University of Rijeka
Faculty of Engineering

CURRICULUM
UNDERGRADUATE UNIVERSITY STUDY OF MECHANICAL ENGINEERING

Rijeka, April 2021

1. CURRICULUM DESCRIPTION

1.1. The list of compulsory and elective courses with the number of active classes required for their performance and ECTS credits

1. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Mathematics I	3	3			6	7
	Statics	3	2			5	6
	Materials I	2	2			4	4
	Electrical Engineering	2	1			3	5
	Computer Applications in Engineering	1		2		3	4
	Engineering Graphics	2			2	4	4
	TOTAL					**25**	**30**

L - lectures, aT – auditory tutorials, lT – laboratory tutorials, dT – design tutorials.

2. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Mathematics II	3	3			6	7
	Kinematics	3	2			5	6
	Strength of Materials I	3	2	1		6	7
	Materials II	2	1			3	5
	Engineering Design	2			3	5	5
	TOTAL					**25**	**30**

3. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Dynamics	2	2			4	5
	Fluid Mechanics	3	2			5	5
	Thermodynamics I	4	2			6	7
	Measurements and Quality Control	2			1	3	5
	Computational Methods	2		2		4	5
	Foreign Language I[1]	1	1			2	3
	TOTAL					**24**	**30**

[1] elective: English or German - free choice

4. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Engineering Statistics	3		1		4	5
	Machine Elements Design I	3			2	5	7
	Hydraulic Machines	2	1	1		4	5
	Production Technologies	3	1			4	5
	Foreign Language II[1]	1	1			2	3
	Professional Practice I						5
	TOTAL					**19**	**30**

5. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Machine Elements Design II	3			3	6	7
	Heat Engines and Devices	2	2			4	5
	Production Machines, Tools, Jigs and Fixtures	2	1	1		4	5
	Technological Processes	2	2			4	4
	Elective Project[2]				3	3	5
Subject from elective group Mechanical Engineering Design:							
	Designing and Product Shaping	2			2	4	4
Subject from elective group Computational Mechanics:							
	Computational Structural Analysis	2		2		4	4
Subject from elective group Technology and Operating Management:							
	Production Management	2			1	3	4
Subject from elective group Thermal Energy and Marine Engineering:							
	Heating Systems	2	2			4	4
	TOTAL					**25**	**30**

[2] election from list of offered projects: Computational Structural Analysis, Computer Methods, Designing and Product Shaping, Dynamics, Engineering Statistics, Fluid Mechanics, Heat Engines and Devices, Heating Systems, Hydraulic Machines, Machine Elements Design I, Machine Elements Design II, Materials I, Materials II, Production Machines, Tools, Jigs and Fixtures, Production Management, Strength of Materials I, Technological Processes,.

6. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Energy Systems	2	2			4	4
	Automation	2	1			3	4
	Organization of Business Systems	2	1			3	4
	Free Elective Subject[3]					3	4
	Final Work						10
Subject from elective group Mechanical Engineering Design:							
	Materials III	2		1		3	4
Subject from elective group Computational Mechanics:							
	Computational Engineering	2			2	4	4
Subject from elective group Technology and Operating Management:							
	Quality Assurance	2	1			3	4
Subject from elective group Thermal Energy and Marine Engineering:							
	Marine Auxiliary Machinery	2	1	1		4	4
	TOTAL					**17**	**30**

[3] election from list of offered subjects

Free Elective Subjects							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Computer Simulations in Engineering	1			2	3	4
	Introduction into Finite Element Method	1		2		3	4
	Energy Sources	3				3	4
	Processes of Heat Treatment	2		1		3	4
	Small Craft Building and Maintenance UN	2	1			3	4
	Basic Ship Dynamics	2	1			3	4
	Introduction to Guidance and Control of Marine Vehicles	2		1		3	4
	Environment Protection	3				3	4

UNDERGRADUATE UNIVERSITY STUDY OF MECHANICAL ENGINEERING TOTAL	Hours	ECTS
	135	180

Basic description		
Course title	**Automation**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Understanding the basic principles of automation and its impact on economic and social development.							
1.2. Course enrolment requirements							
Mathematics I and Mathematics II.							
1.3. Expected course learning outcomes							
Describe the historical development of automation, define the reasons for the introduction of automation and describe the advantages and disadvantages of automation. Define the level of automation and explain the means of automation of manufacturing and service activities. Describe the methods and strategies of automation. Define a methodology for analysis and synthesis of flexible and intelligence systems. Describe the self-organizing system, explain the structure, function, advantages and disadvantages, and describe the evolution of automated devices, machines and systems. Describe case studies of automated devices, machines and systems and define scenarios and strategies of leadership. Describe the current status and development trends of automation and describe barriers to development and forecasting.							
1.4. Course content							
Historical review of the automatic circuits, devices and machines. Ancient and medieval automata. Five levels of automation: assembly, device, machine, system and plant. Automation of manufacturing and service activities. Modern means of automation of production: digital computers, manipulators, robots. Automation strategy. Leading ideas and methodology of synthesis of flexible and intelligent systems. Artificial Intelligence. Self-organizing and autonomous systems. Economic and social aspects of automation of human activities. Selected examples of modern automated machines and systems. Current scientific research projects. Present status and development trends of automation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, activities in the classroom, homework and self-study.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam	0.5	Essay		Research	
Project	1	Sustained knowledge check		Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activities in the classroom, homework, two control written exam and final oral and written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Nikolić, G.: Pneumatics And Hydraulics: Part 1, Pneumatics, Školske novine, Zagreb, 2010. (in Croatian)
Croser, P., Ebel, F.: Pneumatics, Festo Didactic GmbH & Co. 2002.
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien.

1.11. Optional / additional reading (at the time of proposing study programme)

Katalinic, B., Bionic Assembly Systems: Selforganizing Complex Flexible Assembly System, Acta Mechanica Slovaca, Vol. 6, No. 2/2002, pp. 15-20, ISSN: 1335-2393.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Nikolić, G.: Pneumatics And Hydraulics: Part 1, Pneumatics, Školske novine, Zagreb, 2010. (in Croatian)	1	
Croser, P., Ebel, F.: Pneumatics, Festo Didactic GmbH & Co. 2002.	1	
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.	0	
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien	0	

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through a structured quality assurance system of the Faculty.

Basic description		
Course title	**Basic Ship Dynamics**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Introduction to basic methods of dynamic analysis of the ship. Understanding stochastic processes and their application in the ship dynamics. Developing the ability to work in small groups (teamwork).							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Specify the methods of dynamic analysis of the ship. Properly explain, and interpret the basic parameters of the waves as a random process and make a simple statistical analysis of random processes. Explain the energy spectrum and the autocorrelation function and describe the application of Fourier series in the analysis of stochastic dynamic response. Define and solve linear oscillating model of rigid floating bodies motion with one degree of freedom on the sea waves. Itemize and explain the consequences of excessive motion of the ship. Define the types and causes of ship vibrations.							
1.4. Course content							
Introduction to dynamic analysis of ship structures. Single and multi-degree of freedom models. Free oscillations. Forced steady state response. Fourier series: application to frequency response. Introduction to random processes and application in linear systems. Rigid floating body motion in one degree of freedom. Sea wave excitation. Hydrodynamic added mass and damping.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, seminar paper, activity, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Prpić-Oršić J.: Basic ship Dynamics, Faculty of Engineering University of Rijeka, Fintrade &Tours, 2009. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Prpić-Oršić J., Čorić V.: Seakeeping, Zigo, University of Rijeka, 2006. (in Croatian)
Senjanović, I.: Ship vibrations I, University of Zagreb, 1974. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Prpić-Oršić J.: Basic ship dynamics, Faculty of Engineering University of Rijeka, Fintrade &Tours, 2009. (in Croatian)	10	8

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computational Engineering**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Understanding the possibilities for the automation of engineering tasks by programming and connecting used computer programs. Identifying opportunities for implementing such systems. Knowledge of computer tools for creating technical software solutions for preprocessing, visualization and data processing.			
1.2. Course enrolment requirements			
Passed course Computational Methods.			
1.3. Expected course learning outcomes			
Identify opportunities for deploying automation of engineering tasks using high-level programming language. Connect several computer programs by adjusting input-output data. Create advanced data visualizations and other software's output visualizations. Automate the conducting of repetitive engineering tasks and establish systems for their simple optimization.			
1.4. Course content			
Basic programming skills in high-level programming language for software automation, visualization, preprocessing and data processing. Programmable communication between different software. Read and write from a file. Programmable visualization of data. Applying the acquired knowledge on a specific engineering task (project).			
1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other	
1.6. Comments			
1.7. Student's obligations			
Course attendance, consultations, making a project, presenting results, studying.			
1.8. Evaluation of student's work			

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	0.5
Project	1.5	Sustained knowledge check		Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Software manuals and tutorials.

1.11. Optional / additional reading (at the time of proposing study programme)

- Sweigart, A.: Automate the Boring Stuff with Python: Practical Programming for Total Beginners, No Starch Press, 2015.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Software manuals and tutorials	online copies	10

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computational Methods**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Recognize computational problems in mechanical engineering. Understand and apply basic numerical methods. Basic knowledge of Python programming language and associated numerical and visualization modules. Write short computer programs independently and use of existing software to solve numerical problems.		
1.2. Course enrolment requirements		
Mathematics I		
1.3. Expected course learning outcomes		
Recognize the adequate computational methods for given, simpler mathematical formulations of engineering problems. Properly interpret the basic idea of a particular computational method. Correctly interpret the advantages and downsides of a particular computational method. Compare numerical methods applicable to the same type of problem. Apply existing computer programs to simpler problems. Create simple computer programs in Python programming language for individual numerical methods. Evaluate the results of computational methods.		
1.4. Course content		
Engineering examples for nonlinear equations with one unknown. Applicable numerical methods and their comparison. Convergence criteria in iterative methods. Computer programs in Python. Optimization of a variable function with examples from engineering. Appropriate numerical methods and comparison. Computer programs in Python. Examples of engineering for linear equation systems. Appropriate exact and numerical methods and their comparisons. Round-off error. Computer programs in Python. Mechanical engineering examples for curve fitting. Regression, interpolation, and spline curves in computer graphics. Computer programs in Python. Engineering examples for a definite integral. Appropriate numerical methods. Strategies for accuracy improvement of a calculation due to accumulating round-off errors. Computer programs in Python. Engineering examples for ordinary differential equations and systems of ordinary differential equations. Appropriate numerical methods. Local and global errors. Computer programs in Python.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments	-	
1.7. Student's obligations		

Course attendance, mid-term exams, computer knowledge checks.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, mid-term exams, computer knowledge checks, written and/or oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Chapra, S. C., Channale, R. P., Numerical methods for engineers, McGrowHill Inc., 1988
Press, W., et al, Numerical Recipes for C/C++/Pascal/fortran, Cambridge University Press, 1992
Alex Martelli, Python in a nutshell, O'Reilly & Associates Inc., 2003.
Računarsko inženjerstvo uz programski jezik Python, (skripta), Tehnički fakultet, 2018. (electronic edition)

1.11. Optional / additional reading (at the time of proposing study programme)

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1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Chapra, S. C., Channale, R. P., Numerical methods for engineers, McGrowHill Inc., 1988	6	250
Press, W., et al: Numerical Recipes for C/C++/Pascal/fortran, Cambridge University Press, 1992	6	250
Alex Martelli, Python in a nutshell, O'Reilly & Associates Inc., 2003.	1	250
Računarsko inženjerstvo uz programski jezik Python, (skripta), Tehnički fakultet, 2018. (electronic edition)	e-kopije	250

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computational Structural Analysis**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Obtaining knowledge for autonomous stress and strain of analysis of structures applying computational methods.			
1.2. Course enrolment requirements			
Basic knowledge of solid body mechanics.			
1.3. Expected course learning outcomes			
Determine differential equation of bar under axial load. Analyse response of rod-type structures by approximate methods. Determine differential equation of torsion. Analyse torsion problems by approximate methods. Determine differential equation of deflection curve. Analyze bending and buckling of beams by approximate methods. Define finite elements for analysis of beam-type structures under compound loadings. Determine response of frames by finite element method. Design of structures according to the Eurocode. Define models for elastoplastic analysis of beam-type structures. Determine limit-load carrying capacity of beam-type structures.			
1.4. Course content			
Classification of structures. Computational methods in structural analysis. Variational methods. Weight residual methods. Finite difference method. Finite element method. Computer applications. Limit-load carrying capacity of structures.			
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other	
1.6. Comments			
1.7. Student's obligations			
Course attendance, project tasks, studying.			
1.8. Evaluation of student's work			

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	0.5
Written exam		Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, project tasks, written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Brnić, J., Turkalj, G.: "Strength of Materials I" (in Croatian), Zigo, Rijeka, 2006.

1.11. Optional / additional reading (at the time of proposing study programme)

Boresi, A. P., Chong, K. P., Saigal, S.: "Approximate Solution Methods in Engineering Mechanics", John Wiley & Sons,
New York, 2003.
Brnić, J., Čanađija, M.: "Analysis of Solids by Finite Element Method", (in Croatian), Fintrade & Tours d.o.o. Rijeka, 2009.
Sorić, J.: "Introduction into Numerical Methods in Mechanical Engineering", (in Croatian), University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, 2009.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Brnić, J., Turkalj, G.: "Strength of Materials I" (in Croatian), Zigo, Rijeka, 2006.	7	6

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Applications in Engineering**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring knowledge and skills necessary for active participation in an computer aided engineering environment. This primarily refers to acquiring basic knowledge of computer technology and the use of office software, as well as acquiring knowledge of the basics of programming in high-level programming languages.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Adopt the basic concepts of computer technology. Use standard table calculators. Use high-level programming languages for general engineering purposes.							
1.4. Course content							
Basic concepts of computer technology (types of computers, computer hardware, operating systems, Internet, computer security). Tabular calculations. Programming in high-level programming language for engineering needs.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Attendance, class participation, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Continuous knowledge testing, written exam.							

1.10. Assigned reading (at the time of the submission of study programme proposal)

Johnson, S.: Microsoft Office 2007 - Na dlanu, Miš, Zagreb, 2007.
Računarsko inženjerstvo uz programski jezik Python (textbook), Faculty of Engineering, 2018. (e-book)

1.11. Optional / additional reading (at the time of proposing study programme)

Oliphant, T. E.: Guide to NumPy: 2nd Edition, CreateSpace Independent Publishing Platform, 2015.
McGreggor, D. M.: Mastering matplotlib, Packt Publishing, 2015.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Johnson, S.: Microsoft Office 2007 - On the palm of your hand, Miš, Zagreb, 2007. (in Croatian)	1	200
Računarsko inženjerstvo uz programski jezik Python (textbook), Faculty of Engineering, 2018. (e-book)	e-book	200

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Simulations in Engineering**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

General knowledge of computer simulation techniques for technical purposes. Understanding the basis of mathematical modeling. General understanding of basic numerical procedures. Understanding the problem of calibrating the numerical model and the capabilities and limitations of computer simulations. Understanding the differences between numerical and physical models. Adopting simulation results interpretation skills.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Properly interpret the methodology of mathematical modeling. Classify computer models typical of technical systems. Identify the basic types of numerical grids. Explain the entire process of applying computer simulations to solving engineering problems. Apply computer modeling technology in an available software to simpler technical problems.

1.4. Course content

Overview of computer modeling methodology. The procedure of mathematical modeling and numerical methods of solving the model. An overview of the entire process of preparation and implementation of computer simulations and interpretation of results, in specific examples of engineering practice. Getting acquainted with standard engineering software for computer modeling. Conducting simulations in the provided software for specific tasks.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments	-	

1.7. Student's obligations

Attendance, class participation, individual assignment.

1.8. Evaluation of student's work

Course attendance	1.5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam		Oral exam		Essay		Research	
Project	0.5	Sustained knowledge		Report		Practice	

		check					
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing, seminar paper.

1.10. Assigned reading (at the time of the submission of study programme proposal)

User Manuals and Tutorials for engineering software used in the course.

1.11. Optional / additional reading (at the time of proposing study programme)

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1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
User Manuals and Tutorials for engineering software used in the course	online copies	50

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Designing and Product Shaping**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Acquiring competence in correct embodiment design of products in mechanical engineering in regard to manufacturing, maintenance, environment, ergonomics, safety and costs.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Define functional and technological correctnes. Explain guidelines for the correct embodiment design. Detect and on some cases analyze the correctness or incorrectness of the design. Compare manufacturing technologies regarding their advantages and drawbacks. Solve design task through application of corresponding methods and software.			
1.4. Course content			
Design to standards, tolerances and fits. Materials selection. Design for manufacturing - cast, forged, welded, machined, sheet metal and polymeric components. Design for 3D printing technology. Design for ease of assembly, maintenance, transport and storage. Design for ergonomics. Design for environment protection. Design against corrosion damage. Design for safety and noise protection. Design for minimum costs.			
1.5. Teaching methods	X lectures seminars and workshops X exercises long distance education X fieldwork	X individual assignment multimedia and network laboratories mentorship other	
1.6. Comments	–		
1.7. Student's obligations			
Course attendance, activity, solving of program assignments, studying.			
1.8. Evaluation of student's work			

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Program assignments	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, mid-term exams, program assignments, final written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Course materials and lecture notes.

Križan, B.: Osnove proračuna i oblikovanja konstrukcijskih elemenata, Školska knjiga, Zagreb, 2008.

1.11. Optional / additional reading (at the time of proposing study programme)

Bode, E.: Konstruktionsatlas, Vieweg, Braunschweig/Wiesbaden, 1996.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Križan, B.: Osnove proračuna i oblikovanja konstrukcijskih elemenata, Školska knjiga, Zagreb, 2008.	10	40

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Dynamics**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Obtaining theoretical knowledge and develop skills for determination of dynamics characteristics of motion of particles, systems of particles and rigid body. Capability of qualitative and quantitative analysis of basic characteristics of dynamical systems.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and explain Newton's laws and the concept of inertial forces. Define the concept of momentum, angular momentum as well as kinetic energy of a particle and work done by a force and calculate simple examples. Calculate the tasks based on the principles of the change of linear momentum, angular momentum and the principle of kinetic energy of a system of particles. Define the generalized coordinates, and determine the equation of motion using Lagrange's equations of motion of second kind. Analyze the dynamics of systems with variable mass. Define the mass moment of inertia of a rigid body. Classify and compare the methods of experimental testing of the mass moment of inertia of a rigid body. Set up the loads and calculate the dynamic reactions for the rotation of a rigid body around the fixed axis. Calculate and analyze the equation of particles motion and/or rigid bodies in collision. Calculate the center of impact.		
1.4. Course content		
Dynamics of particle. Newton's laws. Inertial and non-inertial coordinate systems. D'Alembert's principle. Momentum and angular momentum. Mechanical work. Kinetic and potential energy. Power. Dynamics of a system of particles. Inertial forces. D'Alembert's principle. Momentum and angular momentum. Motion of the centre of mass. Momentum conservation. Kinetic energy. Mechanical work. Conservation of energy. Virtual work. Lagrange-d'Alembert's principle. Generalized coordinates and Lagrange's equations of motion of second kind. Rigid body dynamics. Mass moments of inertia. Equations of motion of rigid body. Planar motion of rigid body. Calculation of joint reactions and balancing moments for planar mechanisms. Kinetic energy. Energy conservation. Power. Impulse and momentum. Spatial motion of rigid body. Dynamic reactions for the rotation of a rigid body around the fixed axis. Rotation about fixed point of rigid body. Gyroscopic effect. Introduction in the theory of collision.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, 3 constructional exercises, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Krpan, M., Butković, M., Žigulić, R., Braut, S., Franulović, A., Dynamics – Theory and applicacctions, Faculty of Engineering – University of Rijeka, 2001. (in Croatian)
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Beer , F., Johnston, E.R., Cornwell, P.: Vector Mechanics for Engineers: Dynamics, Mc.Graw Hill Education, New York, 2012.
Pustaić, D., Wolf, H., Tonković, Z.: Introduction in analytical mechanics with basics of theory of vibrations, Golden marketing / Tehnička knjiga, Zagreb, 2005. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Žigulić, R., Braut, S.: Dynamics – Theory and applications, Faculty of Engineering – University of Rijeka, 2012. (in Croatian)	16	99
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)	3	99

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Elective Project**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	0+45+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Application of acquired knowledge and skills to solve practical problems in the field of associated course from which the project is elected.			
1.2. Course enrolment requirements			
Enrolled course from which the project is elected.			
1.3. Expected course learning outcomes			
Apply the knowledge and skills from professional content of the associated course. Solve practical task. Acquire competence for individually solving specific professional tasks.			
1.4. Course content			
Chosen chapter of associated course from which the project was elected.			
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other	
1.6. Comments			
1.7. Student's obligations			
Attending the consultation, individually solving task and writing the project report.			
1.8. Evaluation of student's work			

Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	2	Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	3				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam	
Assesses and evaluates the accuracy and completeness of the project task solution and its presentation.	
1.10. Assigned reading (at the time of the submission of study programme proposal)	
References listed for the associated course from which the project is elected.	

1.11. Optional / additional reading (at the time of proposing study programme)		
References listed for the associated course from which the project is elected.		
1.12. Number of assigned reading copies with regard to the number of students currently attending the course		
Title	*Number of copies*	*Number of students*
1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences		
Through the Institution's quality assurance system.		

Basic description		
Course title	**Electrical Engineering**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Mastering basic concepts, postulates and methods of electrostatics, magnetostatics and electrical circuits. Describing behavior of electromagnetic circuits' main components and analysis of electrical circuits.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe and apply basic laws of electrostatics. Define and use basic electric quantities. Apply fundamental laws and methods of DC circuits. Describe and apply basic laws of magnetostatics. Analyse AC circuits. Organize and conduct electric measurements.

1.4. Course content

Electrostatics - basic concepts and laws. Basic concepts and laws of DC circuits. DC circuit analysis - methods and theorems. Magnetostatics - basic concepts and laws. Magnetic materials and circuits. Basic concepts and laws of AC circuits. Three-phase electric system – rotating magnetic field.

1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, homeworks, studying.

1.8. Evaluation of student's work

Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, continuous knowledge testing (homeworks, mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Pinter, V.: Fundamentals of electrical engineering – part I, Tehnička knjiga, Zagreb, 1994. (in Croatian)
Pinter, V.: Fundamentals of electrical engineering – part II, Tehnička knjiga, Zagreb, 1994. (in Croatian)
Đurović, G.: Electrical engineerging I, Školska knjiga, Zagreb, 2004. (in Croatian)
Đurović, G.: Electrical engineerging II, Školska knjiga, Zagreb, 2004. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Šehović, E., Tkalić, M., Felja, I.: Fundamentals of electrical engineering - collection of examples (part 1), Tehnička knjiga, Zagreb, 1987. (in Croatian)
Felja, I., Koračin, D.: A collection of assignments and solved examples from fundamentals of electrical engineering, part 1. and 2., Školska knjiga, Zagreb, 1991. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Pinter, V.: Fundamentals of electrical engineering - part I, Tehnička knjiga, Zagreb, 1994. (in Croatian)	14	
Pinter, V.: Fundamentals of electrical engineering – part II, Tehnička knjiga, Zagreb, 1994. (in Croatian)	10	
Đurović, G.: Electrical engineerging I, Školska knjiga, Zagreb, 2004. , (in Croatian)	11	
Đurović, G.: Electrical engineerging II, Školska knjiga, Zagreb, 2004. , (in Croatian)	10	

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Energy Sources**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+0+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Obtaining theoretical knowledge in the field of energy engineering. Acquiring the basic knowledge required for attending lectures in the field of thermal and energy engineering.							
1.2. Course enrolment requirements							
Basic knowledge of thermodynamics.							
1.3. Expected course learning outcomes							
Describe the energy conversion and compare conventional energy sources. Describe ways of electricity production. Describe the use of nuclear energy and interpret the operation of nuclear power station. Define and describe the types of renewable energy sources. Describe the basic characteristics of hydro power usage. Describe the basic characteristics and ways to use the solar energy. Describe the basic characteristics of wind energy. Describe the basic characteristics of geothermal energy and biomass energy. Describe and compare ways of using environmental heat by heat pumps. Describe how to obtain and utilize the hydrogen as an energy source. Define and describe the basic principles of energy planning and energy policy.							
1.4. Course content							
World energy consumption. Conventional energy sources: coal, oil, natural gas. Energy conversion. Electrical energy. Nuclear power. Renewable energy sources. Energy from water: rivers and lakes, wave power. Solar energy: solar thermal energy, photovoltaic. Wind power. Geothermal energy. Biomass. Heat of environment - heat pumps as renewable energy systems. Hydrogen and fuel cells: technology and usage. Energy planning. Energy policy.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course and fieldwork attendance, seminar work, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam		Oral exam	1	Essay		Research	
Project		Sustained knowledge	1	Report		Practice	

		check					
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course and fieldwork attendance, continuous knowledge testing (two mid-term exams), seminar work, written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Udovičić, B.: Energy Engineering, Školska knjiga Zagreb, 1993. (in Croatian)
Knapp, V.: New Energy Sources, Školska knjiga Zagreb, 1993. (in Cropatian)
Several authors: Renewable Energy Sources, Energetika marketing, Zagreb, 2002. (in Croatian)
World Energy Council – World Energy Resources – 2016, www.worldenergy.org/wp-content/uploads/2016/10/World-Energy-Resources-Full-report-2016.10.03.pdf" i „El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988.

1.11. Optional / additional reading (at the time of proposing study programme)

Duffie, J.A., Beckmann, W.A.: Solar Engineering of Thermal Processes, John Wiley & Sons, NY, 1991.
Granić, G., ... : National Energy Programme, EIHP, Zagreb, 1998. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Udovičić, B.: Energy Engineering, Školska knjiga Zagreb, 1993. (in Croatian)	1	62
Knapp, V.: New Energy Sources, Školska knjiga Zagreb, 1993. (in Cropatian)	1	62
Several authors: Renewable Energy Sources, Energetika marketing, Zagreb, 2002. (in Croatian)	0	62
World Energy Council – World Energy Resources – 2016, www.worldenergy.org/wp-content/uploads/2016/10/World-Energy-Resources-Full-report-2016.10.03.pdf" i „El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988.		62

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Energy Systems**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Acquisition of theoretical knowledge and develop the skills needed to solve technical problems in the design phase, construction and management of energy systems. Developing competencies for project management in the energy sector.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Describe the changes of the working fluid states in energy processes. Draw diagrams of state changes in energy processes. Define and analyze energy and exergy losses in energy processes. Calculate the energy losses and efficiency of the process. Calculate the size of the main energy processes. Develop a basic scheme of energy systems. Define the basic operating parameters and sizes of power systems. Analyze and explain the influential parameters of energy processes. Calculate and explain the operating costs of power plants. Describe ways of increasing the efficiency of energy systems. Describe the sources and ways to reduce environmental pollution in energy plants.		
1.4. Course content		
Thermodynamic fundamental of energy systems. Main characteristics of heat energy. Main characteristics of electrical energy. Efficiency of energy processes. Energy conversion efficiency. Energy systems with the steam process (Clausius – Rankine). Influencing factors on efficiency of steam energy systems. Processes in nuclear power plants. Main parts of nuclear power plant. Types of nuclear power plants. Comparison of nuclear and conventional power plant. Energy systems with gas-turbine process (Joule - Brayton). Efficiency of Joule-Brayton's process. Efficiency improving of gas-turbine process. Combined energy systems. Gas-turbine systems for aero-jet driving. Cogeneration energy plants. Energy system with MHD generator. Energy systems with fuel cells. Techno-economical analysis and comparison of cogeneration systems. Economical analysis of energy plants. Auxiliary systems of energy plants. Environment protection in energy plants. Economic production and rational use of energy.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework	0.25				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing (2 mid-term exams), written or oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Prelec, Z.: Energetics in process industry (book), Školska knjiga Zagreb, 1994. (in Croatian language)

1.11. Optional / additional reading (at the time of proposing study programme)

El-Vakil, M.: Power Plant Technology, Mc Graw Hill Book Company, 2002.
Reay, D., Wright, A.: Inovation for Energy Efficiency, Pergamon Press, 2013.
Nag, P.K.: Power Plant Engineering 4e, Mc Graw Hill Education, 2014.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Prelec, Z.: Energetics in process industry (book), Školska knjiga Zagreb, 1994. (in Croatian language)	10	150

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's system of quality assurance.

Basic description		
Course title	**Engineering Design**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+45+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Understanding of engineering design and familiarization with 2D and 3D geometrical modelling computer techniques.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Anticipate the process of object modelling in accordance with the design intent. Analyze 2D and 3D computer techniques for 2D and 3D object modelling. Plan and create parametric geometry models. Generate 3D object model database and technical documentation.			
1.4. Course content			
Engineering design and application of CAD techniques in 2D and 3D geometry modelling. Geometrical entities and relations, 3D primitives, transformations. Types of 3D CAD models: wireframe, surface and solid model. Parametric modelling. Application of 3D model database. Merging physical and virtual world – new technologies.			
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other	
1.6. Comments	-		
1.7. Student's obligations			
Course attendance and activity (lectures, exercises), constructive work, continuous knowledge testing, studying.			
1.8. Evaluation of student's work			

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio		Constructive work	1.5	Homework			

1.9. Procedure and examples of learning outcome assessment in class and at the final exam
Constructive work, continuous knowledge testing, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2012.
Lecture materials

1.11. Optional / additional reading (at the time of proposing study programme)

T. Kishore: Learn Autodesk Inventor 2018 Basics, Apress, Berkeley, CA, USA, 2017
Randy H. Shih, Parametric Modeling with Autodesk Inventor 2018, SDC Publications, USA, 2017
Dennis K. Lieu, Sheryl A. Sorby: The Fundamentals of Visualization, Modeling, and Graphics for Engineering Design, Delmar cengage learning, 2009.
James Leake: Engineering Design Graphics: Sketching, modeling and visualization, New York: John Wiley&Sons, Inc., 2008.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition	3	120
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2010.	10	120
Lecture materials	web	120

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution´s quality assurance system.

Basic description		
Course title	**Engineering Graphics**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Acquiring knowledge required for the design and interpretation of technical documentation using traditional tools and computer techniques. Developing the ability to visualize and use graphics as a system for engineering communication in which ideas are expressed clearly and in accordance with standards.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define and explain the concept of engineering graphics. Interpret the technical drawing. Select the appropriate shape description method to display the object. Create technical documentation using traditional and CAD techniques in accordance with standards.							
1.4. Course content							
Graphic communications. Traditional and CAD techniques. Role of engineering graphics. Formation of simple geometric bodies and complex objects. Shape description: projection theory, multi-view and cross-sectional drawings, axonometric representations. Standardization and standards. Creation of technical documentation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance and activity (lectures, exercises), constructive works, continuous knowledge testing.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio		Constructive work	1	Homework			
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Constructive works, continuous knowledge testing, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2010.
G. Marunić, J. Butorac, S. Troha: Inženjerska grafika, Zbirka zadataka iz opisa oblika, Zigo Rijeka, Rijeka, 2008.
Krautov inženjerski priručnik, SAJEMA, Zagreb, 2009.
Lecture materials

1.11. Optional / additional reading (at the time of proposing study programme)

D. K. Lieu, S. Sorby: *Visualization, Modelling, and Graphics for Engineering Design*, Delmar Cengage Learning, 2009.
G. R. Bertoline, E. N. Wiebe: *Fundamentals of Graphic Communication*, Mc Graw-Hill, New York, 2005.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition	3	120
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2010.	10	120
G. Marunić, J. Butorac, S. Troha: Inženjerska grafika, Zbirka zadataka iz opisa oblika, Zigo Rijeka, Rijeka, 2008.	10	120
Krautov inženjerski priručnik, SAJEMA, Zagreb, 2009.	6	120
Lecture materials	web	120

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution´s quality assurance system.

Basic description		
Course title	**Engineering Statistics**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	45+15+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Acquiring basic knowledge and skills in probability and statistics needed for solving problems in engineering practice.		
1.2. Course enrolment requirements		
Mathematics I, Mathematics II.		
1.3. Expected course learning outcomes		
Define basic terms in descriptive statistics and perform statistical data analysis. Define and interpret correctly: random, events and probabilities of events. Express and interpret correctly the total probability rule and Bayes theorem. Apply rules for evaluating the probability of intersection and union of events, conditional distributions, total probability and Bayes theorem. Define and interpret correctly random variables, interpret correctly and calculate means and variances. Describe some basic probability distributions, interpret correctly their meaning and use them in typical experiments. Express and understand the central limit theorem. Estimate some parameters of a population or a probability distribution from samples (confidence intervals). Express and interpret correctly basic concept about statistical hypotheses tests, and particularly, explain the concept of goodness of fit test and perform it. Define and interpret correctly basic concepts of random vectors. Determine the linear regression functions for two-dimensional statistical data set and interpret the results correctly.		
1.4. Course content		
Descriptive statistics. Basics of probability theory: events, probability and probability space. Conditional probability. Random variable: probability distribution function, cumulative distribution function, numerical parameters. Standard probability distributions. Central limit theorem. Random vectors. Basics of statistical inference: Estimating parameters. Testing of hypotheses. Goodness of fit test.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity/participation, studying		
1.8. Evaluation of student's work		

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, tests on computer, mid-term exams, tests on computer, written and oral exam

1.10. Assigned reading (at the time of the submission of study programme proposal)

Črnjarić-Žic N., Material of course and solved problems in Engineering statistics, Rijeka 2010. (in Croatian)
Elezović, N., Discrete probability; Random variables; Statistics and processes, Biblioteka Bolonja, Element, Zagreb 2007 (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

J.L.Devore, Probability and statistics for engineering and the sciences, Cengage Learning, 2016,
Pauše, Ž.: Introduction to mathematical statistics, Školska knjiga Zagreb, 1993 (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Črnjarić-Žic N., Material of course and solved problems in Engineering statistics, Rijeka 2010.	110	110
Elezović, N.: Discrete probability, Random variables, Statistics and processes, Biblioteka Bolonja, Element, Zagreb 2007.	3	110

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Environment Protection**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+0+0

1. COURSE DESCRIPTION

1.1. Course objectives

Define the basic concepts of ecology and environmental protection. To analyze the impact of the technological aspects of the environment. Describe the processes that affect pollution. Compare technologies and their impact. Distinguish the development of sustainable development. Argue the importance of sustainable development. Describe the current problems of global pollution. Distinguishing the basic concepts of ecology and environmental protection. Understanding the impact of technology on the environment.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Analyzing the impact of the different engineering aspects of the environment based on research. Developing the ability to work within an interdisciplinary team and communicating with experts in other fields. Developing the ability to create and project management in the field of environmental protection.

1.4. Course content

Introduction to the environment, the subject of ecology. Soil, atmosphere, water and sea. Interaction with the environment. Monitoring of the environment, particularly in the marine environment. Sampling from the environment. Measurement methods of analytical chemistry. Physical methods of measurement. Fluorescent methods. Basics of modelling processes in the environment. Environmental protection. Improving the environment. Ocean Engineering. Marine technology objects and its interaction with the environment. International conventions and norms.

1.5. Teaching methods		
	☒ lectures	☒ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☒ fieldwork	☐ other

1.6. Comments	-

1.7. Student's obligations

Attendance, activity, class participation, research and search the literature sources, making self-employment, consulting, independent learning, presentation of work.

1.8. Evaluation of student's work

Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing, written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Briški, F.: Zaštita okoliša, Fakultet kemijskog inženjerstva i tehnologije, Zagreb, 2016.
Črnjar, M.: Economics and Environmental Policy, Ekonomski fakultet, Rijeka, 2002. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Dobrinić, J., Bonato, J.: Physics, Pomorski fakultet, Rijeka, 2009. (in Croatian)
Reible, D. D.: Fundamentals of Envirenmental Engineering, Springer, London, 1999.
Matas, M., Simonić, V., Šobot, S.: Protection of the Environment today for tomorrow, Školska knjiga, Zagreb, 1989. (in Croatian)
Pandey, G. N., Carney, G. C.: Envirenmental Engineering, Tata McGraw-Hill, New Delhi, 1989

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Briški, F.: Zaštita okoliša, Fakultet kemijskog inženjerstva i tehnologije, Zagreb, 2016.	1	
Črnjar, M.: Economics and Environmental Policy, Ekonomski fakultet, Rijeka, 2002. (in Croatian)	1	

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Final Work**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	10
	Number of hours (L+E+S)	-

1. COURSE DESCRIPTION			
1.1. Course objectives			
The Final Work is an individual assignment and verification of student expertises, which should show the appropriate level of engineering skills for individually solving specific professional task.			
1.2. Course enrolment requirements			
Enrolled course from which the Final Work is selected.			
1.3. Expected course learning outcomes			
Apply acquired knowledge, expertises and skills of the content of Final Work associated course. Solve practical task. Acquire competence for individually solving specific professional task.			
1.4. Course content			
The content of the Final Work is based on the application of acquired knowledge from educational programs at the undergraduate university studies. Final thesis can be specified from a particular course specific professional content and exceptionally from course that belongs to the group of shared content, when it represents a broader entity with a particular course specific content of the studies. Student enrollers the Final Work by enrolling the last semester. Thesis of the Final Work is establishes by Commission for Final Works, based on suggestion of teacher who will mentor the Final Work.			
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other	
1.6. Comments			
1.7. Student's obligations			
Attending the consultation, individually solving task and writing the Final Work report.			
1.8. Evaluation of student's work			

Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	8	Final work in written form	2		

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Assesses and evaluates the accuracy and completeness of a given task solving process, the Final Work written report, and its oral presentation

1.10. Assigned reading (at the time of the submission of study programme proposal)

1.11. Optional / additional reading (at the time of proposing study programme)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Fluid Mechanics**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	45+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Understanding the physical meaning of laws and equations of fluid mechanics and developing students' abilities to solve problems related to the field of fluid mechanics and the development of independent work and projects related to various problems involving fluid mechanics.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and describe fluid properties. Define and describe fluid statics: Euler equation of fluid statics, relative fluid movement, stability, fluid pressure on flat and curved surfaces, buoyancy. Define and describe the basic laws of fluid dynamics: Conservation of Mass - The Continuity Equation, The Linear Momentum and Moment of Momentum Equations with the Bernoulli equation, The Energy Equation with the modified Bernoulli equation. Define and describe laminar and turbulent viscous fluid flow. Apply the basic laws of fluid mechanics to calculate the physical values of the fluid flow, orifice flow, flow through the wide openings, Venturi meter and Pitot-Prandtl tube. Calculate fluid flow losses through a complex pipeline system.		
1.4. Course content		
Introduction to Fluid Mechanics. Basic physical values. Fluid properties. Fluid statics. Euler equation of fluid statics with solutions. Pressure measurement devices. Relative fluid motion. Stability. Fluid forces on flat and curved surfaces. Buoyancy. Fluid kinematics. Velocity and acceleration. Circular motion and discharge. Fluid dynamics. Basic laws of fluid dynamics. Conservation of Mass - The Continuity Equation, The Linear Momentum and Moment of Momentum Equations with the Bernoulli equation, The Energy Equation with the modified Bernoulli equation. Euler equation of motion. Application of the Bernoulli equation: orifices, weirs, Pitot tube, Venturi meter. Viscosity and viscosity measurement. Relation between the laminar and turbulent flow. Dimensional analysis. Real fluid flow. Pipe flow losses. Cavitation. Flow around bodies. Introduction to free surface flow. Introduction to compressible flow.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity, homework, studying.		
1.8. Evaluation of student's work		

Course attendance	2.5	Activity/Participation	-	Seminar paper	-	Experimental work	-
Written exam	1	Oral exam	-	Essay	-	Research	-
Homework	-	Sustained knowledge check	1.5	Report	-	Practice	-
Portfolio	-						

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous knowledge testing (two mid-term exams), written exam

1.10. Assigned reading (at the time of the submission of study programme proposal)

L. Sopta, L. Kranjčević, Fluid Mechanics, skripta. Faculty of Engineering, Rijeka, 2004. (in Croatian)
Bruce R. Munson, D. F. Young, T. H. Okiishi, Fundamentals of Fluid Mechanics, 4th Updated Edition, John Wiley and Sons, 2003.
Streeter, V.L, Wylie E.B., Fluid mechanics, 8th edition, McGraw Hill, 1985.

1.11. Optional / additional reading (at the time of proposing study programme)

Kakac, S., Liu, H.: Heat exchangers, CRC Press, Florida, 2002.
Kays, W.M., London, A.L.: Compact heat exchangers, McGraw-Hill Book Co., NY,1984.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
L. Sopta, L. Kranjčević, Fluid mechanics, skripta. Faculty of Engineering Rijeka, 2004.	network version	120
Bruce R. Munson, D. F. Young, T. H. Okiishi, Fundamentals of Fluid Mechanics, 4th Updated Edition, John Wiley and Sons, 2003.	1	120
Streeter, V.L, Wylie E.B., Fluid mechanics, 8th edition, McGraw Hill, 1985.	1	120

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**English Language I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Students should be able to use general purpose English as well as technical jargon at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level).							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Students should be able to use general English as well as technical English at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately simple diagrams, charts, figures and mathematical formulae. Present the advantages and disadvantages in covered units (e.g. engineering profession, information age, renewable and unrenewable energy sources, etc.). Orally define and explain professional terms covered in texts and write summaries.							
1.4. Course content							
Topics: Engineering profession. Mathematical formulae. General principles of dynamics. Energy and forms of energy. Energy efficiency. Renewable and unrenewable energy sources. Heat and temperature. States of the matter. Heat transfer and conduction. Information age. Fluids and Fluid containments. Grammatical and language structures: Tenses. Passive. Modal verbs. Articles. Nouns. Word formation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class and autonomous learning.							
1.8. Evaluation of student's work							
Course attendance	1	Activity/Participation	0.5	Seminar paper		Experimental work	

Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity, continuous evaluation of knowledge (two tests), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Velčić Janjetić, E. & Badurina Filipin, A.: Radni materijal za engleski jezik I – Strojarstvo/Brodogradnja. 2019.

1.11. Optional / additional reading (at the time of proposing study programme)

Ibbotson, M.: Professional English in Use. Engineering. Cambridge Universtity Press 2009.
Ibbotson, M.: Cambridge English for Engineering. Cambridge University Press 2015.
Dunn, M., Howey, D. & Ilic, A: English for Mechanical Engineering in Higher Education Studies. Garnet Publishing Ltd 2010.
Glendinning, E. H. & Glendinning, N.: Oxford English for Electrical and Mechanical Engineering. Oxford University Press 2001.
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Školska knjiga, Zagreb 1990.
Vince, M.: Intermediate Language Practice. Heinemann ELT. Oxford 1998.
Paterson, K. & Wedge, R.: Oxford Grammar for EAP. Oxford University Press 2013.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: Radni materijal za engleski jezik I – Strojarstvo/Brodogradnja. 2019.	123	123

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**English Language II**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Students should be able to use professional jargon independently, namely communicate with other experts in the field of the engineering profession and in an international environment, at the B2 level of the Common European Framework of Reference for Languages.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Students should be able to use autonomously general English as well as technical English according to the Common European Framework of Reference for Languages (up to B2 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately more complex diagrams, charts, figures and mathematical formulae. Present the advantages and disadvantages in covered units (e.g. materials in engineering, various types of material processing, etc.). Express one's point of view and evaluate solutions of given problems.							
1.4. Course content							
Topics: Materials in engineering (types and properties). Material processing. Heat treatment. Machining. Non-mechanical joints. Engine fundamentals. Cars and new technology. Computer essentials. Electronics and automation. Globalisation. Technology and its influence on society. Grammatical and language structures: Sequence of tenses. Adjectives and comparison of adjectives. Relative Clauses. Participles (-ing/-ed). Gerund and to+infinitive form of the verb. Word formation. Prefixes and suffixes. Conditional clauses.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class and autonomous learning.							
1.8. Evaluation of student's work							
Course	1	Activity/Participation	0.5	Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report/Presentation		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity, continuous evaluation of knowledge (two tests), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Engleski jezik II – Strojarstvo / Brodogradnja* 2020.

1.11. Optional / additional reading (at the time of proposing study programme)

Ibbotson, M.: Professional English in Use. Engineering. Cambridge Universtity Press 2009.
Ibbotson, M.: Cambridge English for Engineering. Cambridge University Press 2015.
Dunn, M., Howey, D. & Ilic, A: English for Mechanical Engineering in Higher Education Studies. Garnet Publishing Ltd 2010.
Glendinning, E. H. & Glendinning, N.: Oxford English for Electrical and Mechanical Engineering. Oxford University Press 2001.
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Školska knjiga, Zagreb 1990.
Vince, M.: Intermediate Language Practice. Heinemann ELT. Oxford 1998.
Paterson, K. & Wedge, R.: Oxford Grammar for EAP. Oxford University Press 2013.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Engleski jezik II – Strojarstvo / Brodogradnja* 2020.	123	123

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**German Language I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Students should be able to use general purpose German as well as technical jargon at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level).							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Students should be able to use general English as well as technical English at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately simple diagrams, charts, figures and mathematical formulae.							
1.4. Course content							
Topics: Engineering profession. Branches of engineering. Studying at the Faculty of Engineering. Mathematical expressions and formulae. Basics of mechanics. Energy and forms of energy. Renewable and unrenewable enrgy sources. Basics of electrical engineering. Electric circuit. Ohm's law. Conductors and insulators. Grammatical and language structures: Tenses. Verbs. Prepositions. Modals. Nouns. Compounds. Word formation. Passive voice. Subbordinate clauses.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class, independent learning.							
1.8. Evaluation of student's work							
Course attendance	1	Activity/Participation	0.5	Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	

Project		Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity/participation, continuous evaluation of knowledge (two tests), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Njemački jezik I.* 2019.

1.11. Optional / additional reading (at the time of proposing study programme)

Steinmetz, M. & Dintera, H.: *Deutsch für Ingenieure*. Ein DaF-Lehrwerk für Studierende ingenieurwissenschaftlicher Fächer. Springer Fachmedien. Wiesbaden 2014.
Fearns, A. & Buhlmann, R.: *Technisches Deutsch für Ausbildung und Beruf.* Lehr- und Arbeitsbuch. Goethe Institut - Verlag Europa-Lehrmittel. Haan-Gruiten 2013.
Štambuk Z./Marinić, D.: *Deutsch und Technik.* Školska knjiga. Zagreb 1993.
Grujoski V./Kovačić D.: *Tekstovi, vježbe i zadaci iz njemačkog jezika za elektrotehničku struku.* Školska knjiga. Zagreb 1997.
Jin, F. & Voß, U.: *Grammatik aktiv A1-B1. Verstehen-Üben-Sprechen*. Cornelsen Verlag. Berlin 2018.
Buscha, A. & Szita, S.: *B-Grammatik. Übungsgrammatik DaF. Sprachniveau B1-B2*. Schubert Verlag. Leipzig 2015.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Njemački jezik I.* 2019.		

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**German Language II**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Students should be able to use professional jargon independently, namely communicate with other experts in the field of the engineering profession and in an international environment, at the B2 level of the Common European Framework of Reference for Languages.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Students should be able to use autonomously general English as well as technical English according to the Common European Framework of Reference for Languages (up to B2 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately more complex diagrams, charts and figures. Present the advantages and disadvantages in covered units (e.g. materials in engineering, various types of material processing, etc.). Express one's point of view and evaluate solutions of given problems.							
1.4. Course content							
Topics: Materials in engineering. Machine elements. Material processing. Mechanical and non-mechanical joints. Man and machines. Electric energy. Conduction and transmission of electric current. Discoveries and inventions. The computer. The internet. Technology and its influence on society. Grammatical and language structures: Relative clauses. Adjectives and comparison of adjectives. Participles. Word Formation. Prefixes and suffixes of nouns and adjectives. General vs. professional language. Conditional clauses.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class, independent learning.							
1.8. Evaluation of student's work							
Course	1	Activity/Participation	0.5	Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity/participation, continuous evaluation of knowledge (two tests), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Velčić Janjetić, E. & Badurina Filipin, A.: Radni materijal za Njemački jezik II. 2020.

1.11. Optional / additional reading (at the time of proposing study programme)

Steinmetz, M. & Dintera, H.: *Deutsch für Ingenieure*. Ein DaF-Lehrwerk für Studierende ingenieurwissenschaftlicher Fächer. Springer Fachmedien. Wiesbaden 2014.
Fearns, A. & Buhlmann, R.: *Technisches Deutsch für Ausbildung und Beruf.* Lehr- und Arbeitsbuch. Goethe Institut - Verlag Europa-Lehrmittel. Haan-Gruiten 2013.
Štambuk Z./Marinić, D.: *Deutsch und Technik.* Školska knjiga. Zagreb 1993.
Grujoski V./Kovačić D.: *Tekstovi, vježbe i zadaci iz njemačkog jezika za elektrotehničku struku.* Školska knjiga. Zagreb 1997.
Jin, F. & Voß, U.: *Grammatik aktiv A1-B1. Verstehen-Üben-Sprechen*. Cornelsen Verlag. Berlin 2018.
Buscha, A. & Szita, S.: *B-Grammatik. Übungsgrammatik DaF. Sprachniveau B1-B2*. Schubert Verlag. Leipzig 2015.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Njemački jezik II.* 2020.		

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**Heat Engines and Devices**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. *Course objectives*		
Obtaining theoretical knowledge and skills about heat engines and devices. Solving exercises from the subject.		
1.2. *Course enrolment requirements*		
Attended course Thermodynamics I.		
1.3. *Expected course learning outcomes*		
Become aware of the role of heat engines and devices in society. Describe and analyze basic types of heat engines and devices. Apply the laws of thermodynamics and fluid mechanics to processes in steam generators, heat turbines, compressors and internal combustion piston engines.		
1.4. *Course content*		
Development, importance and classification of heat engines and devices. Energy sources and consumption. Basic physical values and equations in calculations. The basics of fuel and combustion. Steam generators: description, classification, components, systems, basic calculations. Steam turbines: description, classification, operation principle, velocity triangles, steam expansion. Steam turbine plants: components, process, efficiency, basic calculations. Compressors: classification, piston compressor process, dynamic compressors basics. Gas turbines: application, classification, construction, components. Basic calculations of the steam turbine process. Internal combustion reciprocating engines: principle of operation, components and systems, ideal and real thermodynamic process, working fluid exchange, combustion in the Otto and Diesel engines, boost charging, cooling and lubrication.		
1.5. *Teaching methods*	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. *Comments*		
1.7. *Student's obligations*		
Lectures and excercises attendance, individual learning and excercise solving.		

1.8. *Evaluation of student's work*

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge	1.5	Report		Practice	

		check					
Portfolio							

1.9. *Procedure and examples of learning outcome assessment in class and at the final exam*

Course attendance, continuous knowledge testing (two mid-term exams), written or oral final exam.

1.10. *Assigned reading (at the time of the submission of study programme proposal)*

1.11. *Optional / additional reading (at the time of proposing study programme)*

Prelec, Z.: Marine Steam Generators, Školska knjiga, Zagreb, 1990. (in Croatian)
Giampaolo, A.: Gas Turbine Handbook - Principles and Practice, The Fairmont Press, Inc.,Lilburn, Georgia, 2006.
S. L. Dixon, B. Eng., C. A. Hall: Fluid Mechanics and Thermodynamics of Turbomachinery, Elsevier Inc., 2010.

1.12. *Number of assigned reading copies with regard to the number of students currently attending the course*

Title	*Number of copies*	*Number of students*
		94

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Heating Systems**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Within the course students acquire theoretical knowledge and skills that are required to solve practical problems related to the design and use of building heating devices and systems.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and describe the psychophysical factors that affect human comfort in enclosed spaces. Analyze the influence and explain the use of climate-meteorological data in building energy balance calculations. Comment the influence of thermal properties of building materials and building characteristics on building energy consumption. Calculate energy demand for building heating and domestic hot water preparation. Compare local, central and district heating systems. Explain classification and designs of heat generators for hot water central heating and DHW systems. Define the task and describe designs of the basic elements of heating systems: heating devices; chimneys; piping; circulation pumps; expansion vessels; isolation, control and safety valves and pipe fittings. Apply acquired knowledge to solve practical problems of sizing and selection of the elements and devices of the heating systems.		
1.4. Course content		
Psychophysical factors that affect human comfort in enclosed spaces. Thermal comfort and indoor air quality. Comfort indices. The influence of local climate-meteorological data on design of thermotechnical systems in buildings. Energy performance of buildings. Basics of building physics. Building characteristics. Thermal properties of building materials. Heating demand calculations. Heating systems. Local heating systems. District heating. Hot water central heating systems. Boilers for hot water central heating systems. Chimneys. Heating devices. Piping. Pipe thermal expansion compensation methods. Pipe thermal insulation. Piping design and pressure drop evaluation. Circulation pumps. Valves and pipe fittings. Control and safety equipment for heating systems. Expansion tanks and modules. Domestic hot water (DHW) preparation devices and systems. Use of renewable energy sources in building heating systems. Solar thermal collectors. Heat pumps. Sizing and selection of the elements and devices of heating systems.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous knowledge testing (two mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Bošnjaković, F.: Thermdynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian)
Group of authors: Buildings Energy Certification Handbook, UNDP, Zagreb, 2010. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

P. Donjerković: Basics and Control of HVAC Systems, Vol. I and II, Alfa Zagreb, 1996. (in Croatian)
Labudović, B. et al.: Basics of Heat Pumps, Energetika marketing, Zagreb, 2009. (in Croatian)
Recknagel, Sprenger, Schramek: Heating and Ventilation Handbook, Springer Verlag, München (in German or in Serbian)
ASHRAE: Handbook of Fundamentals, ASHRAE, Atlanta
Strelec V. et al.: Gas Engineering Handbook, Energetika marketing, Zagreb. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Bošnjaković, F.: Thermodynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian)	38	45
Group of authors: Building Energy Certification Handbook, UNDP, 2010. (in Croatian) (free download from www.energetska-efikasnost.undp.hr/images/stories/prirucnici/prircert.pdf)	neograničen	45

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Hydraulic Machines**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
An understanding of hydraulic machinery fundamentals and methods for selection of hydraulic machines in different work regimes. Understanding the limits of hydraulic machinery application, related to cavitation. Understanding the pump operating point. Understanding of the operation of a complex system composed of several turbomachines. Understanding of the operation of water turbines.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and describe hydraulic machines classification. Define and describe the Euler turbine equation and methods for selection of turbomachines. Define, describe and apply dimensional analysis, similarity laws for turbomachinery, model testing and sizing, selection, and performance of turbomachines. Apply acquired knowledge of turbomachines to water turbines (Kaplan, Francis and Pelton), pumps and fans. Define and describe the degree of reactivity, cavitation and NPSH for pumps. Define and analyze numerical fluid flow modelling in turbomachines. Describe and analyze the operation of a system that consists of several turbomachines.		
1.4. Course content		
The definition and classification of turbomachines. The Euler turbine equation. Methods of selecting turbomachines. Dimensional analysis. The similarity theory. Model testing. Typical performance curves. Dimensionless quantities. Kaplan, Francis and Pelton turbines. Pumps. Fans. The operating point, system resistance curve and pump curve. The degree of reactivity. Cavitation. NPSH. Fluid flow modelling in turbomachines. Introduction to turbomachinery fluid flow modeling.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other

1.6. Comments	

1.7. Student's obligations

Attendance, activity, homework, independent learning

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous testing of knowledge (two mid-term exams), final exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Čarija, Z., Hydraulic machines, Tehnički fakultet Rijeka, 2008.- (pdf web release) ,(in Croatian)
Pečornik, M., Hydraulic machines fundamentals, Tehnički fakultet Rijeka, 1977., (in Croatian)
Horvat, D., Water turbines, Tehnička knjiga, 1955., (in Croatian)
Krivchenko, G., Hydraulic Machines: Turbines and Pumps, ISBN 1-56670-001-9, CRC Press, 1994.

1.11. Optional / additional reading (at the time of proposing study programme)

Karassik, Messina, Cooper, Heald: Pump Handbook, ISBN 0-07034032-3 McGraw-Hill, 2001.
Tuzson J.: Centifugal Pump Design, ISBN 0-471-36100-3, John Wiley & Sons, Inc., 2000.
Rouse, H., Engineering Hydraulic, Iowa Institute of Hydraulic Research, 1950.
Raabe, J., Hydraulische Maschinen und Anlagen I, II, III, VDI Verlag, 1970.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Čarija, Z., Hydraulic machines, Tehnički fakultet Rijeka, 2008.- (pdf web release) , (in Croatian)	pdf, web	220
Pečornik, M., Hydraulic machines fundamentals, Tehnički fakultet Rijeka, 1977. (in Croatian)	1	220
Horvat, D., Vodne turbine, Tehnička knjiga, 1955., (in Croatian)	1	220
Krivchenko, G., Hydraulic Machines: Turbines and Pumps, ISBN 1-56670-001-9, CRC Press, 1994.	1	220

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction into Finite Element Method**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills to solve practical problems with the finite element analysis of solids.							
1.2. Course enrolment requirements							
Knowledge of statics and strength of materials.							
1.3. Expected course learning outcomes							
Define stiffness matrix, load vector and finite element equation for basic types of finite elements. To assembly global stiffness matrix, displacement vector and load vector. To apply boundary conditions on the global stiffness matrix. Discretize structure for practical problems. Using finite element method calculate displacement and stress fields for linear structures, planar structures and solids. To asses validity of obtained results.							
1.4. Course content							
Introduction. Application of FEM in solid mechanics. Introduction to the forming of finite element stiffness matrix, load vector and finite element equation. Local and global coordinate systems. Boundary conditions. Structure equation. Basic application in rods, beams, trusses, frames, plates and bodies.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, homework, seminar paper, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework	0.5				
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, activity, homework, seminar paper), written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Brnić, J., Čanađija, M.: "Finite element analysis of solids", Fintrade, Rijeka, 2009. (in Croatian)
Brnić, J.: "Elastomechanics and plastomechanics", Školska knjiga, Zagreb, 1996. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Bathe, K. J.: "Finite Element Procedures", Prentice Hall, Englewood Cliffs, 1996.
Zienkiewicz, O. C., Taylor, R. L.: "The Finite Element Method", Vol. 1, Butterworth-Heinemann, 2000.
Cook, R. D., Malkus, D. S., Plesha, M. E., Witt, R. J.: "Concepts and Applications of Finite Element Analysis", John Wiley & Sons, 2001.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Brnić, J., Čanađija, M.: "Finite element analysis of solids", Fintrade, Rijeka, 2009. (in Croatian)	10	1
Brnić, J.: "Elastomechanics and plastomechanics ", Školska knjiga, Zagreb, 1996. (in Croatian)	13	1

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Guidance and Control of Marine Vehicles**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Mastering the methods and techniques of mathematical modelling and computer simulation of various technical processes. Modelling and simulation for guidance and control of marine vehicles.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
To adopt the basic principles of creating mathematical models of various dynamic systems. To master basic use of Matlab & Simulink simulation software for model creation, simulation and system analysis. To model the system using differential equations and transfer functions. To transform the mathematical model of the system into a graphical representation using block diagrams. To transform the system using the state space representation. To linearize nonlinear systems. To distinguish reference frames for marine vehicle control. To model kinematics and dynamics of marine vehicles. To model environmental loads. To model thrusters for control purposes. To explain principles of guidance, navigation and control of marine vehicles. Do design simple controllers and observers. To simulate created models and interpret the results.							
1.4. Course content							
Introduction to modelling. The types and properties of models. Methods of determining the mathematical models of the systems. Time and frequency domain. First principle system modelling with differential equations. Transfer functions. State space representation. Simulation and system response. Numerical integration methods for systems' simulations. Data driven modelling and empirical models. Types of marine vehicles from a modelling and control point of view. Degrees of freedom. Reference frames. Kinematics and dynamics of marine vehicles. Environmental loads. Thrusters. Guidance and control systems. Sensors. Filtering and estimation. Autopilots. Dynamic positioning systems.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, work on laboratory exercises, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, work on laboratory exercises, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

D.J. Cloud: Applied Modelling and Simulation: An Integrated Approach to Development and Operation, McGraw-Hill, 1998.
N.M.Karayanakis: Advanced System Modelling and Simulation With Block Diagram Languages, CRS Press, 1995.
Kluever, C.A. (2016). Dynamic Systems: Modeling, Simulation, and Control. John Wiley & Sons, Ltd., UK.
Fossen, T.I. (2011). Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons, Ltd., UK.

1.11. Optional / additional reading (at the time of proposing study programme)

A.Cavallo, R. Sctola, F. Vasca: Using Matlab, Simulink and Control System Tool Box: A Practical Approach, Prentice Hall, 1996.
de Silva, C.W. (2018). Modeling of Dynamic Systems with Engineering Applications. CRC Press, USA.
Klee, H., Allen, R. (2017). Simulation of Dynamic Systems with MATLAB and Simulink. 3rd Ed. CRC Press, USA.
Perez, T. (2005). Ship Motion Control - Course Keeping and Roll Stabilisation Using Rudder and Fins. Springer, Germany.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
D.J. Cloud: Applied Modelling and Simulation: An Integrated Approach to Development and Operation	-	20
N.M.Karayanakis: Advanced System Modelling and Simulation With Block Diagram Languages	-	20
Kluever, C.A. (2016). Dynamic Systems: Modeling, Simulation, and Control. John Wiley & Sons, Ltd., UK.	1	20
Fossen, T.I. (2011). Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons, Ltd., UK.	1	20

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Kinematics**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills for determination of kinematic characteristics of motion of particles and rigid body. Capability of qualitative and quantitative analysis of basic characteristics of motion as trajectory, displacement, velocity and acceleration.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define the spatial motion of material particles in Descartes, cylindrical, spherical and natural coordinate system. Calculate the trajectory and components of the velocity and acceleration in different coordinate systems. Transform the velocity and acceleration from one coordinate system to another. Define the degrees of freedom of motion and types of motion of a rigid body. Calculate the velocity and acceleration of translation and rotation about a fixed axis of a rigid body. Calculate the velocity and acceleration of the plane motion of a rigid body by applying analytical and grafoanalytical methods. To analyze the motion of planar mechanisms. Calculate the angular velocity and angular acceleration as well as speed and acceleration in the case of motion of a rigid body about a fixed point. To analyze the general case of motion of a rigid body.							
1.4. Course content							
Kinematics of particles. Position, displacement, velocity and acceleration vectors. Distance vs. time equation. Linear motion. Harmonic and damped oscillation. Dependent motion of the particles. Curvilinear motion. Spatial motion of particles in Descartes, cylindrical, spherical and natural coordinate system. The transformation of velocity and acceleration from one to another coordinate system. Complex motion of particles. Kinematics of rigid bodies. Degrees of freedom. Translational motion. Rotation about a fixed axis. Planar motion of the rigid body. Determination of velocity and acceleration of planar mechanisms. Motion of a rigid body about a fixed point. The general case of motion. Complex motion of a rigid body.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course	2.5	Activity/Participation		Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, 3 constructional exercises, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Žigulić, R., Braut, S.: Kinematics, Faculty of Engineering – University of Rijeka, 2012. (in Croatian)
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Beer , F., Johnston, E.R., Cornwell, P.: Vector Mechanics for Engineers: Dynamics, Mc.Graw Hill Education, New York, 2012.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Žigulić, R., Braut, S.: Kinematics, Faculty of Engineering – University of Rijeka, 2012. (in Croatian)	10	142
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)	10	142

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Machine Elements Design I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+30+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Acquiring theoretical knowledge and skills development in order to understand loads, stresses, types, functions, designs and materials of machine elements, as well as calculation procedures according to standards.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Choose the criteria for dimensioning and design of simple machine elements. Apply standard procedures for the strength calculation of machine elements. Solve given construction problems. Interpret achieved results by sharing information, through presentation and technical documentation.			
1.4. Course content			
Fundamentals of design. Design process. Types of load. Stresses and deformations of machine elements. Steady load. Variable load. Material characteristics. Allowable stresses. Woehler's diagram. Smith's diagram. Stress concentration. Fasteners and joints. Threaded fasteners. Power screws. Pins. Shaft-hub connections. Snap joints. Springs. Welded joints. Soldered joints. Bonded joints. Riveted joints. Axes and shafts.			
1.5. Teaching methods	X lectures seminars and workshops X exercises long distance education fieldwork	X individual assignment multimedia and network laboratories mentorship other	
1.6. Comments	–		
1.7. Student's obligations			
Course attendance, activity, solving of design problems during exercises and at home, studying.			
1.8. Evaluation of student's work			

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project	2	Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance. Written or oral mid-term exams. Continuous assessment of accuracy, precision, completeness and creativity when solving construction design projects. Final written and/or oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Križan, B.: Fundamentals of Calculation and Design of Machine Elements, Školska knjiga, Zagreb, 2008. (in Croatian)
Križan, B.; Franulović, M., Zelenika, S.: Machine Elements Design - Exercises' Collection: Fundamentals, Joints, Shafts and Axels, Rijeka: Tehnički fakultet Sveučilišta u Rijeci, 2012. (in Croatian)
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Decker, K.-H.: Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)
Križan, B.; Basan, R.: Polimeric Machine Elements, Zigo, Rijeka, 2009. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Križan, B.: Fundamentals of Calculation and Design of Machine Elements, Školska knjiga, Zagreb, 2008. (in Croatian)	18	230
Križan, B.; Franulović, M., Zelenika, S.: Machine Elements Design - Exercises' Collection: Fundamentals, Joints, Shafts and Axels, Rijeka: Tehnički fakultet Sveučilišta u Rijeci, 2012. (in Croatian)	35	230
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009. (in Croatian)	35	230

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Machine Elements Design II**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
To develop a capability to calculate, design and apply basic machine elements by means of traditional and computer aided techniques.							
1.2. Course enrolment requirements							
Attended course Machine Elements Design I.							
1.3. Expected course learning outcomes							
Describe couplings. Analyze the operation of a friction clutch. Compare couplings. Describe lubricants. Describe rolling and sliding bearings. Apply rolling bearings. Describe hydrostatic and hydrodynamic lubrication. Apply HS and HD lubrication calculations. Design a sliding bearing with HD lubrication. Compare bearings. Apply knowledge to actual engineering problems.							
1.4. Course content							
Basics of friction and belt drives, their operation and components. Couplings: types, design, dimensioning, application and selection. Compensation couplings. Elastic couplings. Safety couplings. Friction clutches and brakes. Hydrodynamic couplings. Basics of lubrication. Introduction to lubricants. Basics of gear transmission applications. Rolling bearings: types and durability calculation. Sliding bearings: types and load capacity. Design, dimensioning and optimisation of radial sliding bearing with hydrodynamic lubrication. Introduction to piping systems. Seals and sealing.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity during class, oral examinations, mid-term examinations, coursework, individual study.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project	2.5	Sustained knowledge check	0.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance. Verification of individual study by mid-term examinations. Continuous monitoring of accuracy, precision, completeness and creativity of coursework assignments. Oral and/or written final examination.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Kraut's Mechanical Manual (In Croatian), Sajema, Zagreb, 2009.
Obsieger, B., Belt Transmissions (In Croatian), Faculty of Engineering, Rijeka, 2012.
Obsieger, B., Couplings (In Croatian), Faculty of Engineering, Rijeka, 2012.
Obsieger, B., Gear Transmissions (In Croatian), Faculty of Engineering, Rijeka, 2012.
Obsieger, B., Rolling Bearings (In Croatian), Faculty of Engineering, Rijeka, 2012.

1.11. Optional / additional reading (at the time of proposing study programme)

Obsieger, B.: Radial sliding bearing calculation, e-paper (In Croatian)
Flender Technical Handbook, Flender, pdf (internet)
Decker, K.-H., Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (In Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Kraut's Mechanical Manual (In Croatian), Sajema, Zagreb, 2009.	15 (2009 edition); 9 (1997 edition)	100
Obsieger, B., Belt Transmissions (In Croatian), Faculty of Engineering, Rijeka, 2012.	75	100
Obsieger, B., Couplings (In Croatian), Faculty of Engineering, Rijeka, 2012.	75	100
Obsieger, B., Gear Transmissions (In Croatian), Faculty of Engineering, Rijeka, 2012.	75	100
Obsieger, B., Rolling Bearings (In Croatian), Faculty of Engineering, Rijeka, 2012.	75	100

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Marine Auxiliary Machinery**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills to solve practical problems in the field of marine auxiliary machinery.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define elements of ship pipelines and pumps. Analyze pumps in serial or parallel connection and NPSH value. Describe parts and working principle of centrifugal separators. Describe and compare filtering equipment. Describe and compare ship fresh water generators. Describe and compare types of heat exchangers on ships. Describe and compare hydraulic steering gears. Describe parts and design of ship shaft lines. Desribe parts and working principle of marine incinerator.							
1.4. Course content							
Generally on marine auxiliary machinery. Rules for design and maintenance of marine auxiliary machinery. Ship pumps. Heavy fuel oil and lubricating oil centrifugal separators. Filters. Fresh water generators. Marine heat exchangers. Compressors. Types of ship propulsion plants, application and arrangement on ships. Marine steering gears. Shaft line. Marine reduction gears and propulsors.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	1	Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, continuous knowledge testing (two mid-term exams), oral or written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Ozretić, V.: Marine Auxiliary Machines and Devices, Dalmacijapapir, Split, 1996. (in Croatian)
Martinović, D.: Marine Machinery Systems, Digital point, Rijeka, 2005. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Smith, D. W.: Marine Auxiliary Machinery, Butterworths, London, 1988.
Knak, C.: Diesel Motor Ships, Engines and Machinery, Institute of Marine Engineers, 1990.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Ozretić, V.: Marine Auxiliary Machines and Devices, Dalmacijapapir, Split, 1996. (in Croatian)	8	40
Martinović, D.: Marine Machinery Systems, Digital point, Rijeka, 2005. (in Croatian)	3	40

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Materials I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1.COURSE DESCRIPTION		
1.1. Course objectives		
Introduction of different types of materials, their structure, properties and specificities and their application in the engineering.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and analyze types of interatomic and intermolecular bonds and their influence on material properties. Define and analyze the ideal and the real structure of the materials. Explain the influence of crystal structure imperfections on material properties in production and application. Draw and analyze equilibrium two-component phase diagrams and apply them in determination of phase composition and phase amount. Define and explain polymers, polymerization reactions and different classifications of polymer materials. Explain the structure of macromolecules and basic properties and typical application of thermoplastics, thermosets and elastomers. Define ceramic materials and their classification into traditional and technical ceramics. Explain the structure, properties and application of ceramics. Define composite materials and their clasiffication according to the type of reinforcement or type of matrix. Explain the properties and application of polymer-matrix, metal-matrix and ceramic-matrix composites.		
1.4. Course content		
Definition and clasiffication of materials. Trends in the application of technical materials. Structure of matter. Interatomic and intermolecular bonding and properties of materials. Amorphous and crystal structure. Crystal systems. Directional indices and Miller indices. Crystal imperfections. Solid solutions. Intermetallic compound. Metal solidification. Diffusion. Phase diagrams. Cooling curves. Phase transformations. Equilibrium two-component diagrams. Clasiffication of polymer materials. Polymerization. Structure of macromolecules, properties and application of thermoplastics, thermosets and elastomers. Ceramic materials in the engineering. Structure, properties and processing of ceramic materials. Classification, structure, properties and application of composite materials in engineering.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments	-	
1.7. Student's obligations		
Course attendance, participation in teaching, studying.		

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, continuous knowledge testing, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Smokvina Hanza, S., E-Lectures: Materials I, RITEH, Rijeka, 2020. (in Croatian)
Katavić, I., Introduction to materials, Sveučilište u Rijeci, 1997. (in Croatian)
Filetin, T., Kovačiček, F., Indolf, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Askeland, D. R., Wright, W. J., The science and engineering of materials, Boston [etc.]: Cengage Learning, cop. 2016.
Callister, W. D., Jr., Materials science and engineering: An Introduction, John Wiley & Sons, New York, Chichester, etc., 1996.
Raos, P., Šercer, M., Theoretical bases of polymer production, Strojarski fakultet, Slavonski Brod, 2010. (in Croatian)
Filetin, T., Kramer, I., Technical ceramics, FSB, Zagreb, 2005. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Katavić, I., Introduction to materials, Sveučilište u Rijeci, 1997. (in Croatian)	22	155
Filetin, T., Kovačiček, F., Indolf, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)	5	155
Smokvina Hanza, S., E-Lectures: Materials I, RITEH, Rijeka, 2020. (in Croatian)	available on Merlin	155

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Materials II**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**			
1.1. Course objectives			
Student will be informed with production of materials and material properties, same as microstructure characterization. Moreover, student will acquire basic modification methods of alloy properties.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Analyse the application of equilibrium diagrams. Define the relation between microstructure and material properties. Describe the basic properties of materials. Analyse the methods of materials testing. Define the mechanisms and methods of material properties modification.			
1.4. Course content			
Production of metals and alloys. Iron - carbon diagram. Non-ferrous phase diagrams of metals. Microstructure characterisation. Optical microscopy. Electron microscopy. Microstructure and properties of materials. Theoretical and real strength of materials. Basic mechanical properties of materials. Tensile strength test results. Engineering and true stress-strain curve. Ultimate tensile strength. Yield strength. Modulus of elasticity. Hardness. Tribological properties of materials. Mechanisms and methods of alloy properties modification. Corrosion properties of materials. Electrical properties of materials. Magnetic properties of materials. Permanent and non-permanent magnets.			
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other	
1.6. Comments			
1.7. Student's obligations			
Course attendance, homework preparation, studying.			
1.8. Evaluation of student's work			

Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, sustained knowledge check, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Katavić, I., Introduction to materials, RITEH, Rijeka, 2008. (in Croatian)
Schumann, H., Metallographie, VEB Deutscher Verlag fuer Grundstoffindustrie, Leipzig, 1967. (in German)
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)
Ivušić, V., Tribology, Croatian society for materials and tribology, Zagreb, 2002. (in Croatian)
Filetin, T., Kovačiček, F., Indof, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)
Stupnišek, M., Cajner, F., Fundamentals of heat treatment of metals, FSB, Zagreb, 2001. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Askeland, D. R., Wright, W. J., The science and engineering of materials, Cengage Learning, cop., Boston, etc., 2016.
Callister, W. D., Jr., Materials science and engineering: An Introduction, John Wiley & Sons, New York, Chichester, etc., 1996.
Nondestructive Evaluation and Quality Control, ASM Handbook Vol. 17, ASM International, Materials Park, OH, 1991.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Katavić, I., Introduction to materials, RITEH, Rijeka, 2008. (in Croatian)	22	142
Schumann, H., Metallographie, VEB Deutscher Verlag fuer Grundstoffindustrie, Leipzig, 1967. (in German)	3	142
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)	3	142
Ivušić, V., Tribology, Croatian society for materials and tribology, Zagreb, 2002. (in Croatian)	12	142
Filetin, T., Kovačiček, F., Indof, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)	5	142
Stupnišek, M., Cajner, F., Fundamentals of heat treatment of metals, FSB, Zagreb, 2001. (in Croatian)	2	142

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Materials III**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Acquisition of basic knowledge about the types and properties of metallic and non-metallic materials in engineering. Understanding the principles of corrosion protection. Understanding the behavior of materials in thermal processes.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Define the properties and possibilities of application of basic groups of metallic and non-metallic materials in engineering. Describe the mechanisms of metal corrosion. Explain the principles and methods of corrosion protection. Define basic thermal processes of materials. Explain the basic phenomena in thermal processes of metallic materials. Define fracture and deformation. Explain the meaning of fractography.			
1.4. Course content			
Theoretical and real strength of materials. Strengthening mechanisms of metallic materials. Types and trends of application of basic groups of metallic materials in engineering. Types and trends of application of basic groups of non-metallic materials in engineering. Definition and mechanisms of corrosion. Basic methods of corrosion protection. Influence of thermal processes of materials on the structure of metallic materials. Definition of fracture and deformation. Fractography.			
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other	
1.6. Comments			
1.7. Student's obligations			
Course attendance, homework, seminar paper, studying.			
1.8. Evaluation of student's work			

Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, continuous knowledge testing, seminar paper, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Novosel, M., Krumens, D., Ferrous materials. Part II: Structural steels, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 1995. (in Croatian)
Filetin, T., Kovačiček, F., Indolf, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)
Raos, P., Šercer, M., Theoretical bases of polymer production, Strojarski fakultet, Slavonski Brod, 2010. (in Croatian)
Juraga, I., Alar, V., Stojanović, I., Corrosion and coating protection, FSB, Zagreb, 2014. (in Croatian)
Schumann, H., Metallographie, VEB Deutscher Verlag fuer Grundstoffindustrie, Leipzig, 1967. (in Croatian)
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Hertzberg, R. W., Deformation and Fracture Mechanics of Engineering Materials, Wiley, 1996.
Askeland, D. R., Wright, W. J., The science and engineering of materials, Cengage Learning, cop., Boston, etc., 2016.
Corrosion: Materials, ASM Handbook Vol. 13B, ASM International, Materials Park, OH, 2005.
Metals engineering – processes, ASME Handbook, McGraw-Hill Book Co., Inc., New York, etc., 1958.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Novosel, M., Krumens, D., Ferrous materials. Part II: Structural steels, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 1995. (in Croatian)	1	43
Filetin, T., Kovačiček, F., Indolf, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)	5	43
Raos, P., Šercer, M., Theoretical bases of polymer production, Strojarski fakultet, Slavonski Brod, 2010. (in Croatian)	1	43
Juraga, I., Alar, V., Stojanović, I., Corrosion and coating protection, FSB, Zagreb, 2014. (in Croatian)	1	43
Schumann, H., Metallographie, VEB Deutscher Verlag fuer Grundstoffindustrie, Leipzig, 1967. (in Croatian)	1	43
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)	3	43

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Mathematics I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Acquiring basic knowledge and skills in linear algebra and calculus.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define and correctly interpret basic notions in linear algebra, single-variable functions, and single-variable calculus. State and correctly interpret basic results in linear algebra and single-variable calculus. Carry out basic computations with matrices, vectors, determinants; determine solutions of systems of linear equations. Apply vector operations to compute some areas, volumes; determine equations of planes and lines. Compute limit values and derivatives of single-variable functions. Apply integration rules and evaluate indefinite and definite integrals of some function.							
1.4. Course content							
Solving systems of linear equations. Matrices. Determinants. Vectors and analytical geometry in space. Single-variable functions. Limit values and continuous functions. Elementary functions. Derivatives. Indefinite and definite integrals.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity/participation, studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity/participation, sustained knowledge check (mid-term exams, tests), and written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)
Slapničar I.: Mathematics 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Elezović N., Aglić A., Linear algebra - a collection of tasks, Element, Zagreb 1999 (in Croatian)
Zill D., Wright W., Calculus: early transendentals, 4th edition, Jones and Bartlett publishers, 2011.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)	123	123
Slapničar I.: Mathematics 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)	123	123
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)	18	123
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	123

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Mathematics II**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Acquiring basic knowledge and skills in application of calculus for single-variable functions, calculus for multi-variable functions, and ordinary differential equations.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Correctly interpret and apply single-variable calculus. Define and correctly interpret basic notions of multi-variable calculus and ordinary differential equations (ODE). Compute derivatives and some integrals of multi-variable functions, and solutions of some ODE. Compute polynomial approximations; find local extremes of single-variable and multi-variable functions by applying differential calculus. Compute some lengths, areas, and volumes by applying integral calculus. Model vibrations in simple mechanical and electrical systems by applying ODE.							
1.4. Course content							
Applications of single-variable calculus. Multi-variable functions. Partial derivatives, differential calculus for two-variable functions and applications (approximations, local extremes, optimal control problems). Double integral and applications. First order ODE. Higher order ODE. Systems of ODE. Applications of ODE.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity/participation, studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge	2.5	Report		Practice	

		check					
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity/participation, sustained knowledge check (mid-term exams, tests), and written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Slapničar I.: Mathematics 2, Sveučilište u Splitu FESB, Split 2002, online book, (in Croatian)
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Kreyszig E., Advanced Engineering Mathematics, John Wiley & Sons, Inc., 1993
Zill D., Wright W., Calculus: early transendentals, 4th edition, Jones and Bartlett publishers, 2011.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 2, Sveučilište u Splitu FESB, Split 2002, online book, (in Croatian)	123	123
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	123

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Measurements and Quality Control**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Understanding the basis of measurements and quality control. The acquisition of specific skills in methods and techniques of metrology and control. Understanding trends in the development of measurement in production and science.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Interpret basic metrological concepts. Conduct basic measurements in the field of industrial metrology. Error sources in dimensional measurements and calculation uncertainty of measurement results. Analyze, compare and validate the test results. Explain the basic principles of optical measurement techniques and 3D measurement systems. Explain the basic concepts of quality control.							
1.4. Course content							
Development and application of measurement. International System of Units. Base, derived and Non-SI units accepted for use with SI. Anglo-Saxon system of units. Fundamentals of metrology, measuring procedures, measurement error and uncertainty. Measurements and measurement equipment: length, shape, position, displacement, pressure, temperature, force, hardness, roughness, flow, speed, sound and basic electromagnetic quantities. Sensors in process/product control. Optical and opto-electronic measuring devices. 3D contact and non-contact coordinate measuring machines and devices. Testing, verification and calibration of measuring means. Quality control. Planning and documenting measurement. Evaluating measurement results. Quality assessments of products and processes.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, active participation in the course, attendance at laboratory exercises and independent learning.							
1.8. Evaluation of student's work							
Course	1.5	Activity/Participation		Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	3	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Laboratory exercises, sustained knowledge check and final written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

1.11. Optional / additional reading (at the time of proposing study programme)

Zaimović Uzunović, N.: Mjerna tehnika, Mašinski fakultet u Zenici, Zenica, 2006.
Jay L. Bucher: The Metrology Handbook, ASQ Quality Press, 2004.
Smith, G. T.: Industrial Metrology, Springer, 2002.
Bašić, H.: Mjerenja u mašinstvu, Mašinski fakultet, Sarajevo, 2008.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Organization of Business Systems**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Acquiring theoretical concepts and knowledge of the organization and business economics.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Explain the concept of a business system and raising the business system. Define the basic principles of organization. Define the manageability of systems and information in a business system. Distinguish organizational forms of business systems. Analyze the types of organizational structures. Analyze job evaluation. Distinguish ownership, management and leadership. Distinguish formal from the informal organization. Define the principles of management and leadership. Analyze teamwork. Define business policy. Describe the principles and methods of planning. Define long-term and short-term plans. Define the factory as an economic system. Analyze income and expenses. Know the basic financial statements. Define business effects. Explain the resources of the organization and analyze competitiveness.							
1.4. Course content							
Definition and evolution of business system organization. Organizational forms of business systems. Building a business system. Basic principles of organization. System manageability. Formal and informal organization. Information in the business system. The behavioural approach in organizational theory. Types of organizational structures. Designing a business system organization. Organizational changes. Job evaluation. Property. Management. Leadership. Teamwork. Business politics. Planning. Long-term and short-term business system plans. Factory as an economic system. Revenues and expenses. Profitability threshold. Finance reports. Business effects. Organizational resources and competitiveness.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, class participation, independent learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, class activity, continuous assessment, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

T. Mikac, M. Ikonić.: Organizacija poslovnih sustava, Tehnički fakultet Sveučilišta u Rijeci, online script in Croatian, Rijeka, 2011.

1.11. Optional / additional reading (at the time of proposing study programme)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Processes of Heat Treatment**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Student will be familiar with the processes of heat treatment and surface engineering.							
1.2. Course enrolment requirements							
Attended course Materials II.							
1.3. Expected course learning outcomes							
Analyse the basic knowledge related to the heat treatment. Analyse the transformations and basic processes of heat treatment of steel. Analyse the basic processes of heat treatment of non-ferrous metals. Analyse the surface heat treatment processes of alloys. Analyse the processes of surface engineering. Define the processes of heat treatment and surface engineering on the basis of construction and technological requirements.							
1.4. Course content							
Heat treatment of steel: hardening, stress relief, tempering, normalizing. Surface hardening processes: induction (high frequency) hardening, flame hardening. Diffusion treatments: carburizing, nitriding, boronizing. Isothermal tempering of ductile iron. Heat treatment of non-ferrous metal alloys. Nitriding. Plasma carburising, ion carburising. Surface engineering processes. Chemical vapor deposition (CVD). Physical vapor deposition (PVD). Methods for the application of thin layers by spraying technologies: thermal, electric arc, plasma, explosion.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, homework preparation, preparation for participation in teaching, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	1	Oral exam		Essay		Research	

Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, sustained knowledge check, preparation of seminars, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Smoljan, B., Heat treatment of steel, gray and ductile iron castings, Zagreb: Hrvatsko društvo za toplinsku obradbu i inženjerstvo površina, Udžbenici Sveučilišta u Rijeci, 1999. (in Croatian)
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)
Krumes, D., Heat treatment, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod 2000. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Heat Treating, ASM Handbook Vol. 4, ASM International, Materials Park, OH, 1991.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Smoljan, B., Heat treatment of steel, gray and ductile iron castings, Zagreb: Hrvatsko društvo za toplinsku obradbu i inženjerstvo površina, Udžbenici Sveučilišta u Rijeci, 1999. (in Croatian)	4	46
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)	6	46
Krumes, D., Heat treatment, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod 2000. (in Croatian)	1	46

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Production Machines, Tools, Jigs and Fixtures**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Assuming with basic terms and characteristics of machine tools. Ability to solve problems from machine tools simulation and tools, jigs and fixtures design for real examples. Developing working skills in small groups.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define basic machine tools structural elements and classified machine tools. Analyse control systems on machine tools. Analyse technical-technological characteristics of machine tools. Explain basic design of tools, jigs and fixtures. Analyse examples of metal cutting tool design. Analyse examples of tool holders and fixtures. Define modular manufacturing systems and flexible manufacturing cells. Describe machining centers, special machining tools. Specify of basic of high dynamic machining tools. Describe clamping systems, storage, tools and workpiece transportation. To apply software in machine tool simulation.							
1.4. Course content							
Basic terms, classification and development of machine tools. Review and characteristics of basic structural elements of machine tools. Static and dynamic stiffness of machine tools. Main and feed drives. Measuring systems on machine tools. Review of control systems on machine tools. Basic of NC programming. Technical-technological characteristics of following group of machine tools: lathe, milling machine, drilling machine, planers, grinding machine, saw machine, threads and gear cutting machine. Machining centers. Flexible manufacturing cells and manufacturing systems. Modular manufacturing systems and transfer lines. Trends in development of machine tools and additional equipment. Basic of cutting tool geometry. Cutting tool and fixture materials. Basic principle of cutting tools and work holding devices. Classification and design of jigs and fixtures.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Class attendance and activity, homework and independent learning.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework's	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Class attendance and activity, homework, continuous knowledge assessment, and written and/or oral examination.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Hriešik, A.: Jurković, Z.: *Production Equipment – Vol. 1*, Tehnički fakultet Rijeka, 2003. (in Croatian)
Tadić, B., Vukelić, Đ., Jurković, Z.: *Tools, Jigs and Fixtures*, ISBN: 978-86-6335-000-7, Fakultet inženjerskih nauka u Kragujevcu, Kragujevac, 2013. (in Serbian)
Grizelj, B.: *Tools, Jigs and Fixtures*, ISBN: 953-6048-26-4, Strojarski fakultet u Sl. Brodu, 2004. (in Croatian)
Cebalo, R.: *Machine Tools*, ISBN: 953-96501-0-0, Zagreb, 2000. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Cebalo, R.: *Machining Systems*, ISBN: 953-96501-4-3, Zagreb, 2000. (in Croatian)
Pahole, I., Balič, J.: *Machine Tools*, ISBN: 86-453-0522-6, Fakulteta za strojništvo, Maribor, 2003. (in Slovenian)
Kopač, J.: *Machine Tools – Vol. 1*, ISBN: 961-6238-32-9, Fakulteta za strojništvo, Ljubljana, 2001. (in Slovenian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Hriešik, A.: Jurković, Z.: *Production Equipment – Vol. 1*, Tehnički fakultet Rijeka, 2003. (in Croatian)	1	100
Tadić, B., Vukelić, Đ., Jurković, Z.: *Tools, Jigs and Fixtures*, ISBN: 978-86-6335-000-7, Fakultet inženjerskih nauka u Kragujevcu, Kragujevac, 2013. (in Serbian)	12	100
Grizelj, B.: *Tools, Jigs and Fixtures*, ISBN: 953-6048-26-4, Strojarski fakultet u Sl. Brodu, 2004. (in Croatian)	2	100
Cebalo, R.: *Machine Tools*, ISBN: 953-96501-0-0, Zagreb, 2000. (in Croatian)	1	100

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Production Management**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Qualification for analyzing influential factors of production, understanding the principles of production planning and management.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define the structure of the business system. Distinguish factors of organization of production function. Analyze organizational types of industrial production. Define quantitative methods of production. Analyze the position of the operational preparation department in the production function. Distinguish the types and content of operational preparation work. Explain the organizational structure of the operational preparation department. Define the concept of operational production management. Distinguish between construction and technological documentation. Compare the basic models and logics of the production management process. Define production planning. Explain the types and content of production plans. Distinguish operational planning methods. Describe the basic features of the MRP II concept. Define the launch and monitoring of production and inventory management. Describe the content of CIM and the structure of an integrated information system.		
1.4. Course content		
Introductory basic concepts. Influencing factors on the organization of the production function. Organizational types of industrial production. Quantitative ways of production. Position of operational preparation department in the production function. Type and content of operational preparation work. The organizational structure of operational preparation. Definition of the concept of operational production management. Basic factors of production management. Basic constructional and technological documentation. Basic models and logic of the production management procedure. Production planning. Types and content of production plans. Operational planning methods. Basic features of the MRP II concept. Launch and monitoring of production. Inventory management. CIM. CAPPC within the CIM. The structure of an integrated information system. Production management software features.		
1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Class attendance, class participation, participation in construction exercises, seminars preparation and independent learning.

1.8. Evaluation of student's work

Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, class participation, seminar preparation, continuous assessment, written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Mikac, T.: Planiranje i upravljanje proizvodnjom, on-line script, Tehnički fakultet Rijeka, Rijeka, 2016. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Vollmann, T.E.; Berry, W.L.; Whybark, D.C.: Manufacturing planning and control systems, Irwin Inc., Chicago, 1999.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Production Technologies**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	45+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Introduction to the basics of analyzed production technologies / processes and their application, and training to select the most appropriate production process with regard to economic aspects and the quality of the finished product, to perform calculations and to specify the technological parameters.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
To identify and to describe the production technologies / processes and their application. To interpret the physical fundamentals of the analyzed production processes. To interpret the selection criteria of production processes. To apply the basic calculations of technological parameters. To analyze the characteristics of different production processes. To assess the advantages and limitations of different production processes with respect to the application area. To select the most appropriate process with regard to economic aspects and the quality of the finished product.							
1.4. Course content							
Significance, development and classification of production technologies. Casting processes: expendable-mould and permanent-mould processes. Forming processes: bulk deformation, sheet metalworking, special and non conventional processes. Machining processes: conventional and non conventional processes. Joining processes. Powder metallurgy processes. Ceramics and glass forming processes. Polymer processing methods. Additive manufacturing processes. Competitive aspects of production.							
1.5. Teaching methods	☒ lectures ☒ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☒ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Course attendance, homework, control tasks, preparation and presentation of seminar, independent learning.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge	1	Report		Practice	

		check					
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, sustained knowledge check, seminar paper, written and / or oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Katavić, I.: Foundry, Tehnički fakultet Sveučilišta u Rijeci, 2001. (in Croatian)
Duplančić, I.: Metal Forming Processes, Fakultet elektrotehnike, strojarstva i brodogradnje Sveučilišta u Splitu, 2007. (in Croatian)
Cukor, G.: Calculations in Metal Cutting, internal script, Tehnički fakultet Sveučilišta u Rijeci, 2014. (in Croatian)
Cukor, G.: Metal Cutting, internal script, Tehnički fakultet Sveučilišta u Rijeci, 2021. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Kalpakjian, S., Schmid, S.R.: Manufacturing Processes for Engineering Materials, 4th ed., Prentice Hall, 2003.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Katavić, I.: Foundry, Tehnički fakultet Sveučilišta u Rijeci, 2001. (in Croatian)	5	125
Duplančić, I.: Metal Forming Processes, Fakultet elektrotehnike, strojarstva i brodogradnje Sveučilišta u Splitu, 2007. (in Croatian)	2	125
Cukor, G.: Calculations in Metal Cutting, internal script, Tehnički fakultet Sveučilišta u Rijeci, 2014. (in Croatian)	100	125
Cukor, G.: Metal Cutting, internal script, Tehnički fakultet Sveučilišta u Rijeci, 2021. (in Croatian)	100	125

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Professional Practice I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	-

1. COURSE DESCRIPTION							
1.1. Course objectives							
Student verifies and complements his own expertise, along with a comprehensive view of the work process.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Apply acquired knowledge and skills from studied courses professional content. Gain working process experience. Develop and further improve competence for solving specific professional engineering problems.							
1.4. Course content							
Industrial practice within Undergraduate University Study of Naval Architecture is carried out individually in work organization that is engaged in the student's field of study, and with activities in accordance with the Industrial Practice Rules and Study Program curriculum. Within such practice, student is familiarized with the corresponding jobs that are studied through programs of education, with the task of verifying and complementing their own expertise, along with a comprehensive view of the work process.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Conducting professional practice in duration of 15 working days, or 120 hours, and writing the corresponding report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report	1	Practice	4
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Assesses and evaluates student work and dedication, and written report.							

1.10. Assigned reading (at the time of the submission of study programme proposal)
1.11. Optional / additional reading (at the time of proposing study programme)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences
Through the Institution's quality assurance system.

Basic description		
Course title	**Quality Assurance**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
The course is designed to provide the student with basic knowledge in quality assurance topics. Through exercises students are introduced with practical application of several course objectives.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
To interpret the meaning and importance of quality assurance. Explain the basic concepts of quality assurance and quality control. Classify quality characteristics of products, processes and services. Quality cost analysis. Interpret basic requirements of ISO 9001 standard. Apply basic quality tools. Assess results of statistical process control. Analyse R%R of measurement system. Measure process reliability and select acceptance sampling.							
1.4. Course content							
Definitions of quality. Quality of products, processes and services. Quality costs. Economical level of quality. Optimal quality. Quality inspection. Quality assurance. International quality standards ISO 9000. Quality management. Total quality. Planning for quality. Quality improvement. Quality engineering. Method and tools for quality assurance and improvement. Cause-and-effect relationships. Causes of quality variability. Statistical process control methods. Common probability distributions. Control charts. Products and processes quality assessment methods. Quality of measurement system. Acceptance sampling. Reliability.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Course attendance, active participation in the course, attendance at laboratory exercises and independent learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Sustained knowledge check and final written exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

1.11. Optional / additional reading (at the time of proposing study programme)

Juran, J. M., Gryna, F. M.: Planiranje i analiza kvalitete, Mate, Zagreb, 1999.
Montgomery, D.C., Jennings, C. L., Pfund, M. E.: Managing, controlling, and improving quality, John Wiley & Sons Wiley, 2011.
Bilić, B.: Kvaliteta-planiranje, analiza i upravljanje, FESB, 2016.
Kondić, Ž., Maglić, L., Pavletić, D.: Kvaliteta 1, 2, 3, Sveučilište Sjever, Strojarski fakultet Slavonski Brod, Tehnički fakultet Sveučilišta u Rijeci, 2018

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Small Craft Building and Maintenance UN**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
The acquisition of specific competencies dealing with the small craft building and maintenance. Acquiring the skills of independent work and developing the ability to present the achieved results.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Distinguish materials for the building of small crafts. Describe the methods for building small crafts of wood and wooden materials, plastics and metals. Describe the installation of propulsion engine with associated systems. Describe the work on the interior and exterior outfitting of small crafts. Describe the works on maintenance and repair of small crafts. Describe the places for building, maintenance and winter storage of small crafts and facilities for retrieving, lifting/launching and hauling of small crafts.							
1.4. Course content							
Materials for building the small crafts: wood, wooden laminate, single-skin FRP laminate, cored FRP laminate, steel, aluminum alloys, other materials. Durability and protection of materials. Building of traditional wooden small crafts. Building of plywood small crafts. Building of small crafts using the WEST technique. Building of FRP small crafts. Building of steel small crafts. Building of aluminum small crafts. Building small crafts of other materials. Installation of engines and related systems. Small craft interior and exterior outfitting. Sailboat rigging. Maintenance and repair of small crafts. Places for building, maintenance and winter storage of small crafts. Facilities for retrieving, lifting/launching and hauling of small crafts.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance at lectures, seminar work with presentation, self learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge		Report		Practice	

		check					
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance at lectures, seminar work with presentation, written examination.

1.10. Assigned reading (at the time of the submission of study programme proposal)

du Plessis, H.: Fibreglass Boats, International Marine, Camden, 1996.
..., The Gougeon Brothers on Boat Construction-Wood and WEST System Materials, The McKay Press, Inc., Midland, 1985.
Pollard, S.F., Boatbuilding with Aluminum, International Marine, Camden, 1993.

1.11. Optional / additional reading (at the time of proposing study programme)

Calder, N. *Boatowner's Mechanical and Electrical Manual*, International Marine, Camden, 1996.
Warren, N., *Metal Corrosion in Boats*, Adlard Coles Nautical, London, 1998.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
du Plessis, H.: Fibreglass Boats, International Marine, Camden, 1996.	1	19
..., The Gougeon Brothers on Boat Construction-Wood and WEST System Materials, The McKay Press, Inc., Midland, 1985.	1	19
Pollard, S.F., Boatbuilding with Aluminum, International Marine, Camden, 1993.	1	19

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution’s quality assurance system.

Basic description		
Course title	**Statics**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Obtaining theoretical knowledge and develop skills to solve practical problems in the field of statics.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define force, moment for a point and an axis, couple of forces and resultant of a force system. Solve problem of system of forces in a plane and space: colinear, concurrent and general systems. To simplify system of forces in a plane. Determine equilibrium conditions. Decomposition of forces in a plane. Determine the central axis of force system in space. Determine centroids of lines, areas and bodies. Apply Pappus-Guldin theorems. Define various types of beams, possible loads and internal forces. To solve trusses. To solve beams, frames and curved beams: equilibrium and internal forces diagrams. Solve problems that include sliding and rolling friction. Solve statics problems by the application of the virtual work principle.		
1.4. Course content		
Colinear system of forces. Concurrent, parallel and general system of forces in a plane. Determination of resultant of forces and equilibrium conditions in a plane. Moment of a force about a point. Varignon's theorem. Couple of forces and properties. Separation of a force into three components. Concurrent, parallel and arbitrary system of forces in a space. Determination of resultant of forces and equilibrium conditions in a space. Separation of force into three noncoplanar components. Moment of a force about a given axis. Reduction of arbitrary spatial system of forces. Axis of wrench. Centres of gravity: lines, surfaces, bodies. Pappus-Guldin theorems. Types of equilibrium. Trusses, beams, frames and curved beams. Sliding friction and rolling friction. Virtual work in statics.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments	-	
1.7. Student's obligations		
Course attendance, activity, homework, studying.		

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Brnić, J.: "Statics", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)
Brnić, J.: "Mechanics and structural elements ", Školska knjiga, Zagreb, 1996. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Matejiček, F., Semenski, D., Vnučec, Z.: "Introduction to Statics", Golden Marketing, Zagreb, 1999.(in Croatian)
Beer, F. P., Johnston, E.R., Eisenberg, E.R.:"Vector Mechanics for Engineers: Statics", McGraw-Hill, 2003.
Gross, D., Hauger, W., Schröder, J., Wall, W.A., Rajapakse, N.: Engineering Mechanics 1 – Statics, Springer, 2013

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Brnić, J.: "Statics", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)	12	140
Brnić, J.: "Mechanics and structural elements", Školska knjiga, Zagreb, 1996. (in Croatian)	14	140

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Strength of Materials I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Developing theoretical knowledge and skills for determining dimensions, loading capacities and materials of engineering structures.							
1.2. Course enrolment requirements							
Basic knowledge of statics of rigid bodies.							
1.3. Expected course learning outcomes							
Define the basic assumptions and notions in structural mechanics. Recognize loading types of structural elements. Define notions of stress and strains. Define the concept of stress and strain. Determine Cauchy's stress equations. Explain tensile test and define Hooke's lawCalculate extreme normal and shear stresses at uniaxial and planar stress states. Determine Mohr's stress and strain circles. Define Hooke's law for planar stress conditions. Determine membrane stresses in thin-walled pressure vessels. Calculate the strain and stress in structural elements subjected to axial loading, direct shear and torsion. Calculate the cross-section properties and determine Mohr's circle of inertia. Explain theories of failure. Determine equivalent stress for biaxial and triaxial stress conditions. Define types of bending of straight beams, analyze shearing force and bending moment diagrams, determine strains and stresses. Determine deflection line of straight beams. Calculate strains and stresses of structural members subjected to combined loadings. Determine and analyse distribution of internal forces, strains and stresses at curved beams. Determine buckling loads of elastic and inelastic columns.							
1.4. Course content							
Introduction. Simple and combined loadings. Axial loading. Direct shear. Stress and strain. Torsion. Geometric properties. Theories of failure. Bending of beams. Deflection curves. Unsymmetric bending. Eccentric loading. Bending and torsion. Curved beams. Buckling of columns.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, laboratory exercises, final exam, self-studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	0.5

Written exam	1.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance. Continuous knowledge testing. Laboratory exercises. Written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

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1.11. Optional / additional reading (at the time of proposing study programme)

Brnić, J., Turkalj, G.: "Strength of Materials I" (in Croatian), University of Rijeka, Faculty of Engineering, Rijeka, 2004.
Brnić, J., Turkalj, G.: "Strength of Materials II" (in Croatian), Zigo, Rijeka, 2006.
Alfirević, I.: "Strength of Materials I" (in Croatian), Tehnička knjiga, Zagreb, 1995.
Šimić, V.: "Strength of Materials I" (in Croatian), Školska knjiga, Zagreb, 1992.
Gross, D., Hauger, W., Schröder, J., Wall, W.A., Bonet, J.: "Engineering Mechanics 2", Springer, 2011.
Gere, J. M.: "Mechanics of Materials", Brooks/Cole – Thomson Learning, Belmont, CA, 2004.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
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-	-	-

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Technological Processes**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Introduction to fundamental concepts in the production area. Knowing the features of the process and the impact on the setting process. Positive effects of simultaneous engineering. Introduction to the elements defining and managing processes and procedures rationalization and optimization processes.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define the basic concepts in the area of production (manufacturing process, technological process, technology, technology legality, technological discipline, machining system, production system, machining cycle, production cycle). Define the features of process and interpret their impact on the settings of process. Define the types of production and interpret the influence of the type and mode of the technological process and its settings. Explain the impact of the performance of the product in the process - techno logicality. Analyse of product parts techno logicality's elements.		
1.4. Course content		
Introduction. The manufacturing process and technological process, technological chains. Machining cycle and production cycle. Machining system. Production system - the basic models. Other basic concepts. Optimal technological process. Reliability processes. Definition of technological process. Influence of production type and ways of keeping production in the setting process. Impact performance in the process - techno logicality. Technological analysis of products and parts. Simultaneous engineering. Operation. The impact on the structure of the process. Preparation and clearing job. Stages of development processes, technological documentation. The parameters of the process. Optimisation of process parameters - the impact of job characteristics. Categories of time in defining operation. The choice of input materials - variant processes. Technological bases. Production equipment. Operating funds. Roles of special tools - economic justification for the application. Group technology - the impact of the rationalization of production and preparatory activities.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, class participation, homework, self-learning.		

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance and activity on teaching, homework, continuous knowledge check and written and/or oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Gačnik, V., Vodenik, F.: Technological Processes Design, Zagreb 1990. (in Croatian)
Curis, M.A.: Process Planning, New York, 1988.
Jurković, M., Tufekčić, D.: Tehnological Processes, Design and Modelling, Tuzla, 2000. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Mueller, G.: Gleichungen fuer Technologen. Veb Verlag Technik. 1988.

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Gačnik, V., Vodenik, F.: Technological Processes Design, Zagreb 1990. (in Croatian)	4	102
Curis, M.A.: Process Planning, New York, 1988.	1	102
Jurković, M., Tufekčić, D.: Tehnological Processes, Design and Modelling, Tuzla, 2000. (in Croatian)	3	102

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.

Basic description		
Course title	**Thermodynamics I**	
Study programme	**Undergraduate University Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	60+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Obtaining theoretical knowledge and develop skills to solve practical problems in the field of thermodynamics. Acquiring the knowledge required for attending lectures in the field of thermal and energy engineering.		
1.2. Course enrolment requirements		
Attended courses Mathematics I and Mathematics II.		
1.3. Expected course learning outcomes		
Define and describe the first and second laws of thermodynamics as well as the concept of thermal conditions. Define and describe the equation of state of an ideal gas and gas mixtures. Describe the ideal gas state changes. Describe and compare the thermal cycles. Compare and analyze the reversible and irreversible processes and define work losses due to the irreversibility. Describe and compare the processes of internal combustion engines. Describe state changes during evaporation and condensation. Describe, compare and analyze processes of steam plants. Describe and analyze the thermal behaviour during combustion. Describe and analyze the exchange of energy in the flow through the nozzle. Define, describe and compare basic types of heat transfer and describe the heat transfer within the heat exchanger. Describe and analyze the humid air changes of state. Apply acquired knowledge to solve thermodynamic tasks (practical problems).		
1.4. Course content		
Thermal state and thermal equilibrium postulates. The first law of thermodynamics. Ideal gas equation of state. Work and pV-diagram. Specific heat capacity. Gas mixtures. Ideal gas state changes. Thermodynamic cycles. Carnot cycle. Reversible and irreversible processes. Irreversibility and work. Entropy and irreversibility. The second law of thermodynamics. Technical work. Maximum work. Damping. Enthalpy. Mixing of gases. Mixing of gases irreversibility. Losses due to the irreversibility. Processes of internal combustion engines. Evaporation and condensation. The heat exchange during evaporation. State changes of saturated steam. Superheated steam. Processes of steam plants. Mollier hs-diagram. Exergy. Combustion. Thermal phenomena during combustion. Energy exchange in the flow. De Laval nozzle. Fundamentals of heat transfer. Heat conduction. Heat transfer by convection. Heat transfer by radiation. Overall heat transfer coefficient. Heat exchangers. Humid air. Mollier hx-diagram. Humid air changes of state.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	1.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous knowledge testing (three mid-term exams), written and oral exam.

1.10. Assigned reading (at the time of the submission of study programme proposal)

Bošnjaković, F.: Thermodynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian)
Halasz, B, Galović, A., Tadić, M.: Collections of exercises in Thermodynamics, part I, part II, Sveučilišna tiskara, Zagreb, 1993. and 1996. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)

Galović, A.: Termodynamics I, (book), Fakultet strojarstva i brodogradnje, Zagreb, 2007. (in Croatian)
Galović, A.: Termodynamics II, (book), Fakultet strojarstva i brodogradnje, Zagreb, 2007. (in Croatian)

1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Bošnjaković, F.: Thermodynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian)	38	150
Halasz, B, Galović, A., Tadić, M.: Collections of exercises in Thermodynamics, part I, part II, Sveučilišna tiskara, Zagreb, 1993. and 1996. (in Croatian)	19	150

1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Through the Institution's quality assurance system.