J.J. Strossmayer University of Osijek
Faculty of Electrical Engineering
KnezaTrpimira 2b
31 000 OSIJEK

First Cycle Degree in Electrical Engineering (Bachelor level) – Study Programme

Osijek, 2008
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CONTENTS

1. INTRODUCTION

a) Rationale for founding the Faculty

Faculty of Electrical Engineering in Osijek was founded in 1978, but the university programme of electrical engineering has been carried out since 1990. During that period, the Faculty has developed into a respectable institution in material and staff terms, which is the basis for implementing study programmes at the highest level. During the previously mentioned period, the Faculty has been equipped with modern lecture rooms and staff offices, but what is more important it has equipped laboratories, which are of greatest importance in the modern education of students studying electrical and computer engineering.

Assessment of rationale with respect to labour market requirements - The labour market in Croatia shows that experts who complete their studies of electrical engineering find an employment easily so that there are hardly any unemployed engineers of the mentioned profile. Faculty of Electrical Engineering in Osijek is the only institution in the Eastern Croatia that educates professionals in the field of electrical engineering, and that makes the basis for future successful activities but also for employment of highly educated staff as well as development of both this region and Croatia in general. Some data from nearer, but also broader area, the European Union, the USA and other highly developed countries show that experts who complete the study programme of electrical engineering have great possibilities to find an employment due to the constant need for staff of this profile. Furthermore, trends of growth and development of electrical engineering, computer engineering, information and communication technologies as well as the impact of new technologies and services show that more experts of this profile will be needed. It is to be expected that this trend is going to be continued, which is the main reason for starting a study of this profile. Engineers who will complete the Bachelor level of electrical engineering will acquire basic knowledge to be able to become part of the labour market. Worldwide experience shows that short–cycle engineers easily find an employment due to the lack of educated labour force as well as narrow specialisation of particular jobs which require some basic knowledge offered by the Bachelor level of electrical engineering study programme.

Further social and economic development of modern society as well as Croatia in general is inconceivable without electrical engineering which is present in every segment of human life**.** Electrical engineering will undoubtedly remain the main initiator of social development which will require highly educated experts who will be able to respond to the challenges of the new age. Highly educated experts of electrical engineering educated at the Faculty of Electrical Engineering in Osijek have found and will find their place at the labour market.

Connection with modern scientific ideas and/or skills based on them- The modern study of electrical engineering is based on the overall research and development in the field of natural and technical sciences but on new technologies as well. It is especially manifested in the development of electrical engineering and electronic industry which is supported by most recent ideas in the scientific field of electrical engineering. The initiator of the development and research in this field is the labour market, which supports further investment into science and research in the field of electrical engineering. Consequently, most recent scientific ideas have to be followed by research and development at the

Faculty, in the first place within the framework of different projects supported by the Ministry of Science, Education and Sports, through projects supported by the European Union and certainly through cooperation and projects with economy.

Comparability with programmes of other eminent foreign higher education institutions – The Bachelor level programme in electrical engineering at the Faculty of Electrical Engineering in Osijek is based on and can be compared with related European universities. Furthermore, it can be compared with the first cycle programme of electrical engineering at TU Vienna and with the first cycle programme of electrical engineering and computer science at EHT Zürich. The common base is the three-year study programme during which students can acquire the minimum of 180 ECTS credits. The common qualification awarded after the successful completion of the first cycle studies is Baccalaureus / Baccalaurea of Electrical Engineering (and Computer Science), i.e. Bachelor of Science in Electrical Engineering. The basis of research of the first cycle programme is represented by entirely comparable fundamental courses of the study programme in the first and the second years of study and obligatory and/or elective modules/courses through which students obtain some additional orientation towards the labour market, i.e. towards Master level (second cycle studies).

b) Experience in the implementation of equivalent or similar programmes

Faculty of Electrical Engineering in Osijek has been educating engineers in the field of electrical engineering for many years. In the new curriculum and study programme of the undergraduate study which was accepted in 2003, engineers in the scientific field of electrical engineering are educated at the Faculty of Electrical Engineering. They can choose one of the three following branches: Power Engineering**,** Automation and Computer Engineering in Process Control**,** and Computer Engineering and Telecommunications**.** Furthermore, the postgraduate study of electrical engineering is carried out at the Faculty of Electrical Engineering in the following branches: Power Engineering, Telecommunications and Computer Science**.** On account of the mentioned studies, the Faculty of Electrical Engineering has acquired valuable experience in the education of experts in the scientific field of electrical engineering. Former studies of electrical engineering represent the foundation for the new First cycle studies of electrical engineering, that will, together with the Second cycle studies and the Third cycle studies**,** create a continuing educational cycle from the Bachelor to the Master and finally to the doctoral degree. In this way, the Faculty of Electrical Engineering will encircle the education of experts in the scientific field of electrical engineering.

d) Faculty overtness towards mobility of students

Within the scope of the Bachelor level programme in electrical engineering, students from other universities/faculties will be given an opportunity to take particular courses/modules or to study even whole semesters at the Faculty of Electrical Engineering in Osijek. Studying at other higher education institutions will be made available to our own students. Mobility of students as well as the teaching staff will be regulated on the basis of a partnership agreement between different universities/faculties. Coordination and agreeing of particular arrangements will be executed by ECTS coordinators of partnership institutions.

2. PRELIMINARIES

2.1. *Study programme*:

First cycle degree in Electrical Engineering

2.2. *Institution*:

J. J. Strossmayer University of Osijek, Faculty of Electrical Engineering Osijek in co-operation with other University institutions (faculties, departments)

2.3. *Duration of study*:

Bachelor level study programme in electrical engineering would take **3 years** and a student should acquire a minimum of **180 ECTS credits**.

2.4. *Entry requirements*:

Bachelor's study programme in electrical engineering would be open to applicants who completed their four-year secondary school education and passed a compulsory entrance examination attaining a required threshold level. Admission of qualified applicants to the university study programme in electrical engineering would be done according to a rank-list compiled on the basis of the overall secondary school achievements as well as entrance examination results. Introducing a GCE A-level examination in the secondary school education in the Republic of Croatia would allow applicants admission without being obliged to take the entrance examination, stressing thereby the importance of the overall secondary school achievements and GCE A-level results.

2.5. *Qualification attributes or competencies electrical engineering students would achieve and positions they would be qualified for:*

Graduates from the Faculty of Electrical Engineering in Osijek and its Bachelor level programme in electrical engineering would acquire the necessary knowledge and skills to apply their knowledge of mathematics, physics, science and engineering to electrical engineering, as well as to design and conduct experiments, and analyse and interpret measurement results. Engineers of this profile would learn how to identify, formulate, and solve engineering problems. Furthermore, they would acquire abilities to recognise the interaction between engineering activities and design, manufacturing, marketing, user requirements and requirements of the manufacturing process. They should also learn how to adapt to technology changes and new techniques as part of a life long learning process. Moreover, electrical engineering students would display an understanding of engineering activities and their influence on life in general and the environment, demonstrating high moral and ethical principles while solving engineering tasks. Students would be able to apply the acquired knowledge to undertake appropriate further training aimed at improving their professional and academic abilities. By solving complex problems, electrical engineering students would creatively and critically evaluate arguments, assumptions, concepts and data in order to make effective judgement and offer adequate contribution to the overall solution.

First cycle degree holders in electrical engineering would acquire the necessary knowledge and abilities to:

- apply the basic laws of electrical engineering to RCL networks;
- provide a thorough analysis and calculation of dimensions of electrical distribution system;
- develop and implement computer networks and communication protocols;
- explain fundamental principles of power generation and distribution;
- work with basic analogue and digital circuits as parts of larger systems;
- apply simulation software tools for the purpose of designing electronic components;
- use laboratory equipment for testing, design and development;
- work with basic and advanced software tools for solving engineering problems;
- plan, install and maintain basic control systems.

The knowledge and skills first cycle degree holders in electrical engineering would acquire during their studies would prepare them for a continuing Master level, i.e. second cycle degree in computer engineering, both in Croatia and abroad. Moreover, through a basic knowledge of mathematics, physics and electrical engineering they would be completely or partially educated and trained to continue with their study programme at second cycle degree granting institutions majoring in other branches of engineering and computer science.

2.8. *Qualification awarded after the successful completion of the study programme:*

After the successful completion of the first cycle study programme (Bachelor level) in electrical engineering graduates would be awarded the title **Bachelor of Science in Electrical Engineering**.

3. Program Description

3.1. First-cycle Degree Study Programme in Electrical Engineering- obligatory and elective courses

Curriculum of the first-cycle degree study programme (Bachelor level) in Electrical engineering is described in detail in tables showing the order of enrolling and carrying out respective study courses. The tables provide course titles, weekly workload (contact hours pertaining to lectures + problem solving + laboratory practice + design/construction exercises). The courses are assumed to be conducted for the whole semester, i.e. fifteen weeks. The total weekly workload of students relative to lectures and practice is at most 25 hours excluding their duties referring to Physical Education and optional courses. All courses are one-semester courses. Students can take respective examinations after completing lectures and practice/exercises. The estimated students' workload per semester is expressed by ECTS (European Credit Transfer System) credits. ECTS credits are assigned according to the following principles and criteria:

- Credits are assigned by setting a norm in one semester to 30 ECTS credits ;
- Number of credits assigned to each course represents part of students' workload and engagement within that particular course with respect to the total semester workload (30 ECTS credits); number of credits per one course is rounded to half a credit (0.5);
- Students' workload includes the total time required for successful course completion (lectures, problem solving, laboratory practice, design/construction exercises, preparation for practice and exercises, writing reports, testing laboratory practice, seminar papers, time spent studying, i.e. independent learning, tests and examinations, etc.);
- Detailed credit value has been determined on the basis of lecturer's estimation regarding content complexity, as well as a questionnaire conducted among students concerning the existing courses at the faculty and the time required for their successful completion.

Course notation

For easy reference courses are denoted by codes in the following way:

Course code: P Bx y z

where: P – one-letter symbol for the first-cycle degree study programme
B – one- or multi-letter symbol for the study programme
E – Electrical engineering courses
K – Communications courses
R – First-cycle degree study programme in computer engineering

x – semester
y z – two-digit symbol for the course number in the semester

Workload notation

P - lectures
A – problem solving
L – laboratory practice
K - design/construction exercises

Electrical Engineering, elective block EE

1. YEAR OF STUDY PROGRAM

1. semester

Code	Course	L workload	E workload	ECTS	Teacher
PF101	English - facultative	15	15	2	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
PE104	Physics I	45	30	5	VARGA PAJTLER MAJA
P105	Engineering Graphics and Documentation	30	15	3	Prof.dr.sc. MRČELA TOMISLAV
P101	Linear Algebra	30	30	5	Doc.dr.sc. KATIĆ ANITA Prof.dr.sc. GALIĆ RADOSLAV *
P102	Calculus I (Differential Calculus)	30	30	5	Doc.dr.sc. RUDEC TOMISLAV
P103	Fundamentals of Electrical Engineering I	30	45	6	Izv.prof.dr.sc. HEDERIĆ ŽELJKO Doc.dr.sc. BARUKČIĆ MARINKO
P106	Programming I	30	30	5	Prof.dr.sc. MARTINOVIĆ GORAN Doc.dr.sc. BAUMGARTNER ALFONZO
P107	Physical Education I	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

2. semester

Code	Course	L workload	E workload	ECTS	Teacher
P204	Electronics I	45	45	6	Izv.prof.dr.sc. MATIĆ TOMISLAV (st.) Doc.dr.sc. VINKO DAVOR
PF201	English - facultative	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
PE203	Physics II	45	30	6	VARGA PAJTLER MAJA
P201	Calculus II (Integral Calculus - Differential Equations)	30	30	6	Doc.dr.sc. KATIĆ ANITA
P202	Fundamentals of Electrical Engineering II	45	45	6	Izv.prof.dr.sc. HEDERIĆ ŽELJKO Doc.dr.sc. BARUKČIĆ MARINKO
P205	Programming II	30	30	5	Doc.dr.sc. JOB JOSIP Izv. prof. dr. sc. NENADIĆ KREŠIMIR
P206	Physical Education II	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

2. YEAR OF STUDY PROGRAM

3. semester

Code	Course	L workload	E workload	ECTS	Teacher
PE301	Energy Conversions	45	30	7	Prof.dr.sc. STOJKOV MARINKO *
PF301	English - facultative	15	15	2	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
P301	Calculus III	30	30	5	Doc.dr.sc. MAROŠEVIĆ TOMISLAV *
PE302	Electrical Materials	30	30	5	Prof.dr.sc. MRČELA TOMISLAV
PE303-17	Fundamentals of Power Engineering and Ecology	45	30	6	Prof.dr.sc. ŠLJIVAC DAMIR
PEK301	Measurement Basics	45	45	6	Izv.prof.dr.sc. MILIČEVIĆ KRUNO
P303	Physical Education III	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

4. semester

Code	Course	L workload	E workload	ECTS	Teacher
PEK401	Network Analysis	45	30	5.5	Izv.prof.dr.sc. MILIČEVIĆ KRUNO
P404	English I	15	15	2	FERČEC IVANKA
P401	Communication Networks	45	30	6	Doc.dr.sc. GRGIĆ KREŠIMIR Prof.dr.sc. ŽAGAR DRAGO
PE401	Fundamentals of Electrical Machines	45	30	5.5	Izv.prof.dr.sc. BARIĆ TOMISLAV
P403	Signals and Systems	30	30	5	Izv. prof. dr. sc. GALIĆ IRENA
P405	Physical Education IV	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO
P402	Probability and Statistics	30	30	5	Doc.dr.sc. RUDEC TOMISLAV Prof.dr.sc. GALIĆ RADOSLAV *

3. YEAR OF STUDY PROGRAM

5. semester

Code	Course	L workload	E workload	ECTS	Teacher
P501	English II	30	15	3	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
PER501	Basics of Automatic Control	45	30	7	Prof.dr.sc. SLIŠKOVIĆ DRAŽEN
PE501	Fundamentals of Electric Drives	45	30	7	Izv.prof.dr.sc. BARIĆ TOMISLAV
PE502-17	Basics of Power Systems	45	30	6	Doc.dr.sc. FEKETE KREŠIMIR Prof.dr.sc. NIKOLOVSKI SRETE
PE503	Principles of Power Electronics	45	30	7	Izv.prof.dr.sc. PELIN DENIS

6. semester

Code	Course	L workload	E workload	ECTS	Teacher
P601	Company Economics	30	15	5	Izv.prof.dr.sc. CRNJAC-MILIĆ DOMINIKA
PE602-17	Electrical Installation and Lightning	30	15	5	Izv. prof. dr.sc. KLAIĆ ZVONIMIR
P604	English III	15	15	5	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
P603	Communication Skills	30	15	5	Izv.prof.dr.sc. GLAVAŠ JERKO *
P605	Final Paper	0	0	10	

Electrical Engineering, elective block KI

1. YEAR OF STUDY PROGRAM

11. semester

Code	Course	L workload	E workload	ECTS	Teacher
PF101	English - facultative	15	15	2	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
PE104	Physics I	45	30	5	VARGA PAJTLER MAJA
P105	Engineering Graphics and Documentation	30	15	3	Prof.dr.sc. MRČELA TOMISLAV
P101	Linear Algebra	30	30	5	Doc.dr.sc. KATIĆ ANITA Prof.dr.sc. GALIĆ RADOSLAV *
P102	Calculus I (Differential Calculus)	30	30	5	Doc.dr.sc. RUDEC TOMISLAV
P103	Fundamentals of Electrical Engineering I	30	45	6	Izv.prof.dr.sc. HEDERIĆ ŽELJKO Doc.dr.sc. BARUKČIĆ MARINKO
P106	Programming I	30	30	5	Prof.dr.sc. MARTINOVIĆ GORAN Doc.dr.sc. BAUMGARTNER ALFONZO
P107	Physical Education I	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

2. semester

Code	Course	L workload	E workload	ECTS	Teacher
P204	Electronics I	45	45	6	Izv.prof.dr.sc. MATIĆ TOMISLAV (st.) Doc.dr.sc. VINKO DAVOR
PF201	English - facultative	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
PE203	Physics II	45	30	6	VARGA PAJTLER MAJA

P201	Calculus II (Integral Calculus - Differential Equations)	30	30	6	Doc.dr.sc. KATIĆ ANITA
P202	Fundamentals of Electrical Engineering II	45	45	6	Izv.prof.dr.sc. HEDERIĆ ŽELJKO Doc.dr.sc. BARUKČIĆ MARINKO
P205	Programming II	30	30	5	Doc.dr.sc. JOB JOSIP Izv. prof. dr. sc. NENADIĆ KREŠIMIR
P206	Physical Education II	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

2. YEAR OF STUDY PROGRAM

3. semester

Code	Course	L workload	E workload	ECTS	Teacher
PRK301	Digital Electronics	30	45	6	Prof.dr.sc. HOCENSKI ŽELJKO
PK301	Electronics II	45	30	6	Izv.prof.dr.sc. MATIĆ TOMISLAV (st.)
PF301	English - facultative	15	15	2	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
P301	Calculus III	30	30	5	Doc.dr.sc. MAROŠEVIĆ TOMISLAV *
PEK301	Measurement Basics	45	45	6	Izv.prof.dr.sc. MILIČEVIĆ KRUNO
PRK302-17	Object-oriented software development principles	30	45	6	Prof.dr.sc. MARTINOVIĆ GORAN
P303	Physical Education III	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

4. semester

Code	Course	L workload	E workload	ECTS	Teacher
PEK401	Network Analysis	45	30	5.5	Izv.prof.dr.sc. MILIČEVIĆ KRUNO
P404	English I	15	15	2	FERČEC IVANKA
P401	Communication Networks	45	30	6	Doc.dr.sc. GRGIĆ KREŠIMIR Prof.dr.sc. ŽAGAR DRAGO
P403	Signals and Systems	30	30	5	Izv. prof. dr. sc. GALIĆ IRENA
PRK401	Information Theory	45	30	5.5	Prof.dr.sc. ŽAGAR DRAGO
P405	Physical Education IV	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO
P402	Probability and Statistics	30	30	5	Doc.dr.sc. RUDEC TOMISLAV Prof.dr.sc. GALIĆ RADOSLAV *

3. YEAR OF STUDY PROGRAM

5. semester

Code	Course	L workload	E workload	ECTS	Teacher

PRK503	Computer Architecture	30	45	7	Prof.dr.sc. HOCENSKI ŽELJKO
PRK501	Data Bases	45	30	7	Doc.dr.sc. LUKIĆ IVICA
P501	English II	30	15	3	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
PK501	Communication Systems	45	30	7	Prof.dr.sc. RIMAC-DRLJE SNJEŽANA
PRK502	Modelling and Simulation	30	30	6	Izv.prof.dr.sc. VUČINIĆ DEAN

6. semester

Code	Course	L workload	E workload	ECTS	Teacher
P601	Company Economics	30	15	5	Izv.prof.dr.sc. CRNJAC-MILIĆ DOMINIKA
P604	English III	15	15	5	LIERMANN-ZELJAK YVONNE FERČEC IVANKA
P603	Communication Skills	30	15	5	Izv.prof.dr.sc. GLAVAŠ JERKO *
PRK602-17	Technical System Designing	30	15	5	Prof.dr.sc. MRČELA TOMISLAV
P605	Final Paper	0	0	10	

3.2. First Cycle Degree in Electrical Engineering (Bachelor level) – Courses description

General information		
Lecturer	**Izv.prof.dr.sc. MILIČEVIĆ KRUNO**	
Course name	PEK401 Network Analysis	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5.5
	Workload (L+(AE+LE+CE)+S)	45+(30+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.explain the basic properties of passive and active network elements 2.explain the difference between the original and a model on an example of components/devices and elements of an electrical network, and evaluate the applicability of models in engineering applications 3.evaluate properties of the network and network elements with respect to (non)linearity and time (in)variance 4.select and apply the method appropriate for solving and analysing linear/nonlinear time-variant/invariant electrical networks 5.evaluate the solutions obtained by network analysis	
1.4. Course content	
Kirchhoff networks. Basic properties of dissipative elements. One-port and multiport resistors. Basic properties of reactive elements. Commutation laws. Conservation of charge in the node. Conservation of flux in the loop. Time responses of networks. First-and second-order circuits. Nonlinear and time-variant electrical networks. Fundamentals of network topology. Network matrices. Node and mesh analysis. Loop and cut-set analysis. State equations. Computer aided analysis of networks. Superposition integrals. General method of analysis of linear-time invariant networks. Network functions. Network theorems. Two-port equations. Harmonic steady-state solution.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	**ECTS**	**Learning outcomes**	**Teaching method**	**Assessment method**	**Points**	
					Min	**max**

Attendance Lectures, Auditory exercises	1.3	1,2,3,4,5	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	10
Practice – problem solving	2	4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	2	1,2,3,4,5	Oral exam	Assessment of student's answers	20	40
Group tasks	0.2	1,2,3	Group tasks	Evaluation of exercises	0	10

1.10. Obligatory literature

1. Flegar, I.. Teorija mreža.Osijek: Sveučilište u Osijeku, 2001.
2. Robbins, Allan H. Circuit Analysis: Theory & Practice, 3E, Delmar Cengage Learning; 3rd edition (July 1, 2003)
3. I. Flegar, Teorija mreža-Zbirka zadataka, Sveučilište u Osijeku, Osijek 1997.

1.11. Recommended additional literature

1. L.O. Chua, C.A. Desoer, E.S. Kuh, Linear and nonlinear circuits, Mc Graw Hill Comp., New York, 1987.
2. J.W. Nilsson, S.A Riedel, Electric circuits, Reading, Massachusetts, Addison-Wesley Publ. Comp., 1996.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. HOCENSKI ŽELJKO**	
Course name	PRK503 Computer Architecture	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	30+(15+15+15)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.explain computer hardware 2.analyse the functioning of computer system components 3.explain the connection, serial and parallel data transfer 4.design a software solution in assembly language 5.apply programming tools and environments for programme designing 6.evaluate and test the functioning of a designed computer system	
1.4. Course content	
Basic features of a digital computer. Microprocessor. 8-bit microprocessor architecture. System busses. Microcomputer operation: instruction fetch and execution. Instruction set. Addressing modes. Instruction execution time. Personal computer architecture. Intel microprocessor family. Address decoders and bus drivers. Motherboards and specific busses. Input-output functional units. Parallel input/output interface (PIO). Parallel busses and basic protocols (AT/ISA, SCSI, PCI, GPIB). Serial interface (UART, SIO). Serial busses and protocols (RS-232, RS-485, USB, IEEE-1394, IIC). Timing circuits (CTC). Memory devices. Memory organisation: Cache and virtual memory. Memory management. External storage. Magnetic media (Floppy, HDD). Optical disks (CD-ROM, CD-R/W, DVD). Direct memory access (DMA). Basic input/output methods. Interrupts. Modern microprocessor and computer architecture. Self-diagnostics. Reliability. Design and diagnostics tools and equipment.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises Construction exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises, Design exercises	2.5	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Practice – problem solving	1.5	3,4,5	Midterm exam	Evaluation of (written) exercises	18	35
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.5	4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	20
Oral exam	0.5	1,2,3,4	Oral exam	Assessment of student's answers	15	30
Problem-solving related to design exercises	1	5,6	Design exercises	Evaluation of problem solving exercises	10	10

1.10. Obligatory literature

1. Hocenski Ž; .Martinović, G; .Aleksi,I. Arhitektura računala- Zbirka zadataka. ETF Osijek 2010.
2. Williams, R. Computer Systems Architecture. Addison Wesley, 2001.

1.11. Recommended additional literature

1. S. Ribarić: Arhitektura računala, Školska knjiga, Zagreb, 1990
2. J.L. Hennessy, D.A. Patterson: Computer Architecture, A Quantitative Approach; Morgan Kaufmann Publishers, 1990.
3. V.P. Heuring, Harry F. Jordan,Computer Systems Design and Architecture, Addison-Wesley, 1997.
4. Ž. Hocenski, G. Martinović, M. Antunović, Arhitektura računala- Priručnik za laboratorijske vježbe, ETF Osijek, 2005.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. LUKIĆ IVICA**	
Course name	PRK501 Data Bases	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.list basic database terms, and use ER diagram for database modeling 2.differentiate database models with the emphasis on a relational model, and create a relational database model from an ER diagram 3.comprehend a normalised relational database schema and sketch a database using normalisation 4.create a database using SQL queries on various database management systems 5.evaluate and implement simple and complex SQL queries using relational algebra 6.create SQL queries to ensure database security and integrity, and understand the link between database integrity and business rules	
1.4. Course content	
Information system. Business system model. Data bases. Database management system. Information system development. Development methods. Development phases. Data modelling. Conceptual data modelling. Entity relationship model. Object models. Logical data modelling. Relational data model. Relational algebra. SQL. Integrity rules in the relational database model. Normalisation. Network, hierarchical and relational model. Physical data modelling. Data control. Control functions. Computer-aided control.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Practice – problem solving	2	2,3,4,5	Midterm exam	Evaluation of (written) exercises	25	50
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	4,5,6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	8	15
Oral exam	1.5	1,2,3,5	Oral exam	Assessment of student's answers	15	30

1.10. Obligatory literature

1. Hamilton, Bill . Programiranje SQL Server 2005. O'Reilly, 2006
2. Churcher, Clare . Beginning Database Design, 2nd Edition.New York, Apress, 2012.
3. D. Grundler, Primijenjeno računalstvo, Graphis, Zagreb, 2000.

1.11. Recommended additional literature

1. E. Codd, The Relational model for base Management, Addison Wesley, 1990.
2. L. Budin, Informatika za 1. razred gimnazije, Element, Zagreb, 1997.
3. J. Martin, Computer -base Organization, Prentice Hall, 1977.
4. M. Varga, Baze podataka, DRIP- Zagreb, 1994.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. HOCENSKI ŽELJKO**	
Course name	PRK301 Digital Electronics	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	30+(15+15+15)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.explain the terms and categories in digital electronics 2.determine and explain the functions of logic circuits 3.apply the appropriate logic circuits and calculate their parameters 4.build logic circuits into a more complex system and examine it 5.design a digital system based on default requirements in VHDL 6.test the parameters and explain the functioning of the digital system 7.prepare and demonstrate the functionality of the designed digital system	
1.4. Course content	
Digital circuit and system features. Development survey. Number systems and conversions. Digital arithmetic. Codes. Error detection and correction codes. Logic functions. Logic function simplification. Logic integrated circuits. Characteristics of TTL, CMOS and modern technologies. Combination circuits: analysis and synthesis. Integrated logic circuit examples. Sequential circuits. State diagram. Flip-flop types and realisation. Asynchronous and synchronous counters. Synchronous counters design. Register types. Memories. Semiconductor memories: bipolar and MOS. Static and dynamic RAM memories. ROM, PROM, EPROM, EEPROM memories. Memories programming. Magnetic media. Optical media. Programmable logic circuits: features, programming and applications. Visual displays. ADC and DAC circuits. Digital circuit and system design software tools. Development and testing of digital circuits and equipment. Digital circuit reliability.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises Construction exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises, Design exercises	2.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Practice – problem solving	1	3,4,5	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,3,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	8	25
Oral exam	1	1,2,3	Oral exam	Assessment of student's answers	15	30
Problem-solving related to design exercises	0.5	3,4,5,6,7	Design exercises	Evaluation of problem solving exercises	7	10

1.10. Obligatory literature

1. Peruško, U. ; Glavinić, V. Digitalni sustavi. Školska knjiga, 2005.
2. Hocenski, Ž.; .Martinović, G. Digitalna elektronika - Zbirka zadataka. ETF Osijek, 2010.
3. Pedroni, Volnei A. Circuit Design and Simulation with VHDL. MIT Press, 2010.
4. U. Peruško, Digitalna elektronika, Školska knjiga, Zagreb, 1991.
5. ž. Hocenski, G. Martinović, M. Antunović, Digitalna elektronika- Priručnik za laboratorijske vježbe, ETF Osijek, 2003.

1.11. Recommended additional literature

1. D.C.Green, Digital electronics, Addison Wesley Longman, 1999.
2. J.M.Yarbrough, Digital Logic, Applications and Design, West Publishing Company, 1997.
3. R.L.Tokheim, Digital Principles, McGraw-Hill, 1988.
4. J.F.Wakerly, Digital design, Principle and Practices, Prentice Hall, 1994

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. CRNJAC-MILIĆ DOMINIKA**	
Course name	P601 Company Economics	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(15+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.use basic concepts related to microeconomics 2.define the concept of production and know how to interpret the production function 3.define the term amortisation, calculate it by using one of the methods for calculating amortisation and interpret the result 4.define the terms interest rate and interest calculation and choose the calculation method in the tasks 5.define costs and elaborate on the types of costs 6.explain the term investment calculations and apply certain methods of assessing the viability of the investment	
1.4. Course content	
Introduction to business economics, production theory, types of production costs, cost dynamics, demand and supply, consumer behaviour, cost calculation, investment calculation, business calculations, business performance measures (economic performance measurement metrics, business success strength measurement methods), economic resources, purchasing, logistics, business plan, business information systems, entrepreneurship and entrepreneur (economic and social prerequisites for founding and successful business operations).	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance	1.2	1,2,3,4,5,6	Lectures, Auditory	Attendance register.	0	10

Lectures, Auditory exercises			exercises	Mandatory attendance percentage is: 70%.		
Practice – problem solving	1.3	3,4,6	Midterm exam	Evaluation of (written) exercises	15	30
Oral exam	1.5	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30
Writing a seminar paper (teamwork)	0.5	1	Writing a seminar paper (teamwork)	Grading a seminar paper in terms of a structure and content	0	15
Oral presentation of the seminar topic with the help of ppt presentation	0.5	1	Making a presentation in Power Point and presenting the seminar paper in the class	Listening to presentations during classes	0	15

1.10. Obligatory literature

1. Karić, M. Ekonomika poduzeća. Ekonomski fakultet, Osijek, 2007.
2. Karić, M., Lacković, Z., Ekonomika elektrotehničkih poduzeća, Elektrotehnički fakultet u Osijeku, Osijek, 2003.

1.11. Recommended additional literature

1. Ravlić, P., Ekonomika poduzeća, Ekonomski fakultet, Zagreb, 1993.
2. Babić, ©. , Uvod u ekonomiku poduzeća, Školska knjiga, Zagreb, 1973.
3. Pindyck, R.S., Rubinfeld, D. L., Mikroekonomija, Mate d.o.o., Zagreb, 2005.
4. Hamarić, S. i Sikavica, P., Ekonomika i organizacija poduzeća, Birotehnika, Zagreb, 1989.
5. Sikavica, P., Novak, M., Poslovna organizacija, Informator, Zagreb, 1993.
6. Karić, M., Mikroekonomika, Ekonomski fakultet, Osijek,2006.
7. Panian, K.Ćurko, Poslovni informacijski sustavi, Zagreb,2010.
8. Caroselli M., Vještine vodstva za menadžere, Mate d.o.o., Zagreb, 2014.
9. Cohen S. P., Vještine pregovaranja za menadžere, Mate d.o.o., Zagreb 2014.
10. Atkinson R. D., Ezell S.J., Ekonomika inovacija, Mate d.o.o., Zagreb 2014.
11. Buble M., Klepić Z., Menadžment malih poduzeća: Osnove poduzetništva, Ekonomski fakultet Sveučilišta, Mostar, 2007.
12. Certo S., Certo T., Moderni menadžment, Mate d.o.o., Zagreb, 2008.
13. Ferenčak, I., Počela Ekonomike, Ekonomski fakultet, Osijek, 2003.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv. prof. dr.sc. KLAIĆ ZVONIMIR**	
Course name	PE602-17 Electrical Installation and Lightning	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(0+15+0)+0

1. Course description	
1.1. Goals	
Introduce students to the types of installations and protection in LV installations. Introduce students to the concept of smart installations. Introduce students to photometric quantities, light sources, interior and exterior lighting, lighting management systems and lighting efficiency measures.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.classify the low voltage grounding systems, the types of protection against indirect and direct contact in low-voltage installations, parts and modes of smart installation 2.propose the operating state of the selected electrical machine that meets the specified operating mode of the electric drive 3.calculate a voltage drop and select a line cross-sectional area; calculate indirect contact protection and the basic energy consumption for the lighting system 4.measure the safety of low voltage installations	
1.4. Course content	
Basic terms and names (measuring quantities and units, low voltage network designation, types of faults, networks and installations). Valid electrical engineering regulations and standards. Lightning installation. Influence of electric current on a human body. Protection against indirect and direct contact in low-voltage installations. Low voltage lines and networks. Voltage drop on an electric line and the choice of a line considering the load. Types of consumables and consumer facilities. Overcurrent protection. Smart electrical installations. Basic photometric quantities, lighting classes, lighting quality criteria and regulations. Indoor and outdoor lighting. Lighting control systems and lighting design. Lighting efficiency.	
1.5. Teaching methods	Lecture Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning	Teaching method	Assessment method	Points

		outcomes			Min	max
Attendance Lectures, Laboratory exercises	1.5	1,2,3,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	10
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	20
Oral exam	1.5	1,2,3,4	Oral exam	Assessment of student's answers	25	50
Problem solving	1	1,2	Revision exams (written exam)	Evaluation of exercises	10	20

1.10. Obligatory literature

1. N. Srb, Niskonaponske mreže i instalacije, Tehnička knjiga, Zagreb, 1991.
2. V. Srb, Kabelska tehnika, priručnik, Tehnička knjiga, Zagreb, 1970.
3. E. Širola, Cestovna rasvjeta, Grafika Hrašće, 1997.

1.11. Recommended additional literature

1. The IESNA Lighting Handbook – References and Application, 9. Izdanje, IESNA, New York, SAD 2000.
2. Ganslandt, R., Hofmann, H., Handbook of Lighting Design, ERCO Leuchten GmbH, Germany, 1. Edition, 1992.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. MATIĆ TOMISLAV (st.), Doc.dr.sc. VINKO DAVOR**	
Course name	P204 Electronics I	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(30+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define and understand the physical properties of semiconductor materials, generation of free charge carriers, and current conduction in semiconductors 2.evaluate static and dynamic properties of the PN compound and the metal-semiconductor compound 3.define the principles of diode, bipolar and unipolar transistors operation based on current voltage characteristics and dynamic models 4.evaluate the operation of basic semiconductor power switches 5.evaluate the basic semiconductor optoelectronic components 6.design basic amplifiers with bipolar and unipolar transistors 7.evaluate the operation principles of amplifiers and comparators 8.design basic logic circuits	
1.4. Course content	
Basics of semiconductor physics. Charge carrier generation. Current flow mechanisms in semiconductor. PN and metal-semiconductor junctions: static and dynamic characteristics. Solid-state diodes: static and dynamic characteristics, types of solid-state diodes. Bipolar junction transistor (BT): working principle, static IU- characteristics, dynamic models, frequency dependence of parameters. Junction and MOS FET: working principle, static IU- characteristics, dynamic models, frequency dependence of parameters. Thyristors: working principle, classification. Basic bipolar and unipolar transistor amplifiers. Power amplifiers: A, AB and B-class. Operational amplifier. Comparators. Basic logic circuits.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information	

Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	0.8	1,3,5,7,8	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	2.2	2,3,4,6	Midterm exam	Evaluation of (written) exercises	20	40
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	20
Oral exam	2	1,2,3,4,5,6,7,8	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Švedek, T. Poluvodičke komponente i osnovni sklopovi, Svezak I, Poluvodičke komponente, Graphis, 2001., Zagreb
2. P. Biljanović, Elektronički sklopovi, Školska knjiga, Zagreb, 1989.

1.11. Recommended additional literature

1. A.S. Sedra, K.C.Smith, Microelectronic Circuits, 3. Edition, Saunders College Publishing, New York, 1991.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. MATIĆ TOMISLAV (st.)**	
Course name	PK301 Electronics II	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.analyse and synthesise electronic circuits with diodes and transistors in static and dynamic working conditions 2.design and implement amplifiers with bipolar and unipolar transistors for the defined frequency and amplification range 3.design amplifiers of classes A, AB, B, C and D 4.design a stabilised amplifier using negative feedback 5.define the structure of an operational amplifier and use an operational amplifier in impulse electronics 6.implement the alternating waveform generators using oscillators and multivibrators 7.design basic logic, combinational and sequential circuits and analog-to-digital converters	
1.4. Course content	
Basics of electronic circuit analysis. Single-stage bipolar and unipolar transistor amplifiers. Setting and stabilisation of a biasing point. Analysis of dynamic parameters in small signal mode and at low frequencies: current and voltage gain, input and output resistance. Large signal mode of operation. Power amplifiers: A, AB, B, C and D class. Multi-stage amplifiers - cascading. DC coupled amplifiers: Darlington pair, cascade, differential amplifier, phase splitter. Feedback. Amplifier frequency characteristic and stability in the presence of negative feedback. Operational amplifier. Impulse response and linear shaping. Comparators – comparator with hysteresis (Schmitt's trigger). Wave-shape generators: oscillators and multivibrators. Transistor as a switch. Analogue switch. Basic logic circuits, basic combinational and sequential circuits. Circuits of digital/analogue (D/A) and analogue/digital (A/D) conversion.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	0.7	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	2	1,2,5	Midterm exam	Evaluation of (written) exercises	20	40
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,3,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	20
Oral exam	2.3	1,2,3,4,5,6,7	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. P. Biljanović, Elektronički sklopovi, Školska knjiga, Zagreb, 19891.
2. T. Švedek, Poluvodičke komponente i osnovni sklopovi, Svezak I, Poluvodičke komponente, Graphis, Zagreb, 2001 (udžbenik Sveučilišta J.J.Strossmayer u Osijeku)

1.11. Recommended additional literature

1. A.S.Sedra, K.C.Smith, Microelectronic Circuits, 3.Edition, Saunders College Publishing, New York, 1991

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. STOJKOV MARINKO**	
Course name	PE301 Energy Conversions	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(30+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.classify state variables in the ideal gas law and thermodynamic theory, process variables as energy forms that pass through the system boundaries and classify internal energy 2.analyse basic thermodynamic processes of an ideal gas using a mathematical model and graphical diagrams 3.formulate input and outcome amounts of heat and mechanical work during thermodynamic processes, changing the state variables and internal energy 4.propose the possibility of engineering influence on increasing efficiency degree of circular thermodynamic cycle 5.interpret the acquired knowledge in thermodynamic analysis of the basic processes in a real power plant 6.interpret the acquired knowledge in the thermodynamic analysis of the basic processes in a real power plant	
1.4. Course content	
About the course and energy. Classification of energy forms. Electricity generation from internal energy. Fluid. Definition of thermodynamic systems. The 1st thermodynamic law for closed and open systems. Application to thermal power plant subsystems. Ideal gas and ideal liquid. Thermodynamic laws applied to (ideal) gas and liquid. Processes in thermal power plants (nuclear power plants). Circular process of closed and open systems. Heat accumulation tanks. Thermal (energy) efficiency. The 2nd thermodynamic law. Role and different formulations. Entropy, definition of entropy. Determining exergy and loss of exergy. Exergy efficiency degree. Aggregate states - conversions. Processes in steam and gas thermoelectric plants. Energy relations in steam, gas and water turbines: equations of power and energy. Heat transfer. General information about heat transfer. Thermal energy transfer by conductance. Thermal energy transfer by natural and forced convection. Thermal energy transfer by radiation. Heat losses in different materials.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	2	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	2	2,3,4,6	Midterm exam	Evaluation of (written) exercises	15	30
Oral exam	2	1,2,4,5	Oral exam	Assessment of student's answers	25	50
Written exam (multiple choice theory questions)	1	1,2,5	Written exam (multiple choice theory questions)	Knowledge assessment	0	20

1.10. Obligatory literature

1. H. Požar: Osnove energetike 1, Školska knjiga, Zagreb, 1992.
2. H. Požar: Osnove energetike 2, Školska knjiga, Zagreb, 1992

1.11. Recommended additional literature

1. F. Bošnjaković: Nauka o toplini, I dio, Tehnička knjiga, Zagreb, 1990.
2. F. Bošnjaković: Nauka o toplini, II dio, Tehnička knjiga, Zagreb, 1990.
3. Galović: Termodinamika I, Sveučilište u Zagrebu, fakultet strojarstva i brodogradnje, Zagreb, 2002.
4. A. Galović: Termodinamika II, Sveučilište u Zagrebu, fakultet strojarstva i brodogradnje, Zagreb, 2003.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**LIERMANN-ZELJAK YVONNE, FERČEC IVANKA**	
Course name	PF101 English	
Study program	Undergraduate study programme, Electrical Engineering (facultative)	
Course status	Facultative	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	2
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.produce simple grammatical structures in written exercises
2.express simple grammatical structures in everyday communication situations
3.analyse and interpret shorter texts
4.independently produce simple sentences in written and oral communication
5.apply essential vocabulary for everyday life
6.compare cultural similarities and differences between Croatian and Anglo-Saxon culture

1.4. Course content

Introducing yourself. Personal pronouns. Lost property. Plural formation. A glamorous life. The Simple Present Tense. First date. Breakfast time. Articles. Countable and uncountable nouns. Renting a flat. The Present Continuous Tense. The Meeting. Jobs.

1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	

1.7. Student obligations

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	0.7	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem	0.6	1,4,5	Midterm exam	Evaluation of (written)	25	50

solving				exercises		
Oral exam	0.5	2,3,4,5	Oral exam	Assessment of student's answers	15	30
Grammar-related exercises/Short essays	0.1	1,4,5	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	5	10
Active class participation	0.1	2,3,4,5,6	Active class participation in defining and elaborating on grammar- and subject-related topics	Monitoring and assessing class participation and students' work	0	10

1.10. Obligatory literature

1. Redston, Chris; Cunningham, Gillie: Face2Face Elementary, Cambridge University Press, 2005.

1.11. Recommended additional literature

1. Murphy, R.: English Grammar in Use, Cambridge University Press, 1995.
2. Harris, Michael; Mower, David; Sikorzynkska, Anna: New Opportunities-Preintermediate, Pearson Longman LTD, 2009.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**FERČEC IVANKA, LIERMANN-ZELJAK YVONNE**	
Course name	PF201 English	
Study program	Undergraduate study programme, Electrical Engineering (facultative)	
Course status	Facultative	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	2
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.produce simple grammatical structures in written exercises
2.express simple grammatical structures in everyday communication situations
3.analyse and interpret shorter texts
4.independently produce simple sentences in written and oral communication
5.compare cultural similarities and differences between Croatian and Anglo-Saxon culture
6.independently use dictionaries, on-line dictionaries and glossaries

1.4. Course content

Lifestyles. The Present Simple Tense vs. The Present Continuous Tense. People Who Changed The World. The Simple Past Tense; Have you ever ...?. The Present Perfect Simple. The Present Perfect Simple vs. The Simple Past.

1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	

1.7. Student obligations

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	0.7	1,2,3,4,5	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem	0.6	1,4,5	Midterm exam	Evaluation of (written)	25	50

solving				exercises		
Oral exam	0.5	2,3,4,5	Oral exam	Assessment of student's answers	15	30
Grammar-related exercises/Short essays	0.1	1,4,5,6	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	5	10
Active class participation	0.1	1,2,3,4,5,6	Active class participation in defining and elaborating on grammar- and subject-related topics	Monitoring and assessing class participation and students' work	0	10

1.10. Obligatory literature

1. Redston, Chris; Cunningham, Gillie. Face2Face Elementary. Cambridge University Press, 2005.

1.11. Recommended additional literature

1. Murphy, R.: English Grammar in Use, Cambridge University Press, 1995.
2. Harris, Michael; Mower, David; Sikorzynkska, Anna: New Opportunities-Preintermediate, Pearson Longman LTD, 2009.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**LIERMANN-ZELJAK YVONNE, FERČEC IVANKA**	
Course name	PF301 English	
Study program	Undergraduate study programme, Electrical Engineering (facultative) Undergraduate study programme, Electrical Engineering, elective block KI (facultative)	
Course status	Facultative	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	2
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.produce grammatical structures in written and oral communication 2.express simple grammatical structures in everyday communication situations 3.independently reproduce more complex sentences in written and oral communication 4.correctly apply more complex vocabulary in different contextual situations 5.deliver a short, informal presentation on a given topic 6.express his/her opinion on a given topic	
1.4. Course content	
Challenge; The present perfect tense vs. the past simple tense; Champions; Nothing is impossible; Expressing opinion; Celebration; Modal verbs; Food; Comparatives and superlatives; Eating out; Heroes; The past simple tense vs. the past continuous tense; Articles; Gadgets; Will-future; Going-to future.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	0.7	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0

Practice – problem solving	0.6	1,3,4	Midterm exam	Evaluation of (written) exercises	25	50
Oral exam	0.5	1,2,3,4,6	Oral exam	Assessment of student's answers	15	30
Grammar-related exercises/Short essays	0.1	1,3,4,5,6	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	5	10
Active class participation	0.1	1,2,3,4,5,6	Active class participation in defining and elaborating on grammar- and subject-related topics	Monitoring and assessing class participation and students' work	0	10

1.10. Obligatory literature

1. Redston, Chris; Cunningham, Gillie: Face2Face Elementary, Cambridge University Press, 2005.

1.11. Recommended additional literature

1. Murphy, R.: English Grammar in Use, Cambridge University Press, 1995.
2. Harris, Michael; Mower, David; Sikorzynkska, Anna: New Opportunities-Preintermediate, Pearson Longman LTD, 2009.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**FERČEC IVANKA**	
Course name	P404 English I	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	2
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.identify and describe the differences between general and technical English language based on the chosen specialised texts and topics 2.recognise essential elements (key words) in a more complex specialised text and produce shorter specialised texts based upon given key words 3.define and interpret specialised vocabulary used in texts and use the vocabulary while translating short specialised texts 4.summarise diagrams, schemes, figures and mathematical formulae orally and in written form 5.use grammatical structures in both written and spoken communication 6.summarize texts, arguments and definitions in a written form	
1.4. Course content	
Academic English. What is engineering? Atom. Materials in electrical engineering. The electric circuit. Transistors. How transistors work. Tenses (form, use, adverbs of time). Making questions (yes-no questions, wh-questions). Adjectives and adverbs. The passive voice. Functions of “as”. Cause and effect discourse markers. Classification	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance	0.7	1,2,3,4,5,6	Lectures, Auditory	Attendance register.	0	0

Lectures, Auditory exercises			exercises	Mandatory attendance percentage is: 70%.		
Practice – problem solving	0.6	1,2,3,4,5,6	Midterm exam	Evaluation of (written) exercises	25	50
Oral exam	0.5	2,3,4,5	Oral exam	Assessment of student's answers	20	40
Grammar-related exercises/Short essays	0.1	2,3,4,5,6	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	0	5
Active class participation	0.1	3,4,5	Active class participation in defining and elaborating on engineering issues, participating in organised debates and engineering topics	Monitoring and assessing class participation and students' work	0	5

1.10. Obligatory literature

1. Smith H.C.R. (2014) English for Electrical Engineering in Higher Education Studies. Reading: Garnet Publishing Ltd.
2. Bošnjak Terzić, B. Study Technical English 1, Školska knjiga, Zagreb, 2009.
3. Bartolić, Lj. Technical English in Electronics and Electrical Power Engineering, Školska knjiga, Zagreb, 1994.

1.11. Recommended additional literature

1. Murphy, R.: English Grammar in Use, CUP, Cambridge, 1995.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**LIERMANN-ZELJAK YVONNE, FERČEC IVANKA**	
Course name	P501 English II	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	3
	Workload (L+(AE+LE+CE)+S)	30+(15+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.identify and describe the differences between general and technical English language based on the chosen specialised texts and topics 2.recognise essential elements (key words) from a complex specialised text and analyse and interpret complex specialised texts 3.define and interpret specialised vocabulary used in texts and use the vocabulary while translating short specialised texts 4.use grammatical structures in both written and spoken communication 5.expand and acquire new communication models and provide a critical review of a specialised topic in both written and oral form 6.give an oral presentation of a specialized topic	
1.4. Course content	
Branch Power Engineering: Measuring instruments. Resistors. Diodes. Inside an electric motor. Introduction to the energy business. Oral presentations. Comparing and contrasting. Function of an item. Relative clauses. Reduced relative clauses. Conditional clauses. Making questions. Question tags. Usage of sequence words. Branch Communications and Informatics: Operational amplifiers. Microcontrollers. History of telecommunications. A GSM network. What's to fear about mobile phones. Buying a computer. Networks. Network communications. Oral presentations. Comparing and contrasting. Function of an item. Relative clauses. Reduced relative clauses. Conditional clauses. Making questions. Question tags. Usage of sequence words. Branch Computer Engineering: Computer users, Computer architecture, Peripherals: magnetic storage, optical storage, flash memory, former student, operating systems. Oral presentations. Comparing and contrasting. Function of an item. Relative clauses. Reduced relative clauses. Conditional clauses. Making questions. Question tags. Usage of sequence words.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	1.1	1,2,3,4,5	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	0.8	2,3,4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	0.6	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Oral presentation of a chosen engineering topic	0.3	6	Oral presentation of a chosen engineering topic	Presentation grading	0	20
Homework	0.1	3,4,5	Grammar-related exercises/Short essays	Checking exercises/Correcting exercises and essays	0	5
Active class participation	0.1	1,2,3,4,5	Active class participation in defining and elaborating on engineering issues, participating in organised debates and engineering topics	Monitoring and assessing class participation and students' work	0	5

1.10. Obligatory literature

1. Bošnjak Terzić, B. (2009). Study Technical English 1. Zagreb: Školska knjiga
2. Bošnjak Terzić, B. Study Technical English 2. Školska knjiga: Zagreb, 2008.
3. Glendinning, Eric H.; McEwan, J. (2006). Oxford English for Information Technology. Oxford University Press/Esteras, S.R. (2008). Infotech - English for Computer Users. Cambridge University Press
4. Campbell, S. (2009). English for the Energy Industry, Oxford: Oxford University Press (Express Series)
5. Esteras, S.R.: Infotech - English for Computer Users, Cambridge University Press, 2008.

1.11. Recommended additional literature

1. Murphy, R.: English Grammar in Use, CUP, Cambridge, 1995.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**LIERMANN-ZELJAK YVONNE, FERČEC IVANKA**	
Course name	P604 English III	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.identify and describe the differences between general and technical English language based on the chosen specialised texts and topics
2.recognise essential elements (key words) from a complex specialised text and analyse and interpret complex specialised texts
3.explain specialised vocabulary used in texts and use the vocabulary while translating short specialised texts
4.use grammatical structures in both written and spoken communication
5.compose a formal letter in written form
6.provide a critical review of a specialized topic in both written and oral form

1.4. Course content

Introduction to computer science terminology. Computer applications. Configuration. Hardware vs. software. Memory. Buying a computer. Input devices. Output devices. Storage devices. Operating systems. The graphical user interface. Word processing facilities. Design. Multimedia systems. Electronic communications.

1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	

1.7. Student obligations

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory	0.7	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance	0	0

exercises				percentage is: 70%.		
Practice – problem solving	1.5	1,2,3,4,5,6	Midterm exam	Evaluation of (written) exercises	25	50
Oral exam	1.3	1,2,3,4,6	Oral exam	Assessment of student's answers	20	40
Grammar-related exercises/Short essays	1	2,3,4,5,6	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	0	5
Active class participation	0.5	1,2,3,4,6	Active class participation in defining and elaborating on engineering issues, participating in organised debates and engineering topics	Monitoring and assessing class participation and students' work	0	5

1.10. Obligatory literature

1. Krznarić, M. (2014). Zagreb: Tehničko veleučilište u Zagrebu, Elektrotehnički odjel.
2. Campbell, S. (2009). English for the Energy Industry, Oxford: Oxford University Press (Express Series)
3. Glendinning, Eric H.; McEwan, J. (2006). Oxford English for Information Technology. Oxford University Press
4. Esteras, S.R. (2008). Infotech - English for Computer Users. Cambridge University Press
5. Bošnjak Terzić, B.: Study Technical English 2, Školska knjiga, Zagreb, 2008.

1.11. Recommended additional literature

1. Thomson, A.J.; Martinet A.V.: A Practical English Grammar, Oxford University Press, 1986.
2. Thomson, A.J.; Martinet A.V.: A Practical English Grammar - Exercises 1, Oxford University Press, 1986.
3. Thomson, A.J.; Martinet A.V.: A Practical English Grammar - Exercises 2, Oxford University Press, 1986.
4. Ricca-McCarty, T.; Duckworth, M.: English for Telecoms and Information Technology, Oxford University Press, 2009.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**VARGA PAJTLER MAJA**	
Course name	PE104 Physics I	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.distinguish the fundamental physical quantities and units of measurement in the field of mechanics and thermodynamics 2.interpret fundamental laws of mechanics and thermodynamics 3.calculate and predict (on the basis of the laws of mechanics and heat) the physical size of interest 4.integrate fundamental laws of mechanics and thermodynamics in solving problems related to electrical engineering 5.assemble and use simple measuring instruments 6.interpret the results of measurements of physical quantities of interest	
1.4. Course content	
The course consists of two parts: Mechanics: vectors; kinematics; dynamics; work; power; energy; system of particles; rigid body dynamics; (non)inertial systems; Newton's law of gravitation;harmonic oscillator; waves; fluid mechanics. Thermodynamics: ideal gas law; kinetic theory of gases; laws of thermodynamics; Carnot's heat engines; entropy.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory	1.3	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory	Attendance register. Mandatory attendance	2	4

exercises, Laboratory exercises			exercises	percentage is: 70%.		
Practice – problem solving	1	1,2,3,4	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.9	1,2,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	25
Oral exam	1.4	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Homework	0.2	1,2,3,4,5	Students need to thoroughly solve their homework and send them by email.	Evaluating homework by carrying out a detailed analysis	1	5
Additional tasks	0.2	1,2,4	Students write a comprehension test at the beginning and end of the semester to test the understanding of fundamental physics phenomena.	Checking solutions and exam grade	0	6

1.10. Obligatory literature

1. Kulišić, Petar. Mehanika i toplina.Zagreb: Školska knjiga, 2011.
2. Keller, Frederick J. et al.. Physics (Classical and Modern). Mc Graw Hill, 1993.
3. P. Kulišić, Mehanika i toplina
4. P. Kulišić i dr, Riješeni zadaci iz mehanike i topline

1.11. Recommended additional literature

1. R. P. Feynman, R. B. Leighton, M. Sands, The Feynman Lectures on Physics, The Berkeley Physics Course

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**VARGA PAJTLER MAJA**	
Course name	PE203 Physics II	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.distinguish the fundamental physical quantities and units of measurement in the field of electromagnetism, optics and modern physics 2.interpret fundamental laws of electromagnetism, optics and modern physics 3.calculate and predict (on the basis of these laws) the physical size of interest 4.integrate fundamental laws of electromagnetism, optics and modern physics in solving problems related to electrical engineering 5.assemble and use simple measuring instruments 6.interpret the measurement results of physical quantities of interest	
1.4. Course content	
Gauss's law; Faraday's law; Ampere's law; Maxwell equations; electromagnetic field; energy of electromagnetic field; wave equation; Poynting vector; reflection; refraction; dispersion; absorption; geometrical optic; interference; Fraunhofer diffraction; polarisation; photo-metrics; black body radiation; Planck's law of radiation; photoelectric effect; Compton's effect; Rutherford and Bohr model of the atom; correspondence principle; dual nature of matter; electron diffraction; quantum numbers; spin; structure of atomic nucleus; radioactivity; fission; fusion.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1.5	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	2	4
Practice – problem solving	1.3	1,2,3,4	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.1	1,2,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	25
Oral exam	1.7	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Homework	0.2	2,3,4	Students prepare for taking revision exams by doing their homework	Evaluating homework by carrying out a detailed analysis and during a written exam	1	5
Additional tasks and understanding of teaching content	0.2	1,2,3,4	Students write a comprehension test at the beginning and end of the semester to test the understanding of the course content.	Checking solutions	0	6

1.10. Obligatory literature

1. Kulišić, Petar et al.. Elektromagnetske pojave i struktura tvari. Zagreb: Školska knjiga, 2003.
2. Keller, Frederick J. et al. Physics (Classical and Modern). Mc Graw Hill, 1993 H.D.
3. Young, R.A; Freedman, A; Lewis Ford. Sears and Zemansky's University Physics with Modern Physics, 12th edition. Pearson Education, 2008.
4. P. Kulišić i V. Henč-Bartolić, Valovi i optika
5. V. Henč-Bartolić i dr, Riješeni zadaci iz valova i optike

1.11. Recommended additional literature

1. R. P. Feynman, R. B. Leighton, M. Sands, The Feynman Lectures on Physics, The Berkeley Physics Course

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. MRČELA TOMISLAV**	
Course name	P105 Engineering Graphics and Documentation	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	3
	Workload (L+(AE+LE+CE)+S)	30+(0+0+15)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.create projections of simple geometric relationships of the point, line segment, line, two- and three-dimensional figures 2.draw sketches of construction elements 3.create orthogonal and isometric projections and cross sections 4.create a technical drawing in DraftSight and draw orthogonal and isometric projections and cross sections 5.design a project of technical documentation 6.draw schemes using Draft Sight	
1.4. Course content	
Orthogonal and axiomatic projections, cross-sections. Lines, technical script, paper formats. Draft and draft methods. Dimensions of models. Graphical interpretation in space and plane. Isometry. Norms and rules pertaining to construction and usage of technical documentations. Drawing selection and caption. Tolerances and endorsement. Meaning and options of graphical communication in electrical engineering. Basic symbols of electrical, electronic, electromechanical elements and systems. Types, design and usage of schemes in electrical engineering. Flowchart. Operation, electrical, connection schemes, access plan. Diagrams of logical systems and drawing methods. Connection schemes. Textual documentation. Technical description, manuals. Description of components and rules of using CAD systems. Using CAE systems in projects concerning electric power system and additional documentation. Introduction to electronic system documentation (systems, facilities) using the CAD computer programme. Exercises: Fundamentals of design and making documentation by means of a computer. Working in the AutoCAD programme applications. Marking elements according to IEC standards.	
1.5. Teaching methods	Lecture Construction exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Design exercises	1.5	1,2,3,4,5,6	Lectures, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	2	5
Oral exam	0.3	1,2,3,4,5,6	Oral exam	Assessment of student's answers	18	35
Problem-solving related to design exercises	0.7	1,2,3,4,5,6	Design exercises	Evaluation of problem solving exercises	12	20
Visual, drawings	0.2	4	Visual, drawings	Direct observing	0	10
Homework	0.2	5	Visual, drawings	Observation	0	20
Revision exam	0.1	4,6	Written exam	Evaluation of sketches	0	10

1.10. Obligatory literature

1. Opalić, M; Kljajin M, S. Sebastijanović: Tehničko crtanje, Zrinski Čakovec 2003
2. Omura, George. Mastering AutoCAD 2016 and AutoCAD LT 2016.

1.11. Recommended additional literature

1. J. H. Earle. Graphics for Engineers, Addison-Wesley Publishing Company, New York, 1999.
2. F. E. Giesecke, A. Mitchell, H.C. Spencer, I.L. Hill, J.T. Dygton: Technical Drawing, Machimillan Publishing Company, New York, 1986.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. GRGIĆ KREŠIMIR, Prof.dr.sc. ŽAGAR DRAGO**	
Course name	P401 Communication Networks	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.analyse and differentiate various types of communication networks 2.differentiate physical and logical topology of modern wired and wireless communication networks 3.evaluate a protocol stack based on OSI and TCP/IP reference models in modern communication networks 4.compare and evaluate properties, characteristics and implementation of control, routing and communication protocols on the Internet 5.estimate basic security and quality of service requirements in modern communication networks 6.propose and apply software tools for understanding and operation analysis of communication protocols	
1.4. Course content	
Communication network definition. Communication efficiency. Information and traffic network characteristics. Network flows and capacities. Communication network model. The project network parameters. Communication networks applications. Telecommunication network. The integrated digital communication network. Intelligent network. Network signalisation. The physical network structure. The logical network structure. OSI reference model. TCP/IP reference model. Transmission media. Wireless communication. Mobile networks, Local area networks. Industrial LANs and protocols. Telemetric networks and technologies. Ad Hoc networks. Internet network architecture. Network routing. Communication networks examples. Network services. Quality of service. Network security. Network standardisation.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1.7	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	1	4
Practice – problem solving	1.2	2,4,5	Midterm exam	Evaluation of (written) exercises	16	32
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.3	2,4,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	24
Oral exam	1.5	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Individual tutorials during office hours	0.3	2,3,4	Office hours	Evaluation of exercises	6	10

1.10. Obligatory literature

1. Bažant, A. i ostali: .Osnovne arhitekture mreža. Zagreb: Element, 2014.
2. Tanenbaum, A.S. Wetherall, D.J. Computer Networks (5. izdanje). Boston: Prentice Hall, 2011.
3. V. Sinković, Informacijske mreže, Školska knjiga Zagreb, 1994.

1.11. Recommended additional literature

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**lzv.prof.dr.sc. GLAVAŠ JERKO**	
Course name	P603 Communication Skills	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(15+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.recognise the basics of the communication process 2.identify forms and roles of nonverbal communication 3.develop effective message formatting in public and written communications 4.combine listening skills and asking questions 5.identify presentation skills and communication in a group 6.create a communication system using information-communications technologies	
1.4. Course content	
Concept and process of communication. Verbal and nonverbal communication. Principles of successful communication. Listening skills and asking questions. Assertive communication. Public speaking. Presentation skills. Teamwork. Communication in a group. Conflict resolution. Bargaining skills. Conducting a meeting. Written communication. Business etiquette and protocol. Business ethics.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	**ECTS**	**Learning outcomes**	**Teaching method**	**Assessment method**	**Points**	
					Min	**max**
Attendance Lectures, Auditory	1.5	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance	0	10

exercises				percentage is: 70%.		
Practice – problem solving	1.3	2,3,4,5,6	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.2	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30
Preparation of an introductory presentation during exercises	1	2,3,4,5,6	Preparation of an introductory presentation during exercises	Presenting and participating in performing exercises	0	20

1.10. Obligatory literature

1. BOVEE, Courtland L.; THILL, John V. Suvremena poslovna komunikacija. Zagreb: Mate doo, 2012.
2. Guffey, Mary Ellen; Dana Loewy. Business communication: Process and product. Cengage Learning, 2010.
3. Borg, J., Govor tijela, Veble commerce, Zagreb, 2009.
4. Gottesman, D., Mauro, B., Umijeće javnog nastupa, Naklada Jesenski i Turk, Zagreb, 2006.

1.11. Recommended additional literature

1. M. Plenković: Komunikologija masovnih medija, Barbat, Zagreb, 1993.
2. Thun, F.S.von, Kako međusobno razgovaramo, Smetnje i razjašnjenja, Erudita, Zagreb, 2006.
3. F. Vreg: Humana komunikologija, HKD i Nonacom, Zagreb 1998.
4. Vodopija, Š. Opća i poslovna komunikacija, Naknada Žagar, Rijeka, 2006.
5. Rouse J.R., Rouse, S., Poslovne komunikacije, Masmedia, Zageb, 2005.
6. Pease, A. & B., Body Language, Orion Book, London, 2004.
7. Fox, R. Poslovna komunikacija, Hrvatska sveučilišna naknada, Zagreb, 2006.
8. Pease A. & B., Komunikacija za sva vremena, Lisac & Lisac, Zagreb, 2007.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. RIMAC-DRLJE SNJEŽANA**	
Course name	PK501 Communication Systems	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.compare the spectra of periodic and nonperiodic (random) signals and calculate the power spectral density of a random pulse sequence 2.measure a modulated signal spectrum by spectral analyser and evaluate the measurement results 3.analyse the characteristics of modulation techniques: AM, FM, PSK, QAM and FSK, and compare them with respect to robustness to noise and spectral efficiency 4.calculate the parameters of a coaxial cable and two-wire cable, and compare the cables according to their transmission characteristics 5.explain the principle of electromagnetic wave generation as well as wave equations 6.compare antennas according to their parameters and choose an appropriate antenna in a radio system design 7.define parameters of a point-to-point radio link	
1.4. Course content	
The communication channel model. Spectral signal analysis. Measurement by spectrum analyser. Random processes, power spectral density, noise sources in communication systems, noise models. Principle of amplitude, frequency and phase modulation, analysis of the analogue systems (AM, FM, PM) and digital systems (ASK, FSK, PSK, QAM) with respect to spectral efficiency as well as resistance to noise. OFDM. Signal to noise ratio (S/N) and BER. Transmission media. Transmission lines. ADSL. Generation of electromagnetic waves, wave equation. Hertz dipole. Antenna parameters. Dipole and unipole antennas. Antennas for different frequencies. Radio links. Mobile communication systems. Optical communication systems: semiconductor laser diodes, optical amplifiers, optoelectronic modulators and photodetectors, multimode and single-mode optical fibres. Integration of communication systems.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Practice – problem solving	2	1,3,4,6,7	Midterm exam	Evaluation of (written) exercises	13	25
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.8	1,2,3,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	4	10
Oral exam	2.3	1,2,3,4,5,6,7	Oral exam	Assessment of student's answers	25	50
Problem solving	0.4	1,3,4,6,7	Problem solving	Successfully solved tasks	2	10

1.10. Obligatory literature

1. Zentner, E. Antene i radiosustavi. Zagreb: Graphis, 2001.
2. Molisch, A. F. Wireless Communications, 2nd edition. John Wiley&Sons, 2010.

1.11. Recommended additional literature

1. S. Haykin, M. Moher: Communication Systems, John Wiley & Sons, 2009.
2. H.Taub, D.L. Schilling: Principles of Communication Systems, MGraw-Hill Book Company, 1987.
3. S. Rimac-Drlje: Komunikacijski sustavi, priručnik za laboratorijske vježbe, zavodska skripta, 2011.
4. T. Brodić, G. Jurin, Svjetlovodna tehnika, Tehnički fakultet, Sveučilište u Rijeci, 1995

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. KATIĆ ANITA, Prof.dr.sc. GALIĆ RADOSLAV**	
Course name	P101 Linear Algebra	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.graphically construct a linear combination of vectors and select a computational operation from vector space V3 when solving problem tasks 2.define matrices and perform basic computational operations with matrices 3.for the given relationship between points, lines and planes in space, create equations which will result in the required object or relationship 4.for the given linear operator, create a kernel and an image, and if the domain and codomain are the same vector space, determine the minimal polynomial and diagonise the matrix 5.solve the system of linear equations by various methods and discuss solutions	
1.4. Course content	
Elements of mathematical logic. Vector space V3. Operations on vectors. Linearly dependent and independent vectors. Vector projection. Base of a vector space. Coordinate system. Scalar, vector and triple product. Analytic geometry. Point, line, plane and mutual relations. Matrix and elementary transformations of matrices. Operations with matrices. Vector space of matrices. Determinant and its properties. Calculation of determinant value. Rank of a matrix. Regular matrices. Inverse matrices. Systems of linear equations. Discussion of solutions. Methods for solving systems of equations. n-dimensional vector space. Base and space dimension. Subspaces. Examples of vector space. Linear operator. Representation of a linear operator in a basis. Algebra. Minimum polynomial. Similarity of matrices. Eigenvalues and eigenvectors. Characteristic polynomial. Hamilton-Cayley theorem. Matrix diagonalisation. Scalar product. Norm. Unitary spaces. Orthogonality. Gramm-Schmidt orthogonalisation. Quadratic forms. Curves of second degree. Second degree surfaces.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	2	2,3,4,5	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	5
Practice – problem solving	1	1,2,4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1	1,2,3,4,5	Oral exam	Assessment of student's answers	25	50
Homework	1	1,2,4,5	Homework	Questions related to the subject contents	0	5

1.10. Obligatory literature

1. Elezović, N; Aglić, A. Linearna algebra, zbirka zadataka. Zagreb: Element, 2001.
2. Lipschutz, Seymour. Linear algebra, Schaum's outlines, 1991.
3. K.Horvatić, Linearna algebra, PMF Matematički odjel, Zagreb,1995.

1.11. Recommended additional literature

1. S.Kurepa, Uvod u linearnu algebru, Školska knjiga, Zagreb,1990.
2. L.Čaklović, Zbirka zadataka iz linearne algebre, Školska knjiga, Zagreb 1979.
3. R.Galić, Osnive linearne algebre, ETF, Osijek, 1994.
4. N.Elezović, Linearna algebra, Element, Zagreb, 1995
5. N.Bakić, A.Milas, Zbirka zadataka iz linearne algebre, PMF Matematički odjel, Zagreb,1995.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. RUDEC TOMISLAV**	
Course name	P102 Calculus I (Differential Calculus)	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.discuss the properties of the given elementary function by knowing the properties and characteristic examples of elementary functions 2.construct a model for the decision on the convergence of the given sequence by knowing the properties and the characteristic examples of sequenceS 3.discuss the general characteristics of different elementary functions by comparing them 4.construct the form of a default function 5.construct a mathematical or physical problem model using differential calculus	
1.4. Course content	
1. Preliminaries. Real numbers, infimum and supremum, absolute value, intervals. Complex numbers. 2. Functions. Definition of a function. Basic properties. Composition of functions. Inverse function. Elementary functions (polynomial, rational, exponential, logarithm, trigonometric, cyclometric, hyperbolic and area functions). 3. Sequences of real numbers. Concept of a sequence, properties and convergence. Number e. 11 4. Limits and continuity of functions. Concept and properties of the limits of the function. Asymptotes. Continuity of functions. 5. Differential calculus. The derivative and the tangent. The derivative as velocity. Concept of the derivative. Derivative rules. The chain rule and the derivative of the inverse function. The derivative of elementary functions. Implicit differentiation. Parametric differentiation. Mean value theorem. Higher derivatives. Taylor's theorem. 6. Application of the differential calculus. Differential. Newton's method. L'Hôpital's rule. Examination of functions (monotonicity, minima and maxima, convexity, asymptotes). Sketching curves.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	1.2	1,2,3,4	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.1	1,3,4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.7	1,2,3,4	Oral exam	Assessment of student's answers	25	50
Revision exams	1	1,2,4,5	Revision exams	Checking solutions	0	10

1.10. Obligatory literature

1. Galić, A; D.Crnjac Milić; Galić, I;.Katić, A. Matematika 1.Osijek: ETF Osijek, 2008.
2. Demidović, B.P. - Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke. Zagreb:Tehnička knjiga, 2003.
3. S. Kurepa, Matematička analiza 1 (diferenciranje i integriranje), Tehnička knjiga, Zagreb, 1989.

1.11. Recommended additional literature

1. S. Kurepa, Matematička analiza 2 (funkcije jedne varijable), Tehnička knjiga, Zagreb, 1990.
2. W. Rudin, Principles of Mathematical Analysis, Mc Graw-Hill, Book Company, 1964.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. KATIĆ ANITA**	
Course name	P201 Calculus II (Integral Calculus -Differential Equations)	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.explain the meaning and application of a definite integral 2.for a given mathematical problem, create an integral, solve it and interpret the solution 3.for a given series of real numbers and series of functions, create a statement of convergence decisions 4.for a given, specific problem in mathematics or physics, design a mathematical model using basic forms of differential equations	
1.4. Course content	
1. Riemann integral. The integral as an area. Concept and properties of the Riemann integral. Integrability of monotonic and continuous functions. The mean value theorem for integral of the continuous function. Newton-Leibniz formulae. 2. Indefinite integral. Basic methods and techniques of integration (the method of substitution, integration by parts, integration of rational functions and integration of functions boiling down to integrals of rational functions, Euler substitution, binomial integral) 3. Application of integration. Area between two curves, surface and volumes of revolution, length of curve, work of power, moments, centre of mass. Improper integral. Numerical integration (trapezium and Simpson's rule). 4. Series of real numbers. Concept of series and convergence. Criteria of convergence. 5. Series of functions. Uniform convergence. Power series. Taylor series of elementary functions. Exponential and logarithm function. 6. Ordinary differential equations. Sources of ordinary differential equations. General and particular solution. Cauchy problem. Geometric point of view. Problem of sensitivity to a change of initial values. Some types of ordinary differential equations of the first order (exact, homogeneous, linear, Bernoulli equation). Examples and applications. 7. Ordinary differential equations of the second order. Some special types. Linear differential equation of the second order. Lagrange's method of variation of the constant. Linear differential equation of the second order with constant coefficients. Examples and applications (harmonic oscillator).	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	2	2,3,4	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	3	1,2,3	Midterm exam	Evaluation of (written) exercises	25	50
Oral exam	0.7	1,2,3	Oral exam	Assessment of student's answers	20	40
Homework	0.3	1,2,4	Homework	Discussion upon presentation	0	10

1.10. Obligatory literature

1. Demidović, B.P. Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke . Zagreb: Tehnička knjiga, 2003.
2. D. Jukić, R. Scitovski, Matematika I, Odjel za matematiku, Osijek, 2000.
3. I. Ivanšić, Fourierovi redovi. Diferencijalne jednadžbe, Odjel za matematiku, Osijek, 2000.

1.11. Recommended additional literature

1. W. Rudin, Principles of Mathematical Analysis, Mc Graw-Hill, Book Company, New York, 1964.
2. S. Kurepa, Matematička analiza 1 (diferenciranje i integriranje), Tehnička knjiga, Zagreb, 1989.
3. S. Kurepa, Matematička analiza 2 (funkcije jedne varijable), Tehnička knjiga, Zagreb, 1990.
4. G.F.Simmons, J.S.Robertson, Differential Equations with Applications and Historical Notes, 2^{nd Ed., McGraw-Hill, Inc., New York, 1991.
5. Schaum's outline series, McGRAW-HILL, New York, 1991.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. MAROŠEVIĆ TOMISLAV**	
Course name	P301 Calculus III	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.discuss functions of several variables and graphically illustrate the functions of two variables, and understand the concept of multidimensional space 2.calculate partial derivatives and differentials of the first and higher orders for functions of several variables 3.calculate function extrema of several variables and conditional extrema 4.define double and triple integrals, discuss them and calculate examples and applications 5.calculate curve integrals of the first and second kind and apply them in exercises 6.use concepts of scalar and vector fields, and basic vector calculus in engineering theory and application; understand the concept of complex functions of a complex variable	
1.4. Course content	
Real functions of several real variables. Level curves and level surfaces. Limits and continuity. Partial derivatives and differential. Equation of tangent plane to a surface. Partial derivatives of composite functions and implicit functions. Partial derivatives and differentials of higher orders. Taylor's formula for functions of several variables. Extrema and conditional extrema of functions of several variables. Double and triple integrals - basic concepts, calculation and applications. Line integrals (of the first and of the second kind) – definition, properties, calculation and applications. Vector functions of several variables. Scalar and vector field. Gradient of a scalar field; divergence of a vector field; curl of a vector field; applications. Complex functions of a complex variable. Derivative. Cauchy-Riemann equations. Integral of function of a complex variable. Cauchy theorem and integral formula. Taylor and Laurent series. Singularities. Residues.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises	2	1,2,4	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.3	2,3,4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.3	1,4,6	Oral exam	Assessment of student's answers	25	50
Seminars	0.4	2,3,5,6	Writing a seminar paper on a given topic	Grading a seminar paper	0	10

1.10. Obligatory literature

1. Javor, P. Matematička analiza II. Zagreb: Element, 2000.
2. Demidović, B.P. - Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke. Zagreb: Tehnička knjiga, 2003.
3. H. Kraljević, S. Kurepa, Matematička analiza 4/1 (funkcija kompleksne varijable), Tehnička knjiga, Zagreb, 1986.

1.11. Recommended additional literature

1. M. Krasnov et al., Mathematical Analysis for Engineers – Vol. 1, & ibid. Vol. 2, Mir Publishers, Moscow, 1990.
2. S. Kurepa, Matematička analiza 3 (funkcije više varijabli), Tehnička knjiga, Zagreb, 1979.
3. R. Galić, Funkcije kompleksne varijable – za studente tehničkih fakulteta, Osijek, Elektrotehnički fakultet, 1994.
4. N. Elezović, D. Petrizio, Funkcije kompleksne varijable: zbirka zadataka, Element, Zagreb, 1994.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. MRČELA TOMISLAV**	
Course name	PE302 Electrical Materials	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.interpret basic types of engineering materials in electrical engineering 2.explain the structure of basic materials types in electrical engineering 3.explain the main mechanical, thermal, electrical and magnetic properties of electrical materials and basic testing methods 4.estimate the basic requirements during the selection of materials used in electrical engineering products 5.compare the basic applications of conductive, magnetic, dielectric and semiconductive materials 6.explain the connection between processing, structure and properties of technical materials	
1.4. Course content	
Structure of crystals, amorphous, liquid crystals, polymers, ceramics. Structure of metals and alloys. Materials properties and testing – mechanical, electrical, magnetic, thermal and manufacturing. Influence structure to properties. Atomic processes in solid bodies. Conducting materials – low-resistivity conducting materials, high-resistivity conducting materials, termoelements, thermocouple, contacts, circuit breakers. Superconductors. Semiconductors. Magnetic materials – soft and hard magnetic materials. Ferrites. Materials for thermo-magneto-optic memory. Electrical insulating materials. Polarization. Inorganic, organic and compound insulating materials. Technological processes and the impact on properties.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning	Teaching method	Assessment method	Points

		outcomes			Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	4	8
Practice – problem solving	1	2,3	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.8	1,2,3	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30
Seminar paper	0.2	1,2,3,4,5,6	Presenting a seminar paper	Oral presentation	0	2

1.10. Obligatory literature

1. Filetin, T ; Kovačiček, F; Indof, J. Svojstva i primjena materijala. Zagreb: Fakultet strojarstva i brodogradnje, 2009.
2. Callister , W. D.; Rethwisch, D. G. Fundamentals of Materials Science and Engineering: An Integrated Approach.. New York: John Wiley & Sons, 2012.
3. V. Knapp, P. Colić, Uvod u električna i magnetska svojstva materijala, Školska knjiga Zagreb, 1990

1.11. Recommended additional literature

1. Kalpakjian, S, Manufacturing Engineering and Technology, Upper Saddle River NJ, Prentice Hall, 2000,
2. R. M. Brick i dr., Structure and Properties of Engineering Materials, McGraw Hill, 1977.
3. V. Bek, Tehnologija elektromaterijala, skripta ETF u Zagrebu, Sveučilišna naklada, Zagreb
4. T. Filetin: Materijali i tehnologijski razvoj, Akademija tehničkih znanosti Hrvatske, Zagreb, 2002.
5. Solymar, L. Walsh, D.Electrical Properties Of Materials, OUP, 1998.
6. T. Fischer, Materials Science for Engineering Students, Elsevier, London, 2009.
7. W. D. Callister, Materials science and engineering: an introduction, John Wiley & Sons, New York, 2000
8. Pintarić, Materijali u elektrotehnici - laboratorijske vježbe, ETF, Osijek, 2007.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. VUČINIĆ DEAN**	
Course name	PRK502 Modelling and Simulation	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	30+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.understand the principles and importance of modelling 2.analyse, evaluate and plan the use of mathematical models in the development of technical systems 3.identify and relate the key features in modelling and simulation 4.evaluate and justify software engineering development models 5.design a dynamic system model, prepare it for implementation in MATLAB and simulate it in Simulink 6.apply adopted principles and mechanisms, and use acquired knowledge in modelling and simulation of domain specific real systems	
1.4. Course content	
Model types. Process models. Physical limits of modelling – participation model. Mathematical models – anticipative and incursive models. Electrotechnical component models. Connectivity model. Approximative models and set theory. Qualitative and quantitative modelling. Software process models. Hydrodynamical models. Unit process models – laser processes. Bond graph modelling method. Scale models and analogies. Verbal models. Models and corresponding differential equations. Discretized solutions. Fluid dynamic models. Boundary and discretization conditions.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning	Teaching method	Assessment method	Points

		outcomes			Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	7	10
Practice – problem solving	1.3	2,4,6	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,3,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	5	10
Oral exam	1.3	1,3,4,6	Oral exam	Assessment of student's answers	20	40
Homework	0.4	2,3,6	Homework	Homework evaluation	3	10

1.10. Obligatory literature

1. Bungartz, Hans-Joachim; Zimmer, Stefan; Buchholz, Martin; Pflüger, Dirk .Modeling and Simulation: An Application-Oriented Introduction. Springer, 2014.

1.11. Recommended additional literature

1. Kramer/Neclau, Simulationstechnik, Springer Verlag, Wien, 1998.
2. Kuipers, B., Qualitative reasoning, Modelling ans Simulation, MIT Press, 1999.
3. Jović F, Flegar I, Slavek N., Modeliranje i simulacija, Skripta ETF Osijek, 2005.
4. Monself Y., Modelling and Siumulation of Coimplex Systems - Methods, Techniques aand Tools, SCS, European Publ. House, 1998.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. SLIŠKOVIĆ DRAŽEN**	
Course name	PER501 Basics of Automatic Control	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.build a mathematical model of a simple dynamic system 2.analyse dynamic behaviour of a system in a time area, complex variable area and frequency area 3.test a regulation circuit and analyse its static properties 4.test the stability of a control loop by applying analytical and graph-analytical methods 5.design a simple controller using grapho-analytical and synthesis methods 6.carry out an analysis of a control loop using Matlab 7.explain the structure and implementation of a digital control system	
1.4. Course content	
Automatic control and its purpose. Basic terms and definitions. Basic structure and elements of the control loop. Implementation of a control system. Properties of controlled systems. Linearization of characteristic curve. Dynamic behaviour of the system and its mathematical description. Description of linear, continuous and time invariant systems in time and frequency domain. Laplace transform and transfer function. Bode and Nyquist plot. Basic dynamic elements. Control loop and its characteristics. Control loop stability and methods of stability analysis. Performance indices in time and frequency domain. Basic controller types. Control loop synthesis. Fixed set-point control and servo control. Control loop behaviour in regard to reference variable and disturbance. Classic methods of synthesis of linear continuous control systems. Synthesis in time and frequency domain. Empirical rules for setting the controller parameters. Improvement of dynamic properties of control systems by introducing feedforward and cascade control. Practical examples. Principles of digital implementation of control systems.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	2	6
Practice – problem solving	1.5	1,2,3,4,5	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.7	2,3,4,6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	24
Oral exam	1.3	2,3,4,5,7	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Perić, N., Automatsko upravljanje - predavanja, Zavodska skripta, FER, Zagreb, 1998.

1.11. Recommended additional literature

1. Tomac, J., Osnove automatske regulacije - predavanja, Fakultetska skripta, ETF, Osijek, 2004.
2. Šurina, T., Automatska regulacija, Školska knjiga, Zagreb, 1991.
3. Franklin, G.F., J.D. Powell, A.E. Naeini, Feedback Control of Dynamic Systems, Addison - Wesley Publishing Company, 1994.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. BARIĆ TOMISLAV**	
Course name	PE501 Fundamentals of Electric Drives	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.understand and describe the physical image of a drive
2.analyse and explain the general characteristics of certain types of machines and loads
3.analyse and explain the static characteristics of standard drives
4.analyse and explain the features of different machines in individual drives
5.compare the advantages and disadvantages of different controlling modes for particular drive types
6.analyse and explain the external and regulatory characteristics of DC, asynchronous and synchronous machines
7.measure and evaluate static and dynamic physical quantities in drives

1.4. Course content

Tasks and structure of electric drives. Speed-torque characteristics of industrial equipment and electrical motors. Static and dynamic behaviour of electric drives. Drives with DC motors. Variable voltage supply for DC motors. Drives with asynchronous and synchronous motors. Converter for AC motors. Dynamics of electric drives. Choice of a power motor. Modelling and simulating electric drives.

1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	

1.7. Student obligations

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max

Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	0.5	3,4,5	Midterm exam	Evaluation of (written) exercises	25	50
Writing pre-lab write-ups, results analysis and writing laboratory reports	2	1,2,3,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	10
Oral exam	2	1,2,3,4,5,6	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Krause, Paul C.; Wasynczuk, Oleg; D. Sudhoff, Scott . Analysis of Electric Machinery and Drive Systems. Wiley-IEEE Press, 2002
2. Jurković, B., Elektromotorni pogoni, Školska knjiga, Zagreb, 1990.

1.11. Recommended additional literature

1. Riefenstahl, U., Elektrische Antriebstechnik, Teubner Verlag, Stuttgart Leipzig, 2000.
2. Vogel, J., Elektrische Antriebstechnik, Hütig Verlag, Heidelberg, 1998
3. Paul C. Krause, Oleg Wasynczuk, Scott D. Sudhoff, Analysis of Electric Machinery and Drive Systems, Wiley-IEEE Press, 2002
4. Austin Hughes, Electric Motors and Drives: Fundamentals, Types and Applications (3rd Edition), Newnes, 2005
5. Grupa autora, Elektromotorni pogoni, TE/4 JLZ, Zagreb, 1973

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. BARIĆ TOMISLAV**	
Course name	PE401 Fundamentals of Electrical Machines	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5.5
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.distinguish and compare types of electrical machines 2.understand and explain the working principle of induction, synchronous and DC machines 3.categorise and explain the constructional design of electrical machines 4.properly use electric machines in practice 5.analyse and explain the operating conditions of asynchronous, synchronous and DC machines 6.analyse and solve selected numerical examples concering electrical machines 7.measure and evaluate basic electrical and mechanical physical quantities on electrical machines	
1.4. Course content	
Fundamentals of energy transformation. Transformers. Ideal and real transformer. Kapp's diagram. Losses and usefulness. Three-phase transformers. Autotransformer. Measuring transformers. Transformer performances. Rotary machines and their models. Current lining and flow. DC machines. Induced voltage and developed torque. Mode of operation and performances. AC machines. Induced voltage and developed torque. Mode of operation of synchronous and asynchronous machines. Their performances. One-phase machines.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning	Teaching method	Assessment method	Points

		outcomes			Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	0.5	6	Midterm exam	Evaluation of (written) exercises	25	50
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,3,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	10
Oral exam	1.5	1,2,3,4,5	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Pyrhonen, Juha; Jokinen, Tapani; Hrabovcova, Valeria. DESIGN OF ROTATING ELECTRICAL MACHINES. John Wiley & Sons, 2008
2. Wolf, R.: Osnove električnih strojeva, Školska knjiga, Zagreb 1991.

1.11. Recommended additional literature

1. Ivan Mandić, Veselko Tomljenović, Milica Pužar, , Tehničko veleučilište u Zagrebu, Zagreb, 2012.
2. Piotrovskij, L.M.: Električni strojevi, Tehnička knjiga, Zagreb 1970.
3. Dolenc, A. i dr.: Transformatori I i II, skripta ETF Zagreb, 1978.
4. Bego, V.: Mjerni transformatori, TE/8 JLZ, Zagreb 1982.
5. Irving M. Gottlieb, Practical Transformer Handbook, Newnes, 2004
6. Dolenc, A. i dr.: Električni strojevi, TE/4 JLZ, Zagreb 1973.
7. Kelemen, T.: Transformator, TE/13 HLZ, Zagreb 1997.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. FEKETE KREŠIMIR, Prof.dr.sc. NIKOLOVSKI SRETE**	
Course name	PE502-17 Basics of Power Systems	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
Introduce students to the function and basic features of an electric power system as well as the basic elements (generator, transformer, transmission line and cable and consumer). Train students to independently calculate currents and voltages in simple power grids as well as to perform power flow calculations using computer programmes.	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define a power system and describe its main features and elements 2.define and explain the electrical parameters of the main elements of a power grid: generators, transformers, transmission lines and consumers 3.describe and draw three-phase and single-phase equivalent circuits for generators, transformers and consumers 4.describe mathematical models for short, medium-long and long transmission lines 5.describe the following methods for calculating currents and voltages in a power grid: absolute impedance method, per-unit method and two-port method and perform the calculations using these methods 6.describe and calculate power flows in a power grid using a computer programme 7.measure electrical quantities for transmission lines under different conditions using a laboratory transmission line and transformer simulato	
1.4. Course content	
Introduction. Basic principles and characteristics of an electric power system (EPS) - definition and function of an EPS, basic elements, historical development and future trends. Electric power grid (or simple grid) - types, tasks and operation of an electric grid, electrical parameters of a grid, definitions of an active and a passive branch in a grid, definition of power in a grid, three-phase grid and single-phase equivalent. Generator - function, basic principles, electrical parameters and equivalent circuit. Power transformer - function, basic principles, electrical parameters and equivalent circuit. Transmission line - function, basic principles, electrical parameters, equivalent circuit and mathematical models for short, medium and long transmission lines. Calculations of current and voltages in a grid - method of absolute impedances and per-unit method, two-port network and basics of power flow calculations.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1	3,4,5,6	Midterm exam	Evaluation of (written) exercises	20	40
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	10
Oral exam	1.5	1,2,3,4,5,6	Oral exam	Assessment of student's answers	25	50

1.10. Obligatory literature

1. M. Ožegović i K. Ožegović: Električne energetske mreže I, II, III i IV, FESB Split i OPAL COMPUTING, 1997.
2. S. Nikolovski i D. Šljivac: Elektroenergetske mreže (zbirka zadataka), ETF Osijek, 2003.

1.11. Recommended additional literature

1. T. Gonen: Electrical Power Transmission System Engineering Analysis and Design, CRC Press, 2014.
2. J. D. Glover, T. Overbye, M.S. Sarma: Power System Analysisi and Design, 6th Edition, Cengage Learning, 2017.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. HEDERIĆ ŽELJKO, Doc.dr.sc. BARUKČIĆ MARINKO**	
Course name	P103 Fundamentals of Electrical Engineering I	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	30+(30+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define basic physical quantities in the electric and magnetic field (charge, electric field, magnetic field, potential, voltage) and electrical circuit (current, voltage, power, electrical resistance, inductance, capacitance, mutual inductance) 2.interpret basic physical laws, mathematical expressions and models for solving simple problems in electrical and magnetic fields, magnetic circuits and real electrical resistive and capacitance circuits in steady state 3.make a mathematical model of an electrical equivalent circuit by using Kirchhoff's laws 4.choose corresponding basic electrical and magnetic field laws to solve simple electrical and magnetic field problems and simple magnetic circuits 5.validate analytical and numerical mathematical models of electrical DC circuits consisting of linear elements in steady state using Kirchhoff's laws and magnetic circuits with and without feroomagnetic core 6.connect a real simple electric DC circuit 7.validate measurements of basic electrical quantities in DC circuits	
1.4. Course content	
Introduction. Force on the point charge and the vector of the electric field, Coulomb's law, Gauss's law. Electric induction, dielectricity. Field of a point (spherical) charge, line charge and a flat sheet of charge. Electric potential and voltage, power in electric field. Potential surfaces and field lines, potential around point charge. On capacitance, capacitance of a plane capacitors and capacitance of two wire system. Energy in electrostatic field. Electric circuit, intensity, direction and density of curent. Various effects of electric current, electrical resistance and conductance, influence of temperature. The ideal voltage and current source. Ohm's law. Kirchhoff's laws. Power and energy in circuits, Joule's law, maximum of usable power and efficiency. Force on a moving charge, density of the magnetic flux, the magnetic field vector, Ampere's law, magnetic flux, imaging with field lines. Magnetic field around linear conductor and in the thorodial coil. Force influence on a conductor and between two conductors. Biot-Savart's law. Magnetic field of a coil. Permeability, ferromagnetism, magnetisation curve and hysteresis loop. Magnetic circuit and its reluctance. Faraday's law and Lenz's law. Self-induction and mutual induction, inductance and mutual inductance. Energy of the magnetic field.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	5
Practice – problem solving	1.7	2,3,4,5	Midterm exam	Evaluation of (written) exercises	18	35
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.5	3,6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	20
Oral exam	1.3	1,2,3,4	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Kuzmanović, B. Osnove elektrotehnike I. Zagreb: Element, 2000.
2. Prasad, Rajendra. Fundamentals of Electronic Engineering. Cengage Learning, 2012.
3. Šehović, Felja, Tkalić, Osnove elektrotehnike zbirka primjera prvi dio, Školska knjiga, Zagreb, 1992.
4. Hederić, željko; Snježana Rimac-Drlje; Barukčić, Marinko: Osnove elektrotehnike I. Priručnik za laboratorijske vježbe, ETF, Osijek, 2010.

1.11. Recommended additional literature

1. V. Pinter, Osnove elektrotehnike I i II, Tehnička knjiga, Zagreb, 1994.
2. B. Kuzmanović, Zbirka zadataka i pitanja iz Osnova elektrotehnike 1, Element, Zagreb, 2010.
3. M.Pužar, I.Mandić, Osnove elektrotehnike I, lecture notes, ETF, Osijek, 2010.
4. J. Edminister: Electric Circuits, Schaum
5. U.A.Bakshi, V.U.Bakshi: Basic Electrical Engineering, Technical Publications, 2009.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. HEDERIĆ ŽELJKO, Doc.dr.sc. BARUKČIĆ MARINKO**	
Course name	P202 Fundamentals of Electrical Engineering II	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(30+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define basic electrical quantities and terms of equivalent circuit (current, voltage, power, active and passive elements, impedance, admittance, resistance, inductance, capacitance, mutual inductance) 2.choose appropriate mathematical models of basic physical elements of a real AC electrical circuit 3.propose models of electrical AC circuits containing linear elements in steady state 4.compare methods for solving electrical AC circuits containing linear elements in steady state 5.numerically and analytically solve the mathematical models of AC circuits containing linear elements in a steady state using a phasor transformation 6.connect a real AC circuit 7.validate measurement results of basic electrical quantities in AC circuits	
1.4. Course content	
Currents changing in time. Alternating and sinusoidal currents. Basic effects of alternating currents. Average and RMS values. Connecting R, L and C on an AC voltage. Power and voltage relations in AC circuits. Phasor representation. Impedance and admittance, complex power. Methods for solving electrical networks: direct usage of the Kirchhoffov' laws, the method of node voltages, the method of loop currents, the method of superposition. Thevenin's theorem, Norton's theorem and Millman's theorem. Compensation of the reactive power. Resonance. Q factor and frequency characteristic. Multiphase currents. Three-phase system. Delta and wye connected load. Power of the three-phase system. Inductances and transformer. Total inductance of mutual coils. Coreless transformer - equation and scheme. Transformer with iron core.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1.5	1,2,3,4,5	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	2
Practice – problem solving	1	2,3,4,5	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.5	6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	9	18
Oral exam	3	1,2,3,4,5	Oral exam	Assessment of student's answers	25	50

1.10. Obligatory literature

1. Kuzmanović, B. Osnove elektrotehnike II. Zagreb: Element, 2000.
2. Alexander, Charles K; Sadiku, Matthew N.O. Fundamentals of Electric Circuits. McGraw Hill Higher Education, 2009.
3. Felja, Koračin, Malić, Zbirka zadataka i rješenih primjera iz Osnova elektrotehnike, I. i II. dio, 1991.
4. Hederić, željko; Barukčić, Marinko: Osnove elektrotehnike II. Priručnik za laboratorijske vježbe, interna skripta ETF, Osijek, 2010.

1.11. Recommended additional literature

1. B. Kuzmanović, Zbirka zadataka i pitanja iz Osnova elektrotehnike 1, Element, Zagreb, 2010.
2. J. Edminister: Electric Circuits, Schaum's Outline Series, McGraw-Hill Book Company, 1983.
3. U.A.Bakshi, V.U.Bakshi: Basic Electrical Engineering, Technical Publications, 2009.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. ŠLJIVAC DAMIR**	
Course name	PE303-17 Fundamentals of Power Engineering and Ecology	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.estimate basic physical and social-political terms regarding energy, basic energy sources and shapes 2.evaluate basic energy and ecological characteristics of renewable and non-renewable energy sources 3.expand knowledge and adopt attitudes about the influence of power conversions to the environment 4.identify and interpret basic properties of electrical energy and the power system 5.apply the theoretical knowledge in non-renewable and renewable energy sources to analytical problems 6.demonstrate knowledge acquired during lectures and auditory exercises based on the chosen models (models of laboratory exercises present the Seebeck and Peltier effect, wind and solar energy conversion as well as familiarising with the basics of the power system)	
1.4. Course content	
Importance of energy. Forms, sources and classification of energy. Non-renewable energy sources (coal, oil, nuclear and geothermal energy). Renewable energy sources (hydropower, biomass, wind power, solar energy, etc.). Fundamental energy conversion. Conversion of primary energy forms into the final desired forms (conversion of chemical and nuclear energy into internal energy, internal energy into mechanical energy, potential water energy into mechanical energy, mechanical energy into electrical energy, direct conversions into electrical energy, and conversion of electrical energy into other forms). Transmission energy. Transmission and distribution of energy forms. Storage of energy. Environmental impact of engineering products and processes. Industrial ecology. Life cycle assessment. Material flow analysis. Sustainable production and consumption systems.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	10
Practice – problem solving	1.5	5	Midterm exam	Evaluation of (written) exercises	10	20
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	20
Oral exam	1	1,2,3,4	Oral exam	Assessment of student's answers	25	50

1.10. Obligatory literature

1. Silvio de Oliveira Jr. Exergy: Production, Cost and Renewability. Springer-Verlag London, 2013.
2. L. Jozsa: Energetski procesi i elektrane, udžbenik, ETF Osijek, 2008.
3. B. Udovičić: Energetika, Školska knjiga, Zagreb, 1993.

1.11. Recommended additional literature

1. D. Feretić i suradnici: Elektrane i okoliš, Element, Zagreb, 2000.
2. V. Knapp: Novi izvori energije - nuklearna energija fisije i fuzije, Školska knjiga, 1993
3. P. Kulišić: Novi izvori energije – sunčana energija i energija vjetra, Školska knjiga, 1991.
4. D. Šljivac, Z. Šimić: Obnovljivi izvori energije s osvrtom na gospodarenje, ETF Osijek, 2008.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. PELIN DENIS**	
Course name	PE503 Principles of Power Electronics	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.estimate power conversion characteristics of power electronic converter (PEC) components for basic and on a one-time basis connections of a system with different characteristics 2.choose models of conversion components of a PES for a sufficiently accurate and mathematically less demanding analysis 3.expound the basic connections as well as cascade connection of PEC on their subsystems 4.evaluate the choice of PEC topology regarding the cascade connection of several converters 5.analyse the basic topologies of DC/DC converters, rectifiers and autonomous inverters	
1.4. Course content	
Power converters. Basic concepts. Basic properties. Power indices of a conversion process. The concept of a conversion device. Constitutive devices and topology of power converters. Possible u-i characteristics of conversion devices. Uncontrolled switch. Unilateral current, unilateral voltage and bilateral switches. Implementation of a conversion device comprising two or more power semiconductor devices. Dc converters. Basic properties. One-quadrant direct and indirect dc converter. Two-and four-quadrant dc converter. Reduction of power semiconductor devices switch stresses. Rectifiers. Basic properties. Uncontrolled rectifiers. Phase-controlled rectifiers. Rectifier and inverter mode of operation. Autonomous inverters. Basic properties. Reduction of harmonic in output current of autonomous inverters.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1	1,2,5	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	10
Practice – problem solving	2	2,5	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.3	3,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	20	20
Oral exam	1.7	1,2,5	Oral exam	Assessment of student's answers	15	30
Testing of identifying converters topology from practice	1	3,4	Testing of identifying converters topology from practice	Supervision of a teacher. Checking solutions	0	10

1.10. Obligatory literature

1. Flegar, I. Elektronički energetski pretvarači.. Zagreb: Kigen, 2010.
2. I.Flegar, Energetski elektronički pretvarači , KIGEN, Zagreb, 2010
3. J.G. Kassakian, M.F.Schlecht, G.C.Verghese: Osnove energetske elektronike-I dio ; Topologije i funkcije pretvarača, Graphis, Zagreb, 2000.

1.11. Recommended additional literature

1. N. Mohan, T.M. Undeland, W.P.Robbins, Power Electronics;John Wiley &Sons Inc., New York, 1995
2. P.T.Krein, Elements of Power Electronics, Oxford University Press, Oxford, 1998
3. B.Bose, Power Electronic and Variable Frequency Drives:Technology and Applications; Wilwy-IEEE Press, 1997.
4. I.Flegar, Sklopovi energetske elektronike, Graphis, Zagreb, 1996

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv.prof.dr.sc. MILIČEVIĆ KRUNO**	
Course name	PEK301 Measurement Basics	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(15+30+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.list and mutually connect basic terms in metrology and evaluate their significance in engineering applications 2.explain the mathematical background of calculating uncertaintyti 3.select and use a suitable measuring instrument for measuring electrical quantities 4.interpret instrument specifications 5.select and use one of the basic measurement methods for measuring electrical quantities 6.calculate measurement uncertainty and error, and express and evaluate complete measurement result 7.select a measuring instrument and/or a measuring transducer for the measurement of basic non-electric physical quantities 8.define the basic components of an automated metering system	
1.4. Course content	
Basic terms in metrology. Measurement uniformity, metrology pyramid, traceability. International system of (measurement) units (SI). Numerical (ratio) units. Errors. Measurement uncertainty. Complete measurement result. Decision making based on the complete measurement result. Types of signals, signal parameters, visualisation in time and frequency domain. Measurement equipment. Measurement instruments (electromechanical, analogue electronic, digital). Maintenance of measurement instruments. Digital multimetre. Oscilloscope. Digital measurement systems (sensor, transducer, conditioner, display). Measurement methods (deflection, null, comparison, substitution, differential, direct, indirect). Measurement of electrical quantities (current, voltage, frequency, phase displacement, apparent power, active power, reactive power, power factor, energy, resistance, inductance, capacitance, dissipation factor, impedance and admittance). PC based automated measuring systems.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information	

Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.2	1,2,3,4,5,6,7,8	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1	2,3,4,5,6	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.6	3,4,5,6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1	1,2,3,4,5,6,7,8	Oral exam	Assessment of student's answers	15	30
Group tasks	0.2	2,3,4,5	Group tasks	Evaluation of exercises	0	10

1.10. Obligatory literature

1. Smith, R.C. Uncertainty Quantification. SIAM 201
2. Z. Godec, Iskazivanje mjernog rezultata, Graphis, Zagreb, 1995.
3. Z. Godec, D. Dorić, Osnove mjerenja, laboratorijske vježbe, Sveučilište u Osijeku, Elektrotehnički fakultet, Osijek, 2001.
4. Z. Godec, D. Dorić, Električka mjerenja s laboratorijskim vježbama, Sveučilište u Osijeku, Elektrotehnički fakultet, Osijek, 2000.

1.11. Recommended additional literature

1. D. Vujević, B. Ferković, Osnove elektrotehničkih mjerenja I i II, Školska knjiga, Zagreb, 1996.
2. R. Malarić, Instrumentation and measurement in electrical engineering, BrownWalker Press 2011.
3. V. Bego, Mjerenja u elektrotehnici, Školska knjiga, Zagreb, 1990.
4. D. Karavidović, Električna mjerenja I i II, ETF Osijek, 1994.
5. Šantić, Elektronička instumentacija, Školska knjiga, 1993.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. MARTINOVIĆ GORAN, Doc.dr.sc. BAUMGARTNER ALFONZO**	
Course name	P106 Programming I	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(0+30+0)+0

1. Course description	
1.1. Goals	
Explain the principles of computer hardware and software components as well as the basics of algorithmic thinking in developing software solutions; Explain to students the basic principles of software engineering, the basic elements of programming languages and current development tools; Train students to design software of varying complexity with different methods and tools; Inform students about different data types, input and output functions and various types of operators; Explain to students programming loops and commands; Show to students the possibility of using 1D and 2D arrays, explain how to use functions, work with memory, pointers, and how to generate pseudo-random numbers; Explain and show the basic principles of object-oriented programming.	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.identify and connect key features of computer hardware and software, find possible development tools and framework solutions for customers' requirements and support 2.understand algorithmic approach to problem solving and write it in the programming language using different structures and data types 3.develop one's own software problem solution in a specific programming language 4.examine, analyse and repair a developed software solution in a developing framework	
1.4. Course content	
Basic terminology and historical overview of computer science. Fundamentals of computer organisation: CPU, peripheral units. System and application software. Networking and the Internet. Number systems and data formats. Basics of mathematical logic. Algorithms: notation forms, timing and space complexity on examples. Programming fundamentals, programming language structure, program development, languages of different abstraction level, compiler, interpreter and browser on examples. Programming in C: programme structure, keywords, data types, C preprocessor, variables, arithmetic and logic expressions, input and output, control - flow statements, functions, basics of pointers, arrays and structures, files.	
1.5. Teaching methods	Lecture Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Laboratory exercises	2	1,2,3,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	6
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	24
Oral exam	1	1,2,3	Oral exam	Assessment of student's answers	20	40
Written exam.	1	2,3,4	Written exam	Knowledge assessment by a written or revision exam	15	30

1.10. Obligatory literature

1. J. Šribar, B. Motik, Desmistificirani C++, 3. dopunjeno izdanje, 2010.
2. S.G. Kochan, Programming in C (Developer's Library), 4th Ed., Addison-Wesley Professional, 2014.
3. D. Kusalić, Napredno programiranje i algoritmi u C-u i C++-u, Element, 2014.

1.11. Recommended additional literature

1. D. Patterson, J. Hennessy, Computer Organization and Design: The Hardware / Software Interface (5th. Edition), Morgan Kaufmann Publ., 2013.
2. A.S. Tanenbaum, T. Austin, Structured Computer Organization (6th Ed.), Pearson, 2012.
3. R. Sedgewick, K. Wayne, Algorithms (4th Ed.), Addison-Wesley Professional, 2011.
4. B. Stroustrup, Programming: Principles and Practice Using C++ (2nd Ed.), Addison-Wesley Professional, 2014.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. JOB JOSIP, lzv. prof. dr. sc. NENADIĆ KREŠIMIR**	
Course name	P205 Programming II	
Study program	Undergraduate study programme, Electrical Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(0+30+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.compare and/or explain complex data types, pointers, functions, and file types using an appropriate example
2.select or design a suitable algorithm to solve problems by using different data and structural elements
3.develop your own software solution of the given simple problem
4.define and explain the basic concepts of object-oriented programming principles

1.4. Course content

Basics of C programming language. Complex data types: arrays, structures and unions. Pointers: interconnections with arrays, pointers arithmetic. Function, parameter exchange by a value and an address. Features for working with file system (files): binary files, textual files, files with a direct access. Systematic approach to software development: top-down and bottom-up approaches. Algorithm and the conversion process to the programming code. Examples of search and sorting algorithms. Fundamentals of object-oriented programming. Classes and objects. Inheritance.

1.5. Teaching methods	Lecture Laboratory exercises
1.6. Comments	

1.7. Student obligations

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Laboratory exercises	1	1,2,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	5	10

Writing pre-lab write-ups, results analysis and writing laboratory reports	2	2,3	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1	1,2,3,4	Oral exam	Assessment of student's answers	15	30
Revision exams (written exam)	1	2,3	Revision exams (written exam)	Evaluation of exercises	15	30

1.10. Obligatory literature

1. Šribar, J.; Motik, B. Desmistificirani C++, 3. dopunjeno izdanje, 2010.
2. Motik, Šribar, Demistificirani C++ (2. izd.), Element, Zagreb, 2003.

1.11. Recommended additional literature

1. Kernighan, Ritchie, The C Programming Language, Prentice-Hall, Englewood Cliffs, NJ, 1996
2. Knuth, The Art of Computer Programming, Vol. 1., Fundamental Algorithms, Addison-Wesley, Reading, MA, 1997.
3. Fischer, Zbirka zadataka iz C-a, ETF Osijek (Zavodska skripta), 1999.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. MRČELA TOMISLAV**	
Course name	PRK602-17 Technical System Designing	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(15+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define, classify and analyse types of projects 2.prepare main project documentatio 3.prepare tender documentation 4.prepare offer documentation 5.prepare main project documentation 6.prepare detailed design documentation	
1.4. Course content	
Introduction. Technical systems. Properties of technical systems. Developing technical systems. Technical systems classification. Electrical systems. Design. Basic development theory. Creativity. Structure of process developing. Project types. Operations and activities in designing. Containment design process integrated design access. Decision making. Knowledge-base and data-base. Knowledge resources. Data acquisition and preservation. Technical concept solutions. Catalogue of knowledge and skills. Optimal and alternative project solution. Choice. Project standardisation. Technical project standardisation. Introduction of norms and standards into technical systems. Evaluation of projects in electrical engineering and introduction of regulatory rules about project realisation.	
1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning	Teaching method	Assessment method	Points

		outcomes			Min	max
Attendance Lectures, Auditory exercises	1.5	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Practice – problem solving	1	1,2,3,4,5,6	Midterm exam	Evaluation of (written) exercises	15	30
Oral exam	0.7	1,2,3,4,5,6	Oral exam	Assessment of student's answers	18	35
Preparing for the Control Assignment 1	0.6	1,2,3	Auditory exercises and individual work	Evaluation of exercises	6	10
Preparing for revision exams 2	0.5	4,5,6	Auditory exercises and individual work	Evaluation of exercises	6	10
Seminar paper	0.7	1,2,3,4,5,6	Practical work	Grading a seminar paper based on the preset criteria	6	10

1.10. Obligatory literature

1. Graditeljski projekt i njegova knjiga - Priručnik projektnoga tima Orešković, Mirko, Hrvatska sveučilišna naklada, 2011.
2. Božidar Križan, Osnove proračuna i oblikovanja konstrukcijskih elemenata, Sveučilište u Rijeci, Tehnički fakultet Rijeka, 1998.

1.11. Recommended additional literature

1. Karlheinz Roth, Konstruieren mit Konstruktionskatalogen, Sprenger-Verlag Berlin Heidelberg New York 1982.
2. Hubka V., Eder E., Design Science – Introduction to the Needs, Scope and Organisation of Engineering Design Knowledge, Springer Verlag, Berlin Heidelberg New York 1995.
3. Pahl G., Beitz W., Engineering Design A Systematic Approach, Springer-Verlag, Berlin Heidelberg New York 1991.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. MARTINOVIĆ GORAN**	
Course name	PRK302-17 Object-oriented software development principles	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	30+(15+30+0)+0

1. Course description	
1.1. Goals	
The aim of this course is to enable students to employ advanced, language independent, object-oriented programming concepts in software development. The employed principles enable code reuse and modification, easier testing and software maintenance. Primarily, this concerns layered modelling, the S.O.L.I.D. principles and design patterns that enable the fulfilment of the former. The utilised language is C# and knowledge acquired during this course extends on the knowledge acquired on the courses Programming I and II and Object-oriented programming.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.describe the basic principles important in object-oriented software development 2.describe and use the S.O.L.I.D. principles when developing software 3.describe and outline various often employed design patterns and explain the problems they solve 4.explain more complex problems solved by a specific design pattern 5.identify the design pattern applied in the given code and the one appropriate for a specific problem 6.apply the design patterns while developing software 7.connect different design patterns and utilise them when constructing complex software solutions	
1.4. Course content	
Introduction. Fundamentals of OOP. The principles of object-oriented software design (S.O.L.I.D.). Layered modelling. Clean code. Naming, commenting, formatting. Code smells. Heuristics. Creational patterns (factory method, abstract factory, builder, prototype, singleton). Structural patterns (adapter, bridge, composite, decorator, façade, proxy, flyweight). Behavioural patterns (chain of responsibility, command, iterator, mediator, memento, observer, strategy, visitor). Refactoring tools and techniques. Object relational mapping. ORM tools. LINQ.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1	2,5,6,7	Midterm exam	Evaluation of (written) exercises	20	40
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,5,6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	10
Oral exam	1	1,3,4,5	Oral exam	Assessment of student's answers	15	30
Homework	0.5	1,2,3,4,5,6,7	Solving homework or writing seminar papers	Evaluation of exercises	7	20

1.10. Obligatory literature

1. E. Freeman et al., Head First Design Patterns, O'Reilly Media, 2004.
2. E. Gamma et al., Design Patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley Professional, 1998.
3. R. C. Martin, Clean Code: A Handbook of Agile Software Craftsmanship, Prentice Hall, 2008.

1.11. Recommended additional literature

1. M. Fowler, Refactoring, Addison-Wesley, 2001.
2. R. C. Martin, Agile Software Development: Principles, Patterns, and Practices, Prentice Hall, 2002.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Izv. prof. dr. sc. GALIĆ IRENA**	
Course name	P403 Signals and Systems	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define and classify signals and systems, and use terms from signal and system theory 2.analytically solve and evaluate mathematical models of time-dependent and time-discrete linear systems of the first and second order 3.model and evaluate the dynamic system in Simulink, and programme in MATLAB 4.define and describe the principle of superposition, superposition integral, superposition sum, convolution integral and convolution sum 5.define Laplace and z-transform, and apply and evaluate them to determine the response of linear time invariant systems 6.interpret four Fourier transforms (TCFS, TCFT, TDFS, TDFT) and their properties, and describe their application	
1.4. Course content	
Mathematical models of time-continuous and time-discrete signals and systems. Classification. Analysis of linear systems. Fourier transforms of time-continuous and time-discrete signals (FS, FT, DTFT and DTFS). Frequency characteristics and filtering principles. Laplace and Z-transform. Decomposition and realisation of systems. Stability, controllability and observability of systems. Signal sampling and regeneration. Equivalence of time-continuous and time-discrete systems. Software used for analysis and simulation of systems.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2	1	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	2
Practice – problem solving	1	1,2,4,5	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,3	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	18
Oral exam	1	1,2,4,5,6	Oral exam	Assessment of student's answers	25	50

1.10. Obligatory literature

1. B. P. Lathi. Linear Systems and Signals. Oxford University Press, 2004; ISBN: 0-19-515833-4

1.11. Recommended additional literature

1. A.V.Oppenheim, A.S.Willsky, Signale und Systeme, Arbeitsheft, VCH, Verlagsgesellschaft, Weinheim, 1989
2. Gabel i Roberts, Signals and Linear Systems, 3/e, J. Willey, 1987.
3. H. Babić. Signali i sustavi, Zavodska skripta, ZESOI, Fakultet elektrotehnike i računarstva Zagreb, 1996.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Prof.dr.sc. ŽAGAR DRAGO**	
Course name	PRK401 Information Theory	
Study program	Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5.5
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define basic concepts in the field of information theory 2.describe the basic elements of a communication system 3.assess the correctness of applying theoretical basics in solving tasks 4.create a simulation of basic elements of the information system using a software tool 5.choose an appropriate coding method for the defined problem 6.propose an information system design for a simple problem 7.compare simple information systems	
1.4. Course content	
Nature of information. Information sources and users. Events and information. Information layers: stochastic, syntax, semantic, pragmatic, apobetic. Information redundancy. Entropy. Entropy on the information channel. Codes. Markov chains. Syntactic aspect of information: rules and syntax forms. Semantic parameters: actuality, existence, reachability, relevance and importance. Measurement of a semantic information aspect: SIT. Natural languages. Bioinformatics. Signal and information: BT. Analytic and asymptotic signals. Noise and information channel coding: Shannon's theorem. Bayes' postulate and theorem. Optimum code. Coding time. Complex data processing: selection, filtering, classification and presentation. Qualitative and quantitative information aspects. Železnikar's theses. Information agents: independent, team and social. Information agent construction. Web agents.	
1.5. Teaching methods	Lecture Auditory exercises Laboratory exercises
1.6. Comments	
1.7. Student obligations	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.8. Course assessment	
Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9	
1.9. Assessment and evaluation of the students' work during the semester and on the final exam	

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	1	4
Practice – problem solving	1.3	3,5,6	Midterm exam	Evaluation of (written) exercises	16	32
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.2	3,4,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	24
Oral exam	1.3	1,2,5,6,7	Oral exam	Assessment of student's answers	15	30
Seminar paper	0.7	5,6,7	Creation and presentation of seminar work	Grading a seminar paper and results presentation	6	10

1.10. Obligatory literature

1. V. Sinković, Informacija, simbolika i semantika, Školska knjiga, 1997., Zagreb
2. Gray, Robert M. .Entropy and Information Theory, Information Systems Laboratory Electrical Engineering Department Stanford University.New York, Springer-Verlag, 2013.
3. Ž. Pauše, Uvod u teoriju informacije, Školska knjiga, Zagreb, 1989.

1.11. Recommended additional literature

1. I. S. Pandžić i dr., Uvod u teoriju informacije i kodiranje, Element , Zagreb, 2007.
2. F. Jović, Teorija informacije - skripta, moodle.etfos.unios.hr, 2011.
3. V. Matković i V. Sinković, Teorija informacije, Školska knjiga Zagreb, 1984.

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer	**Doc.dr.sc. RUDEC TOMISLAV, Prof.dr.sc. GALIĆ RADOSLAV**	
Course name	P402 Probability and Statistics	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.design a problem model using basic counting rules and basic concepts from combinatorics
2.construct a model for calculating a probability problem by using the rules for calculating the probability of a union and intersection of an event, as well as conditional probability rule using total probability rule and Bayes' theorem
3.design an expression to calculate a probability problem using the terms from the random variables theory
4.in the analysis of the set statistical data group, create mathematical expressions using the basic statistics formulas
5.define and distinguish the basic concepts of statistical tests and apply the appropriate statistical tests on practical examples

1.4. Course content

Fundamentals of combinatorics. Algebra of events. Probability and properties. Random variable. Distribution function of a random variable. Discrete and continuous probability distributions (hypergeometric, binominal, Poisson, normal, uniform, exponential, Chi-squared, student`s t-distribution). Numerical properties of distributions. Two-dimensional probability distributions. Moments and correlations. Statistical set with parameters. Empirical and two-dimensional distributions. Correlation and regression analysis. Samples and numerical properties of samples. Parameter estimation. Interval estimation. Statistical hypothesis testing. Examples of statistical models, statistical thinking and application of statistical programmes. Writing a seminar paper.

1.5. Teaching methods	Lecture Auditory exercises
1.6. Comments	

1.7. Student obligations

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.8. Course assessment

Defined by the Student evaluation criteria of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max

Attendance Lectures, Auditory exercises	1.7	2,3,4,5	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.3	1,3,4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.5	1,2,4	Oral exam	Assessment of student's answers	25	50
Homework	0.5	1,2,3,5	Homework	Discussion upon presentation	0	10

1.10. Obligatory literature

1. Galić, R. Vjerojatnost i statistika. Osijek: ETF, 2013.
2. Montgomery, D.C. Applied Statistics and Probability for engineers. USA: Wiley, 2014.
3. R. Galić, Statistika, ETFOS, Osijek, 2004

1.11. Recommended additional literature

1. Pavlić, Statistička teorija i primjena, Tehnička knjiga, Zagreb, 2000.
2. Ž. Pauše, Uvod u matematičku statistiku, Školska knjiga, Zagreb, 1995.
3. Ž. Pauše, Vjerojatnost i stohastički procesi, Školska knjiga, Zagreb, 2004
4. G. M. Clarke, D. Cooke, A Basic Course in Statistics, Arnold, London, 1992.
5. R. Galić, Vjerojatnost , ETFOS, Osijek, 2004

1.12. Monitoring of students

Conducting university questionnaires on teachers (student-teacher relationship, transparency of assessment criteria, motivation for teaching, teaching clarity, etc.). Conducting Faculty surveys on courses (upon passing the exam, student self-assessment of the adopted learning outcomes and student workload in relation to the number of ECTS credits allocated to activities and courses as a whole).

General information		
Lecturer		
Course name	P605 Final Paper	
Study program	Undergraduate study programme, Electrical Engineering, elective block EE (mandatory) Undergraduate study programme, Electrical Engineering, elective block KI (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	10
	Workload (L+(AE+LE+CE)+S)	-

1. Course description

1.1. Goals

Define the subject and task of graduate thesis work at the appropriate scientific and professional level, so that the student needs to demonstrate the ability of the engineering work to solve problems linked to concrete practical problems. By guiding the mentor helps the student to solve the task.

1.2. Conditions for enrollment

Requirements met for enrolling in the third year of the study programme

1.3. Learning outcomes

Depends on the topic of the thesis.

1.4. Course content

Depends on the topic of the thesis.

1.5. Teaching methods	Consultations
1.6. Comments	

1.7. Student obligations

Defined by the Regulations on final and master thesis, and paragraph 1.9

1.8. Course assessment

Defined by the Regulations on final and master thesis, and paragraph 1.9

1.9. Assessment and evaluation of the students' work during the semester and on the final exam

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Defined by Criteria for evaulation of final and diploma papers	-	-	-	-	-	-

1.10. Obligatory literature

Depends on the topic of the thesis.

1.11. Recommended additional literature
Depends on the topic of the thesis.
1.12. Monitoring of students
According to the Regulations on final and master thesis: - the theme is approved by the Committee for final and master thesis. - the work is reviewed by the evaluator named by the Committee for final and master thesis - the Committee for final and master thesis makes the final decision on work based on the evaluator's recommendation