University of Rijeka
Faculty of Engineering

CURRICULUM
UNDERGRADUATE PROFESSIONAL STUDY OF MECHANICAL ENGINEERING

Rijeka, March 2015

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	IT	dT	L+T	
	Mathematics I	2	3			5	7
	Mechanics I	3	1		1	5	7
	Materials	2	1	1		4	6
	Fundamentals of Electrical Engineering	2		1		3	5
	Applied Computing VO	1		2		3	5
	TOTAL					**20**	**30**

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

2. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics II	2	3			5	7
	Mechanics II	2	1		1	4	6
	Strength of Materials	2	1	1		4	6
	Technical Drawing	2			2	4	6
	Manufacturing Technology I	2		1		3	5
	TOTAL					**20**	**30**

3. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Organization and Economics	2	1			3	4
	Fluid Mechanics VO	2	1			3	5
	Thermodynamics	3	1			4	6
	Manufacturing Technology II	3			1	4	6
	Machine Elements I	3			1	4	6
	Foreign Language I[1]	1	1			2	3
	TOTAL					**20**	**30**

[1] elective: English or German - free choice

4. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Machine Elements II	3			1	4	6
	Machine Tools	2		1		3	5
	Heat Engines and Devices I	2	1			3	5
	Foreign Language II[1]	1	1			2	3
	Professional Practice I						5
Subject from elective group A:							
	Heating and Air Conditioning Systems	3	1			4	6
Subject from elective group B:							
	Tools, Jigs and Fixtures	2			2	4	6
Subject from elective group C:							
	Energy Engineering in Process Industry	3	1			4	6
	TOTAL					**16**	**30**

5. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Measuring Technology VO	2			1	3	5
	Heat Engines and Devices II	2	1			3	5
	Hydraulic Machines VO	2	1			3	5
	Welding Engineering	2		1		3	5
Subjects from elective group A:							
	Engineering Design	3			1	4	5
	Fundamentals of Mechatronics	3		1		4	5
Subjects from elective group B:							
	Technological Processes	2	1		1	4	6
	Organization and Control of Production	3	1			4	4
Subjects from elective group C:							
	Protection of the Environment and Working Ambient	3	1			4	5
	Process Equipment and Devices	3	1			4	5
	TOTAL					**20**	**30**

6. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Free Elective Subject Professional Practice II Final Work					4	5 10 10
Subject from elective group A:							
	Ship Systems and Marine Auxiliary Machinery	2	1	1		4	5
Subject from elective group B:							
	Production Systems	2	1		1	4	5
Subject from elective group C:							
	Technological Processes in Process Industry	3	1			4	5
	TOTAL					**8**	**30**

Free Elective Subject							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Hydraulics and Pneumatics	3		1		4	5
	Automation VO	3	1			4	5
	Quality Assurance VO	3			1	4	5
	Ship Design	2			2	4	5
	Radiocommunications VO	3	1			4	5
	Physical and Health Education[2]			2		2	1

[2] Subject can be enrolled as additional free elective subject

UNDERGRADUATE PROFESSIONAL STUDY OF MECHANICAL ENGINEERING TOTAL	Hours	ECTS
	104	180

Basic description		
Course title	**Automation VO**	
Study programme	**Undergraduate Professional 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)	45+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

None.

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

1.9. Assessment and evaluation of student's work during classes and on 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)
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)

Notes from lectures.

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	13
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.	1	13
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien	2	13

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	**Applied Computing VO**	
Study programme	**Undergraduate Professional 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)	15+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge and developing skills for active participation in the information society. Acquiring the knowledge required for using operating system for personal computers and using office program, using the internet, creating a website, using mathematical and graphical applications.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Using Microsoft Windows operating system, Microsoft Word, Microsoft Excel, Microsoft Access, Microsoft PowerPoint. Using the internet and electronic mail.Using open source programs Linux and OpenOffice.Using Microsoft Project, Microsoft Visio, Microsoft Frontpage. Using a graphic design software CorelDRAW. Using a raster graphics editor Adobe Photoshop. Using an engineering calculation software PTC Mathcad. Using a programming language Microsoft Visual Basic.

1.4. Course content

The basic concepts of information technology (computer architecture, computer networks). Using personal computers and managing data (Microsoft Windows). Word processing (Microsoft Word). Spreadsheet application (Microsoft Excel). Database management system (Microsoft Access). Slide show presentation program (Microsoft PowerPoint). Accessing the internet (CARNet). Internet research and using electronic mail (Microsoft Internet Explorer, Microsoft Outlook Express). Online data bases. Publishing (Microsoft Publisher). Image editing (Adobe Photoshop). Using Microsoft Project and Microsoft Visio. Create and work with web sites using Microsoft FrontPage. Open source programs (operating system Linux and office program OpenOffice). The basics of mathematical program Mathcad and CorelDRAW fundamentals. The basics of programming language Microsoft Visual Basic.

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

Attending lectures, control tests.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Attending lectures, sustained knowledge check (control tests), written exam.

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

Grundler, D.: Applied computing, Graphis, Zagreb, 2000.

Grundler, D., Gvozdanović, T., Ikica, Z. and others: Windows 7 Office 7 (ECDL), PRO-MIL, Varaždin, 2011.

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

Tackett, J., Burnett, S.: Linux, Strijelac, Zagreb, 1999.
Petric, D.: Research on Internet, Bug, Zagreb, 2002

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*
Grundler, D.: Applied Computing, Graphis, Zagreb, 2000.	8	40
Grundler, D., Gvozdanović, T., Ikica, Z. and others: Windows 7 Office 7 (ECDL), PRO-MIL, Varaždin, 2011.	2	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	**Energy Engineering in Process Industry**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+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.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe the changes of the working fluid conditions in energy processes. Draw thermodynamic diagrams of working fluid in energy processes. Define losses of energy and exergy in the energy processes. Calculate energy losses and efficiency of energy processes. Calculate the main values of energy processes. Develop a basic scheme of energy systems in process industry. Define the main parameters and size of energy systems. Analyze the influential parameters of energy processes. Define and explain the operational costs of power plants. Define the ways to increase efficiency of energy systems. Explain the principles of rational production and use of energy. Describe the sources and ways to reduce the pollution in energy plants.

1.4. Course content

The introduction about the energy and energetics. The role of energy in the process industry, types of energy, main features of energy, thermodynamic analysis of energy processes, value of energy and exergy, efficiency of energy processes. Energy systems in process industry, steam turbine systems, gas turbine systems, cogeneration energy systems, combined energy systems, integrated energy systems, modes for improvement of efficiency, influencing factors of economical operation, analysis of operational costs. Rational production and use of energy, modes to improve efficiency of energy processes, influencing factors for economical operation, analysis of costs, optimization of energy production. Environmental protection in energy plants.

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, activity, continuous knowledge testing (2 mid-term exams), written and 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)
Prelec, Z.: Written lectures of the course (pdf. on Faculty web)

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

El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988.
Reis A., Smith I.: Energy Economic and Management in Industry, Vol. 1, Vol. 2, Pergamon Press 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*
Prelec, Z.: Energy in process industry (book), Školska knjiga Zagreb, 1994. (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	**Engineering Design**	
Study programme	**Undergraduate Professional 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)	45+15+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

Categorization of the methods and principles of engineering design and identification of construction phases. Proper design of machine elements and components, considering the requirements in maintenance, ecology, economy and standardization. Constructional design of machine parts with respect to the anticipated production technology and processing, taking into account their function, loads, material, size and weight, shape, ergonomics, quality, assembly and transport. Solution development of the problem, starting with calculation procedure and followed by optimal constructional design of the machine element or component.

1.4. Course content

Engineering design process. Types of designs. The requirements which must be met by construction. Proper construction design with respect to stress. Allowable stresses. Options for increasing dynamic strength. Technologically proper constructional design. Proper design with regard to tolerances. Proper design of casts. Proper design of welded structures. Proper design of forged parts. Proper design of parts processed by the removal of excess material. Proper design of parts from sheet metal. Proper design with regards to the assembly. Proper design with regards to the transport. Lightweight design. Systematic engineering design. Computer support in the design. The basic principles and rules in engineering design.

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

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		Essay		Research	
Project	1	Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance. Oral examination through three mid-term exams. Continuous evaluation of accuracy, precision, completeness and creativity in solving the problem assignment. Written verification of acquired knowledge on the final exam.

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

Križan, B.: Fundamentals of the Calculation and Design of Machine Elements (In Croatian), University of Rijeka, 2008.
Križan, B., Franulović, M. Zelenika, S.: Machine Elements Design - Exercises' Collection: Fundamentals, Joints, Shafts and Axels (In Croatian), University of Rijeka, 2012.

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

Oberšmit, E.: Fundamentals of Design (In Croatian), Sveučilišna naklada, Zagreb, 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*
Križan, B.: Fundamentals of the Calculation and Design of Machine Elements (In Croatian), University of Rijeka, 2008.	6	8
Križan, B., Franulović, M. Zelenika, S.: Machine Elements Design - Exercises' Collection: Fundamentals, Joints, Shafts and Axels (In Croatian), University of Rijeka, 2012.	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	**English Language I**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	compulsory	
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 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). 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 examples (Tenses; Definite and Indefinite Article, Comparison of Adjectives, Relative Clauses); Implement grammatical structures and aspects in written 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; formulate in writing summaries, arguments and definitions.

1.4. Course content

Topics: Engineering Profession. The General Principles of Dynamics. Energy. Thermodynamics. Hydrostatics. Hydrodynamics. Biomechanics. Engineering Materials. Materials in Naval Architecture. Welding. Grammatical Structures: Tenses. Definite and Indefinite Article. Comparison of Adjectives. Relative 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 independent learning.

1.8. Evaluation of student's work

Course attendance	1	Activity/Participation		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

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

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

Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Šk. Knjiga, Zagreb, 1988
Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford 1998

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

Mance, K.: An English Reader for Naval Architects and Shipbuilders. Faculty of Engineering Rijeka, 2006
Selected Professional articles and texts at the upper intermediate level of the Cambridge and Longman University Press.

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*
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Šk. Knjiga, Zagreb, 1988.	10	10
Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford, 1998.	18	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	**English Language II**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	compulsory	
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

Attended course English Language I.

1.3. Expected course learning outcomes

Students should be able to use Professional jargon like experts in Mechanical Engineering who spend the most of their time in the plant, i.e. in the field, and to a lesser extent in the office, at the B2 level of the Common European Framework of Reference for Languages. Students should be able to: recognize and explain grammatical structures typical of the Professional jargon (Passive. Sequence of Tenses. Direct and Indirect Speech. Modals. Compounds. Word Formation. Conditional Clauses. Final Clauses); implement grammatical structures in written exercises; analyse and differentiate terminology and relevant elements in texts; paraphrase certain relevant parts in the text; write summaries of the text, arguments and definitions; analyse and describe complex diagrams, charts, figures, processes, experiments and mathematical formulae; defend orally their own positions as well as critically evaluate individual solutions of a problem.

1.4. Course content

Topics: Bearings. Principles of Tribology. Some Basic Concepts about Electrical and Electronic Engineering. Computers. Electronics and Automation. Engine Fundamentals. Propulsion. Propellers. Structure of the Ship. Longitudinal Strength of the Ship. Production Management. Ergonomics. Grammatical Structures: Passive. Sequence of Tenses. Direct and Indirect Speech. Modals. Compounds. Word Formation. Conditional Clauses, Final Clauses. Writing Summaries.

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 independent learning.

1.8. Evaluation of student's work

Course attendance	1	Activity/Participation		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

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

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

Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Šk. Knjiga, Zagreb, 1988.
Murphy R.: English Grammar in Use. Cambridge University Press, 1994.

Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford 1998.

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

Mance, K.: An English Reader for Naval Architects and Shipbuilders. Faculty of Engineering Rijeka, 2006
Selected Professional articles and texts at the upper intermediate level of the Cambridge and Longman University Press.

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*
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Šk. Knjiga, Zagreb, 1988.	10	10
Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford,1998.	18	10
Murphy R.: English Grammar in Use. Cambridge University Press, 1994.	15	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	**Final Work**	
Study programme	**Undergraduate Professional 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 Professional knowledge, which should show the appropriate level of engineering skills for individually solving specific Professional tasks.

1.2. Course enrolment requirements

Enrolled course from which the Final Work is selected.

1.3. Expected course learning outcomes

Apply acquired knowledge and skills of the Professional content of Final Work 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 Professional studies. Final thesis can be specified from a particular course specific Professional content and exceptionally from course that belongs to the group of shared Professional content, when it represents a broader entity with a particular course specific Professional 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. Assessment and evaluation of student's work during classes and on 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 VO**	
Study programme	**Undergraduate Professional 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

Obtaining theoretical knowledge and develop skills to solve practical problems in the field of fluid mechanics.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define and describe fluid properties such as density, pressure, viscosity, surface tension. Describe and apply the Euler equation of fluid statics. Analyse and describe various pressure measurement devices. Analyse and describe relative fluid movement under constant linear and rotational acceleration. Describe and apply fluid pressure on flat surfaces Describe and analyse buoyancy and stability. Define and describe the following equations: 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 analyse velocity and streamlines, streaklines and pathlines. Describe control volume and control surface. Define and describe laminar and turbulent flow, transition from laminar to turbulent flow, turbulent velocity profile, Reynolds number (Moody Chart) and other numbers important for Fluid Mechanics. Analyse pipe flow with minor and friction loses using Darcy Weisbach equation, parallel pipes, pipes in series.

1.4. Course content

Introduction to Fluid Mechanics, basic physical values. Continuum, vapour pressure. Fluid properties – density, surface tension, viscosity. Viscosity measurement. SAE oil classification. Fluid statics, Pascal's law. Pressure, Compressibility, Bulk Modulus of Elasticity, Speed of sound. Euler equation of fluid statics. Application of Pascal's law in hydraulic machinery. Euler equation of fluid statics. Relative fluid movement. Pressure measurement devices. Fluid forces on flat surfaces. Buoyancy and stability. Fluid kinematics, velocity and acceleration. 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. Steady closed conduit flow. Cavitation. Reynolds number (Moody Chart) and other numbers important for Fluid Mechanics. Transition from laminar to turbulent flow. Turbulence – velocity profile, turbulence modelling. Minor and friction loses. Pipes systems – parallel pipes and pipes in series.

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

Course attendance, activity, homework, 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	
Homework		Sustained knowledge check	2.5	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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, script. Tehnički fakultet 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)

Internal script.

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, script. Tehnički fakultet Rijeka, 2004. (in Croatian)	network version	49
Bruce R. Munson, D. F. Young, T. H. Okiishi, Fundamentals of Fluid Mechanics, 4th Updated Edition, John Wiley and Sons, 2003.	1	49
Streeter, V.L, Wylie E.B., Fluid mechanics, 8th edition, McGraw Hill, 1985.	1	49

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	**Fundamentals of Electrical Engineering**	
Study programme	**Undergraduate Professional 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

Understanding the relationship between electrical quantities. Measurements of basic electrical quantities. Knowledge of the basic principles of electrical machines and electronic components.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Explain the basic physical phenomena, quantities and laws in the field of electricity and magnetism. Define and explain the terms, determine the quantitative relationship between the basic electric quantities of DC and AC circuits. Define and explain the terms, determine the quantitative relationship between the basic quantities of the magnetic circuits. Explain the basic principles of basic electrical devices and machines. Explain and apply basic measurement of electrical quantities and methods of measurement.

1.4. Course content

The structure of matter. Electric charge. Electric field, potential. Electrical capacity. Direct current. Circuits. Ohm's law and Kirchhoff's laws. DC energy and power. The magnetic field. Magnetic flux. Induction. A current in a magnetic field. Electromagnetic induction. Self-induction, mutual-induction. Magnetic properties of matter. The magnetization curve. The magnetic circuit. Alternating current. Frequency, phase relations, and the mean and effective values. AC circuit with R, L, C elements. Power and energy of alternating current. Symmetrical three-phase system. Transformer. Synchronous and asynchronous motor. DC machines.

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

Course attendance, activity, 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	2	Report		Practice	0.5
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, laboratory exercises, continuous knowledge testing (homeworks, tests, 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., 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	76
Pinter, V.: Fundamentals of electrical engineering – part II, Tehnička knjiga, Zagreb, 1994. (in Croatian)	10	76
Đurović, G.: Electrical engineerging I, Školska knjiga, Zagreb, 2004. , (in Croatian)	11	76
Đurović, G.: Electrical engineerging II, Školska knjiga, Zagreb, 2004. , (in Croatian)	10	76

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	**Fundamentals of Mechatronics**	
Study programme	**Undergraduate Professional 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Adoption of theoretical knowledge about the components that constitute mechatronic systems. Understanding the relationship of different parts of mechatronic systems. Connecting knowledge from fields of mechanical and electrical engineering, electronics and computer science.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define and explain the concept of mechatronics. Describe mechatronic systems and their features. Distinguish components of mechatronic systems. Describe and explain the principles and features of mechanical, hydraulic, pneumatic and electromechanical actuators. Describe the different sensors and their application. Select appropriate sensor. Describe the operation and characteristics of DC, servo, stepper and linear motors. Adopt basics of working in the LabVIEW programming environment.

1.4. Course content

Mechatronics and mechatronic systems. Models of mechatronic systems and components. Real system, the model and simulation. Mechanical systems. Rotational and translational mechanical energy transmissions. Hydraulic and pneumatic systems. Functional Plan, functional diagrams. Pneumatic systems. Hydraulic systems. Electrohydraulic. Electrical systems. The concept of regulation and control, auto-technical administrators to manage systems (open and closed systems), static and dynamic characteristics of the control, conventional controllers. Static and dynamic behavior of mechatronic systems. Synthesis of mechatronic systems. Basics of working with programming and simulation tools (LabVIEW, Matlab/Simulink, SimulationX).

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, class participation, preparation and problem solving, independent learning.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Attendance, continuous assessment (partial exams), work on laboratory exercises and problem solving, written/oral exam.

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

Bishop, R. H.: The Mechatronics Handbook, CRC Press, Washington, D. C., 2005.
Group of authors: Fachkunde Mechatronik, Verlag Europa-Lehrmittel, Haan-Gruiten, 2004.

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

Wolf, R.: Fundamentals of electric machines, Školska knjiga, Zagreb, 1991.
Younkin, G. W.: Industrial Servo Control Systems, Marcel Dekker, Basel, 2003.
Kuo, B. C.: Step Motors and Control Systems, SRLO Illinois, Urbana-Champaign, 1979.

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*
The Mechatronics Handbook, CRC Press, Washington, D. C., 2005.	-	7
Group of authors: Fachkunde Mechatronik, Verlag Europa-Lehrmittel, Haan-Gruiten, 2004.	-	7

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 Professional Study of Mechanical Engineering**	
Course status	compulsory	
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 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). They should be able to: compare general with technical German on the basis of selected texts and topics from the field of mechanical engineering, naval architecture and electrical engineering; recognize and explain grammatical structures and principles typical of the Professional jargon from examples (Tenses; Modals, Compounds, Word Formation, Dependent Clauses, Relative Clauses, Passive); implement grammatical structures and aspects in written exercises; recognize 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: Development and Manufacture of Technical Products. Basics of Mechanics. Basics of Thermodynamics. Basics of Fluids. Basics of Electrical Engineering. Energy. Electrical Energy. Current Circuit. Conductors and Insulators. Electricity in Households. Materials in Mechanical Engineering and Naval Architecture. Metal Forming. Tools and Machinery. Fittings. Grammatical Structures: Tenses. Modals. Compounds. Word Formation. Dependent Clauses. Relative Clauses. Passive.

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		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

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

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

Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian)

Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga, Zagreb. (in Croatian)
Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993.

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

Zettl / Jansen / Müller: Aus moderner Technik und Naturwissenschaft. Hueber 2003.
Selected texts.

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*
Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian).	1	3
Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga, Zagreb. (in Croatian).	0	3
Štambuk / Marinić: Deutsch und Technik. Školska knjiga ,1993.	0	3

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 Professional Study of Mechanical Engineering**	
Course status	compulsory	
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

Attended course German Language I.

1.3. Expected course learning outcomes

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. They should be able to: recognize and explain grammatical structures typical of the Professional jargon (Conditional Clauses. Infinitive Forms. Present and Past Participle. Comparison of Adjectives); implement grammatical structures in written exercises; differentiate and analyse relevant elements in the text; paraphrase certain relevant parts in the text; write summaries of the text; analyse and describe complex diagrams, charts, figures, processes and mathematical formulae; defend orally their own positions as well as critically evaluate individual solutions of a problem.

1.4. Course content

Topics: Sources of Energy and Environment Protection. Information Technology. Data Processing. Computer and Microcomputer. Generators and Motors. Semiconductors. Transistors. Electromagnetic Waves. Internal Combustion Engines. Diesel Engines. Grammatical Structures: Conditional Clauses. Infinitive Forms. Present and Past Participle. Comparison of Adjectives. Specific vocabulary, grammatical and communication structures of German technical jargon.

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		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

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

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

Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian)

Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga, Zagreb. (in Croatian)
Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993.

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

Zettl / Jansen / Müller: Aus moderner Technik und Naturwissenschaft. Hueber 2003.
Selected texts.

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*
Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian).	1	3
Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga, Zagreb. (in Croatian).	0	3
Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993	0	3

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 I**	
Study programme	**Undergraduate Professional 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

Acquiring general knowledge of the thermal reciprocating machines and complex influences of certain functions of the efficiency of the machine. Particularly insisted on the adoption of knowledge from the conversion of fuel chemical energy into heat and continuing into mechanical work.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Application of the knowledge of the mechanics and the theory of vibration to the cranking mechanism. Analysis of the kinematics, dynamics, loads and vibrations of cranking mechanism. Application of the laws of thermodynamics and fluid mechanics to processes in compressors. Analysis of processes in compressor and its equipment and its impact to the characteristics of the compressor. Application of the laws of thermodynamics and mechanics to the processes of internal combustion engines. Analysis of the processes in the internal combustion engine and its equipment and their impact on the characteristics of the engine as a whole.

1.4. Course content

Introduction to heat engines. Basic energy conversion processes. Thermodynamic processes. Characteristic parameters of machines. Auxiliary systems. Introduction to the reciprocating machines. Basic dimensions and parameters. Kinematics and dynamics of the cranking mechanism. Dynamics of multi-cylinder machines. Reciprocating compressors. Classification and application. The process of the compressor. Characteristics. Compressor capacity control. Parts of the system under pressure. Internal combustion engines. Ideal thermodynamic processes and efficiency. The real process. Engine characteristics. Measuring the engine power and other parameters. Fuels and fuel-air mixtures. Exchange of the working fluid. Engine supercharging and turbocharging. Preparation of the fuel-air mixture. Combustion in the engine. Heat transfer in the engine. Emissions and environment protection. Measuring of emissions level. Regulations on allowable emissions. Engine control and protection systems. Engine design. Engine parts. Materials. Auxiliary systems.

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

Course attendance, activity, homework, 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	2.5	Report		Practice	
Portfolio		Homework					

1.9. Assessment and evaluation of student's work during classes and on 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)

Jeras, D.: Piston Engines, Devices, Školska knjiga, Zagreb, 1992. (in Croatian)
Andrassy, M.: Reciprocating Compressors, Fakultet strojarstva i brodogradnje, Zagreb, 2004. (in Croatian)

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

Heywood, J. B.: Internal Combustion Engines Fundamentals, McGraw Hill Book Co., New York, 1988.
Grljušić, M.: Internal Combustion Engines, Fakultet elektrotehnike strojarstva i brodogradnje, Split, 2000. (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*
Jeras, D.: Piston Engines, Devices, Školska knjiga, Zagreb, 1992. (in Croatian)	5	24
Andrassy, M.: Reciprocating Compressors, Fakultet strojarstva i brodogradnje, Zagreb, 2004. (in Croatian)	1	24

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 II**	
Study programme	**Undergraduate Professional 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+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge and skills about dynamic heat engines and devices.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Description and analysis of the thermal process in steam turbines. Analysis of the consumption of steam, heat and fuel in steam turbine plants. Description of the the thermal process in the steam generator. Analysis of water & vapor circulation in steam generators. Analysis of the thermal process in turbine stage. Thermodynamic calculation of the turbine stage. Analysis of the losses of flow in turbine stage and turbine as whole. Description of the control and protection of the turbine. Description of the process of energy conversion in gas turbine. Description of the structural components of the gas turbine. Description the operation and exploitation of the turbine. Describe the turbine maintenance and overhaul.

1.4. Course content

Development of heat engines and their significance. Thermal power plant process. Efficiency of thermal power plant. Consumption of steam, heat and fuel in thermal power plants. Steam generators and their design. Combustion and stoichiometric ratios. Sizing of heating surface. circulation in the steam generator. Design of the steam generator. Control of the steam generator. Water for steam generators. Steam turbines and their applications. Thermal process in turbine stage. The losses in the turbine and the turbine stage. Multistage steam turbines. The basic design of turbine structures. Control and protection of turbines. Operation and maintenance of the turbines. Gas-turbine plants. Open and closed gas-turbine process. The design and performance of gas-turbine parts of capacities. Compressors. The combustion chamber. The performances of the gas turbine. Improving the efficiency of gas-turbine power plants.

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

Lectures and excercises attendance, individual learning and excercise solving.

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	2.5	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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)

Kreuh, L.: Steam Generators, Školska knjiga, Zagreb, 1978. (in Croatian)

Miler. J. : Steam and Gas Turbines, Parts I & II, Tehnička knjiga, Zagreb, 1962. (in Croatian)

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

Prelec, Z. Marine Steam Generators, Školska knjiga, Zagreb, 1990. (in Croatian)
Bathia W.W. : Fundamentals of Gas Turbines, John Wiley & Sons Inc., New York, 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*
Kreuh, L.: Steam Generators, Školska knjiga, Zagreb, 1978. (in Croatian)	4	33
Miler. J. : Steam and Gas Turbines, Parts I & II, Tehnička knjiga, Zagreb, 1962. (in Croatian)	1	33

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 and Air Conditioning Systems**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+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, ventilation and air conditioning systems.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe psychophysical factors that affect human comfort in enclosed spaces. Use climate – meteorological data for 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 cooling and domestic hot water preparation. Compare local, central and district heating systems. Differentiate types of heating devices for hot water central heating systems. Explain tasks and design of the basic elements of central heating systems - radiators, convectors and surface heating systems; chimneys; piping; circulation pumps; expansion vessels; isolation, control and safety valves and pipe fittings. Compare natural and mechanical ventilation, local and central air conditioning systems. Discuss design of the basic elements of ventilation and air conditioning systems. Differentiate air distribution methods in rooms. Classify types of automatic controls for heating, ventilation and air conditioning systems. Apply acquired knowledge to solve practical problems of sizing and selection of the elements and devices of heating, ventilation and air conditioning systems.

1.4. Course content

Psychophysical factors that affect human comfort in enclosed spaces. Human body temperature regulation. Thermal comfort. Comfort indices. Indoor air quality. Use of climate-meteorological data for building energy consumption calculations. Energy performance of buildings. Building physics. Building characteristics. Thermal properties of building materials. Water vapour diffusion. Heating and cooling demand calculations. Heating systems. Local heating systems. District heating. Hot water central heating systems. Heating devices for hot water central heating systems. Chimneys. Radiators, convectors and surface heating systems. Piping. Pipe thermal expansion compensators. 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. Automatic controls for heating systems. Humid air. Ventilation requirements. Natural and mechanical ventilation. Local and central ventilation and air conditioning systems. Air handling unit elements and designs. Waste heat recovery systems. Air diffusion devices. Air distribution. Air ducts. Air pressure drop calculations. Automatic controls for ventilation and air conditioning systems. Sizing and selection of the elements of heating, ventilation and air conditioning systems.

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

Course attendance, activity, homework, studying.

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 check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Assessment and evaluation of student's work during classes and on 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)

Materials from the lectures and exercises.

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

Group of authors: Heating Engineering Handbook, Energetika marketing, Zagreb, 2005. (in Croatian)
Group of authors: HVAC Handbook, Energetika marketing, Zagreb, 2003. (in Croatian)
P. Donjerković: Basics of HVAC Systems and their Control, Parts I & II, Alfa Zagreb, 1996. (in Croatian)
Group of authors:Buildings Energy Certification Handbook, UNDP, Zagreb, 2010. (in Croatian) (free download from www.energetska-efikasnost.undp.hr/images/stories/prirucnici/prircert.pdf)

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*
Materials from the lectures and exercises.	-	16

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 VO**	
Study programme	**Undergraduate Professional 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+15+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.

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: isolated profile analyses and planar flow through a cascade. 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 modeling in turbomachines. The two-dimensional cascade theory.

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. Assessment and evaluation of student's work during classes and on 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)

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	**Hydraulics and Pneumatics**	
Study programme	**Undergraduate Professional 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Mastering the basics of hydrostatic and pneumatic power transmissions, the application of knowledge to assemble circuits and simulations on commercial computer program.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Explain the mode of power transmission in hydraulic and pneumatic systems. Define sources of hydraulic and compressed air energy. Distinguish components for control in hydraulic and pneumatic systems. Describe auxiliary devices in hydraulic and pneumatic systems. Define logic circuits and types of control. Connect hydraulic and pneumatic components into simple systems. To implement the acquired knowledge in complex hydraulic and pneumatic systems.

1.4. Course content

Development and application of hydraulic and pneumatic equipment and systems. Standardized symbols of hydraulic and pneumatic components. Working fluids. Energy and power in hydraulic and pneumatic systems. Sources of the hydraulic energy and compressed air (pumps and compressors). Actuators (motors and cylinders). Control components of hydraulic and pneumatic systems (valves, pressure valves, flow control valves). Auxiliary devices for the transmission of energy (pipelines, fittings, filters, tanks, hydro accumulators, devices for maintaining the temperature of the fluid, the elements of air treatment, contact-free sensors, pneumatic gates and reflex nozzles, switches, indicators, signal converters, silencers). Hydro-pneumatic devices. Vacuum devices. Pneumatic logic circuits. Designing of the fluid power 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, laboratory work, the application of knowledge to a specific system for fluid power transmission through an essay.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, activity, assembling circuits in laboratory, continuous knowledge testing (two mid-term exams), essay, written and oral exam.

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

Siminiati, D.: Oil Hydraulics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)
Bauer, G.: Ölhydraulik, B. G. Teubner, Stuttgart, 1992.
Nikolić. J.: Pneumatic Control, Zagreb, 1976. (in Croatian)

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

Krist, T.: Hydraulik, Fluidtechnik, Vogel Buchverlag, 1997.
Haug, R.: Pneumatische Steuerungstechik, Teubner, Stuttgart, 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*
Siminiati, D.: Oil Hydraulics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)	10	8
Nikolić. J.: Pneumatic Control, Zagreb, 1976. (in Croatian)	3	8
Bauer, G.: Őlhydraulik, B. G. Teubner, Stuttgart, 1992.	-	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	**Machine Elements I**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Introducing with the loads, stresses, types, functions, forms, materials and calculations of machine elements.

1.2. Course enrolment requirements

None..

1.3. Expected course learning outcomes

Explain the types of stresses of machine elements. Distinguish removable and non-removable joint. Compare removable and non-removable clamp connections. Distinguish pins, bolts, wedges and feathers. Describe the types of springs. Compare the axle and the shaft. Define and select machine elements using norms. To implement the acquired knowledge to concrete examples.

1.4. Course content

Load capacity of machine elements. Fatigue. Wöhler's diagram. Smith's charts. Stress concentration. Complex and equivalent stresses. Allowable stresses and safety factors in the calculation of machine elements. Pressure vessels. Pipe elements. Compensation expansion pipeline. Welded, soldered, adhesive and riveted joints. Fixing bolts. Preloaded bolts. Quality, tolerances and fits. Non-removable clamping joints. Connection with cone. Compounds with collets and clamping cartridge. Bolts, pins, wedges and feathers. Springs. Torsion, disk and leaf springs. Axles and shafts. The stability of the long axles and shaft.

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, solving structural tasks in class and at home, independent studying.

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	1.5	Sustained knowledge check	1	Report		Practice	
Portfolio		Homework					

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, 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)

Križan, B.: Fundamentals of Calculation and Design of Machine Elements, Školska knjiga, Zagreb, 2008. (in Croatian)
Decker, K.H.:Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009.(in Croatian)

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

Orlić, Ž., Orlić, G.: Axles and Shafts, Zigo, Rijeka, 2004.
Orlić, Ž., Orlić, G.: Metal Springs, Zigo, Rijeka, 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*
Križan, B.: Fundamentals of Calculation and Design of Machine Elements, Školska knjiga, Zagreb, 2008.(in Croatian)	4	30
Zagreb, 2006. Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)	3	30
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009.(in Croatian)	6	30

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 II**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Development of the ability of calculation and application of machine elements.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Evaluation and selection of standardized machine elements and assemblies. Assortment of the criteria for dimensioning and design of bearings, power transmissions, pipelines and couplings. Application of standardized calculation procedures to solve the tasks of appointed problem. Based on the imposed requirements and selected criteria, calculation and design of a machine assembly in accordance with the standards.

1.4. Course content

Roller bearings: forms and durability control. Sliding bearings with hydrodynamic / hydrostatic lubrication: shapes and basic dimensions. Lubricant types. Mineral oils: characteristics, labels and selection. Sealing beds. Gears and gearing. Basic design of gears and gear transmissions. Basic geometry and load capacity of cylindrical gears. Flexible couplings: purpose, types and selection. Belt and chain transmissions: design and basic characteristics. Pipelines.

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	1	Oral exam		Essay		Research	
Project	2	Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance. Written or oral examination through two mid-term exams. Continuous evaluation of accuracy, precision, completeness and creativity in solving the problem assignment. Written verification of acquired knowledge on the final exam.

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

Decker, K.H.: Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (In Croatian)
Obsieger, B., Couplings, Zigo, Rijeka, 2004. (In Croatian)
Obsieger, B., Gear Transmissions, Zigo, Rijeka, 2003. (In Croatian)

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

Kraut's Mechanical Engineering Handbook, Sajema, Zagreb, 2009. (in Croatian)

Obsieger, B., Sliding Bearings, Zigo, Rijeka, 2003. (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*
Decker, K.H.: Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (In Croatian)	3	27
Obsieger, B., Couplings, Zigo, Rijeka, 2004. (In Croatian)	5	27
Obsieger, B., Gear Transmissions, Zigo, Rijeka, 2003. (In Croatian)	5	27

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 Tools**	
Study programme	**Undergraduate Professional 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

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.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define and classified machine tools. Analyse control systems on machine tools. Make machine tool simulation for real example. Describe characteristics of machining centers, special machining tools. Describe clamping systems, storage, tools and workpiece transportation. Introduction of modern trends in machine tools building.

1.4. Course content

Basic terms, classification of machine tools. Review and characteristics of basic structural elements of machine tools. Static and dynamic stiffness of machine tools. Tribology of machine tools. Main and feed drives. Clamping systems, storage, tools and workpiece transportation. Electronic systems on machine tools. Review and development of control systems on machine tools (NC/CN/DNC/AC). Basic classification and terms of modern CNC lathes. Basic classification and terms of modern CNC milling machine. Machining centers, special machining tools. Machine tools for high speed machining. Basic programming of NC machine tools. G-code, syntax, technological and geometrical information. Example of NC program. CAD/CAM programming. Automatic systems of workpiece transport (AGV).

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, student activity on course, homework and independent learning.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, student activity on course, homework's, sustained knowledge check and written exam.

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)
Cebalo, R.: Machine Tools, Zagreb, 2000. (in Croatian)
Cebalo, R.: Machining Systems – Flexible Machining Systems, Zagreb, 2000. (in Croatian)

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

Pahole, I., Balič, J.: *Machine Tools*, Maribor, 2003. (in Slovenian)
Hans B. Kief: CNC for Industry, Hanser Gardner Publications, 2000.
Weck, M.: Werkzeugmaschinen Fertigungssysteme, Band 1-5, Springer-Verlag, 1998-2002.
Smid, P.: CNC programming handbook, ISBN-13: 978-0831133474, Industrial Press, 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*
Hriešik, A.: Jurković, Z.: Production Equipment – Vol. 1, Tehnički fakultet Rijeka, 2003. (in Croatian)	1	37
Cebalo, R.: Machine Tools, Zagreb, 2000. (in Croatian)	1	37
Cebalo, R.: Machining Systems – Flexible Machining Systems, Zagreb, 2000. (in Croatian)	1	37

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	**Manufacturing Technology I**	
Study programme	**Undergraduate Professional 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

Acquiring knowledge in casting processes and procedures for the production of castings. Understanding the process of solidification in the mold. Acquiring knowledge of the principles of casting design. Acquiring skills in designing of gating and risering system.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Explain and differentiate casting processes in the production of castings. Describe the process of alloy solidification in the mold. Define the gating and risering system. Describe the basic rules of casting design. Choose an appropriate casting process based on construction and technological requirements. Describe the testing methods of casting properties. Describe the methods of environmental protection in foundry production.

1.4. Course content

Casting processes and procedures in casting production. Casting materials. The solidification of metals and alloys in the mold. The gating and risering system. The rules of casting design. Features of casting alloys. Criteria for selection of casting process. Environmental protection in foundry 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, participation in teaching, 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	1.5	Report		Practice	
Portfolio		Homeworks	1				

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, participation in teaching, homework, continuous knowledge testing (two mid-term exams), written and/or oral exam.

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

Katavić, I.: Foundry, Sveučilište u Rijeci, 1993. (in Croatian)
Lyman, T.: Metals Handbook, Melting and Casting, American Society for Metals

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

Pelhan, C.: Casting, Ljubljana 1983. (in Slovenian)
Casting Handbook, Savez ljevača Hrvatske. (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.: Foundry, Sveučilište u Rijeci, 1993. (in Croatian)	12	62
Lyman, T.: Metals Handbook, Melting and Casting, American Society for Metals	1	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	**Manufacturing Technology II**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

To teach the basics of the analyzed production technologies / processes and their implementation, and training to select the most appropriate manufacturing process due to the economic aspects and the quality of the finished product, performed calculations and specification of the technological parameters.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Identify and describe the basic forming processes and their application. To interpret the physical base of forming and explain the basic concepts. Select the most appropriate forming process for making the given product. Apply basic calculations for the deformation force and deformation work, and develop hardening curves of I., II. and III. degree. Identify and describe the basic machining processes and their application. To interpret the physical foundations of the cutting theory. To describe the geometry of the tool and identify the geometry of the tool and its application based on the tool manufacturer's catalogue data. Calculate and specify the optimum cutting speeds, feeds and depths of cut on the basis of standard calculations or tool manufacturer's catalogue data.

1.4. Course content

Basic theory of plasticity. Classification of forming processes. Punching. Bending. Deep-drawing. Pressing. Rotating drawing and extrusion. Rolling. Forging. Non conventional forming processes. Modelling, simulation and optimization of processes. CAD / CAPP / CAM in forming processes. The theory of machining and classification of processes. Turning, chip geometry, forces, cutting parameters, tools. Drilling, reaming, cutting parameters, forces, tools. Milling, chip geometry, forces, cutting parameters, tools. Broaching, tool geometry. Grinding, processes, tools. Finishing, honing, superfinishing, lapping, polishing. Machining of gears. Non conventional machining processes. Modelling, simulation and optimization of processes. CAD / CAPP / CAM in the machining.

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, field work, control tasks, project task solving, 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	1	Sustained knowledge check	1.5	Report		Practice	
Portfolio		Report of fieldwork	0.5				

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance and activity, report of fieldwork, continuous assessment (three control tasks), project task, written and / or oral examination.

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

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

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

Kuljanić, E.: Machining of Metals, Tehnička enciklopedija, tom. 11, Zagreb, 1988. (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*
Duplančić, I.: Metal Forming Processes, Fakultet elektrotehnike, strojarstva i brodogradnje Sveučilišta u Splitu, 2007. (in Croatian)	1	43
Cukor, G.: Calculations in Metal Cutting, Tehnički fakultet Sveučilišta u Rijeci, 2014. (in Croatian)	100	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	**Materials**	
Study programme	**Undergraduate Professional 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Student will be informed with the fundamentals of material science. In engineering practice student will be skilled for appropriate materials selection. Moreover, student will acquire basic methods of heat treatment and surface engineering.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define the relationship between microstructure and properties of materials. Analyse the methods of materials testing. Analyse the application of phase diagram. Define equilibrium and non-equilibrium microstructure transformations in steel. Define the basic processes of heat treatment of steel and cast iron.

1.4. Course content

Definition and classification of technical materials. Trends of materials application in engineering. Microstructures of alloys. Phase composition of alloys. Solid solutions. Intermediate phases. Crystal imperfections. Diffusion. Phase diagrams of alloys. Metallographic analysis of the structure. Structure and properties of polymers. Thermoplastics and thermosets. Elastomers. Structure and properties of ceramics. Structure and properties of composite materials. Mechanical properties of materials. Basic destructive testing of materials. Basic non-destructive testing of materials. Special mechanical properties of polymers and ceramics and their evaluation. Electrical properties of materials. Heat treatment of steel. Fe-Fe_3C diagram, equilibrium and non-equilibrium microstructure transformations in steel. TTT-diagrams and their application. The basic processes of heat treatment of steel. Heat treatment of cast iron. Heat treatment of other alloys. Thermal treatment of other alloys. Possibility of application of certain materials in engineering.

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

Course attendance, participation in teaching, studying.

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 check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, participation in teaching, homework, sustained knowledge check (two mid-term exams), written exam.

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

Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)
Katavić , I.: Introduction to materials, Tehnički fakultet Rijeka, Rijeka, 1997. (in Croatian)

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

Pirš, J.: Materials technology, The science of metals I, II, III, IV i V part, Pedag. servis, Rijeka, 1965. (in Croatian)
Group of authors: Materials in mechanical engineering, Hrvatsko društvo za materijale i tribologiju, 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*
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)	6	85
Katavić , I.: Introduction to materials, Tehnički fakultet Rijeka, Rijeka, 1997. (in Croatian)	19	85

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 Professional 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)	30+45+0

1. COURSE DESCRIPTION

1.1. Course objectives

Understanding the basic concepts of linear algebra and differential calculus. Acquiring knowledge and skills necessary to develop the ability to solve mathematical problems set.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe and define basic mathematical operations with matrices and determinants. Describe the methods of solving systems of linear equations to solve the system and discuss the resulting solutions. Define the vector and arithmetic operations with vectors and correctly applied to calculate the sum of vectors, scalar and vector product of the concrete examples. Define the function, explain the basic concepts of functions of one variable (definition, parity, periodicity, the limit value, continuity) and define, draw and correctly interpret the elementary functions. Define the derivative of functions of one variable to calculate the derivatives of elementary and some complex functions. Apply derivatives in optimization and analysis of complex functions and draw their graphs.

1.4. Course content

Matrices. Determinants. Solving systems of linear equations. Vector in the plane and in the space. The functions of one variable. Limits and continuity of functions. Elementary functions (properties and graphs). The definition of derivation and their properties. Derivatives of elementary and complex functions. Taylor's theorem. Application of derivatives (linear approximation, the determination of extremes, flow testing functions, optimization).

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, studying, activity, homework, control tasks and tests.

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam	0.75	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	1				

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, homework assignments, continuous knowledge testing, written and oral exam.

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

Štambuk, Lj.: Mathematics I, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2002. (in Croatian)
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2008. (in Croatian)
Demidovič, B. P.: Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, sva izdanja, (in Croatian)

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

Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online textbook
Finney, R. L., Thomas, G. B..: Calculus, Addison-Wesley Publishing Company, New York, 1992.

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*
Štambuk, Lj.: Mathematics I, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2002. (in Croatian)	14	20
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2008. (in Croatian)	5	20
Demidovič, B. P.: Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, sva izdanja, (in Croatian)	6	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	**Mathematics II**	
Study programme	**Undergraduate Professional 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)	30+45+0

1. COURSE DESCRIPTION

1.1. Course objectives

Understanding the basic concepts of linear algebra and differential calculus. Acquiring knowledge and skills necessary to develop the ability to solve mathematical problems set.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe and define basic mathematical operations with matrices and determinants. Describe the methods of solving systems of linear equations to solve the system and discuss the resulting solutions. Define the vector and arithmetic operations with vectors and correctly applied to calculate the sum of vectors, scalar and vector product of the concrete examples. Define the function, explain the basic concepts of functions of one variable (definition, parity, periodicity, the limit value, continuity) and define, draw and correctly interpret the elementary functions. Define the derivative of functions of one variable to calculate the derivatives of elementary and some complex functions. Apply derivatives in optimization and analysis of complex functions and draw their graphs.

1.4. Course content

Matrices. Determinants. Solving systems of linear equations. Vector in the plane and in the space. The functions of one variable. Limits and continuity of functions. Elementary functions (properties and graphs). The definition of derivation and their properties. Derivatives of elementary and complex functions. Taylor's theorem. Application of derivatives (linear approximation, the determination of extremes, flow testing functions, optimization).

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, studying, activity, homework, control tasks and tests.

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam	0.75	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	1				

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, homework assignments, continuous knowledge testing, written and oral 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)
Demidovič, B. P. : Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, (in Croatian)
Kreyszig, E.: Advanced Engineering Mathematics, John Wiley&Sons, Inc.1993.

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

Slapničar, I.: Mathematics I, University of Split FESB, Split 2002, online textbook
Finney, R. L., Thomas, G. B..: Calculus, Addison-Wesley Publishing Company, New York, 1992.

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)	-	50
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)	15	50
Demidovič, B. P. : Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, (in Croatian)	6	50
Kreyszig, E.: Advanced Engineering Mathematics, John Wiley&Sons, Inc.1993.	4	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	**Measuring Technology VO**	
Study programme	**Undergraduate Professional 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+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.

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. Metrology (scientific, technical and legal). Metrological conditions. Geometrical, mechanical and thermal effects on measurement results. Measurement error and uncertainty. Accuracy. Measuring procedure. Design of experiments in measurement. Measurement and measuring devices: shape, position, contour, pressure, temperature, force, hardness, roughness, speed, noise, electrical and magnetic quantities. Optical and opto-electronic measuring devices. Computer aided measurement and software for measurement. Interferometry. Measurement of the chemical composition materials. Measurement of layer thickness. Coordinate Measuring Machines and non contact three dimensional scanning metrology. Measuring system in machining. Calibration.

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, homework 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		Report	3	Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Sustained knowledge check and final written exam.

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

Jay L. Bucher: The Metrology Handbook, ASQ Quality Press, 2004.
Puhar, J.: Tehnološke meritve, Fakulteta za strojništvo Ljubljana, 1996.
Graham T. Smith: Industrial Metrology, Springer, 2002.

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

Jay L. Bucher: The Metrology Handbook, ASQ Quality Press, 2004.
Graham T. Smith: Industrial Metrology, Springer, 2002.

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*
Jay L. Bucher: The Metrology Handbook, ASQ Quality Press, 2004.	2	24
Puhar, J.: Tehnološke meritve, Fakulteta za strojništvo Ljubljana, 1996.	1	24
Graham T. Smith: Industrial Metrology, Springer, 2002.	1	24

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	**Mechanics I**	
Study programme	**Undergraduate Professional 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+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. Draw free body diagram for a planar and a spatial system of forces. Determine equilibrium equations and reaction forces. Analyse equilibrium problems that involve friction on the slope, screw, wedge and bearing, friction on belts and brakes and rolling friction. Define bending moment, shear force and axial force. Determine distribution of internal forces in trusses, beams and frames. Determine location of centroids of lines, areas and bodies.

1.4. Course content

Introduction. Terms and axioms of statics. Reactions. Planar systems of forces. Colinear, concurrent, parallel and general systems of forces. Moment of a force about a point. Determination of resultant of forces and equilibrium conditions for all systems of forces. Resolution of force into two and three components. Spatial systems of forces. Concurrent, parallel and general systems of forces. Moment of a force about a given axis. Centroids. Lines, areas and volumes. Pappus-Guldin theorems. Types of equilibrium. Trusses, beams and frames. Friction. Sliding: slope, screws, wedges, brakes, belt systems, bearings. Rolling friction.

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

1.9. Assessment and evaluation of student's work during classes and on 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)

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.
Das, M. B., Kasimali, A., Sami, S.: "Engineering Mechanics, Statics", Irwin, Boston, 1994.

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	117
Brnić, J.: "Mechanics and structural elements", Školska knjiga, Zagreb, 1996. (in Croatian)	14	117

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	**Mechanics II**	
Study programme	**Undergraduate Professional 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical and practical knowledge to solve problems in the field of kinematic of particle and rigid body. Ability to analyze basic motion characteristics like trajectory, displacement, velocity and acceleration. Development of theoretical and practical knowledge in the field of dynamics of a particle. Systems of particles and rigid body.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define motion of a particle in a Cartesian (rectangular) and cylindrical coordinate system. Determine the equation of a trajectory on the basis of the equations of motion for the case of planar motion of particles. Analyze the translational and rotational motion about a fixed axis of a rigid body. Calculate the gear ratio for a given configuration of power transmissions. Define and explain Newton's laws and the concept of inertial forces. For a given instances of motion of particles one should apply; Principle of linear impulse and momentum and the law of conservation of mechanical energy. Identify the work and the power due to the force or torque on the particle. Define the axial moments of inertia of simple bodies. Apply paralel–axis theorem. Analyze the planar motion of a rigid body by the action of forces and moments. Analyze the free and forced vibration of single degree of freedom.

1.4. Course content

Kinematics of particles. Coordinate systems. Graphs of motion. Rectilinear motion. Velocity and acceleration. Constant velocity and constant acceleration motion. Harmonic oscillations. Curvilinear motion of particles. Position, velocity and acceleration of a particle in different coordinate systems. Motion along circular path. Relative motion. Kinematics of a rigid body: translational, rotational and planar motion. Velocities of a body in planar motion. Relative motion analysis: velocity.. Relative motion analysis: acceleration. Three dimensional kinematics. Dynamics of a particle. Newton's laws. Inertial force. D'Alembert's principle. Linear momentum. Work of a force. Angular momentum. Potential and Kinetic energy. Power and efficiency. Dynamics of a rigid body. Translation. Rotation about fixed axis. Moments of inertia. Planar motion.

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, project assignments, 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		Project assignments	1				

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, activity, project assignments, written exam

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

Žigulić, R, Braut, S.: Kinematics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)
Krpan, M., Butković, M,, Žigulić, R., Braut, S., Franulović, A.: Dynamics, TFR, Rijeka, 2001. (in Croatian)
Jecić, S.: Mechanics II (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)

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

Beer , F.P., Johnston, E.R.: Vector Mechanics for Engineers – Dynamics, Mc.Graw Hill, New York, 1988.
Pustaić, D., Wolf, H., Tonković, Z.: Introduction to analytical mechanics with basics of theory of vibration, 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.: Kinematics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)	10	107
Krpan, M., Butković, M,, Žigulić, R., Braut, S., Franulović, A.: Dynamics, TFR, Rijeka, 2001. (in Croatian)	17	107
Jecić, S.: Mechanics II (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)	3	107

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 and Control of Production**	
Study programme	**Undergraduate Professional Study of Electrical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Qualification for an analysis of the organization of the production function. Ability of calculation cost. Understanding the principles of planning and production management. Understanding the organization of the production facility and departments of tools, quality control and maintenance.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Qualification for analyzing the type of production function organization. Ability for calculating the price of production. Knowledge of planning and production control principles. Knowledge of organizing of production department, tool department, quality control and maintenance department.

1.4. Course content

Definition and task of production function in the enterprise. Influence variables on production organization. Technology preparation department: task, basic groups of work. Organization of preparation department. Basic documentation. Price of production. Structure and calculation of product price: method of average value of working hour, method of direct costs. Selling price. Operative preparation department: task, basic groups of work. Definition of production planning and control. Planning of production and launching of production. Basic documents. Stock optimization. Organization of operative preparation department. Production department: task, basic groups of work. Organization of production department. Tool department: task, basic groups of work and organization. Department for quality control: task, basic groups of work and organization. Maintenance department: task, basic groups of work and organization.

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, designing two small projects, 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	1	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Attendance and activity on lessons, continuous assessment (three control tasks), written exam.

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

Mikac, T.; Ljubetić, J.: Organization and Control of Production, Graphis, Zagreb; Tehnički fakultet Rijeka, Rijeka, 2009. (in Croatian)

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

Žugaj, M.; Strahonja, V.: Information Systems of Production, Informator, 1992. (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*
Mikac, T.; Ljubetić, J.: Organization and Control of Production, Graphis, Zagreb; Tehnički fakultet Rijeka, Rijeka, 2009. (in Croatian)	2 (18 web)	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	**Organization and Economics**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
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

Assuming 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 business systems and building the business system. Define the basic principles of the organization. Define the management of systems and information in the enterprise. Analyze the types of organizational structures. Analyze the evaluation of jobs. Distinguish the ownership, the management and the leadership. Define the principles of management and leadership. Analyze the teamwork. Define the business policies. Describe the principles and methods of planning. Define the long-term and operational plans. Analyze network planning technique. Define the plant as an economic system. Analyze income and expenses. Distinguish the Income Statement and Balance Sheet. Define the effects of the business.

1.4. Course content

The definition of a business system. The evolution of the business system. Factory as a business system. Building the business system. The basic principles of the organization. Definition and managing of business system. The information in the enterprise. Types of organizational structures. Design of the business system. Evaluation of jobs. Ownership. Management. Leadership. The principles of management and leadership. Teamwork. Business policy. Planning. Principles and methods of planning. Network planning techniques. Plans of the business system. Long-term and operational plans. Using of computers in planning. Factory as an economic system. Income and expenses. Types of costs. Break even. Income Statement. Balance Sheet. Effects of business.

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, 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. Assessment and evaluation of student's work during classes and on final exam

Attendance, class participation, continuous assessment (two mid-term exams), written exam.

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

Mikac, T., Ikonić, M.: Organization of Business Systems, Tehnički fakultet Sveučilišta u Rijeci, 2008. (in Croatian)

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

Novak, M., Sikavica, P.: Business Organization, Informator, Zagreb, 1999. (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*
Mikac, T., Ikonić, M.: Organization of Business Systems, Tehnički fakultet Sveučilišta u Rijeci, 2008. (in Croatian)	2	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	**Physical and Health Education**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	1
	Number of hours (L+E+S)	0+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

The general objective of the educational field of Physical and Health Education is to satisfy man`s biosocial need for movement through appropriate kinetic activities, thus satisfying this general need by increasing the adaptive and creative capabilities in contemporary life and work conditions.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Through appropriate kinetic activities satisfy man`s biosocial need for movement.

1.4. Course content

The course content of the educational field of Physical and Health Education shall be implemented through regular (field athletics, football, basketball, volleyball, handball, swimming and water- polo, fitness) and optional (skiing, sailing, rowing, trekking, tennis and rafting) programmes.

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.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Regular course attendance.

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

Medved, R.: Sports medicine, Medicinska knjiga, Zagreb. (in Croatian)
Tuka, K.:Physiology of sport, Sportska tribina, Zagreb. (in Croatian)

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*
Medved, R.: Sports medicine, Medicinska knjiga, Zagreb. (in Croatian)	1	187

Tuka, K.:Physiology of sport, Sportska tribina, Zagreb. (in Croatian)	1	187

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	**Process Equipment and Devices**	
Study programme	**Undergraduate Professional 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Assuming theoretical knowledge and development of skills for practical solving of problems in design and application of process equipment and devices.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Classification, description of application and calculation of properties for tanks and pressure vessels in process plants. Description of design and applications of heat exchangers and cooling towers. Description of design and application, interpretation of the heat balance calculations for process furnaces. Basic calculations of chimneys. Description of design of distillation columns, reactors, separators and filters. Selection, calculation and design of pipelines, selection ad calculation of pipeline supports, joints and bellows for compensation of thermal dilatation of pipelines. Basic specification of pipeline materials. Description of types and applications of pipe fittings and valves, specification of calculation and selection procedures of security and pressure relief equipment in process industry. Description of properties, choice of types and performance of calculation for thermal insulation of piping, tanks and process equipment. Description of application of fans, compressors, pumps and vacuum generation devices in process industry. Description of application of control devices for pressure, flow, level and temperature. Specification of process equipment maintenance methodology.

1.4. Course content

Introduction about process equipment and devices. Reservoirs and tanks: classification, design, protection. Pressure vessels: classification, material, mechanical design. Heat exchangers: thermal design, mechanical design, materials, applications, construction. Cooling towers: classification, thermal calculations. Process furnaces: construction, applications, thermal calculations, chimneys. Process columns, separators, process reactors: application, classification, design. Pipelines: design, compensation of thermal dilatations, mechanical design, valves and fittings. Safety devices. Refinery flares. Machines in a process industry (compressors, pumps, fans): application, operating parameters.
Vacuum devices. Pneumatic transport. Control devices: pressure control, flow control, level control, temperature control. Maintenance of process equipment and devices.

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

Course attendance, activity, home work - seminar paper presentation, studying.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, activity, seminar paper, 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)

Pavković, B.: Process equipment and devices, (lectures), mudri.uniri.hr, 2013.

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

Cheremisnof, N. P.: Handbook of Chemical Processing Equipment, (book), Butterworth & Heinemann, Boston, Oxford 2000.
Bloch, H. P.: Major Process Equipment Maintenance and Repair, (book), Gulf Publishing, Houston 1996.
Širola, D.: Machinery, Equipment and Devices in Oil and Petrochemical Industry, (book), Školska knjiga Zagreb, 1986. (in Croatian)
Ludwig, E.E.: Applied Process design for Chemical and Petrochemical Plants, (book), Volume I, II and III, Gulf Publishing Company, Houston 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*
Pavković, B.: Process equipment and devices, (lectures), mudri.uniri.hr, 2013.	unlimited	4

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 Systems**	
Study programme	**Undergraduate Professional 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Qualified for the design of production systems. Ability to analyze models of production structures. Understanding the principles of grouping the articles.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define the production system. Describe the characteristics of the production program. Explain the production availability of equipment and manpower. Analyze capacity utilization and system: technical and economic. Distinguish the models the flow of material and processing workflows. Define the correlation coefficient of operations and equipment. Explain the handling and transport of the workpiece, the input, between operations and exit transport. Define the processing cycle: explain the processing time, time of transport and waiting. Explain the models of production systems, a single or multi-workpiece lines, serial and flexible systems. Explain the organization of the work flow through the production system. Explain the method of grouping articles. Describe the layout of the plant, equipment and organization of the warehouse. Develop the project of production system: the task, analysis the variables, the concept of the project, plans of processing, optimization solutions, and the choice of the production model (lines, serial or flexible system). Choose of the transportation system.

1.4. Course content

Definition of the production system. Characteristics of the production program. Production availability of equipment and manpower. Capacity and systems utilization: technical and economic. Models flow of material: current, wavy, linear, and flexible. Workflow processing: one-way, two-way. The correlation coefficient of operations and equipment. Handling and transport of the workpiece. Input, between operations and exit transport. The level of automation of transport. Workpiece processing cycle: during processing, time of transport and waiting. Models of production systems. Single or multi-workpiece line, serial and flexible systems. The organization of the work flow through the production system. Methods of grouping of workpieces. The process of designing production systems: the task, analysis of variables, the concept of the project, plans processing, optimization solutions, the choice of the production model (lines, serial or flexible system). Choosing of the transportation system.

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 and activity on class, seminar work.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Attendance, class participation, seminar work, written exam.

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

Mikac, T., Ikonić, M.: Organization of Business Systems, Graphic, Zagreb, 2008. (in Croatian)
Mikac, T.: Optimization of the Concept of Production System, disertation, Tehnički fakultet Rijeka, 1994. (in Croatian)

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

Veža, J.: Designing the Production Systems, Fakultet elektrotehnike, strojarstva i brodogradnje, Split, 1994. (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*
Mikac, T., Ikonić, M.: Organization of Business Systems, Graphic, Zagreb, 2008. (in Croatian)	2	16
Mikac, T.: Optimization of the Concept of Production System, disertation, Tehnički fakultet Rijeka, 1994. (in Croatian)	1	16

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 Professional 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 Professional knowledge, along with a comprehensive view of the work process.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Apply acquired Professional knowledge and skills from studied courses. Gain working process experience. Develop and further improve competence for solving practical engineering problems.

1.4. Course content

Professional practice within Undergraduate Professional Study of Mechanical Engineering is carried out individually in work organization that is engaged in the student's field of study, and with activities in accordance with the Professional Practice Rules and with Study Program curriculum. Within Professional practice, student meets 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. Assessment and evaluation of student's work during classes and on 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	**Professional Practice II**	
Study programme	**Undergraduate Professional 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

Student verifies and complements his own Professional knowledge, along with a comprehensive view of the work process.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Apply acquired Professional knowledge and skills from studied courses. Gain working process experience. Develop and further improve competence for solving practical engineering problems.

1.4. Course content

Professional practice within Undergraduate Professional Study of Mechanical Engineering is carried out individually in work organization that is engaged in the student's field of study, and with activities in accordance with the Professional Practice Rules and with Study Program curriculum. Within Professional practice, student meets 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	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☒ fieldwork	☐ other

1.6. Comments

1.7. Student's obligations

Conducting Professional practice in duration of 30 working days, or 240 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	9
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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	**Protection of the Environment and Working Ambient**	
Study programme	**Undergraduate Professional 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Develop the capacity and competence to solve a variety of engineering problems in the field of environmental protection so as to find effective technical solutions to prevent or reduce pollution of the environment. Develop the ability to introduce and use the latest technologies that enable sustainable development.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Analyze the energy and industrial processes from the viewpoint of environmental protection. Describe the types and methods of formation of harmful effects on the environment. Define and calculate the emission into the atmosphere from the combustion process. Explain and calculate the impact of weather conditions on emissions into the atmosphere. Define and describe the technical procedures to reduce emissions of harmful substances into the environment. Develop and describe the schematic representations of flue gas treatment processes, wastewater and solid waste. Analyze and explain the driving factors wastewater treatment processes. Describe the procedures for the reduction, evaluation and treatment of waste. Define and explain identifying characteristics of hazardous waste. Describe the main procedures for the treatment, removal and disposal of hazardous waste.

1.4. Course content

Introduction to environmental protection, basic ecological terms, the balance in the ecosystem, disturbances in the ecosystem. Pollution of the atmosphere, hydrosphere, lithosphere. Legislation. The impact of power and process plants on pollution emissions by flue gas, waste water, waste materials, emissions underground, thermal pollution, effects of pollution legislation. Technical measures to reduce environmental pollution: reduction of flue gas, flue gas treatment, changes in the combustion process, changes in process technology, preventive measures, treatment of waste water, treatment of waste materials (reuse, disposal, incineration), eliminating the effects of pollution. Ecological projects, the state of technical development in the field of environmental protection, new technologies, sustainable development.

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

1.9. Assessment and evaluation of student's work during classes and on final exam

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

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

Prelec, Z.: Summary of lectures (pdf. on Faculty web)
Prelec, Z.: Energtics i process industry, Školska knjiga, Zagreb, 1994. (in Croatian)

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

Kiely, G.: Environmental Engineering, Mc Graw-Hill, International Editions, 1998.
Feretić, D. and other: Power plants and environment, Zagreb, 2000. (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*
Prelec, Z.: Energtics i process industry, Školska knjiga Zagreb, 1994. (in Croatian)	10	

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

Through the Institution's system of quality control.

Basic description		
Course title	**Quality Assurance VO**	
Study programme	**Undergraduate Professional 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)	45+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. Pareto principle. 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. Specification limits and tolerances. Products and processes quality assessment methods. Demerit method. 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, homework and 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. Assessment and evaluation of student's work during classes and on final exam

Sustained knowledge check (three midterm exams) 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)

Montgomery, D.C., Jennings, C. L., Pfund, M. E.: Managing, controlling, and improving quality, John Wiley & Sons Wiley,

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*

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	**Radiocommunications VO**	
Study programme	**Undergraduate Professional 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Students will acquire knowledge of the nature of radio-wave communications and major components of radiocommunication systems, from the source to a receiver. The course will provide the knowledge of key principles, phenomena, techniques, and components of the system.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Apply decibels and nepers. Distinguish the characteristics and implement key relations to analyze the wave propagation through an unguided medium. Explain the wave behavior on the boundary of two media. Apply the basics of wave propagation over a transmission line. Apply the Smith chart. Design a quarter-wavelength and binomial impedance transformer. Distinguish and apply the most used antenna parameters. State the propagation effects in a communication channel. Analyze simple RF link budgets. Evaluate frequency up- and down- conversion and image frequency.

1.4. Course content

Electromagnetic spectrum. Types of electromagnetic waves. A basic scheme of a radiocommunication system. Decibels and nepers. Plane wave in various media. Perpendicular and oblique wave incidence on media boundary. Transmission line model. The Smith chart. Quarter-wave impedance transformer. Binomial transformer. Fundamental antenna parameters. Communication channel and effects on the wave propagation. RF link budget. A brief overview of propagation models for field prediction. Intermodulation products. Frequency conversion. Image frequency.

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, literature reading, class preparation, and continuous studying.

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	1.5	Report		Practice	0.5
Portfolio		Homework					

1.9. Assessment and evaluation of student's work during classes and on final exam

Continuous knowledge examination (midterms) and final exam.

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

D. M. Pozar, *Microwave Engineering*, 3rd ed., Wiley, 2005.

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

J. D. Parsons, *The Mobile Radio Propagation Channel*, 2nd ed, Wiley, 2000.
C. A. Balanis, Antenna Theory: Analysis and Design, 3rd ed, Wiley-Interscience, 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*
D. M. Pozar, *Microwave Engineering*, 3rd ed., Wiley, 2005.	-	10
J. D. Parsons, *The Mobile Radio Propagation Channel*, 2nd ed, Wiley, 2000.	-	10
C. A. Balanis, Antenna Theory: Analysis and Design, 3rd ed, Wiley-Interscience, 2005.	-	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	**Ship Design**	
Study programme	**Undergraduate Professional 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Creating a sense of the complexity of ship design. Based on the basic knowledge of the technical requirements, and its application, achieving compliance with the general basis for the understanding of the important factors in designing vessels.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe the process of the design of the vessel and to analyze the phases of design. Define and describe the concept of design requirements and conceptual and preliminary project. Specify and analyze methods of preparing a preliminary project, and to determine the main characteristics of the ship. Define buoyancy, elements of form and execute verification of the buoyancy and stability in the intact and damaged condition. Analyze the rationality of subdivision (subdivision of marine spaces and tanks) and unsinkability. Make a preliminary calculation of propulsion and prognostic charts. Define specific weights iteratively in various stages of design. Make a general plan, technical description and learn about the classification documentation. Analyze and explain the application of computers for basic calculations in the design of the vessels. Acquaint yourself with the delivery documentation and delivery testing programs.

1.4. Course content

Introduction to the design of the vessel. Design phases of the vessel. Project application. The conceptual design. Preliminary project. Methods of preparing a preliminary project. Determination of the main characteristics of the ship. Determination of buoyancy, elements of ship form and checking buoyancy and stability in the intact and damaged condition. Subdivision and unsinkability. The choice of form and ship lines. Determination of power and choice of main propulsion machinery. Preparation of the general plan of the ship. Determination of marine spaces and tanks. Preliminary determination of weight. The final project. Technical description. Classification documentation. International regulations, standards and conventions and rules of classification societies related to the design of the vessel. Use of computers for basic design calculations. Delivery documentation and acceptance tests.

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, class participation, homework, studying.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Attendance, continuous assessment (2 mid-term exams), the project, written examination, oral examination, or any combination of these forms.

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

Watson, D.: Practical Ship Design, Elsevier Science Ltd., Oxford, 1998.
Schneekluth, H., Bertram, V.: Ship Design for Efficiency & Economy, Butterworth Heinemann, Oxford, 1998.
Letcher, J.: Principles of Naval Architecture Series: The Geometry of Ships The Society of Naval Architects & Marine Engineers (www.sname.org), 2009.

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

Belamarić, I.: Ship and Entropy, Književni krug, Split, 1998. (in Croatian)
Rules for Ship Technical Survey, Part 1.-8., Hrvatski registar brodova, Split, 1999. (in Croatian)
Rawson, K.J., Tupper, A.C.: Basic ship theory, Volume 1 & 2, 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*
Watson, D.: Practical Ship Design, Elsevier Science Ltd., Oxford, 1998.	1	6
Schneekluth, H., Bertram, V.: Ship Design for Efficiency & Economy, Butterworth Heinemann, Oxford, 1998.	1	6
Letcher, J.: Principles of Naval Architecture Series: The Geometry of Ships The Society of Naval Architects	1	6

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

Through a structured system of quality assurance of the Faculty.

Basic description		
Course title	**Ship Systems and Marine Auxiliary Machinery**	
Study programme	**Undergraduate Professional 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge and develop skills to solve practical problems in the field of ship systems and marine auxiliary machinery.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe and analyze ship propulsion systems of ships with diesel engine propulsion plants. Describe and analyze ship ballast and bilge systems. Describe and compare ship cargo heating and cargo loading and unloading systems. Describe and compare ship fire fighting systems. Describe 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 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.

1.4. Course content

Generally on ship systems. Fuel oil systems. Ship cooling systems. Compressed air systems. Other ship engine systems. Ballast systems. Bilge systems. Sanitary systems. Fire fighting systems. Systems for cargo loading and unloading. Inert gas systems. Tank cleaning systems. Ship pumps. Heavy fuel oil and lubricating oil centrifugal separators. Filters. Heat exchangers. 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	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ 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	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

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

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

Ozretić, V.: Marine Auxiliary Machinery and Devices, Dalmacijapapir, Split, 1996. (in Croatian)
Smith, D. W.: Marine Auxiliary Machinery, Butterworths, London, 1988.

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

Martinović, D., Martinović, D.: Handbook in Mechanical Engineering for Deck Officers, Tiskara Žagar, Rijeka, 2000. (in Croatian)
Martinović, I.: Piping Engineering in Shipbuilding, Školska knjiga, Zagreb, 1983. (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*
Ozretić, V.: Marine Auxiliary Machinery and Devices, Dalmacijapapir, Split, 1996. (in Croatian)	8	6
Smith, D. W.: Marine Auxiliary Machinery, Butterworths, London, 1988.	1	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	**Strength of Materials**	
Study programme	**Undergraduate Professional 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge and develop skills to solve practical problems in the field of structural analysis and structural design.

1.2. Course enrolment requirements

Basic knowledge of rigid body statics.

1.3. Expected course learning outcomes

Define basic assumptions and terms in solid mechanics. Define strain and stress. Determine extreme stress values. Differentiate simple and compound stress states. Define Hooke's law. Differentiate simple and compound loading cases. Calculate strains and stresses at axial loading, shear and torsion. Calculate cross-section propreties. Calculate strains and stresses at bending of beams. Define deflection lines of beams. Calculate critical buckling loads of columns. Calculate strains and stresses at compound loadings.

1.4. Course content

Introduction. Strains. Stress. Hooke's law. Axial loading. Shear. Torsion. Theories of strength. Cross-sectional properties of areas. Bending of beams. Deflection of beams in bending. Buckling of bars. Biaxial bending. Eccentric loading. Combined bending and torsion. Springs.

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 experimental work, studying.

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, laboratory experimental work, continuous knowledge testing (mid-term exams), 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", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)
Brnić, J., Turkalj, G.: " Strength of materials II", Zigo, Rijeka, 2006. (in Croatian)

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

Alfirević, I.: " Strength of materials I", Tehnička knjiga, Zagreb, 1995. (in Croatian)
Šimić, V.: " Strength of materials I", Školska knjiga, Zagreb, 1992. (in Croatian)
Seed, G.M.: "Strenght of Materials ", Saxe-Coburg Publications, Edinburgh, UK, 2000. (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*
Brnić, J., Turkalj, G.: " Strength of materials I", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)	15	155
Brnić, J., Turkalj, G.: " Strength of materials II", Zigo, Rijeka, 2006. (in Croatian)	7	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	**Technical Drawing**	
Study programme	**Undergraduate Professional 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

The achievement of the proficiency in the development of 2D geometrical models of 3D objects and implementation of traditional and computer techniques for geometrical modelling. The development of the ability to communicate design ideas using technical drawings in standard drafting formats.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Interpret and apply traditional and CAD techniques for the development of 2D geometrical model. Compare and distinguish the methods of shape description. Compare 3D primitives and interpret the emergence of complex objects. Interpret and apply ISO code system for linear size tolerances, fits, geometrical tolerances and surface texture. Note the role of standardization and standards. Interpret engineering graphics. Organize engineering documentation in accordance with standards. Estimate personal contribution and the contribution of lecturer to the acquisition of contents.

1.4. Course content

Graphical communications. The design process and the role of the design model. Traditional, 2D and 3D CAD techniques for the development of models. The shape description: projection theory, multi-view drawings, sectional views, pictorial representations. Standardization and standards. Technical documentation graphics: size description, tolerances and fits, texture of technical surfaces.

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, homework, studying.

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	1	Report		Practice	
Portfolio		Constructive work	1	Homework	1		

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, homework, 2 constructive works, continuous knowledge testing (2 exams), written exam.

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

M. Kljajin, M. Opalić: *Engineering Graphics,* Strojarski fakultet u Slavonskom Brodu,Slavonski Brod, 2010. (in Croatian)
G. Marunić, J. Butorac, S. Troha: *Engineering Graphics, Collection of Shape Description Problems*, Zigo Rijeka, Rijeka, 2008. (in Croatian)
Kraut` s Engineering Manual, SAJEMA, Zagreb, 2009. (in Croatian)

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*
M. Kljajin, M. Opalić: *Engineering Graphics,* Strojarski fakultet u Slavonskom Brodu,Slavonski Brod, 2010. (in Croatian)	10	115
G. Marunić, J. Butorac, S. Troha: *Engineering Graphics, Collection of Shape Description Problems*, Zigo Rijeka, Rijeka, 2008. (in Croatian)	10	115
Kraut` s Engineering Manual, SAJEMA, Zagreb, 2009. *(in Croatian)*	6	115

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 Professional Study of Mechanical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Introduction to the influential elements of the setting of the technological process. Mastering the knowledge, techniques and methods design and development process. Understanding trends in the development of manufacturing techniques and the impact on the characteristics of process.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define the basic concepts in the production area. Interpret the impact of the type of production and mediation of technological process and its setting. Explain the impact of the performance of the product in the process - technologicality. Enumerate and analyze elements - technologicality parts of the product. Indicate and interpret elements of the planning and management of technological processes. Indicate the category of time when performing operations, define technical standards and analyze ways of determining. Indicate technological background in the processes planning, and interpret their impact on the results and the setting process. Explain the specifics of technological preparation for NC machines. Develop a project of the technological process for a specific workpiece creating basic technological documentation.

1.4. Course content

Fundamental concepts. Influential elements of the technological process. Influence of production and mediation of technological process and its setting. The impact product performance. Technological analysis of products and parts. Planning technology process. Operations and its decomposition. Input material. Technological base. Technological parameters. Categories of time. Production equipment and operating equipment. Technological background. Rigidity, vibration, temperature, internal stresses. Accessories for processing. The accuracy of the workpiece. The ability of the process. Effect of NC equipment to process characteristics. Specificity of technological preparations for NC - machines. The coordinate system and the characteristic points of the system. NC program and its structure. The program drawing, clamping plan, tools plan. Ways of making the NC program. Entering data into the control unit of the machine. Implementation and monitoring of the 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

Course attendance, project development, self learning.

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	1	Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, two mid-term exams, project, and final written and 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	14
Curis, M.A.: Process Planning, New York, 1988.	1	14
Jurković, M., Tufekčić, D.: Tehnological Processes, Design and Modelling, Tuzla, 2000. (in Croatian)	3	14

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 in Process Industry**	
Study programme	**Undergraduate Professional 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Developing skills and competencies involvement in technical issues and solving them during the design, construction and operation. Developing the capacity to identify technical problems, analyzing and making proposals for technical improvements.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe the technological processes in the process industry. Define and explain the main operating parameters of technological processes in the process industry. Develop and explain the basic scheme of technological process. Analyze and explain the factors influencing the efficiency of technological processes. Define and describe the main equipment of process plants. Calculate the main dimensions and operational parameters of equipment, machinery and devices in process plants. To analyze the economic size of technological processes in the process industry. Define and explain the safety requirements of process plants.

1.4. Course content

The introduction of technological processes in the process industry. Basic technological processes (physical and chemical): filtration, separation, aeration, degassing, degasification, evaporation, adsorption, desorption, extraction, neutralization, ion exchange, distillation, fractionation, rectification, thermal cracking, catalytic cracking, hydrocracking, reforming, hydrogenation. Biological processes. Technological installations in the oil industry, the petrochemical industry, the chemical industry and in other process industries. Automation of technological processes. Optimization. Advanced management, monitoring and analysis of technological process control, product quality, operating costs. The economic analysis of technological 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, activity, studying

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on 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)

Prelec, Z.: Energetics in Process Industry, Školska knjiga, Zagreb, 1994. (in Croatian)

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

El-Wakil M. M: Powerplant Technology; Mc Graw Hill Book Company, 1988.
Reis, A., Smith I.: Energy Economic and Management in Industry, Vol. 1 , Vol. 2, Pergamon Press, 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*
Prelec, Z.: Energetics in Process Industry, Školska knjiga, Zagreb, 1994. (in Croatian)	2	

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

Through the Institution's system of quality control.

Basic description		
Course title	**Thermodynamics**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+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 state changes during evaporation and condensation. Describe, compare and analyze processes of steam plants. Describe and analyze the thermal behaviour during combustion. Describe and compare the processes of internal combustion engines. 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 changes and processes with humid air. Apply acquired knowledge to solve thermodynamic tasks (practical problems).

1.4. Course content

The historical development of energy use. Thermal state. The first law of thermodynamics. Ideal and real gas. Equation of state. Work. 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. 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. Processes of internal combustion engines. Energy exchange in the flow. De Laval nozzle. 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 state changes.

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

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	1.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Assessment and evaluation of student's work during classes and on 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	40
Halasz, B, Galović, A., Tadić, M.: Collections of exercises in Thermodynamics, part I, part II, Sveučilišna tiskara, Zagreb, 1993. and 1996. (in Croatian)	19	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	**Tools, Jigs and Fixtures**	
Study programme	**Undergraduate Professional Study of Mechanical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Assuming theoretical and practical knowledge about tools, jigs and fixtures.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Explain basic design of tools, jigs and fixtures. Define design parameters for metal cutting tools. Define design parameters for metal forming tools. Define design parameters for jigs and fixtures. Explain principle of special workholding design and modular principle of design. Explain of basic application of software's at tools, jigs and fixtures design. Make according instructions estimate and design of die and/or fixtures and/or metal cutting tool for real example.

1.4. Course content

Basic design of tool. Responsibility of designer for material chooses and production aim of tool/fixtures. Material for tool and fixtures. Accuracy of machining. Design of metal cutting tool. Basic principle of workholding. Design of tool holder. Die design for stamping. Die design for bending, drawing and cold extrusion. Tool control design. Fixtures design for special purpose, common and modular principle. Modular tools and automated systems for manipulation and storage tools. Basic principles of optimization tools/fixtures. Computers application on tool and fixtures design (CAD/CAM 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, preparation of seminar paper 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	1.5	Report		Practice	
Portfolio		Seminar paper	2				

1.9. Assessment and evaluation of student's work during classes and on final exam

Course attendance, preparation of seminar paper, sustained knowledge check and written exam.

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

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)
Grizelj, B., Seuček, I.: *Cutting Tools*, ISBN: 978-953-6048-41-0, Strojarski fakultet u Sl. Brodu, 2007. (in Croatian)
Hodolič, J., Vukelić, Đ.: *Jigs and Fixtures,* ISBN: 978-86-7892-121-6, Fakultet tehničkih nauka, Novi Sad, 2008. (in Serbian)

Margić, S., Rebec, B.: *Stamping Machines*, Fakultet strojarstva i brodogradnje, Zagreb, 1987. (in Croatian)

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

Boljanovic, V.: Die design fundamentals, Industrial Press, ISBN: 9780831131197, 2005.
Čuš, F.: Jigs and Fixtures for Machining Processes, Maribor, ISBN: 86-435-0608-7, 2004. (in Slovenian)
Rebec, B.: Cutting Tools, Fakultet strojarstva i brodogradnje, Zagreb, ISBN: 86-329-023, 1990. (in Croatian)
Margić, S.: Jigs and Fixtures, Tehnički fakultet Rijeka, 1980. (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*
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)	2	12
Grizelj, B.: Tools, Jigs and Fixtures, ISBN: 953-6048-26-4, Strojarski fakultet u Sl. Brodu, 2004. (in Croatian)	2	12
Grizelj, B., Seuček, I.: Cutting Tools, ISBN: 978-953-6048-41-0, Strojarski fakultet u Sl. Brodu, 2007. (in Croatian)	2	12
Hodolič, J., Vukelić, Đ.: Jigs and Fixtures, ISBN: 978-86-7892-121-6, Fakultet tehničkih nauka, Novi Sad, 2008. (in Serbian)	-	12
Margić, S., Rebec, B.: Stamping Machines, Fakultet strojarstva i brodogradnje, Zagreb, 1987. (in Croatian)	1	12

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	**Welding Engineering**	
Study programme	**Undergraduate Professional 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+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

The course is designed to provide the student with basic knowledge in welding engineering topics. Student is introduced with practical application of several welding processes.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe the basic welding processes and classify welding power sources. Interpret characteristics of arc and mechanisms of formation of the welded joint. Explain weldability and describe the specifics of welding alloy steel, cast iron, aluminum and copper alloys. Classify welding consumables and types of welds. Calculate power requirements for welding and consumption of welding consumables for arch welding. Classify errors in welding and describe methods for quality assurance of welding.

1.4. Course content

Historical development of welding processes. Pressure welding processes. Fusion welding processes. Arc welding. Arc characteristics. Heat input. Static characteristic of an electric arc. Classification of power sources. Welding parameters. Power source equipment. Welding metallurgy. Metal transfer in arc welding. Microstructure of welded joints. Heat affected zone. Weldability. Welding cracks. Preheating. Alloys welding. Design of welded joints. Terms and definitions. Welding symbols. Welding consumables. Classification, characteristics and designation of covered electrodes. Electrodes selection. Energy consumption. Productivity indices. Quality of welds. Welds imperfections. Inspections of welds. Welding procedures.

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 on-site training, homework and 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	2	Report		Practice	
Portfolio			0.5				

1.9. Assessment and evaluation of student's work during classes and on final exam

Sustained knowledge check (three midterm exams) 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)

Connor, L.P., ed.: *Welding Handbook, Vol. 1, Welding Technology*, AWS, Miami, 1989.
O'Brien, R.L., ed.: *Welding Handbook, Vol. 2, Welding Processes*, AWS, Miami, 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*

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

Through the Institution's quality assurance system.