University of Rijeka
Faculty of Engineering

CURRICULUM
UNDERGRADUATE UNIVERSITY STUDY OF ELECTRICAL ENGINEERING

Rijeka, March 2015

1. CURRICULUM DESCRIPTION

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

1. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	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
	Introduction to Computer Engineering	2		2		4	6
	Engineering Graphics and Documenting	2			2	4	5
	TOTAL					24	30

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

2. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Mathematics II	3	3			6	7
	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	lT	dT	L+T	
	Mathematics for Engineers EE	2	2	1		5	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					20	30

[1] elective: English or German - free choice

4. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Digital Logic	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	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	lT	dT	L+T	
	Mechanics and Structural Elements	2	1	1		4	4
	Thermodynamics and Energy Engineering	3	1			4	4
	Fundamentals of Engineering Design	2			1	3	4

5. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	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 Networks	3	1		1	5	7
	TOTAL					22	30

[3] election from list of offered projects: Digital Logic, Electrical Circuits, Electrical Machines, Electrical Power Networks, Electronics I, Electronics II, Elements of Plant Automation, Fundamentals of Automatic Control, Fundamentals of Electrical Engineering I, Fundamentals of Electrical Engineering II, Measurements in the Electrical Engineering, Power Electronics, Programming, Signals and Systems.

6. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Electrical Drives	2	1	1		4	5
	Organization and Economics of Business Systems	2	1			3	4
	Free Elective Subject[4]					3	4
	Final Work						10
Subject from elective group Automation:							
	Automatic Control	3	1	1		5	7
Subject from elective group Power Engineering:							
	Electrical Plants	3	1	1	1	6	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	2			1	3	4
	Introduction into Finite Element Method	2		1		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
	Technology Processes of Shipbuilding	2	1			3	4
	Basic Ship Dynamics	2	1			3	4
	Energy Systems	2	2			4	4
	Quality Assurance	2	1			3	4
	System Modelling and Simulation	2		1		3	4
	Environment Protection	3				3	4
	Physical and Health Education[5]			2		2	1

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

UNDERGRADUATE UNIVERSITY STUDY OF ELECTRICAL ENGINEERING TOTAL	Hours	ECTS
	123	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 check	2	Report		Practice	
Portfolio		Simulation exercises	1.5				

1.9. Assessment and evaluation of student's work during classes and on 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	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. Assessment and evaluation of student's work during classes and on 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)	30+15+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. Assessment and evaluation of student's work during classes and on 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)

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1.12. Number of assigned reading copies with regard to the number of students currently attending the course		
Title	*Number of copies*	*Number of students*
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	Digital Logic	
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. Assessment and evaluation of student's work during classes and on 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

Mathematics I.

1.3. Expected course learning outcomes

After passing of exam, student is able to do following:
Describe elements of electrical circuits. Circuits' analysis in order to determine time responses. Apply circuits' theorems. Analysis of circuits' frequency responses. Analysis of circuits contains two-ports. Analysis of circuits contains transmission lines.

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

1.6. Comments

1.7. Student's obligations

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

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	68
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 requirements of electrical drives. Specific qualities of different machines in electrical drives. Universal criteria in evaluation of suitability: cost of purchase and maintenance, the complexity of application and control of the machine and accompanying devices.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Description of the physical working principle of drives, Description of characteristic types of drives and loads, Definition of the static characteristic of standard drives, Comparison of qualities between different machines in electrical drives. Comparison of advantages and drawbacks between different control systems for particular drive types. Reasoned selection of a particular drive in accordance with the customers requirements

1.4. Course content

Basic mechanical concept of rotational machines and loads. Commutator machines with serial, parallel and separate excitation as part of electrical drives. Control of a separately excited DC machine. Universal machines in electrical drives. Induction machines: the structure. static characteristics, classical open-loop control. Scalar open- and close-loop control of induction motors using a u/f method. Frequency controllers and methods for generation of variable frequency and magnitude voltages. Application of power electronics in electrical drives: choppers, converters, PWM and SVM. Synchronous machines as motors and generators, characteristics, application and 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

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

Course attendance, activities in class, sustained knowledge checks (two tests), written and oral exam

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

B. Jurković: Electrical Drives, Školska knjiga, Zagreb, 1986. (In Croatian)
M. E. El-Hawary: Principles of Electric Machines with Power Electronic Applications, Prentice –Hall, Inc., 1986. (2002.)

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

W. Leonhard: Control of Electrical Drives, Springer Verlag, 1996. V. Ambrožič: Modern control of AC drives, Fakulteta za elektrotehniko, Ljubljana, 1996. (In Slovenian)

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

Title	*Number of copies*	*Number of students*
B. Jurković: Electrical Drives, Školska knjiga, Zagreb, 1986. (In Croatian)	8	60
M. E. El-Hawary: Principles of Electric Machines with Power Electronic Applications, Prentice –Hall, Inc., 1986. (2002.)	0	60
W. Leonhard: Control of Electrical Drives, Springer Verlag, 1996.	2	60
V. Ambrožič: Modern control of AC drives, Fakulteta za elektrotehniko, Ljubljana, 1996. (In Slovenian)	1	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	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☒ laboratories
	☐ long distance education	☐ mentorship
	☒ fieldwork	☐ other

1.6. Comments

1.7. Student's obligations

Lectures, 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. Assessment and evaluation of student's work during classes and on 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	☐ individual assignment
	☒ seminars and workshops	☐ multimedia and network
	☒ exercises	☒ laboratories
	☐ long distance education	☐ mentorship
	☒ fieldwork	☐ other
1.6. Comments		

1.7. Student's obligations

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

Course attendance, activity, homework – construction projects, continuous knowledge testing (three mid-term exams, four unannounced tests), 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 and application on semiconductors' elements.Describe and analyse operation of semiconductors' elements besed on its structure and operating region as well as construct proper substitute model for different area of operation. Aquiring basic knowledge of technology used in semiconductors' production.

1.2. Course enrolment requirements

Fundamentals of Electrical Engineering I.

1.3. Expected course learning outcomes

After passing of exam, student is able to do following:
Describe semiconductors' characteristics: type, electron charge, charge low injection, charge life times, generation and recombination, thermal balance. Describe and analyse physical processes and operation principles of semiconductors' elements for small signals. Apply recombination speeds and optical generations in optoelectronic elements: LED, photodiode and photo-cell. Describe technology process used in semiconductors' production. Define incremental parameters of linear models for semiconductors' elements (pn diode, bipolar transistor, field-effect transistors JFET and MOSFET) operating in small signal mode. Distinguish incremental linear models of semiconductors' elements operating in small signal mode for low and high frequencies. Describe different voltage and current amplifiers for basic operating modes for both, bipolar and field-effect transistors. Analysis of operating mode for nonlinear elements based on parameters' values of incremental linear models of semiconductors' elements. Apply pn diode, bipolar and field-effect transistors.

1.4. Course content

Physical characteristics of semiconductors. Currents in semiconductors. Fermi energy. Physical and electrical characteristics of semiconductors' PN junctions, diodes, optoelectronic elements: photo-resistance, LED, photodiode, photo-cell; bipolar transistors, field-effect transistors: MOSFET and JFET. Secondary effects, transient analysis, analysis of small signals. Developing of models for semiconductors' components for high and small signals. Using incremental models of semiconductors' components in analysis and design of bipolar transistors as well as transistors with field effect with emphasis on MOS components. Technology process used in semiconductors' production.

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

1.7. Student's obligations

Course attendance, homework, laboratory work, written exam.

1.8. Evaluation of student's work

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

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

Course attendance, project assignment, laboratory work, continuous knowledge testing, written and oral 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, Semiconductor Electronics' Elements, Školska knjiga Zagreb, 2004. (in Croatian)	10	60
J. Šribar, J. Divković-Pukšec, Electronics' Elements, problem collection, I i II part, Element, Zagreb, 1996. (in Croatian)	1	60
M.Sze, Physics of Semiconductor Devices, New Jersey: J. Wiley &Sons, Inc. Publication, 2007.	1	60
A.S.Sedra, K.C. Smith, Microelectronic Circuits, 5th edit, N. York, Oxford, Uni. Press, 2004.	1	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	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. Assessment and evaluation of student's work during classes and on 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

Introducing to basic categories of plant automation elements, gaining the theoretical and practical knowledge to analyse systems and solve problems in the scope of automation and practical application of computers and programmable logic controllers in simple systems.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Defining and distinguishing the basic categories of plant automation elements. Explaining the principles of implementation and mathematical analysis of physical phenomena in plant automation elements. Defining and analysing the static and dynamic characteristics of plant automation elements. Applying the experimental methods to define the parameters of plant automation elements. Defining the transfer functions of plant automation elements. Describing the implementation and operation of computers in plant control. Applying the computers and programmable logic controllers (PLC) to automation of simple systems.

1.4. Course content

Classification of technical systems and processes. Principal equations and characteristics of systems. Electromechanical systems, control and stability. Static and dynamic characteristics. Operation principle and characteristics of sensors. Actuators: electrical, hydraulic, pneumatic, and unconventional. Microcomputers and PLC.

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, 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	2	Report		Practice	2
Portfolio							

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

Course attendance, activity, laboratory exercises, sustained knowledge check (two tests), written exam.

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

D. Matika: Elements of Plant Automation – lectures script (available on the course web site) (in Croatian)
E. Prpić: Elements of Plant Automation - auditory tutorials script (available on the course web site) (in Croatian)
Laboratory tutorials script and associated presentations (available on the course web site) (in Croatian)

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

Schneider Manual for Twido PLC (available on the course web site)
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 check	1	Report		Practice	
Portfolio		Homework					

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

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
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 energy 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	X lectures ☐ seminars and workshops X exercises ☐ long distance education X fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, Activity, Studying

1.8. Evaluation of student's work

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

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

Course attendance, activity, continuous knowledge testing (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) Prelec, Z.: Written lectures of the course (pdf. on Faculty web)
1.11. Optional / additional reading (at the time of proposing study programme)
El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988. Rey, D., Wight, A.: Innovation for energy efficiency, Pergamon Press, 1987.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Prelec, Z.: Energy in process industry (book), Školska knjiga Zagreb, 1994. (in Croatian language)	10	90

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 and Documenting	
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

The development of the ability to produce and communicate technical documentation in standard drafting formats, by use of traditional and computer techniques.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Interpret and apply traditional and CAD techniques for the development of engineering graphics. Compare and distinguish the methods of shape description. Compare 3D primitives and interpret the emergence of complex objects. Note the role of the standardization and standards. Recognize and implement the kinds of electrical documentation. Interpret engineering graphics. Organize engineering documentation in accordance with the standards. Estimate personal contribution and the contribution of lecturer to the acquisition of contents.

1.4. Course content

The significance and possibilities of graphical communications. The design process and the role of design model. Traditional, 2D and 3D CAD techniques for the development of documentation. The shape description. Standardization and standards. Technical documentation graphics. Drawn and textual electrical documentation.

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

1.7. Student's obligations

Course attendance and activity (lectures, exercises), constructive works, continuous knowledge testing, homework, studying.

1.8. Evaluation of student's work

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

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

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

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

M. Kljajin, M. Opalić: Engineering Graphics, Strojarski fakultet u Slavonskom Brodu,Slavonski Brod, 2010. (in Croatian)
G. Marunić, J. Butorac, S. Troha: Engineering Graphics, Collection of Shape Description Problems, Zigo Rijeka, Rijeka, 2008. (in Croatian)
L. Padovan: Engineering Graphics and Documenting, Sveučilište u Zagrebu, Zagreb, 1999. (in Croatian)

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. G. Scott Oween et al.: Hypergraph (on-line), ACM SIGGRAPH Education Committee, http://www.siggraph.org/education/materials/HyperGraph/hypergraph.htm, 2005.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
M. Kljajin, M. Opalić: Engineering Graphics, Strojarski fakultet u Slavonskom Brodu,Slavonski Brod, 2010. (in Croatian)	10	106
G. Marunić, J. Butorac, S. Troha: Engineering Graphics, Collection of Shape Description Problems, Zigo Rijeka, Rijeka, 2008. (in Croatian)	10	106
L. Padovan: Engineering Graphics and Documenting, Sveučilište u Zagrebu, Zagreb, 1999. (in Croatian)	6	127106

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	compulsory	
Year	2.	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Students should be able to use general purpose English as well as technical jargon at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level).

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Students should be able to use general purpose English as well as technical jargon at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level). They should be able to: compare general with technical English on the basis of selected texts and topics; recognize and explain grammatical structures and principles typical of the university jargon from examples (Word Formation; Nouns; Compound Nouns; Definite and Indefinite Article; Perfect, Continuous and Passive Aspects; Modals; Comparison of Adjectives; Collocations); implement grammatical structures and aspects in written exercises; recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them; describe and interpret accurately simple diagrams, charts, figures and mathematical formulae; write summaries, arguments and definitions.

1.4. Course content

Topics: Engineering Profession. Engineering Ethics. The Atom. Interaction in Atomic Systems. Materials in Electrical Engineering. Magnetic Materials and Electromagnetism. Energy. Characteristics of Capacitance. Lenz`s Law-Inductance. Ohm`s Law-Resistance. The A-C Cycle. Electric Quantities and Units.
Grammatical Structures: Perfect, Continuous and Passive Aspects. Modals. Definite and Indefinite Articles. Nouns. Compound Nouns. Comparison of Adjectives.

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

1.7. Student's obligations

Attendance, activity in class and independent learning.

1.8. Evaluation of student's work

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

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

Attendance, presentation/report, various assignments and continuous evaluation of knowledge (two tests), written exam.

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

Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga , Zagreb.
Mance, K.: Grammar File I. MudRi.

Murphy R.: English Grammar in Use. Cambridge University Press, 1994. Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford, 1998
1.11. Optional / additional reading (at the time of proposing study programme)
Selected vocational articles and texts at the upper intermediate level of the Cambridge and Longman University Press.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga. Zagreb.	1	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	English Language II	
Study programme	Undergraduate University Study of Electrical Engineering	
Course status	compulsory	
Year	2.	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Students should be able to use professional jargon independently, namely communicate with other experts in the field of the engineering profession and in an international environment, at the B2 level of the Common European Framework of Reference for Languages.

1.2. Course enrolment requirements

Attended course English Language I.

1.3. Expected course learning outcomes

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

1.4. Course content

Topics: English as Lingua Terra. Introduction to Electric Power Systems. Switches, Circuit Breakers and Fuses. Conduction and Transmission of Electric Current. Transformers. Electric Generators and Motors. Information Age. Introduction to Digital Computers and Microcomputers. Fundamentals of Transistor Physics. Transistors.
Grammatical Structures: Participles. Relative Clauses. Sequence of Tenses. Direct and Indirect Speech. Modals. Compounds. Conditional Clauses, Final Clauses. Writing Summaries.

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

1.7. Student's obligations

Attendance, activity in class and independent learning.

1.8. Evaluation of student's work

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

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

Attendance, presentation/report, continuous evaluation of knowledge (two tests), written exam.

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

Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga, Zagreb.

Mance, K.: Grammar File II. MudRi. Murphy R.: English Grammar in Use. Cambridge University Press, 1994 Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford 1998
1.11. Optional / additional reading (at the time of proposing study programme)
Selected vocational articles and texts at the upper intermediate level of the Cambridge and Longman University Press.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga, Zagreb	1	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	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

Developing the skills of analysis and synthesis and creativity in solving problems. Developing the ability to adapt to new situations. Developing the ability to work in an interdisciplinary team, and communication 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. Assessment and evaluation of student's work during classes and on final exam

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

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

Klepac, R.: Fundamentals of Ecology, JUREMA, Zagreb, 1980. (in Croatian)
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*
Klepac, R.: Fundamentals of Ecology, JUREMA, Zagreb, 1980. (in Croatian)	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	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. Assessment and evaluation of student's work during classes and on final exam

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

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

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

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

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

Basic description		
Course title	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.

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 similar mechanic and electric linear continuous systems. 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. Define a control system using state space variables. Apply analytical and numerical functions from Matlab/Simulink toolboxes for analysis and problem solving.

1.4. Course content

Basic terminology. Fundamental principles of automatic control. Classification of control systems. Mathematical approach to control systems. Analyze in the time domain, excitation-response. Response function. Time response of basic elements. Analysis in the complex domain. Laplace transformation. Working principle and transfer functions of basic elements in control systems. Transfer functions of complex systems. Block algebra. Analysis in frequency domain. Bode and Nyquist methods. Stability of control systems. Stability criterion. State space variables. Dynamical and static indicators of control. PID regulator and his derivatives.

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

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)
Vukić, Z. and Kuljača, Lj.: Automatic Control – Analysis of LINEAR systems. Zagreb; Kigen, d.o.o., 2004 (in Croatian) 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*
Matika, D. and Brnobić, D.: Basics of Automatic Control, Mimeographed Notes, Technical Faculty Rijeka, Croatia, 2004 (in Croatian)	12	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. Assessment and evaluation of student's work during classes and on 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. Assessment and evaluation of student's work during classes and on 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 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 topics related to machine elements: loads, stresses, types, functions, designs, materials and calculations.

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 analyze the calculation of machine elements. Sketch machine elements. Apply acquired knowledge in solving design problems.

1.4. Course content

Types of load. Stresses and deformations of machine elements. Material characteristics. Allowable stresses at steady and variable load. Stress concentration. Thermal stresses.
Types of machine elements. Welded, soldered, bonded, riveted, bent sheet metal and snap joints. Threaded fasteners. Power screws. Pins. Shaft-hub connections. Springs.
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 gears. Belt drives. Chain drives.
Clutches and couplings.

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

Course attendance, 2 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)
Križan, B.; Basan, R.: Polimeric Machine Elements, Zigo, Rijeka, 2009. (in Croatian)
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009. (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)		
Decker, K.-H.: Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)		
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.	4	25
Križan, B.; Basan, R.: Polimeric Machine Elements, Zigo, Rijeka, 2009.	5	25
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009.	6	25
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	compulsory	
Year	2.	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Students should be able to use general purpose German as well as technical jargon at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level).

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Students should be able to: compare general with technical German on the basis of selected texts and topics from the field of mechanical engineering, naval architecture and electrical engineering; recognize and explain grammatical structures and principles typical of the vocational jargon from examples (Tenses; Modals, Compounds, Word Formation, Dependent Clauses, Passive Structures); implement grammatical structures and aspects in written exercises; recognize key words and/or information in selected texts as well as differentiate and analyse relevant elements in them; describe and interpret accurately simple diagrams, charts, figures and mathematical formulae.

1.4. Course content

Topics: Development and Manufacture of Technical Products. Basics of Mechanics. Basics of Thermodynamics. Basics of Fluids. Basics of Electrical Engineering. Energy. Electrical Energy. Current Circuit. Conductors and Insulators. Engineering Materials.
Grammatical Structures: Verbs. Tenses. Modals. Compounds. Declension of Nouns. Word Formation. Dependent Clauses: Relative and Causative Clauses. Passive.

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

1.7. Student's obligations

Attendance, activity in class, independent learning.

1.8. Evaluation of student's work

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

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

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

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

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

Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993.
1.11. Optional / additional reading (at the time of proposing study programme)
Zettl / Jansen / Müller: Aus moderner Technik und Naturwissenschaft. Hueber 2003. Selected texts.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

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

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

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

1. COURSE DESCRIPTION

1.1. Course objectives

Students should be able to use professional jargon independently, namely communicate with other experts in the field of the engineering profession and in an international environment, at the B2 level of the Common European Framework of Reference for Languages.

1.2. Course enrolment requirements

Attended course German Language I.

1.3. Expected course learning outcomes

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

1.4. Course content

Topics: Sources of Energy and Environment Protection. Information Technology. Computer and Microcomputer. Generators and Motors. Transistors. Internal Combustion Engines. Diesel Engines
Grammatical Structures: Word Formation. Suffixes of Nouns and Adjectives. Prefixes of Verbs. Passive Constructions. Present and Past Participle. Conditional Clauses. Dependent Clauses: Final, Temporal and Interrogative Clauses. Specific vocabulary, grammatical and communication structures of German technical jargon.

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

1.7. Student's obligations

Attendance, activity in class, independent learning.

1.8. Evaluation of student's work

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

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

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

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

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

Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993.
1.11. Optional / additional reading (at the time of proposing study programme)
Zettl / Jansen / Müller: Aus moderner Technik und Naturwissenschaft. Hueber 2003. Selected texts.
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

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

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

Basic description		
Course title	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)	30+15+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. Assessment and evaluation of student's work during classes and on 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 Computer 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

Understanding the elements of computer systems, connection between hardware and software. Understanding the principles of software development and using application programs.

1.1. Course enrolment requirements

None.

1.2. Expected course learning outcomes

Know and being able to describe elements of information-communication system Using basic commands of operational systems Windows and Linux. Understand connection between computer software and hardware. Understand basic principles of software development.

1.3. Course content

Computer and information technology. Coding of information and storage of data in a computer. Basic building blocks of a computer. Operating systems. Computer networking. Introduction to programming and programming language C.

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

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

Introduction. Materials in electrical engineering. Microstructure. Crystal and amorphous microstructure. Equilibrium diagrams of alloys. Microstructure and properties of metals. Essential properties of macromolecule. Basic properties of polymers. Ceramics. Microstructure and properties of ceramics. Microstructure and properties of composites. Electrical and magnetic properties of materials. Definition of conductors, semiconductors and resistors. Mechanical properties of materials. Corrosion and anti-corrosion properties of materials. Basic manufacturing processes of materials. Heat treatment. Advance technologies. Materials types and possibility of application of a manufacturing processes. Aspects of materials application. Methods of materials selection.

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	1.5	Report		Practice	
Portfolio		Homework	1				

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

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

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

Bek, V., Technology of electrical materials, Sveučilište u Zagrebu, 1991. (in Croatian)

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

Polak, J., Srb, N., Insulating materials and insulating of electrical machinery (manual), R. Končar, Tehnička knjiga, Zagreb, 1987. (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*
Bek, V., Technology of electrical materials, Sveučilište u Zagrebu, 1991. (in Croatian)	2	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)	30+45+0

1. COURSE DESCRIPTION

1.1. Course objectives

Acquiring basic knowledge and skills in Fourier analysis, Laplace transforms, and vector analysis. 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 basic properties of Fourier and Laplace transformations. Compute Fourier series, Fourier transforms 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.

1.4. Course content

Series of functions. Fourier series. Fourier integral and Fourier transformation.
Laplace transformation. Basic properties and application.
Vector analysis. Scalar and vector fields, gradient, divergence, curl, potential.
Curve integrals. Surface integrals. Triple integrals. Applications.
Integral theorems. Formulas of Green-Gauss, Stokes and Ostrogradsky.
Functions of complex variables, derivatives, integrals.
Bases of statistical analysis. Samples and confidence intervals.

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, mid-term exams, tests.

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam	0.75	Essay		Research	
Project		Sustained knowledge check	3	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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)		
Kamenarović, I.: Engineering mathematics I, Tehnički fakultet Sveučilišta u Rijeci, 1997. (in Croatian) 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		
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. Črnjarić-Žic N., Štefan Trubić M., Internal lecture notes about Laplace transforms.		
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*
Kamenarović, I.: Engineering mathematics I, Tehnički fakultet Sveučilišta u Rijeci, 1997. (in Croatian)	15	70
Elezović, N.: Fourier series and integral, Laplace transform, (FER) Biblioteka Bolonja, Element, 2006. (in Croatian)	2	70
Štefan Trubić M., Črnjarić-Žic N: Mathematics for Engineers, book of solved problems, e-lectures	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, mid-term exams, and tests.

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. Assessment and evaluation of student's work during classes and on 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) Demidovič, B. P.: Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, (in Croatian) Devide, V. i oth.: Solved Problems in mathematics, 1-4, Školska knjiga Zagreb, 1990 (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*
Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)	100	100
Slapničar I.: Mathematocs 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)	100	100
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)	5	100
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	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	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, mid-term exams, and tests.

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. Assessment and evaluation of student's work during classes and on 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)
Demidovič, B. P. : Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, (in Croatian)

1.11. Optional / additional reading (at the time of proposing study programme)		
Sopta, L.: Mathematics 2, Tehnički fakultet Sveučilišta u Rijeci, 1995, (in Croatian) Kamenarović, I.: Mathematics in Engineers 1, Tehnički fakultet Sveučilišta u Rijeci, 1997, (in Croatian) Kreyszig E., Advanced Engineering Mathematics, John Wiley & Sons, Inc., 1993		
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)	100	100
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	100
Demidovič, B. P. : Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, (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	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	☒ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☐ exercises	☒ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ other

1.6. Comments

1.7. Student's obligations

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

1.8. Evaluation of student's work

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

1.9. Assessment and evaluation of student's work during classes and on 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	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☒ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ other

1.6. Comments

1.7. Student's obligations

Course attendance, 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 check	1	Report		Practice	
Portfolio							

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

Course attendance. Continuous knowledge testing (two mid-term exams). 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 and Economics 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

Assuming theoretical concepts and knowledge of the organization and business economics.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

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

1.4. Course content

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

1.5. Teaching methods	☒ lectures ☐ 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. Assessment and evaluation of student's work during classes and on final exam

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

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

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

1.11. Optional / additional reading (at the time of proposing study programme)		
Novak, M., Sikavica, P.: Business Organization, Informator, Zagreb, 1999. (in Croatian)		
1.12. Number of assigned reading copies with regard to the number of students currently attending the course		
Title	*Number of copies*	*Number of students*
Mikac, T., Ikonić, M.: Organization of Business Systems, Tehnički fakultet Sveučilišta u Rijeci, 2008. (in Croatian)	As needed	83
Novak, M., Sikavica, P.: Business Organization, Informator, Zagreb, 1999. (in Croatian)	-	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	Physical and Health Education	
Study programme	Undergraduate University Study of Electrical Engineering	
Course status	optional	
Year	3.	
ECTS credits and teaching	ECTS student 's workload coefficient	1
	Number of hours (L+E+S)	0+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

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

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

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

1.4. Course content

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

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

1.7. Student's obligations

Course attendance.

1.8. Evaluation of student's work

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

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

Regular course attendance.

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

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

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

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

Title	*Number of copies*	*Number of students*
Medved, R.: Sports medicine, Medicinska knjiga, Zagreb. (in Croatian)	1	100

Tuka, K.:Physiology of sport, Sportska tribina, Zagreb. (in Croatian)	1	100
1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences		
Through the Institution's Quality Assurance System.		

Basic description		
Course title	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

Adoption of theoretical knowledge and develop the ability to differentiate properties and concepts of classical and modern physics. Forming a proper view of the interpretation of physical phenomena and their applications in engineering.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Parsed in physics in classical and relativistic picture. Identify the exact features access to natural phenomena. Define fundamental physical quantities and units of measure. Understand the properties of motion in classical and relativistic picture. Develop and independently argue simpler problems. Apply learned knowledge to problem-solving tasks.

1.4. Course content

Introduction and brief history of physics. Motion, rectilinear motion, circular motion. Relativity of motion. Classic and special relativity. The motion of rigid bodies, moments, conservation laws. Fluids, pressure. Hydrostatic pressure. Bernoulli equation. Heat and temperature, gas laws. Transfer of heat transfer mechanisms, thermal resistance. Kinetic molecular theory of gases. Oscillations, harmonic oscillator, damped oscillation, forced oscillation. Waves in mechanics, standing waves, Doppler effect.

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	0.5	Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework					

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

Course attendance, activity, continuous knowledge testing, 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)

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	113
Dobrinić, J., Mandić, L.: Physics 1, Tehnički fakultet, Rijeka, 2002. (In Croatian)	9	113
Dobrinić, J. Mandić, L.: Solved examples in Physics1, Tehnički fakultet, Rijeka, 2001. (In Croatian)	16	113
Dobrinić, J. Mandić, L.: Solved examples in Physics 1, Tehnički fakultet, Rijeka, 2010.(In Croatian)	6	113
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

Adoption of theoretical knowledge and develop the ability to differentiate properties and concepts of classical, relativistic and quantum physics. Forming a proper view of the interpretation of physical phenomena and their applications in engineering. .

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Parsed fields of classical, relativistic and quantum physics. Identify features an exact approach phenomena in microcosm. Comparable phenomena in continuum mechanics and atomic physics. Become familiar with the wave properties of electromagnetic radiation. Distinguish between wave and particle properties of matter. Describe the phenomena related to the dual nature of the world. Define the basic settings of material substance. Analyze the interaction between radiation and matter. Develop and independently argue simpler problems. Apply learned knowledge to problem-solving tasks.

1.4. Course content

The electromagnetic oscillations. Electromagnetic waves, the speed of the waves. Reflection and refraction of electromagnetic waves. Doppler effect for electromagnetic waves. Geometric optics. Physical optics, interference, diffraction, polarization. The optical lattice. Elements of quantum physics, Planck's law of radiation. The structure of matter, the Bohr model of the atom. Atomic spectra. Quantum numbers, energy ribbon in the crystal. The emission and absorption, stimulated emission of radiation. Pauli principle and consequences. The interaction of radiation with matter. Photoelectric effect, Compton effect, the formation of pairs.

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	0.5	Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework					

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

Course attendance, activity, continuous knowledge testing, 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)

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	113
Glavan, N., Mandić, L., Dobrinić, J.: Solved examples in Physics II, Tehnički fakultet, Rijeka, 2004. (In Croatian)	13	113

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

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

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

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 courses Materials Technology.

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

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

Course attendance, homework, preparation for participation in teaching, sustained knowledge check (two mid-term exams), written and oral 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)

Stupnišek, M., Cajner, F., Fundamentals of heat treatment of metals, Hrvatsko društvo za toplinsku obradbu, 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*
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. Assessment and evaluation of student's work during classes and on final exam

Assesses and evaluates student work and dedication, and written report.

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

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

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

Title	*Number of copies*	*Number of students*

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

Basic description		
Course title	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

Learning about the process of writing and debugging a program in C programming language.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Understand priciples of program development and usage of basic commands of C programming language. Understand and use of C programming language syntax. Understand and use of commands for control flow. Understand data types and basic data structures. Understand functions and their principles. Apply pointers and dynamic memory allocation. Understand and use of I/O functions.

1.4. Course content

Programming in C computer language. Syntax. Programming loops. Commands for control flow. One-dimensional and two-dimensional fields. Functions. Pointers and structures. Link between pointer and field. Pointers as function arguments. Dynamic memory allocation. Working with files.

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, individual study.

1.8. Evaluation of student's work

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

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

Course attendance, activity, homework, individual study.

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

Rajko Vulin: From Now we are Programming in C, Turbo C, Školska knjiga, Zagreb 1991. (in Croatian)
Kernighan B. W., Ritchie D. M., The C Programming Language, Prentice Hall, Inc., 1988.

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

Rajko Vulin: "Zbirka riješenih zadataka iz C-a", Školska knjiga, Zagreb 1995.

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*

Rajko Vulin: From Now we are Programming in C, Turbo C, Školska knjiga, Zagreb 1991. (in Croatian) 1991.	1	61
Kernighan B. W., Ritchie D. M., The C Programming Language, Prentice Hall, Inc., 1988.	0	61
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. Pareto principle. Economical level of quality. Optimal quality.
Quality inspection. Quality assurance. International quality standards ISO 9000. Quality management. Total quality. Planning for quality. Quality improvement. Quality engineering.
Method and tools for quality assurance and improvement. Cause-and-effect relationships. Causes of quality variability. Statistical process control methods. Common probability distributions.
Control charts. Specification limits and tolerances.
Products and processes quality assessment methods. Demerit method. Quality of measurement system.
Acceptance sampling. Reliability.

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

1.7. Student's obligations

Course attendance, active participation in the course, attendance at laboratory exercises, homework and independent learning.

1.8. Evaluation of student's work

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

Sustained knowledge check (three midterm exams) and final written exam.

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

1.11. Optional / additional reading (at the time of proposing study programme)		
Montgomery, D.C., Jennings, C. L., Pfund, M. E.: Managing, controlling, and improving quality, John Wiley & Sons Wiley, 2011.		
1.12. Number of assigned reading copies with regard to the number of students currently attending the course		
Title	*Number of copies*	*Number of students*
1.13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences		
Through the Institution's quality assurance system.		

Basic description		
Course title	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 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 impulse 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; impulse response, convolution of signals, properties of LTI systems. Fourier series; line spectrum, systems with periodic inputs. Fourier transform; signal energy, transfer function of 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, individual studying.

1.8. Evaluation of student's work

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

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

Sustained knowledge check (written tests), 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.
S. S. Soliman and M. D. Srinath: Continuous and Discrete Signals and Systems, 2/E, Prentice Hall, 1998.
M. Vrankić: Signals and Systems: Solved Problems, (book), Graphis, 2007. (in Croatian)

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

C. L. Phillips, J. Parr, and E. Riskin: Signals, Systems, and Transforms, 4/E, Prentice Hall, 2008.

J. H. McClellan, R. W. Schafer, and M. A. Yoder: Signal Processing First, Prentice Hall, 2003. S. Haykin and B. Van Veen: Signals and Systems, 2/E, Wiley, 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*
B. P. Lathi: Linear Systems and Signals, 2/E, Oxford University Press, 2004.	1	70
S. S. Soliman and M. D. Srinath: Continuous and Discrete Signals and Systems, 2/E, Prentice Hall, 1998.	1	70
M. Vrankić: Signals and Systems: Solved Problems, (book), Graphis, 2007. (in Croatian)	11	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	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. Rigging and sails outfitting of sailing boat. 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 check		Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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	System Modelling and Simulation	
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 technical systems analogous to electrical systems.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Adopt the basic principles of creating mathematical models of various technical systems (mechanical, thermal, electrical, fluid flow system, etc.). Master basic use of Matlab / Simulink simulation software for model creation, simulation and system analysis. Transform the mathematical model of the system into a graphical representation using block diagrams. Display systems in the state space from the differential equation description, transfer function and block diagram description. Linearize nonlinear equations using Taylor series. Simulate different technical systems using electrical networks with operational amplifiers. Generate analytic functions by using the power series and solving differential equations.

1.4. Course content

The types and properties of the models. Methods of determining the mathematical models of the systems. Description of the systems by using differential equations, transfer functions and state-space models. Modelling systems with distributed parameters. Determination of models using physical laws. Complex and simplified models of elements. Modelling systems with distributed parameters. Simulations of systems. Numerical integration methods for systems' simulations. Generation of nonlinear and analytical functions. The simulation software packages.

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

1.6. Comments	-

1.7. Student's obligations

Course attendance, work on laboratory exercises, studying.

1.8. Evaluation of student's work

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

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

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

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.		
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	-	50
N.M.Karayanakis: Advanced System Modelling and Simulation With Block Diagram Languages	-	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	Technology Processes of Shipbuilding	
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 technological processes in shipbuilding, capabilities and techniques of management and organization of preparatory and shipbuilding production processes, and the importance of planning the integration of various processes in shipbuilding, according to defined learning outcomes.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Interpret organizational features of shipbuilding processes of preparation and production. Distinguish between various shipyard processes modelling capabilities. Describe the shipbuilding processes and working areas. Interpret shipyard flexibility. To analyze the structural and technological constraints. Define the shipyard throughput. Interpret and explain the characteristics of the ship assembly process. Describe transport techniques, systems and shipyard equipment. Argue the integration of ship production processes. Analyze delivery procedures throughout production phases.

1.4. Course content

Organizational features of shipbuilding processes of preparation, production and repair. Requirements, divisions and capabilities for modeling shipyard processes. Shipbuilding processes and working areas. Shipyard flexibility. Structural and technological constraints of the processes. Classification and characteristics of the processes. The preparative process. The integration of informations flow. Production processes. Throughput of processes. Characteristics of assembly process. Transport techniques, systems and equipment. The mechanization for assembly process. Process management concepts. The integration of ship production process. Control of resources, material flow, dokumentation. Quality control, delivery procedures throughout production phases, the finalization of the production processes.

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

1.7. Student's obligations

Course attendance, activity, sustained knowledge check, studying.

1.8. Evaluation of student's work

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

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

Course attendance, activity, sustained knowledge check (two mid-term exams), written and oral exam or their combination.

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

Furlan, Z. i dr.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986. (in Croatian)
Lamb, T., at all: A Review of Technology Development. SNAME, Transactions, Vol. 103, 1995.

1.11. Optional / additional reading (at the time of proposing study programme)		
Storch, R. L. et al: Ship Production, SNAME, New Jersey, 1995.		
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*
Furlan, Z. i dr.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986. (in Croatian)	10	5
Lamb, T., at all: A Review of Technology Development. SNAME, Transactions, Vol. 103, 1995.	2	5
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 state changes during evaporation and condensation. Describe, compare and analyze processes of steam plants. Describe and analyze the thermal behaviour during combustion. Describe and compare the processes of internal combustion engines. Describe and analyze the exchange of energy in the flow through the nozzle. Define, describe and compare basic types of heat transfer and describe the heat transfer within the heat exchanger. Describe and analyze the changes and processes with humid air. 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

The historical development of energy use. Thermal state. The first law of thermodynamics. Ideal gas equation of state. Work. 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. Evaporation and condensation. Saturated and superheated steam. Processes of steam plants. Mollier hs-diagram. Exergy. Combustion. Processes of internal combustion engines. 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. Nuclear energy. Fundamentals of energy engineering. Energy planning. Energy management.

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

1.6. Comments

1.7. Student's obligations

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

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

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

Course attendance, activity, homework, continuous knowledge testing (three mid-term exams), written and oral exam.
1.10. Assigned reading (at the time of the submission of study programme proposal)
Bošnjaković, F.: Thermodynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian) Halasz, B, Galović, A., Tadić, M.: Collections of exercises in Thermodynamics, part I, part II, Sveučilišna tiskara, Zagreb, 1993. and 1996. (in Croatian)
1.11. Optional / additional reading (at the time of proposing study programme)
Galović, A.: Termodynamics I, (book), Fakultet strojarstva i brodogradnje, Zagreb, 2007. (in Croatian) Galović, A.: Termodynamics II, (book), Fakultet strojarstva i brodogradnje, Zagreb, 2007. (in Croatian)
1.12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	*Number of copies*	*Number of students*
Bošnjaković, F.: Thermodynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian)	38	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.