives. Classification. Features and classification of gear drives.	3
	Main rule of toothing. Geometry of cylindrical gears.	3
	Gear loadings. Pitting load capacity. Tooth root load capacity.	3
	Bevel gears. Worm gear drives. Belt transmissions. Chain transmissions.	3
	List of laboratory or design exercises	DE hours
	Design of the tapered shaft connection and of the welded joint	13
	Design of the shaft	13

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	Course attendance and activity (lectures, exercises), machine elements design, studying.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	3	Research		Practical training	
	Experimental work		Report		Individual work	3
	Essay		Seminar essay		(Other)	
	Tests		Oral exam		(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	During the semester, there will be two mid-term exams (tests). The first mid-term, after 7 weeks of classes, and the second after 13 weeks of classes. In the final exams students that did not pass the midterm exams take part. Grade (%) = 0,3K + 0,35(M1 + M2) K - rating from design exercises expressed in percentage, M1, M2 - points of first mid-term exams expressed in percentage, mid-term exams consist of theoretical questions. The requirement for a positive evaluation is the positive assessment of design exercises K >= 45%, the first mid-term M1 >= 45%, and the second mid-term M2 >= 45%. The final grade is determined as follows: Percentage - Rating 50% to 61% - Sufficient (2) 62% to 74% - Good (3) 75% to 87% - Very good (4) 88% 100% - Excellent (5) Students who do not get positive evaluation through mid-term exams take written numerical and theoretical exam.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the	Podrug, S.: Machine Elements – course materials (in Croatian)		e-learning portal

library and via other media)	Jelaska, D., Podrug, S: Design of the Tapered Press Connection and of the Welded Joint (Directions), FESB, Split 2003. (in Croatian)		e-learning portal
	Jelaska, D., Piršić, T., Podrug S.: Shaft Design (Directions), FESB, Split 2007. (in Croatian)		e-learning portal
Optional literature (at the time of submission of study programme	- Jelaska, D: Machine Elements, I part, University of Split, 2007. (in Croatian) - Jelaska, D: Gears and Gear Drives, University of Split, 2011. (in Croatian) - Decker, K.H.: Machine Elements, Tehnička knjiga, Zagreb, 2006. (in Croatian)		
proposal)			
Quality assurance methods that ensure the acquisition of exit competences	- 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)			