University of Rijeka
Faculty of Engineering

CURRICULUM
UNDERGRADUATE UNIVERSITY STUDY OF ELECTRICAL ENGINEERING

Rijeka, April 2021

1. CURRICULUM DESCRIPTION

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

1. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics I	3	3			6	7
	Physics I	2	2			4	5
	Fundamentals of Electrical Engineering I	3	2	1		6	7
	Computer Software in Engineering	2		2		4	6
	Engineering Graphics	2			2	4	5
	TOTAL					**24**	**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	3	3			6	7
	Physics II	2	2			4	5
	Fundamentals of Electrical Engineering II	3	2	1		6	7
	Programming	2	1	1		4	6
	Materials Technology	2	1			3	5
	TOTAL					**23**	**30**

3. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics for Engineers EE	3	3			6	7
	Measurements in the Electrical Engineering	3		2		5	7
	Electronics I	3		1		4	6
	Electrical Circuits	3	1			4	7
	Foreign Language I[1]	1	1			2	3
	TOTAL					**21**	**30**

[1] elective: English or German - free choice

4. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Digital Electronics	2	1	1		4	6
	Electronics II	2	1	1		4	6
	Fundamentals of Automatic Control	2	1	1		4	6
	Elective Subject[2]						4
	Foreign Language II[1]	1	1			2	3
	Professional Practice I						5
	TOTAL					**18**	**30**

[2] enroll one subject

Elective Subject							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mechanics and Structural Elements	2	1	1		4	4
	Thermodynamics and Energy Engineering	3	1			4	4
	Fundamentals of Mechanical Engineering Design	2			1	3	4
	Fundamentals of Electrical Engineering and Sustainable Development	3	1			4	4

5. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Electrical Machines	3	1	1		5	6
	Power Electronics	2	2	1		5	6
	Signals and Systems	3	1			4	6
	Elective Project[3]				3	3	5
Subject from elective group Automation:							
	Elements of Plant Automation	2	1	1		4	7
Subject from elective group Power Engineering:							
	Electrical Power Switchgear Installations	3	1	1	1	6	7
	TOTAL					**23**	**30**

[3] election from list of offered projects: Computer Software in Engineering, Digital Electronics, Electrical Circuits, Electrical Machines, Electrical Power Switchgear Installations, Electronics I, Electronics II, Elements of Plant Automation, Fundamentals of Automatic Control, Fundamentals of Electrical Engineering I, Fundamentals of Electrical Engineering II, Mathematics for Engineers EE, Measurements in the Electrical Engineering, Power Electronics, Programming.

6. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Electrical Drives	2	1	1		4	5
	Organization of Business Systems	2	1			3	4
	Free Elective Subject[4]						4
	Final Work						10
Subject from elective group Automation:							
	Automatic Control	3	1	1		5	7
Subject from elective group Power Engineering:							
	Electrical Power Networks	3	1		1	5	7
	TOTAL					**16**	**30**

[4] election from list of offered subjects

Free Elective Subjects							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Computer Simulations in Engineering	1			2	3	4
	Introduction into Finite Element Method	1		2		3	4
	Energy Sources	3				3	4
	Processes of Heat Treatment	2		1		3	4
	Small Craft Building and Maintenance UN	2	1			3	4
	Basic Ship Dynamics	2	1			3	4
	Energy Systems	2	2			4	4
	Quality Assurance	2	1			3	4
	Introduction to Guidance and Control of Marine Vehicles	2		1		3	4
	Environment Protection	3				3	4
	Automation	2	1			3	4
	Introduction to Artificial Intelligence	2		2		4	5

UNDERGRADUATE UNIVERSITY STUDY OF ELECTRICAL ENGINEERING TOTAL	Hours	ECTS
	125	180

Basic description		
Course title	**Automatic Control**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**3.**	
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							
The aim of the subject is adopting of theoretical and simulation knowledge from the automation field. Training students to simulate individually in Matlab with application of different control methods. Developing skills of individual and group work and results presentation.							
1.2. Course enrolment requirements							
Fundamentals of Automatic Control.							
1.3. Expected course learning outcomes							
Define basic terms and definitions in automation control field. Describe basic control structures and characteristics. Analyse linear control systems in time and frequency domain. Analyse stability of linear control systems. Apply PID regulator and other regulators developed from the PID regulator. Compare time and frequency domain graph-analytical and analytical control system design methods. Apply cascade control. Synthesise linear control systems in state space. Analyse controllability and observability of linear control systems.							
1.4. Course content							
Basic terms and definitions. Basic control structures and characteristics. Analysis of linear control systems in time and frequency domain. Stability of linear control systems. PID regulator and other regulators developed from the PID regulator. Time and frequency domain conventional and modern control system design: graph-analytical and analytical methods, cascade control - technical and symmetrical optimum, state space synthesis of linear control systems. Controllability and observability of linear control systems.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, simulation exercises, studying.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge	2	Report		Practice	

		check					
Portfolio		Simulation exercises	1.5				

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

Written or oral explanation of simulation exercises, continuous knowledge testing (two partial exams), written or oral final exam.

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

N. Perić: Automatic control, Fakultet elektrotehnike i računarstva, Zagreb, 2001. (in Croatian)

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

D. Matika, D. Brnobić: Fundamentals of Automatic Regulation, Tehnički fakultet Rijeka, 2004. (in Croatian)
Z. Vukić, Lj. Kuljača: Automatic control - linear systems analysis, Kingen, d.o.o., Zagreb, 2005. (in Croatian)
J. D'Azzo, C. Houpis, S. Sheldon: Linear Control System Analysis and Design with Matlab: Fifth Edition, Marcel Dekker, Inc., New York, 2003.

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

Title	*Number of copies*	*Number of students*
N. Perić: Automatic control, Fakultet elektrotehnike i računarstva, Zagreb, 2001. (in Croatian)	0 (Internet)	42

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	**Automation**	
Study programme	**Undergraduate University 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)	30+15+0

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

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

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

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

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

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

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

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

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

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

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

Through a structured quality assurance system of the Faculty.

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

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

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

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

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

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

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

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

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

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

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Simulations in Engineering**	
Study programme	**Undergraduate University 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)	15+30+0

1. **COURSE DESCRIPTION**			
1.1. Course objectives			
General knowledge of computer simulation technology. Understanding the basis of mathematical modeling. Knowing capabilities and limitations of computer simulations. Identifying methods for solving engineering problems using computer simulations.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Correctly explain the methodology of mathematical modeling. Classify mathematical models typical of technical systems. Identify basic types of numerical network. Classify commercial software for numerical modeling. Explain the entire process of applying computer simulation in solving engineering problems. Perform a simulation of a simple problem of mechanical design, in available software.			
1.4. Course content			
Review of existing CAE systems. The process of mathematical modeling. Using finite-element model of solid body mechanics . Using computational fluid dynamics. Modeling of heat transfer. Introduction to commercial software and I-DEAS, CATIA, FLUENT. Structured and unstructured mesh, boundary condition definitions. Understanding the entire process of application of computer simulation for solving engineering problems.			
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other	
1.6. Comments	-		
1.7. Student's obligations			
Attendance, class participation, individual assignment.			
1.8. Evaluation of student's work			

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

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

Course attendance, activity, continuous knowledge testing, seminar paper.		
1.10. Assigned reading (at the time of the submission of study programme proposal)		
I-DEAS, CATIA, FLUENT User Manuals.		
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*
I-DEAS, CATIA, FLUENT User Manuals.	online copies	50
1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences		
Through the Institution's quality assurance system.		

Basic description		
Course title	**Computer Software in Engineering**	
Study programme	**Undergraduate University Study of Electrical 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		
Acquiring knowledge of the historical overview of computer development, understanding the elements of computer systems, acquiring knowledge of computer hardware architecture, understanding the connection between hardware and software, acquiring knowledge of computer software, understanding the principles of software development, utilizing computer software in engineering, acquiring basic knowledge of relational databases, acquiring basic knowledge of computer networks, acquiring knowledge of risks and preventive measures in computer security.		
1.1. Course enrolment requirements		
None.		
1.2. Expected course learning outcomes		
To summarize historical overview of computer development; To describe computer hardware architecture; To classify computer software; To design relational databases; To understand the basics of computer networks; To list the risks and preventive measures in computer security; To understand connection between computer software and hardware; To possess skills in utilizing operating systems Windows and Linux; To understand basic principles of software development; To be able to use e-mail, internet browsers and search the Internet; To be able to use software for text processing at an advanced level; To possess knowledge on software for presentation design; To be able to utilize software for vector and raster image processing; To be able to use tools for website design; To be able to use spreadsheets; To be able to use and program in tools for matrix and numerical computing; To be able to use tools for engineering and mathematical calculations.		
1.3. Course content		
Historical overview of computer development. Basics of computer hardware architecture. Computer software. Relational databases. Operating systems. Computer networks. Computer security. Utilizing computer software in engineering. Introduction to programing.		
1.4. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.5. Comments		
1.6. Student's obligations		
Course attendance, activity, homework, studying.		

1.7. 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	2.5	Report		Practice	
Portfolio		Homework					

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

Course attendance, activity/participation, independent learning, sustained knowledge check, written and/or oral exam.

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

Darko Grundler: Applied Computing, Graphis Zagreb 2000, ISBN: 953-6647- 03-6 (in Croatian)

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

V. Čerić (urednik): Business Computing, Znak, Zagreb, 1998. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Darko Grundler: Applied Computing, Graphis Zagreb 2000, ISBN: 953-6647- 03-6 (in Croatian)	1	90
V. Čerić (urednik): Business Computing, Znak, Zagreb, 1998. (in Croatian)	1	90

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Digital Electronics**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
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							
Understanding basic concepts of digital logic and operation of logic circuits. Understanding basic methods for analysing and designing combinational and sequential digital circuits and systems. Developing the ability of analysing, synthesizing and solving problems.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Defining logical levels and basic characteristics of digitals signals. Applying various number systems. Using various codes to express digital data. Defining the Boolean algebra axioms and basic theorems. Minimizing logical functions. Distinguishing AND-OR, AND-OR complement, XOR and NOR logic. Using various combinational logic circuits and functions. Explaining operational principles and applications of sequential logic circuits.							
1.4. Course content							
Basic digital concepts: digital and analog quantities, logic levels, digital signals, digital systems. Number systems and operations: decimal, binary, octal and hexadecimal system, complement of number. Error detection and correction codes; weighted and unweighted codes, Hamming code. Boolean Algebra; axioms and theorems, Boolean functions, standard form of function, truth table. Minimization of logic functions: Karnaugh map, Quine–McCluskey algorithm. Combinational logic circuits; AND-OR, AND-OR complement, XOR and exclusive NOR. Universal properties of NAND and NOR logic gates. Functions of combinational logic; adders, comparators, coders, decoders, multiplexors, demultiplexors. Latches: S-R latch, J-K latch and edge triggered flip-flops, applications. Counters; asynchronous, synchronous, design of counters, applications. Shift registers; basic and bidirectional registers, applications.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, laboratory exercises, individual 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	1.5
Portfolio							

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

Sustained knowledge check (tests), laboratory exercises, written exam.

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

A. P. Godse and D. A. Godse: Digital Logic Circuits, Technical Publications, 2011.
U. Peruško i V. Glavinić: Digital Systems, Školska knjiga, 2005. (in Croatian)

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

T. L. Floyd: Digital Fundamentals, 10/E, Prentice Hall, 2009.
M. M. Mano and M. D. Ciletti: Digital Design, 4/E, Prentice Hall, 2007.
W. Kleitz: Digital Electronics with VHDL, Prentice Hall, 2006.

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*
A. P. Godse and D. A. Godse: Digital Logic Circuits, Technical Publications, 2011.	1	75
U. Peruško i V. Glavinić: Digital Systems, Školska knjiga, 2005. (in Croatian)	5	75

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

Through the Institution's quality assurance system.

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

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Application of acquired knowledge and skills to solve practical problems in the field of associated course from which the project is elected.							
1.2. Course enrolment requirements							
Enrolled course from which the project is elected.							
1.3. Expected course learning outcomes							
Apply the knowledge and skills from professional content of the associated course. Solve practical task. Acquire competence for individually solving specific professional tasks.							
1.4. Course content							
Chosen chapter of associated course from which the project was elected.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attending the consultation, individually solving task and writing the project report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	2	Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	3				
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Assesses and evaluates the accuracy and completeness of the project task solution and its presentation.							
1.10. Assigned reading (at the time of the submission of study programme proposal)							
References listed for the associated course from which the project is elected.							

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

References listed for the associated course from which the project is elected.

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Electrical Circuits**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding of relationship between electrical parameters in electrical circuits. Ability of solving circuits and behaviouring determination of electrical circuits. Ability of solving given problem to determinate state in electrical circuits. From basic competencies ability of analysis and basic computing skils will be developed.							
1.2. Course enrolment requirements							
Fundamentals of Electrical Engineering II.							
1.3. Expected course learning outcomes							
1. Choose and apply proper method for solving and analysis linear and time continued electrical circuits in term to obtain time responses. 2. Valorize solutions obtained by circuits analysis. 3. Apply circuit theorems and assess obtained solutions. 4. Calculate imitance functions and transfer functions and on that basis assess circuit frequency response. 5. Calculate basic and mirror twoports parameters. 6. Anayze circuits which contains transmission lines and assess obtained results.							
1.4. Course content							
Definition and principal laws of electrical circuits. Elements of circuits. Kirchhoff's laws. Circuits equations at time domain and frequency domain. Free and forced circuit response. Topology analysis. Circuits theorems. Circuit functions and it's properties. First and second order circuits. Equations and parameters of two-port and multi-port circuits. Mirror parameters. Characteristics and connections of two-ports. Electrical filters. Circuits with distributed parameters. Ideal line and special cases of lines.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Course attendance, homework, written exam.							
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	0.5	Sustained knowledge check	3	Report		Practice	
Portfolio							

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

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

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

N. Stojković, V. Naglić, N. Mijat: Theory of networks and lines, Tehnički fakultet, Rijeka, 2005. (in Croatian)
N. Stojković: Theory of networks and lines – problems collection, Tehnički fakultet, Rijeka, 2005. (in Croatian)

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

Ivanšić, I.: Function of complex variable and Laplace transformation, Sveučilišna naklada Liber, Zagreb, 1978. (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*
N. Stojković, V. Naglić, N. Mijat: Theory of networks and lines, Tehnički fakultet, Rijeka, 2005. (in Croatian)	10	100
N. Stojković: Theory of networks and lines – problems collection, Tehnički fakultet, Rijeka, 2005. (in Croatian)	10	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	**Electrical Drives**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding the basic concepts and the requirements of the electrical drives. Specific qualities of the different machines in the electrical drives. Understanding the structure of electrical drives. Define the mathematical model of electrical drives.							
1.2. Course enrolment requirements							
Fundamentals of Automatic Control.							
1.3. Expected course learning outcomes							
Description of the physical working principle of the electrical drives. Description of characteristic types of the electrical drives and loads. Definition of the static characteristic of standard electrical drives. Comparison of qualities between different electrical machines in electrical drives. Comparison of advantages and drawbacks between different control systems for particular electrical drive types. Mathematical description of the electrical drive and development of the simulation model of the electrical drive.							
1.4. Course content							
Basic concepts. Fundamentals of the rotating machines. Torque characteristics of the loads. Direct current machines with separately or in series excitation in different types of the electrical drives. Speed control of the direct current machines with separated or in series excitation. Dynamic response of the direct current machine with separated excitation. Induction machine: structure, static characteristics and basic types of the speed control. Scalar control (voltage over frequency) of the induction machine. Basic concepts of frequency converters. Synchronous machines in the motoring and the regenerative mode, their characteristics, applications and associated problems. Frequency conveters for synchronous machines. Special electrical drives. Losses in electrical drives during dynamics states.							
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, activities in class, writing laboratory reports, studying							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	0.5

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

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

Course attendance, activities in class, sustained knowledge checks (midterm exam), written and oral exam.

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

B. Jurković: Elektromotorni pogoni, Školska knjiga, Zagreb, 1986.
Ion Boldea, Syed A. Nasar Electric Drives Prentice Hall, 2006.

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

W. Leonhard: Control of Electrical Drives, Springer Verlag, 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*
B. Jurković: Elektromotorni pogoni, Školska knjiga, Zagreb, 1986.	8	60
Ion Boldea, Syed A. Nasar Electric Drives Prentice Hall, 2006.	2	60
W. Leonhard: Control of Electrical Drives, Springer Verlag, 1996.	2	60

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

Through the Institution's quality assurance systems.

Basic description		
Course title	**Electrical Machines**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding the basic concepts and basic operation of electrical machines and transformers. Ability to define steady state characteristics using the mathematical and substitutional models. The ability to work in small groups in the laboratory and writing reports.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Analyze the magnetic circuit. Explain the theory of transformers. Describe the concept of the fundamental equation of torque, rotating and oscillation fields. Apply the theory of electromechanical energy conversion. Describe the operation of electrical generators and motors. Apply the concept of equivalent circuits. Describe and explain the concept of spatial vectors. Describe the structural design of electrical machines. Apply simpler testing of electromechanical devices. Describe the fundamental equation of f a electrucal machine. Distinguish different types of electrical machines. Compare the operation of different types of electrical machines. Analyze the simpler tasks related to the operation of electrical machines. Explain the external characteristics of a electrical machine. Describe the temperature class of insulation. Introduce technological course of production of power transformers.							
1.4. Course content							
Magnetic systems. Transformers. Basic principles of electrical machines. Synchronous machines. Spatial vectors. Synchronous brushless permanent magnet motor. Asynchronous machine-steady state. DC and ECM motors. Heating of the electrical machines.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork		☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Lectures, exercises, studying.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	1
Written exam	0.5	Oral exam	0.5	Essay		Research	

Project		Continuous knowledge testing	1.5	Report		Practice	
Portfolio							

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

Course attendance, activity, continuous knowledge testing, report on experimental work, fieldwork, written and oral exam.

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

L. Šušnjić: Electrical Machines, e-learning material, 2006. (In Croatian)
R. Wolf: Fundamentals of Electrical Machines, Školska knjiga, Zagreb, 1991. (In Croatian)

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

G.R. Slemon: Electric Machines and drives: Addison –Wesley , 1992.
N. Mohan: Electric Drives, MNPERE, 2003

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

Title	*Number of copies*	*Number of students*
R. Wolf: Fundamentals of Electrical Machines, Školska knjiga, Zagreb, 1991. (In Croatian)	5	60

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Electrical Plants**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
The course is a basic professional discipline for all the students of the electric power system studies. The goal is to introduce the students to plants and elements for generation, transmission and distribution of electric energy in industry and electroenergetics.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Classification and basic characteristics of high voltage and low voltage electrical plants in industry and electroenergetics. Description and performance of electrical plants. Methods for calculation of short circuit currents and calculations used for definition of the characteristics of necessary equipment for electrical plants, generation plants and power system in general.							
1.4. Course content							
Voltage and current stresses in electrical plants. Peak short circuit current, breaking short circuit current, thermal short circuit current. Selection of electrical plant elements and configuration regarding voltage level and role in the system. Symmetrical and unsymmetrical three-phase systems. Sequence impedances of power system elements. Auxiliary devices in electrical plants: control, measurement, signal and protection devices. Dimensioning of busbars and selection of post and bushing insulators. Phenomena during breaking currents; types and selection of breakers. Disconnectors and high voltage fuses. Measuring transformers. Surge arresters. Operational and protection grounding system in electrical plants. Operational measurements in electrical plants. Supply sources and auxiliary operations for distribution of supply.							
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, seminar paper, studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	1	Oral exam		Essay		Research	

Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

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

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

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

H. Požar: High-voltage switchgear, Tehnička knjiga, Zagreb, 1990. (In Croatian)
H. Požar:Electrical Plants, Školska knjiga, Zagreb, 1990. (In Croatian)

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

H. Požar: Production of electricity, University of Zagreb, Zagreb, 1962

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*
H. Požar: High-voltage switchgear, Tehnička knjiga, Zagreb, 1990. (In Croatian)	1	20
H. Požar:Electrical Plants, Školska knjiga, Zagreb, 1990. (In Croatian)	1	20

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Electrical Power Networks**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**3.**	
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 physical understanding of electrical parameters in electrical power networks and their correlation under different operating conditions. The ability to model, analyse and determine electrical conditions in electrical power networks. The ability to solve problems with a goal of analysis or optimal development of electrical power networks.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Describe the elements of electrical power networks. Define the equivalent models of electrical power network elements. Analyse the electrical conditions in electrical power networks. Perform the load flow calculation of electrical power networks. Perform the short circuit calculation of electrical power networks. Analyse the stability state of electrical power networks. Perform the reliabilty analysis of electrical power networks. Perform the calculation of voltage drop and electrical power losses in radial electrical power networks. Define the conditions of electrical power networks' development. Describe the characteristics of transmission and distribution electrical networks.		
1.4. Course content		
Definition, structure and main division of electrical power networks. The historical development of electrical power networks. The elements of electrical power networks. The electrical parameters of electrical power network elements. Resistance, inductive reactance and capacitive reactance of the electrical power network elements. The equivalent models of network elements. The composition of equivalent models. Quadripoles. Matix operation for the analysis of electrical power networks and the composition of matrices. The type of calculations in electrical power networks. Load flow calculation. Voltage drop and power flow calculation. Star point earthing in electrical power networks. The analysis and short circuit calculation in electrical power networks. The stability of electrical power networks and its calculation. The analysis of medium voltage and low voltage electrical power networks. The theoretical introduction in transimission power networks. The theoretical introduction in distribution power networks. The load forecast and the planning of the development of electrical power networks.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam	0.5	Essay		Research	
Project	1	Sustained knowledge check	2	Report		Practice	
Portfolio		Homework					

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

Course attendance, activity, homework – construction projects, 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)

M. Ožegović, K. Ožegović: Electrical Power Networks I-VI, FESB Split, 1996.-2008. (In Croatian)
Course materials in electronic form.

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

J. Grainger, W. Stevenson: Power System Analysis, McGrow-Hill, 1994.
B. Debs: Modern Power System Control and Operation, DSI, Atlanta, 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*
M. Ožegović, K. Ožegović: Electrical Power Networks I-VI, FESB Split, 1996.-2008. (In Croatian)	8	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	**Electronics I**	
Study programme	**Undergraduate University Study of Electrical 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		
Understanding of physical relations in semiconductors in electric field. Understanding of operating and behavioring of electronics elements. Ability of solving set problem in terms of calculating electrical values in semiconductor material and electronics elements. From basic competencies ability of analysis and basic computing skils will be developed.		
1.2. Course enrolment requirements		
Fundamentals of Electrical Engineering I.		
1.3. Expected course learning outcomes		
1. Analyze and valorize physical phenomena in semiconductor material with and without electrical field affect. 2. Asses rectifiers effect of *pn*-junction and metal-semiconductor junction. 3. Analyze and valorize operation of semiconductor diode in statical and dynamical conditions. 4. Analyze and valorize operation of basic semiconductor optoelectronics components. 5. Analyze and valorize operation of bipolar transistor in statical and dynamical conditions. 6. Analyze and valorize operation of unipolar transistors in statical and dynamical conditions. 7. Measure current-voltage characteristics of basic semiconductor electronics elements.		
1.4. Course content		
Introduction to electronics. Semiconductor materials. Physical properties of semiconductors. Currents in semiconductors. Planar technology on silicon. Theory *pn*-junction. Semiconductor *pn* diode. Optoelectronics elements. Principle of operation and basic construction of bipolar *npn* and *pnp* transistor. Transistor operation region. Transistor orientations. Ebers-Moll equations and corresponding substitution models. Statical characteristics. Real transistors. Transistor dynamical parameters for small-signal operation. High-frequency transistor properties. Principle of operation and basic construction of junction transistor with field effect. Operation region of JFET. Statical characteristics of *n*- and *p*-channel JFET. Dynamical parameters of JFET. Substitution models of JFET. Principle of operation and basic construction of unipolar MOS transistora with field effect. Operation region of MOSFET. Statical characteristics of *n*- and *p*-channel MOSFET. Scaling of MOSFET. Dynamical parameters of MOSFET for small-signal operation. Substitution models of MOSFET. CMOS inverter.		
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, written exam.

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	3	Report		Practice	
Portfolio							

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

Course attendance, laboratory work, continuous knowledge testing, written exam.

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

P.Biljanović, Semiconductor Electronics' Elements, Školska knjiga Zagreb, 2004. (in Croatian)
J. Šribar, J. Divković-Pukšec, Electronics' Elements, problem collection, I i II part, Element, Zagreb, 1996. (in Croatian)

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

S.M.Sze, Physics of Semiconductor Devices, New Jersey: J. Wiley &Sons, Inc. Publication, 2007.
A.S.Sedra, K.C. Smith, Microelectronic Circuits, 5th edit, N. York, Oxford, Uni. Press, 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*
P.Biljanović, Poluvodički elektronički elementi, Školska knjiga Zagreb, 2004. (in Croatian)	10	100
J. Šribar, J. Divković-Pukšec, Elektronički elementi, zbirka riješenih zadataka i izvoda, I i II dio, Element, Zagreb, 1996. (in Croatian)	10	100
M.Sze, Physics of Semiconductor Devices, New Jersey: J. Wiley &Sons, Inc. Publication, 2007.	1	100
A.S.Sedra, K.C. Smith, Microelectronic Circuits, 5th edit, N. York, Oxford, Uni. Press, 2004.	1	100

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Electronics II**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
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							
Students will be able to describe and analyse transistor circuits in typical configurations.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Analyze the transistor using the large signal model. Analyze the transistor using the small signal model. Analyze different transistor amplifier configurations. Analyze amplifier's frequency response. Describe amplifiers with feedback loop. Analyze operational amplifier. Describe and analyze CMOS logic circuits.							
1.4. Course content							
Circuits with bipolar transistors. Basic transistor amplifier configurations. Differential amplifiers. Cascaded amplifiers. Power amplifiers. Operational amplifiers. Amplifier frequency response. Feedback amplifiers. Stability of feedback amplifiers. Basic CMOS logic circuits. ECL circuits.							
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	1	Sustained knowledge check	2	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Course attendance, activity, project work, continuous knowledge testing (three mid-term exams), written exam.							

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

Ž. Butković: Elektronics 2, Zagreb 2010. (in Croatian)
P. Biljanović: Electronic Circuits, 2 ed., Školska knjiga, Zagreb, 1993. (in Croatian)

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

R. C. Jaeger and T. N. Blalock, Microelectronic Circuit Design, 3rd ed, McGraw Hill, 2008.
Sedra, A.S., Smith, K.C., Microelectronic Circuits, 5th ed, Oxford University Press, 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*
Ž. Butković: Elektronics 2, Zagreb 2010. (in Croatian)	5	70
P. Biljanović: Electronic Circuits, 2 ed., Školska knjiga, Zagreb, 1993. (in Croatian)	5	70

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	**Elements of Plant Automation**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Students will be introduced with basic categories of plant automation elements, and gain theoretical and practical knowledge for system analysis, by solving automation problems and by applying computers and programmable logic controllers (PLC) for automation of simple systems.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define and distinguish between the basic categories of plant automation elements. Explain the implementation principles and mathematically analyse physical phenomena in plant automation elements. Define and analyse static and dynamic characteristics of plant automation elements. Analyse electromechanical, pneumatic and hydraulic actuators. Describe the implementation and computer operation in plant control. Apply the computer and the programmable logic controller (PLC) in automation of simple systems.							
1.4. Course content							
Introduction to programmable logic controllers (PLC). Static and dynamic characteristics of automation elements. Noise sources in the measuring systems. Operational principle and characteristics of sensors: movement, position, fluid level, temperature, flow, and pressure. Operational principle of electromechanical, pneumatic, and hydraulic actuators.							
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 assignments, individual studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	2	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	1

Portfolio							

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

Course attendance, laboratory assignments, continuous knowledge tests, written exam.

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

Clarence W. de Silva: Sensors and Actuators - Control System Instrumentation, CRC Press, 2007
Bela G. Liptak: Instrument Engineers Handbook, 4th Edition, CRC Press, 2003

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

Radoslav Korbar: Pneumatika i hidraulika, Veleučilište u Karlovcu, 2007

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	**Energy Sources**	
Study programme	**Undergraduate University 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+0+0

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

		check					
Portfolio		Homework					

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

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

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

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

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

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

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

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

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

Through the Institution's quality assurance system.

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

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

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

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

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

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

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

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

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

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

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

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

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

Through the Institution's system of quality assurance.

Basic description		
Course title	**Engineering Graphics**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**1.**	
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							
Acquiring knowledge required for the design and interpretation of technical documentation using traditional tools and computer techniques. Developing the ability to visualize and use graphics as a system for engineering communication in which ideas are expressed clearly and in accordance with standards.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define and explain the concept of engineering graphics. Interpret the technical drawing. Select the appropriate shape description method to display the object. Create technical documentation using traditional and CAD techniques in accordance with standards.							
1.4. Course content							
Graphic communications. Traditional and CAD techniques. The role of engineering graphics. Formation of simple geometric bodies and complex objects. Shape description: projection theory, multi-view and cross-sectional drawings, axonometric representations. Standardization and standards. Creation of technical documentation in accordance with standards.							
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), solving of program assignments (constructive work), studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.75	Report		Practice	
Portfolio		Homework		Constructive work	1.5		

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

Program assignments (constructive work), continuous knowledge testing, final written exam.

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

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

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

D. K. Lieu, S. Sorby: Visualization, Modeling, and Graphics for Engineering Design, Delmar Cengage Learning, 2009.

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

Title	*Number of copies*	*Number of students*
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition	3	125
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2010.	10	125
G. Marunić, J. Butorac, S. Troha: Inženjerska grafika, Zbirka zadataka iz opisa oblika, Zigo Rijeka, Rijeka, 2008.	10	125
Lecture materials	web	125

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Environment Protection**	
Study programme	**Undergraduate University 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+0+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Define the basic concepts of ecology and environmental protection. To analyze the impact of the technological aspects of the environment. Describe the processes that affect pollution. Compare technologies and their impact. Distinguish the development of sustainable development. Argue the importance of sustainable development. Describe the current problems of global pollution. Distinguishing the basic concepts of ecology and environmental protection. Understanding the impact of technology on the environment.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Analyzing the impact of the different engineering aspects of the environment based on research. Developing the ability to work within an interdisciplinary team and communicating with experts in other fields. Developing the ability to create and project management in the field of environmental protection.							
1.4. Course content							
Introduction to the environment, the subject of ecology. Soil, atmosphere, water and sea. Interaction with the environment. Monitoring of the environment, particularly in the marine environment. Sampling from the environment. Measurement methods of analytical chemistry. Physical methods of measurement. Fluorescent methods. Basics of modeling processes in the environment. Environmental protection. Improving the environment. Ocean Engineering. Marine technology objects and its interaction with the environment. International conventions and norms.							
1.5. Teaching methods	☒ lectures ☐ 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, class participation, research and search the literature sources, making self-employment, consulting, independent learning, presentation of work.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam	1	Essay		Research	1

Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework					

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

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

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

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

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

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

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

Title	*Number of copies*	*Number of students*
Briški, F.: Zaštita okoliša, Fakultet kemijskog inženjerstva i tehnologije, Zagreb, 2016.	1	12
Črnjar, M.: Economics and Environmental Policy, Ekonomski fakultet, Rijeka, 2002. (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	**English Language I**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

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

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

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

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

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

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

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

Ibbotson, M.: Professional English in Use. Engineering. Cambridge Universtity Press 2009.
Ibbotson, M.: Cambridge English for Engineering. Cambridge University Press 2015.
Smith, R. H. C.: English for Electrical Engineering in Higher Education Studies. Garnet Publishing Ltd 2014.
Glendinning, E. H. & Glendinning, N.: Oxford English for Electrical and Mechanical Engineering. Oxford University Press 2001.
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Školska knjiga, Zagreb 1990.
Bartolić, Lj.: *Technical English in Electronics and Electrical Power Engineering*. Školska knjiga, Zagreb 1987.
Vince, M.: Intermediate Language Practice. Heinemann ELT. Oxford 1998.
Paterson, K. & Wedge, R.: Oxford Grammar for EAP. Oxford University Press 2013.

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

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Engleski jezik I - Elektrotehnika* 2019.	83	83

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

Through the Institution's Quality Assurance System.

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

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Students should be able to use professional jargon independently, namely communicate with other experts in the field of the engineering profession and in an international environment, at the B2 level of the Common European Framework of Reference for Languages.							
1.2. Course enrolment requirements							
Attended course English Language I.							
1.3. Expected course learning outcomes							
Students should be able to use autonomously general English as well as technical English according to the Common European Framework of Reference for Languages (up to B2 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately more complex diagrams, charts, figures and mathematical formulae. Present the advantages and disadvantages in covered units. Express one's point of view and evaluate solutions of given problems.							
1.4. Course content							
Topics: Introduction to electric power systems. Switches, circuit breakers and fuses. Conduction and transmission of electric current. Transformer. Electric generators and motors. Computer essentials. Globalisation. Technology and its influence on society. Grammatical and language structures: Sequence of tenses. Adjectives and comparison of adjectives. Relative Clauses. Participles (-ing/-ed). Gerund and to+infinitive form of the verb. Word formation. Prefixes and suffuixes. Conditional clauses.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class and autonomous learning.							
1.8. Evaluation of student's work							
Course	1	Activity/Participation	0.5	Seminar paper		Experimental	

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

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

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

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

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

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

Ibbotson, M.: Professional English in Use. Engineering. Cambridge Universtity Press 2009.
Ibbotson, M.: Cambridge English for Engineering. Cambridge University Press 2015.
Smith, R. H. C.: English for Electrical Engineering in Higher Education Studies. Garnet Publishing Ltd 2014.
Glendinning, E. H. & Glendinning, N.: Oxford English for Electrical and Mechanical Engineering. Oxford University Press 2001.
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Školska knjiga, Zagreb 1990.
Bartolić, Lj.: *Technical English in Electronics and Electrical Power Engineering*. Školska knjiga, Zagreb 1987.
Vince, M.: Intermediate Language Practice. Heinemann ELT. Oxford 1998.
Paterson, K. & Wedge, R.: Oxford Grammar for EAP. Oxford University Press 2013.

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

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Engleski jezik II – Elektrotehnika* 2020.	83	83

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

Through the Institution's Quality Assurance System.

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

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
The Final Work is an individual assignment and verification of student expertises, which should show the appropriate level of engineering skills for individually solving specific professional task.							
1.2. Course enrolment requirements							
Enrolled course from which the Final Work is selected.							
1.3. Expected course learning outcomes							
Apply acquired knowledge, expertises and skills of the content of Final Work associated course. Solve practical task. Acquire competence for individually solving specific professional task.							
1.4. Course content							
The content of the Final Work is based on the application of acquired knowledge from educational programs at the undergraduate university studies. Final thesis can be specified from a particular course specific professional content and exceptionally from course that belongs to the group of shared content, when it represents a broader entity with a particular course specific content of the studies. Student enrollers the Final Work by enrolling the last semester. Thesis of the Final Work is establishes by Commission for Final Works, based on suggestion of teacher who will mentor the Final Work.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attending the consultation, individually solving task and writing the Final Work report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	8	Final work in written form	2		
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

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

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

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

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Fundamentals of Automatic Control**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
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		
Acquiring theoretical fundamentals and practical knowledge for solving problems in area of automatic control. Usage of program tools for solving control problems. Understanding the principle of a control loop. Knowledge of how to describe control loops using transfer functions. Understanding the basic concepts of stability theory.		
1.2. Course enrolment requirements		
Mathematics II, Fundamentals of Electrical Engineering II		
1.3. Expected course learning outcomes		
After the passed test, the student will be able to: Describe fundamental characteristics of control loops and the principles of regulation. Define, analyse and compare mathematical models of different control system components using Laplace transform. Define the transfer function and step response characteristic of basic dynamic components. Calculate the transfer function of complex dynamic systems. Define the amplitude-phase frequency characteristic of basic dynamic components. Draw the amplitude-phase frequency characteristic of complex systems. Define the stability of control systems. Analyze the stability using analytical and graphical-analytical methods. Describe and calculate the quality indicators of control systems. Apply analytical and numerical functions within simulation software packages for analysis and problem solving. Correctly select the parameters of a controller in a simple control system. Understand the structure of a controller.		
1.4. Course content		
Basic terminology. Mathematical description of control system components. Laplace transform. Transfer functions and time responses of control system components. Amplitude- and phase-frequency characteristics of control system components. Algebraic and graph-analytical stability criteria. Controller structure and parameters. Control system design examples. Control system accuracy. Control system quality indicators.		
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, activities in class, individual attending of laboratory exercises, 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	2.5	Report		Practice	0.5
Portfolio							

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

Course attendance, activities in class, writing laboratory exercise reports, sustained knowledge checks (two tests), written exam

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

Vukić, Z. and Kuljača, Lj.: Automatic Control – Linear System Analysis, Kigen d.o.o., Zagreb, 2004. (in Croatian)
Matika, D. and Brnobić, D.: Basics of automatic control, Mimeographed notes, Technical Faculty Rijeka, Croatia, 2004 (in Croatian)

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

Nise, N.: Control System Engineering. New York; John Wiley and Sons., 2000
Kuljača, Lj. and Vukić, Z.: Automatic Control of Systems. Zagreb; Croatia, Školska knjiga., 1985 (in Croatian)
Šurina, T.: Automatic Regulation. Zagreb; Croatia, Školska knjiga., 2001 (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*
Vukić, Z. and Kuljača, Lj.: Automatic Control – Linear System Analysis, Kigen d.o.o., Zagreb, 2004. (in Croatian)	5	60
Matika, D. and Brnobić, D.: Basics of Automatic Control, Mimeographed Notes, Technical Faculty Rijeka, Croatia, 2004 (in Croatian)	14	60

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

Through the Institution's quality assurance systems.

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

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Introduction to basic electrical quantities, concepts and principles. Ability to solve numerical problems in the field of electrical engineering. Perform experiments and qualitative analysis of established or measured values.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Correctly interpret and use basic concepts and quantities of the electrostatic and electromagnetic fields. Describe and explain the laws of electromagnetic and electrostatic fields (induction, self-induction, the law of flow, potential, Coulomb force ...). Apply the basic laws of electrostatic and electromagnetic fields. Develop and interpret basic calculations of simple magnetic circuits and electrostatic fields. To construe and interpret the basic concepts and the quantities of the DC circuits. Explain and apply basic laws circuits (Kirchhoff's laws, superposition theorem, Thevenin's theorem, method of loop currents, ...) in the calculations of DC circuits. Design and analyze calculations of current, voltage and power in simple DC circuits. Measure electrical quantities in DC circuits.		
1.4. Course content		
Electric charge and electric chargability of the body. Coulomb's law. Electric field. Electric induction. Vector density of electric displacement D. Gauss' law. Work force in electric field. Electric potential and voltage. The lines of electric filed and equipotential surfaces. The relationship between electric field and potential. Capacitor and capacitor's capacity. Matter in the electric field. Field on the border of two insulators. Capacitor's connections. The energy of the electrostatic field. The concept of electric current. Resistance and conductance. The temperature dependence of the resistance. Ideal and real sources of electric current. Electric circuit. Power and energy of DC circuits. Kirchhoff's laws. Linear DC circuits. Nonlinear element in a DC circuit. The magnetic field. The force on a moving charge and current flowing conductor. Current loop in magnetic field. Biot-Savart law. Magnetic flux. Faraday's law of electromagnetic induction. Self-induction and mutual induction. Matter in magnetic field. Ferromagnetism. Magnetic circuits and magnetization curves and hysteresis. Energy of magnetic field.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☒ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Course attendance, activity, studying.

1.8. Evaluation of student's work

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

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

Course attendance, measuring of electric quantities, continuous knowledge testing (mid-term exams, tests), final exam (written and oral exam).

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

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

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

Jajac, B.: Theoretical fundamentals of electrical engineering, Part I-III, Graphis, Zagreb, 2001-2007. (in Croatian)
Kuzmanović, B.: Fundamentals of electrical engineering I, Tehnička knjiga, Zagreb, 1997. (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 I, Tehnička knjiga, Zagreb, (in Croatian)	14	130
Đurović, G.: Electrical engineerging I, Školska knjiga, Zagreb, 2004. , (in Croatian)	11	130

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

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Introduction to basic electrical quantities, concepts and principles. Ability to solve numerical problems in the field of electrical engineering. Performing experiments and qualitative analysis of established or measured values.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
To explain the emergence of a sinusoidal waveform AC voltage concepts, concepts of periods, frequency, current and maximum values and the initial phase shift. Apply the characteristic quantities of the maximum, effective and average values of the current and voltage in the vector and numerical analysis of AC circuits. Distinguish and describe the basic physical models of working and reactive (inductive and capacitive) resistance in the AC circuit. Analyze and explain the vector diagrams and calculations of AC circuits with serial and parallel connection of working and reactive resistance. Explain the fluctuations of working and reactive energy of electric field in condenser and magnetic field in coil. Explain and use the two-dimensional complex numbers in numerical analysis of two-component of working-reactive AC circuits. Apply the basic laws and methods of calculations of AC circuits. Describe the three-phase electrical system and rotating magnetic field. Measure electrical quantities in AC circuits.		
1.4. Course content		
Nonstationary (transient) state in DC circuits. Periodically variable electrical quantities. Characteristic values of the periodic quantities (mean and effective value). Elements of electrical networks. The application of complex analysis in network analysis with sinusoidal currents and voltages. The concept and properties of impedance and admittance. Current and voltage resonance. Instantaneous, active, reactive and apparent power. Matching of load. Analysis of electrical networks with linear elements (application of Kirchhoff's laws, contour currents, voltages of nodes, superposition, theorems network, transfiguration). Symmetric and asymmetric three-phase systems. Rotating magnetic field. Coil with an iron core in an AC circuit. Physical picture of the transformer. Nonlinearity in AC networks and application of Fourier analysis.		
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	3	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Laboratories	0.5	Final exam	1.5		

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

Course attendance, measuring of electric quantities, continuous knowledge testing (mid-term exams, tests), final exam (written and oral exam).

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

Pinter, V.: Fundamentals of Electrical Engineering II, Tehnička knjiga, Zagreb, (in Croatian)
Đurović, G.: Electrical Engineering II, Školska knjiga, Zagreb, 2004. , (in Croatian)

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

Jajac, B.: Theoretical fundamentals of electrical engineering, Part I-III, Graphis, Zagreb, 2001-2007. (in Croatian)
Kuzmanović, B.: Fundamentals of electrical engineering II, Tehnička knjiga, Zagreb, 1997. (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 II, Tehnička knjiga, Zagreb, (in Croatian)	10	130
Đurović, G.: Electrical Engineering II, Školska knjiga, Zagreb, 2004. , (in Croatian)	10	130

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 and sustainable development**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+15+0

2. **COURSE DESCRIPTION**							
1.1. Course objectives							
The main goals of the course are to familiarise students with the fundamentals of electrical engineering and the concept of sustainable development. From general competencies, the ability to analyze, basic computing skills and problem solving will be developed.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Describe energy sources and energy conversions. Explain principles of operation of the most important types of power plants. Explain basic principles of electromechanical energy conversion. Explain principles of operation of electric rotating machines and transformers. Apply knowledge of low voltage electrical installations and lighting. Explain the structure and most significant characteristics of traditional and modern transmission and distribution networks. Explain the impact of the electricity sector on the environment and apply solutions to reduce greenhouse gas emissions in the electricity sector.							
1.4. Course content							
Forms, sources and classification of energy. Energy sources and energy conversion. Thermal power plants, hydroelectric power plants, renewable energy sources. Electricity production and consumption in the world. Transformers and rotating machines. Power system. Structure and operation of transmission and distribution networks. Elements of electric power networks and plants. Low voltage installations and lighting. Electric shock protection. External and internal lightning and surge protection. Basic analysis in power engineering. Impact of the electricity sector on the environment - environmental protection. Greenhouse effect and greenhouse gases. Solutions for reducing greenhouse gas emissions in the electricity sector. Emission reduction strategies through examples and international actions.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	

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

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

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

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

H. Požar, Osnove energetike 1, 2 i 3, Školska knjiga, Zagreb, 1992. (in Croatian)
B. Udovičić, Elektroenergetski sustav, Kigen, Zagreb, 2005. (in Croatian)
P. Hasse, J. Wiesinger, W. Zischank, Priručnik za zaštitu od munje i uzemljenje, Kigen d.o.o., Zagreb, 2009. (in Croatian)
G. Piani, A.Višković, B.Saftić, Protokol iz Kyota; Ostvarenje i budući razvoj, zakonodavstvo, strategije i tehnologije, Kigen d.o.o., Zagreb, 2011. (in Croatian)
Course materials in electronic form.

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

R. Wolf, Osnove električnih strojeva, Školska knjiga, Zagreb, 1991. (in Croatian)
V. Srb, Električne instalacije i niskonaponske mreže, Tehnička knjiga, Zagreb, 1991. (in Croatian)
L. Ujević, Z. Buntić, Elektrane, Školska knjiga, Zagreb, 1993. (in Croatian)
Z. Morvaj, D. Gvozdenac, Ž. Tomšić, Sustavno gospodarenje energijom i upravljanje utjecajem na okoliš u industriji, EM d.o.o., Zagreb, 2014. (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*
H. Požar, Osnove energetike 1, 2 i 3, Školska knjiga, Zagreb, 1992.	X	X
B. Udovičić, Elektroenergetski sustav, Kigen, Zagreb, 2005.	X	X
P. Hasse, J. Wiesinger, W. Zischank, Priručnik za zaštitu od munje i uzemljenje, Kigen d.o.o., Zagreb, 2009.	X	X
G. Piani, A. Višković, B. Saftić, Protokol iz Kyota; Ostvarenje i budući razvoj, zakonodavstvo, strategije i tehnologije, Kigen d.o.o., Zagreb, 2011.	X	X

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 Mechanical Engineering Design**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
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			
Acquiring knowledge about loads, stresses, types, functions, designs, materials and calculations related to machine elements and their integration into mechatronics systems.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Differentiate types of loads and stresses. Define formulae for the calculation of stresses and allowable stresses. Differentiate machine elements. Describe and analyse the calculation of machine elements. Sketch machine elements. Describe basic terms and elements of mechatronics systems. Apply the acquired knowledge.			
1.4. Course content			
Types of loads. Stresses and deformations of machine elements. Material characteristics. Allowable stresses for static and dynamical loads. Stress concentration. Types of machine elements. Welded, soldered, glued, riveted, bent sheet metal and snap joints. Threaded fasteners. Power screws. Bolts and pins. Shaft-hub connections. Springs and their connections. Axes and shafts. Critical speed. Lubricants, friction, lubrication. Rolling bearings. Sliding bearings. Bearing lubrication. Sealing of bearings, axes and shafts. Mechanical transmissions. Gear drives. Spur and helical gears. Belt drives. Chain and friction drives. Clutches and couplings. Mechatronics and elements of mechatronics systems.			
1.5. Teaching methods	X lectures seminars and workshops X exercises long distance education fieldwork	individual assignment multimedia and network laboratories mentorship other	
1.6. Comments	–		
1.7. Student's obligations			
Course attendance, activity, solving of design problems, studying.			
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	1	Sustained knowledge check	1	Report		Practice	
Portfolio							

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

Course attendance, 4 mid-term exams, design project, final 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)
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009. (in Croatian)
S. Zelenika, E. Kamenar: „Precision Engineering and Micro- and Nanosystems Technologies – Precision Engineering“, University of Rijeka – Faculty of Engineering, Rijeka (HR), 2015. (in Croatian)

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

Decker, K.-H.: “Machine Elements”, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)
Orlić Ž. i G.: „Metal springs“, Zigo, Rijeka, 2004. (in Croatian)
Orlić Ž. i G.: „Axes and shafts – calculation according to DIN 743-2000“, Zigo, Rijeka, 2004. (in Croatian)
***: „The Mechatronics Handbook“ - 2nd ed., ed. R.H. Bishop, CRC Press, Boca Raton (FL, USA), 2007.

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)	5	15
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009. (in Croatian)	5	15
S. Zelenika, E. Kamenar: „Precision Engineering and Micro- and Nanosystems Technologies – Precision Engineering“, University of Rijeka – Faculty of Engineering, Rijeka (HR), 2015. (in Croatian)	5	15
Decker, K.-H.: „Machine Elements”, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)	5	15
Orlić Ž. i G.: „Metal springs“, Zigo, Rijeka, 2004. (in Croatian)	5	15
Orlić Ž. i G.: „Axes and shafts – calculation according to DIN 743-2000“, Zigo, Rijeka, 2004. (in Croatian)	5	15
***: „The Mechatronics Handbook“ - 2nd ed., ed. R.H. Bishop, CRC Press, Boca Raton (FL, USA), 2007.	1	15

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

Through the Institution’s quality assurance system.

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

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

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

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

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

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

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

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

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

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

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

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

Through the Institution`s Quality Assurance System.

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

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

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

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

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

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

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

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

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

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

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

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

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**Introduction into Finite Element Method**	
Study programme	**Undergraduate University 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)	15+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills to solve practical problems with the finite element analysis of solids.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define stiffness matrix, load vector and finite element equation for basic types of finite elements. To assembly global stiffness matrix, displacement vector and load vector. To apply boundary conditions on the global stiffness matrix. Discretize structure for practical problems. Using finite element method calculate displacement and stress fields for linear structures, planar structures and solids. To asses validity of obtained results.							
1.4. Course content							
Introduction. Application of FEM in solid mechanics. Introduction to the forming of finite element stiffness matrix, load vector and finite element equation. Local and global coordinate systems. Boundary conditions. Structure equation. Basic application in rods, beams, trusses, frames, plates and bodies.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, homework, seminar paper, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework	0.5				
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

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

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

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

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

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

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

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

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Artificial Intelligence**	
Study programme	**Undergraduate University Study of Electrical 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 artificial intelligence. Acquiring the knowledge required for independent use of computing systems and software packages for solving common computing problems.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Recognise a problem that can be solved using artificial intelligence techniques and apply them for this purpose. Be acquainted with state space search, decision making under (un)certainty and graphical models.			
1.4. Course content			
Introduction to artificial intelligence and application examples. State space search, informed search and adversarial search. Markov decision process. Reinforcement learning. Probability and inference. Bayesian network. Markov model and hidden Markov model.			
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 in class, studying.			
1.8. Evaluation[1] 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] VAŽNO: Uz svaki od načina praćenja rada studenata unijeti odgovarajući udio u ECTS bodovima pojedinih aktivnosti tako da ukupni broj ECTS bodova odgovara bodovnoj vrijednosti predmeta. Prazna polja upotrijebiti za dodatne aktivnosti.

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

Course attendance, midterm exams, exam.

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

Russell, S.J., Norvig P., Artificial Intelligence: A Modern Approach, 3rd ed., Pearson Education Limited, 2016

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

Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. MIT press, 2018.
Poole, David L., and Alan K. Mackworth. Artificial Intelligence: foundations of computational agents. Cambridge University Press, 2010.

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

Title	*Number of copies*	*Number of students*
Russell, S.J., Norvig P., Artificial Intelligence: A Modern Approach, 3rd ed., Pearson Education Limited, 2016	3	60

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

Through the quality assurance system of the Faculty of Engineering.

Basic description		
Course title	**Introduction to Guidance and Control of Marine Vehicles**	
Study programme	**Undergraduate University 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)	30+15+0

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

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

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

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

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

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

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

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

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

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

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

Through the Institution’s quality assurance system.

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

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Student will be familiar with the fundamentals of materials science. Student will be skilled for appropriate materials selection in electrical engineering practice. Moreover, student will acquire basic methods of manufacturing processes.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Compare the basic material groups in electrical engineering. Analyse the material microstructure. Analyse the relation between microstructure and material properties. Define basic material properties. Analyse the basic manufacturing processes of materials. Proper material selection on the basis of construction and technological requirements.							
1.4. Course content							
Definition and classification of materials. Trends in the application of materials in engineering. The structure of matter. Interatomic and intermolecular bonds and material properties. Structure and properties of metallic materials. Structure and properties of polymeric materials. Structure and properties of ceramic materials. Structure and properties of composite materials. Materials characterization. Optical microscopy. Electron microscopy. Basic mechanical properties of materials. Tribological properties of materials. Corrosion properties of materials. Thermal and optical properties of materials. Electrical properties of materials. Magnetic properties of materials. Electrotechnical, constructional and auxiliary materials in electrical engineering. Conductive materials. Insulation materials. Magnetic materials. Semi-conductive materials. Basic manufacturing processes of materials. Advanced technologies. Types of materials and the possibility of applying certain processing 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, homework preparation, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

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

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

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

Katavić, I., Introduction to materials, RITEH, Rijeka, 2008. (in Croatian)
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)
Ivušić, V., Tribology, Croatian society for materials and tribology, Zagreb, 2002. (in Croatian)
Callister, W. D., Jr., Materials science and engineering: An Introduction, John Wiley & Sons, New York, Chichester, etc., 1996.

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

Bek, V., Technology of electrical materials, Sveučilište u Zagrebu, 1991. (in Croatian)
Askeland, D. R., Wright, W. J., The science and engineering of materials, Cengage Learning, cop., Boston, etc., 2016.
DeGarmo, Paul E., Materials and processes in manufacturing, Macmillan Publishing Co., Inc., New York, 1974.

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

Title	*Number of copies*	*Number of students*
Katavić, I., Introduction to materials, RITEH, Rijeka, 2008. (in Croatian)	22	137
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)	3	137
Ivušić, V., Tribology, Croatian society for materials and tribology, Zagreb, 2002. (in Croatian)	12	137
Callister, W. D., Jr., Materials science and engineering: An Introduction, John Wiley & Sons, New York, Chichester, etc., 1996.	1	137

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 for Engineers EE**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Acquiring basic knowledge and skills in Fourier analysis, Laplace transforms, vector analysis, descriptive statistics, and probability. Acquiring basic notions about complex functions and statistics.		
1.2. Course enrolment requirements		
Mathematics I, Mathematics II		
1.3. Expected course learning outcomes		
Define and correctly interpret basic notions from Fourier analysis and Laplace transforms, specify and prove basic properties of Laplace transformations. Compute Fourier series and integrals and Laplace transforms of some functions. Determine solutions of differential equations by using Laplace transforms. Define and interpret correctly basic notions from vector analysis. Give physical interpretation for gradient of scalar fields, directional derivative, divergence and rotor of vector fields; apply these differential operators when solving problems from vector analysis. Define and give physical interpretation of curve and surface integrals, express the basic integral theorems and give their physical meaning. Compute some curve and surface integrals and apply integral theorems. Define and interpret correctly basic notions from complex functions. Evaluate derivatives and some integrals of complex functions. Define basic terms in descriptive statistics, analyze statistical data. Define and interpret the concept of random event, operations with events, and probability of random event. Calculate the probabilities of some events. Express and understand Bayes theorem and apply Bayes formula.		
1.4. Course content		
Series of functions. Fourier series. Fourier integral and Fourier transformation. Laplace transformation. Basic properties and application. Vector analysis. Curve integrals. Surface integrals. Triple integrals. Integral theorems. Applications. Functions of complex variables. Bases of statistical analysis. Concept of random event. Probability of random event. Bayes formula.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments	-	
1.7. Student's obligations		

Course attendance, activity/participation, studying

1.8. Evaluation of student's work

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

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

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

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

Elezović, N.: Fourier series and integral, Laplace transform, (FER) Biblioteka Bolonja, Element, 2006. (in Croatian)
Štefan Trubić M., Črnjarić-Žic N: Mathematics for Engineers, book of solved problems, e-lectures
Črnjarić-Žic N.: Material of course and solved problems in Engineering Statistics (in Croatian).

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

Kreyszig, E.: Advanced Engineering Mathematics, John Wiley & Sons, Inc., 1993.
Črnjarić-Žic N.: Internal lecture notes about statistics and samples.

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*
Elezović, N.: Fourier series and integral, Laplace transform, (FER) Biblioteka Bolonja, Element, 2006. (in Croatian)	5	70
Štefan Trubić M., Črnjarić-Žic N: Mathematics for Engineers, book of solved problems, e-lectures	70	70
Črnjarić-Žic N.: Material of course and solved problems in Engineering Statistics (in Croatian).	70	70

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

Through the Institution's quality assurance system.

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

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

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

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

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

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

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

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

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

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)	83	83
Slapničar I.: Mathematocs 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)	83	83
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)	18	83
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	83

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

Through the Institution's quality assurance system.

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

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

		check					
Portfolio							

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

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

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

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

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

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

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

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 2, Sveučilište u Splitu FESB, Split 2002, online book, (in Croatian)	83	83
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	83

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

Through the Institution's quality assurance system.

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

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Objectives of the course are to prepare the students to understand measurements, characteristics of electrical and electronic measurement instruments and measurement methods, to perform measurements independently ant to apply optimal measurement method, to develop ability to work in a small group (team work) and to present results of measurements.		
1.2. Course enrolment requirements		
Fundamentals of Electrical Engineering I		
1.3. Expected course learning outcomes		
After passing the exam, student is able to do following: 1. Interpret and explain measurement uncertainty 2. Apply the model of measurement uncertainty at simple examples 3. Analyze a measurement problem and determine sources of systematic and random errors 4. Apply measures to eliminate errors in measurements 5. Describe measurements methods for measurements of electrical quantities 6. Apply measurements methods for measurements of electrical quantities 7. Describe working principles of measurement instruments (electrical and electronic) 8. Apply measurements instruments for measurements of electrical quantities 9. Describe transducers for measurements of non-electrical quantities 10. Write complete measurement report, analyze and interpret measurement data		
1.4. Course content		
The international system of units. Measurement uncertainty. Measurement elements. Measurement sources. Electromechanical measurement instruments. Electrical and electronic energy meters. Measurement transformers. Measurement of electrical quantities. Magnetic measurements. Isolation testing. Point of cable failure determination. Measurements of non–electrical quantities. Transducers and sensors of non–electrical quantities. Function generators. Signal generators. Impulse generators. Electronic instruments. Measurement amplifiers and attenuators. Analog electronic measurement instruments. Oscilloscopes. Oscilloscope's measurements. Digital electronic measurement instruments. Communication instrument–computer.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, activity during course lectures, preparation for and attendance of laboratory exercises and studying.

1.8. Evaluation of student's work

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

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

Assessment and evaluation of student's work will be based on sustained knowledge checks, laboratory exercises and final exam.

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

Bego, V.: Measurements in the Electrical Engineering, Graphis, Zagreb, 2003. (in Croatian)
Vujević, D.: Measurements in the Electrical Engineering, Laboratory exercises, Sveučilište u Zagrebu, Zagreb, 1993. (in Croatian)

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

Vujević, D., Ferković, B.: Basics of Measurements in the Electrical Engineering, I. i II. part, Školska knjiga, Zagreb, 1996. (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*
Bego, V.: Measurements in the Electrical Engineering, Graphis, Zagreb, 2003. (in Croatian)	6	80
Vujević, D.: Measurements in the Electrical Engineering, Laboratory exercises, Sveučilište u Zagrebu, Zagreb, 1993. (in Croatian)	2	80

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 and Structural Elements**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Ability to establish the equilibrium equations for rigid and deformable bodies (structures). Ability to determine the resultant of forces in different kinds of force systems. Understanding the relations between internal forces and determine the internal forces in planar structures. Ability to determine the dimensions and materials of bearing structures or its individual parts under external load.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define the concept of force and force system. Determine the momentum for the point, for the axis and for the couple of forces. Define the Coulomb friction law. Reduce the given system of forces to the simplest form and to the reduction point. Determine the equilibrium conditions of a given force system. Determine the reaction forces and the distribution of internal forces in trusses and beam structures. Calculate the geometric characteristics of the straight beam sections. Define the concept of stress and strain. Distinguish between basic and complex shapes of beam structures load cases. Calculate the stress and strain for the axial load, shear, torsion and bending of structures. Analyse the free body diagrams. Define the equilibrium states. Calculate the critical buckling force for compressive loaded rod. Check the dimensions of structure.							
1.4. Course content							
Planar and spatial force systems. Terms of equilibrium. Friction. Truss and beam structures. Stress and strain. Hooke's law. Axial load, shear, torsion, bending and buckling of structural elements.							
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, laboratory exercises, final exam, independent learning.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	0.25
Written exam	0.25	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge	1	Report		Practice	

		check					
Portfolio							

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

Course attendance. Continuous knowledge testing (two mid-term exams). Laboratory exercises. Written and oral exam.

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

Brnić, J.: "Statics", University of Rijeka, Faculty of Engineering, Rijeka, 2004. (in Croatian)
Brnić, J., Turkalj, G.: "Strength of materials I", University of Rijeka, Faculty of Engineering, Rijeka, 2004. (in Croatian)

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

Brnić, J.: "Mechanics and Structural Elements", Školska knjiga, Zagreb, 1996. (in Croatian)
Gross, D., Hauger, W., Schröder, J., Wall, W.A., Rajapakse, N.: "Engineering Mechanics 1", Springer, 2013.
Gross, D., Hauger, W., Schröder, J., Wall, W.A., Bonet, J.: "Engineering Mechanics 2", Springer, 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*
Brnić, J.: "Statics", University of Rijeka, Faculty of Engineering, Rijeka, 2004.	12	35
Brnić, J., Turkalj, G.: "Strength of materials I", University of Rijeka, Faculty of Engineering, Rijeka, 2004.	7	35

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

Through the Institution's quality assurance system.

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

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

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

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

Attendance, class activity, continuous assessment, written exam.

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

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

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

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Physics I**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**1.**	
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							
Students should gain the theoretical knowledge in general physics and develop an ability to differentiate the concepts of classical and relativistic physics. They should be able to properly comprehend important physical phenomena in mechanical physics and their application in engineering field.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Expected course learning outcomes are to distinct the fields of classical and relativistic physics, identify basics of mechanics and be able to solve mechanical problems numerically. Students should be able to define fundamental physical quantities and units of measure, understand the properties of motion in classical and relativistic perspective. They should learn how to develop and discuss basic physical processes and gain problem-solving skills.							
1.4. Course content							
Introduction. Motion, rectilinear motion, circular motion. Relative motion. Kinematics of rigid bodies, conservation laws. Fluid mechanics. Oscillations and waves. Heat and temperature, gas laws. Heat transfer mechanisms, thermal resistance. The kinetic theory of gases.							
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	0.5	Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework					
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Activity, continuous knowledge testing, written and oral exam

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

Dobrinić, J.: Physics (mechanics, vibration, heat), Tehnički fakultet, Rijeka, 1998. (in Croatian)
Dobrinić, J., Mandić, L.: Physics 1, Tehnički fakultet, Rijeka, 2002. (in Croatian)
Dobrinić, J. Mandić, L.: Solved examples in Physics1, Tehnički fakultet, Rijeka, 2001. (in Croatian)
Dobrinić, J. Mandić, L.: Solved examples in Physics 1, Tehnički fakultet, Rijeka, 2010.(in Croatian)

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

Dobrinić, J., Bonato, J.: Physics , Pomorski fakultet, Rijeka, 2009.(in Croatian)
Horvat, D.: Fizika I - Mehanika i toplina, Hinus, 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*
Dobrinić, J.: Physics (mechanics, vibration, heat), Tehnički fakultet, Rijeka, 1998. (In Croatian)	11	83
Dobrinić, J., Mandić, L.: Physics 1, Tehnički fakultet, Rijeka, 2002. (In Croatian)	9	83
Dobrinić, J. Mandić, L.: Solved examples in Physics1, Tehnički fakultet, Rijeka, 2001. (In Croatian)	16	83
Dobrinić, J. Mandić, L.: Solved examples in Physics 1, Tehnički fakultet, Rijeka, 2010.(In Croatian)	6	83

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	**Physics II**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**1.**	
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							
Students should gain the theoretical knowledge in general physics and develop an ability to differentiate the concepts of electromagnetism, optics and modern physics. They should be able to properly comprehend important physical phenomena in electromagnetism, optics and modern physics and their application in engineering field.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Expected course learning outcomes are to distinct classical and modern physics, identify basics of electromagnetism, optics and modern physics, and be able to solve problems numerically. Students should be able to differentiate fundamental small-scale physical phenomena and acquire priciples of electromagnetic radiation, geometric/wave optics and wave-particle duality of matter. They should be able to analyze the interaction between radiation and matter, develop and discuss simple problems and apply gained knowledge to problem-solving tasks.							
1.4. Course content							
Electromagnetic oscillations. Electromagnetic waves. Geometric optics. Physical (wave) optics, interference, diffraction, polarization. Elements of quantum physics, the Planck's law of radiation. Structure of matter, the Bohr model of atom, quantization. Atomic spectra. Interaction of radiation and matter. The photoelectric effect, Compton scattering and pair 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, activity, studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge	1	Report		Practice	

		check					
Portfolio		Homework					

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

Activity, continuous knowledge testing, written and oral exam

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

Dobrinić, J.: Physics (waves, optics, structure of matter), Tehnički fakultet, Rijeka, 1998. (in Croatian)
Glavan, N., Mandić, L., Dobrinić, J.: Solved examples in Physics II, Tehnički fakultet, Rijeka, 2004. (in Croatian)

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

Horvat, D.: Physics II – Oscillations, Waves, Electromagnetism, Optics and Introduction to Modern Physics, Neodidakta, Zagreb, 2011. (in Croatian)
Henč.Bartolić, V. and oth.: Waves and Optics Školska knjiga, Zagreb, 1998.
Dobrinić, J., Bonato, J.: Physics, Pomorski fakultet, Rijeka, 2010.

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

Title	*Number of copies*	*Number of students*
Dobrinić, J.: Physics (waves, optics, structure of matter), Tehnički fakultet, Rijeka, 1998. (in Croatian)	12	83
Glavan, N., Mandić, L., Dobrinić, J.: Solved examples in Physics II, Tehnički fakultet, Rijeka, 2004. (in Croatian)	13	83

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	**Power Electronics**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Presentation of power electronic converters from the theoretical and practical view, preparation for their design.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Describing of models of components which can be found in power converters. Defining of factors which describes processes in power conversion. Describing of standard topological structures of power electronics converters. Describing of power converter functions. Analysing of diode rectifiers' behaviour. Describing of commutation process connected with power electronics valves. Defining of output characteristics of diode rectifiers. Analysing of phase controlled rectifiers. Defining voltage and current transformer equations for DC/DC converters (volt-second balance). Analysing of inverter operation. Generating of FFT analysis for output voltages and current targeting autonomous inverters. Analysing a behaviour of direct and indirect AC/AC converters.							
1.4. Course content							
Applications of power electronics. Power flow in power converters and networks. Quality parameters of electric energy. Rectifier circuits. Conditions for reverse power flow in bidirectional rectifiers. Commutation. DC/DC converter with and without transformer. Inverters. AC/AC converters and their applications.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☒ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments	Lectures are frequently improved by new laboratory models.						
1.7. Student's obligations							
Course attendance, working reports for laboratory exercises							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation	0.5	Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	0.5

Portfolio							

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

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

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

J.G. Kassakian, M.F.Schlecht, G.C.Verghese: Fundamentals of power electronics, 1. Part Topologies and power converter functions, Graphis, Zagreb, 2000. (in Croatian)

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

Z.Benčić, Z.Plenković, Power electronics, semiconductor valves, Školska knjiga, Zagreb 1978. (in Croatian)
T. Brodić: Power electronics, Power electronic converters, Zigo, Rijeka 2005. (in Croatian)
D.W.Hart: Introduction to power electronics, Prentice Hall International Inc., 1997.
J.G. Kassakian, M.F.Schlecht, G.C.Verghese: Fundamentals of power electronics, 2. Part, Graphis, 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*
J.G. Kassakian, M.F.Schlecht, G.C.Verghese: Fundamentals of power electronics, 1. Part Topologies and power converter functions, Graphis, Zagreb, 2000. (in Croatian)	6	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	**Processes of Heat Treatment**	
Study programme	**Undergraduate University 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)	30+15+0

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

Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework					

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

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

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

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

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

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

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

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

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

Through the Institution's quality assurance system.

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

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

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

Basic description		
Course title	**Programming**	
Study programme	**Undergraduate University Study of Electrical 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 course provides basic knowledge of the C programming language. Students will work with basic algorithms and data structures.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Explain the storage formats of primitive data types. Understand and use of fundemantal commands in C programming language. Understand and use of commands for program control flow. Understand and use of primitive and complex data types. Understand principles of functions, recursive functions, pointers, and fields. Understand and use of pointers, dynamic memory allocation and self-referential structures. Understand formats of direct, textual, and binary files.							
1.4. Course content							
Primitive data types and storage formats. Programming in C computer language. Commands for program control flow. One-dimensional, two-dimensional and character fields. Functions. Pointers. Pointers and fields. Structures. File Input/Output. Dynamic memory allocation. Dynamic data structures. Pre-processor directives.							
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 assignments, individual study.							
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	1
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, laboratory assignments, continuous knowledge tests, written exam.

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

Mladen Jurak: Programski jezik C, skripta, ak. god 2003/04.
K. N. King: C Programming, A Modern Approach, 2nd Edition, W. W. Norton & Company, 2008.

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

Dennis M. Ritchie, Brian W. Kernighan: The C Programming Language, Prentice Hall, Inc., 1988.
Rajko Vulin: Zbirka riješenih zadataka iz C-a, 3. izdanje, Školska knjiga, Zagreb 2003.

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

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

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

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

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

Sustained knowledge check and final written exam.

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

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

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

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

Title	*Number of copies*	*Number of students*

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

Through the Institution’s quality assurance system.

Basic description		
Course title	**Signals and Systems**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	compulsory	
Year	**3.**	
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							
Understanding time and frequency analysis and processing methods of continuous and discrete-time signals, as well as basic input-output relationships of linear time-invariant (LTI) systems. Development of analysis, synthesis, and problem solving skills.							
1.2. Course enrolment requirements							
Mathematics I and Mathematics II.							
1.3. Expected course learning outcomes							
Define both elementary signals and basic system properties. Define the response of LTI systems, convolution integral and sum. Use the convolution for the time-domain analysis of LTI systems. Define Fourier series and Fourier transform. Use different Fourier representations in spectral analysis of signals. Define the frequency response of LTI systems. Study LTI systems in the frequency domain. Describe signal sampling and reconstruction procedures.							
1.4. Course content							
Signals and systems; classification, elementary signals, signal models, operations on signals, system properties. Continuous and discrete LTI systems; zero-input response, zero-state response, convolution of signals, properties of LTI systems. Fourier series; line spectrum, systems with periodic inputs. Fourier transform; signal energy, system frequency response, ideal filters. Signal sampling; aliasing, reconstruction filter. Discrete Fourier Transform (DFT); signal spectral analysis.							
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 work, individual 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	1	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 (written tests), project report, final written exam.

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

B. P. Lathi: Linear Systems and Signals, 2/E, Oxford University Press, 2004.

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

H. P. Hsu: Signals and Systems, 3/E, McGraw-Hill, 2014.

S. S. Soliman and M. D. Srinath: Continuous and Discrete Signals and Systems, 2/E, Prentice Hall, 1998.

B. Jeren: Signali i sustavi, Školska knjiga, 2021.

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*
B. P. Lathi: Linear Systems and Signals, 2/E, Oxford University Press, 2004.	3	80

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

Through the Institution's quality assurance system.

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

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

		check					
Portfolio							

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

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

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

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

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

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

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

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

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

Through the Institution’s quality assurance system.

Basic description		
Course title	**Thermodynamics and Energy Engineering**	
Study programme	**Undergraduate University Study of Electrical Engineering**	
Course status	optional	
Year	**2.**	
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		
Obtaining theoretical knowledge and develop skills to solve practical problems in the field of thermodynamics. Acquiring the knowledge required for attending lectures in the field of thermal and energy engineering.		
1.2. Course enrolment requirements		
Attended courses Mathematics I and Mathematics II.		
1.3. Expected course learning outcomes		
Define and describe the first and second laws of thermodynamics as well as the concept of thermal conditions. Define and describe the equation of state of an ideal gas and gas mixtures. Describe the ideal gas state changes. Describe and compare the thermal cycles. Compare and analyze the reversible and irreversible processes and define work losses due to the irreversibility. Describe and compare the processes of internal combustion engines. Describe state changes during evaporation and condensation. Describe, compare and analyze processes of steam plants. Describe and analyze the thermal behaviour during combustion. Describe and analyze the exchange of energy in the flow through the nozzle. Define, describe and compare basic types of heat transfer and describe the heat transfer within the heat exchanger. Describe and analyze the state changes of humid air. Define basic tasks of energy engineering and describe basic forms of energy, energy conversion methods and the impact on the environment. Apply acquired knowledge to solve thermodynamic tasks (practical problems).		
1.4. Course content		
Thermal state and thermal equilibrium postulates. The first law of thermodynamics. Ideal gas equation of state. Work and pV-diagram. Specific heat capacity. Gas mixtures. Ideal gas state changes. Thermodynamic cycles. Reversible and irreversible processes. Irreversibility, entropy and work. The second law of thermodynamics. Technical work. Maximum work. Enthalpy. Mixing of gases irreversibility. Losses due to the irreversibility. Processes of internal combustion engines. Evaporation and condensation. Saturated and superheated steam. Processes of steam plants. Mollier hs-diagram. Exergy. Combustion. Flow through nozzles. Heat conduction. Heat transfer by convection. Heat transfer by radiation. Overall heat transfer coefficient. Heat exchangers. Humid air. Conventional and renewable energy sources. Fundamentals of energy engineering. Energy planning. Energy management.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

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

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

Course attendance, activity, homework, continuous knowledge testing (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	8
Halasz, B, Galović, A., Tadić, M.: Collections of exercises in Thermodynamics, part I, part II, Sveučilišna tiskara, Zagreb, 1993. and 1996. (in Croatian)	19	8

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

Through the Institution's quality assurance system.