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

Application-oriented Study Programme in Electrical Engineering

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 with the application-oriented study programme in electrical engineering. 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 college-level education of students of electrical engineering.

Assessment of rationale regarding the requirements of labour market - The labour market in Croatia shows that experts who complete their two-year application-oriented study programme of electrical engineering find an employment easily so that there are hardly any unemployed engineers of the mentioned profile. The two-year application-oriented study programme in electrical engineering educates engineers for the field of specialisation in Power Engineering, Computer Science and Automation, that can easily be integrated into the organisational structure of companies and institutions. The omnipresent interdisciplinarity determines the presence of electrical engineering and computer engineering in every segment of human life out of which follows the need for personnel of this profile. 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 that will complete the two-year Application-oriented study programme in electrical engineering will obtain fundamental and specialised knowledge and skills to become part of the labour market. Worldwide experience shows that short–cycle engineers can easily find a job. 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 the social development which will require highly educated experts that will be able to respond to the challenges of the new era. Highly educated experts of electrical engineering that are 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 Application-oriented study programme in electrical engineering at the Faculty of Electrical Engineering in Osijek is based on modern study programmes

of distinguished European universities and colleges. The programme is in term of contents completely comparable with the college level programme in electrical engineering at the Faculty of Electrical Engineering in Ljubljana and the college level of computer engineering and computer science at the Faculty of Electrical Engineering and Computer Science in Maribor. Comparison of the proposed Application-oriented study programme with branches in Automation, Power Engineering and Computer Engineering, with corresponding programmes at the faculties in Ljubljana and Maribor shows that there is a high level of programme coordination with the programmes considered.

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 1978 the two–year college level study programme in electrical engineering was founded and since then the Faculty has been educating engineers of electrical engineering with the branches in Electrical Engineering and Electronics. In 1990, the application–oriented study programme develops into the Faculty of Electrical Engineering and as a consequence of that, new university programmes are introduced. According to the new curriculum of the two–year college level programme in electrical engineering, which was accepted in 2003, engineers of electrical engineering have been educated in the branches of Power Engineering**,** Automation and Computer Science. In this way an adjustment of the programme and contents of the two–year college level were made according to present and predictable market needs in the region of Eastern Croatia.

c) Partners not in the higher education system, who are interested in starting the study of this profile

Faculty of Electrical Engineering in Osijek has gained many partners in economy and public sector that are very interested in continuation and further development of their partnership with the Faculty. In the first place it is the partner company, Siemens that bases its branch–office on engineers in the field of electrical and computer engineering that are educated at the Faculty of Electrical Engineering in Osijek. Siemens plans further development and extension as well as employment of a considerable number of new personnel from the field of electrical and computer engineering. Other significant companies cooperating with the Faculty of Electrical Engineering are Croatian National Grid Company (Hrvatska elektroprivreda), Croatian telecommunications (THT), VIPNet as well as other companies interested in the study of such profile.

d) Faculty overtness towards mobility of students

Within the scope of the Application-oriented study 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*:

Application-oriented study programme

2.2. *Institution*:

J. J. Strossmayer University of Osijek, Faculty of Electrical Engineering Osijek in co-operation with other University institutions as well as business partners that would offer practical training to students.
Application-oriented study programme would be carried out at the Faculty of Electrical Engineering in Osijek, and its branches based in Vinkovci and Požega.

2.3. *Duration of study*:

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

2.4. *Entry requirements*:

Application-oriented study programme would be open to applicants with secondary school education. On the basis of secondary school achievements a rank-list of applicants would be made, according to which admission to this study programme would take place.

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

Students who complete their Application-oriented study programme at the Faculty of Electrical Engineering in Osijek would acquire the necessary knowledge and skills to apply their knowledge of mathematics, physics, science and engineering to electrical engineering, as well as to conduct measurements, and analyse and interpret measurement results. Students of this profile would learn how to solve engineering problems. Furthermore, they would acquire abilities to recognise the interaction between engineering activities and design, manufacturing, 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 abilities.

Branch: Power Engineering:

Application-oriented engineers would acquire the necessary knowledge and abilities to construct, test and maintain the following:

- electrical installations at all levels of complexity (ranging from buildings, industrial plants to classical and nuclear power plants);
- transmission and distribution networks and lines, switching substations, city substations, distribution overhead and underground networks;
- facilities and plants (industry, transport, etc.) of flexible manufacturing systems controlled by automated electromotive devices, electrical machines, semiconducting power converters, etc. in companies of various branches.

Branch: Automation

Application-oriented engineers would acquire the necessary knowledge and abilities to:

- design, implement, test and maintain automated technological, power and transport plants and processes,
- design and apply hardware and software support for computer process control;
- implement methods of testing, documentation and evaluation of automation systems.

Branch: Computer Engineering:

Application-oriented engineers would acquire the necessary knowledge and abilities to:

- purchase, develop, and maintain computers and computer systems as well as software products;
- apply computers in process and manufacturing system control;
- design and exploit of computer networks;
- design, implement and maintain business and private networks and the corresponding computer systems;
- apply and maintain hardware and software of design systems in other branches and sectors.

Based upon the knowledge and abilities application-oriented students of electrical engineering would acquire during their studies, they would be qualified to enrol in the continuing specialised second cycle study programme in electrical engineering both in Croatia and abroad.

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

After the successful completion of the Application-oriented study programme in electrical engineering students would be awarded the title **Bachelor of Engineering in** their respective branches: **Power Engineering, Automation or Computer Engineering**.

3. Program Description

3.1. Application-oriented study programme in Electrical Engineering - obligatory and elective courses

Curriculum of the Application-oriented 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: **S Bx y z**

where: **S** – one-letter symbol for the Application-oriented study programme
B – one- or multi-letter symbol for the study programme or an elective course module
R – Computer engineering courses
E – Power engineering courses
A – Automation courses
I – Elective courses
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

branch: Informatics

1. semester

Code	Course	L workload	E workload	ECTS	Teacher
S105-ENG	English I	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
S103	Physics	30	45	5	Dr.sc. MIOKOVIĆ ŽELJKA
S104	Engineering Graphics	15	30	4	Prof.dr.sc. MRČELA TOMISLAV
SR107	Calculus I	30	30	5	HREHOROVIĆ IVAN
S105-NJEM	German I	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
SR101	Fundamentals of Electrical Engineering	30	45	6	Izv.prof.dr.sc. BARIĆ TOMISLAV
SR102	Programming I	45	45	7	Doc.dr.sc. LUKIĆ IVICA
S106	Physical Education I	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

2. semester

Code	Course	L workload	E workload	ECTS	Teacher
S204-ENG	English II	15	15	3	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
SR206	Calculus II	30	30	7	HREHOROVIĆ IVAN
S204-NJEM	German II	15	15	3	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
S203	Fundamentals of Electronics	45	45	8	Izv. prof. dr. sc. HERCEG MARIJAN Izv.prof.dr.sc. MATIĆ TOMISLAV (st.)
S206-17	Business communication	15	15	3	Izv.prof.dr.sc. GLAVAŠ JERKO *
SR201-17	Programming	45	60	8	Izv. prof. dr. sc. NENADIĆ KREŠIMIR
S205	Physical Education II	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

3. semester

Code	Course	L workload	E workload	ECTS	Teacher
SARIE301	Computer System Architecture	45	30	6.5	Doc.dr.sc. KESER TOMISLAV
SAR301	Digital Electronics	45	30	6	Doc.dr.sc. KESER TOMISLAV
SIR302-17	Hardware Description Languages - elective	30	30	5	Doc.dr.sc. MATIĆ TOMISLAV (ml.) Doc.dr.sc. ALEKSI IVAN
S302-16	Mathematical Statistics	30	15	5	HREHOROVIĆ IVAN
SIR304-17	Basics of 3D Modelling - elective	30	30	5	Doc.dr.sc. LIVADA ČASLAV
SIR303-17	Programming of Small Linux Computers - elective	30	30	5	Doc.dr.sc. MATIĆ TOMISLAV (ml.) Doc.dr.sc. ALEKSI IVAN

SR303-17	Java Programming	30	45	6.5	Doc.dr.sc. KÖHLER MIRKO
SIR301-17	Computer Graphics - elective	30	30	5	Izv. prof. dr. sc. GALIĆ IRENA Doc.dr.sc. BAUMGARTNER ALFONZO
S301	Physical Education III	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO
SI301	Discrete Mathematics - elective	30	30	5	Doc.dr.sc. RUDEC TOMISLAV

4. semester

Code	Course	L workload	E workload	ECTS	Teacher
SR404-17	Algorithms and data structures	45	30	6	Doc.dr.sc. BAUMGARTNER ALFONZO
SIR401-17	Graph Algorithms - elective	30	30	5	Doc.dr.sc. BAUMGARTNER ALFONZO
SR402-15	Data Bases	30	45	7	Doc.dr.sc. LUKIĆ IVICA
SIR402-17	Object-Oriented Software Design - elective	30	30	5	Prof.dr.sc. MARTINOVIĆ GORAN
SAR401-17	Information Systems and Computer Networks	45	30	7	Prof.dr.sc. ŽAGAR DRAGO Doc.dr.sc. GRGIĆ KREŠIMIR
SIR403-17	Microcomputer Systems - elective	30	30	5	Doc.dr.sc. KESER TOMISLAV
SR401	Operating Systems	30	30	5	Prof.dr.sc. MARTINOVIĆ GORAN
SIR404-17	Applied Machine Learning - elective	30	30	5	Doc.dr.sc. GRBIĆ RATKO Prof.dr.sc. SLIŠKOVIĆ DRAŽEN
SI401-17	Service Learning Projects - elective	15	45	5	Doc.dr.sc. ALEKSI IVAN Dr.sc. MIOKOVIĆ ŽELJKA

5. semester

Code	Course	L workload	E workload	ECTS	Teacher
SR502-17	Digital Communications	45	45	7.5	Doc.dr.sc. MANDRIĆ-RADIVOJEVIĆ VANJA
S501-16	Business communication	15	15	3	Izv.prof.dr.sc. GLAVAŠ JERKO *
SAR503-17	Software Engineering	30	30	4	Izv. prof. dr. sc. GALIĆ IRENA
S502-17	Practical Training	0	200	9	Doc.dr.sc. MANDRIĆ-RADIVOJEVIĆ VANJA Mr.sc. DORIĆ DRAŽEN
S503-17	Introduction to Economics and Management	30	15	3	Izv.prof.dr.sc. CRNJAC-MILIĆ DOMINIKA
SR501-17	Web Programming	30	45	6.5	Izv. prof. dr. sc. NENADIĆ KREŠIMIR

6. semester

Code	Course	L workload	E workload	ECTS	Teacher
SIR601-17	User Interface Design - elective	30	30	5	Doc.dr.sc. LIVADA ČASLAV

SAIR601-17	Industrial Informatics - elective	30	45	5.5	Prof.dr.sc. SLIŠKOVIĆ DRAŽEN
SR604-17	Information Security	30	30	5	Doc.dr.sc. GRGIĆ KREŠIMIR
SIR606-17	Internet of Things - elective	30	30	5	Doc.dr.sc. GRBIĆ RATKO
SR601	Multimedia Technique	45	30	5	Doc.dr.sc. VRANJEŠ MARIO
SF601	German - facultative	30	30	4	FERČEC IVANKA
SIR607-17	Database Design - elective	30	30	5	Doc.dr.sc. LUKIĆ IVICA Doc.dr.sc. KRPIĆ ZDRAVKO
SI601-17	Service Learning Projects - elective	15	45	5	Dr.sc. MIOKOVIĆ ŽELJKA Doc.dr.sc. ALEKSI IVAN
SR603-17	Mobile platform application development	30	45	5	Izv. prof. dr. sc. NENADIĆ KREŠIMIR
SD601-17	Final Paper	0	0	10	

branch: Automation

1. semester

Code	Course	L workload	E workload	ECTS	Teacher
S105-ENG	English I	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
S103	Physics	30	45	5	Dr.sc. MIOKOVIĆ ŽELJKA
S104	Engineering Graphics	15	30	4	Prof.dr.sc. MRČELA TOMISLAV
SAE107-17	Calculus I	45	30	6	HREHOROVIĆ IVAN
S105-NJEM	German I	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
SAE101	Fundamentals of Electrical Engineering I	45	45	7	Dr. sc. MIKLOŠEVIĆ KREŠIMIR
SAE102	Programming	30	30	5	Doc.dr.sc. KÖHLER MIRKO
S106	Physical Education I	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

2. semester

Code	Course	L workload	E workload	ECTS	Teacher
S204-ENG	English II	15	15	3	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
SAE206-17	Calculus II	45	30	7	HREHOROVIĆ IVAN
S204-NJEM	German II	15	15	3	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
S203	Fundamentals of Electronics	45	45	8	Izv. prof. dr. sc. HERCEG MARIJAN Izv.prof.dr.sc. MATIĆ TOMISLAV (st.)
SAE201	Fundamentals of Electrical Engineering II	45	45	8	Dr.sc. ĆORLUKA VENCO
S206-17	Business communication	15	15	3	Izv.prof.dr.sc. GLAVAŠ JERKO *
S205	Physical Education II	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

3. semester

Code	Course	L workload	E workload	ECTS	Teacher
SARIE301	Computer System Architecture	45	30	6.5	Doc.dr.sc. KESER TOMISLAV
SAR301	Digital Electronics	45	30	6	Doc.dr.sc. KESER TOMISLAV
S302-16	Mathematical Statistics	30	15	5	HREHOROVIĆ IVAN
SAIE301-17	Basics of Automatic Regulation	30	30	6.5	Prof.dr.sc. CUPEC ROBERT
SEIA301-17	Fundamentals of Power Engineering - elective	30	30	6	KRAUS ZORISLAV
S301	Physical Education III	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO
SI301	Discrete Mathematics - elective	30	30	5	Doc.dr.sc. RUDEC TOMISLAV

4. semester

Code	Course	L workload	E workload	ECTS	Teacher
SA401-15	Electrical Machines and Electric Drives	45	30	6	Dr. sc. ŠPOLJARIĆ ŽELJKO Dr. sc. MIKLOŠEVIĆ KREŠIMIR
SIAE402-17	Electronic Measurements and Instrumentation - elective	45	15	5	Mr.sc. DORIĆ DRAŽEN
SEIA401-15	Power Electronics - elective	45	30	6	Izv.prof.dr.sc. PELIN DENIS
SAR401-17	Information Systems and Computer Networks	45	30	7	Prof.dr.sc. ŽAGAR DRAGO Doc.dr.sc. GRGIĆ KREŠIMIR
SAE401	Materials and Production Processes	30	15	5	Prof.dr.sc. MRČELA TOMISLAV
SAE402-15	Measurements in Electrical Engineering	45	45	7	Mr.sc. DORIĆ DRAŽEN
SI401-17	Service Learning Projects - elective	15	45	5	Doc.dr.sc. ALEKSI IVAN Dr.sc. MIOKOVIĆ ŽELJKA
SIAE401-17	Recycling of Electrical Waste - elective	30	30	5	Prof.dr.sc. MRČELA TOMISLAV

5. semester

Code	Course	L workload	E workload	ECTS	Teacher
SA501	Automatic Control	45	30	7	Prof.dr.sc. SLIŠKOVIĆ DRAŽEN
SA502-16	Microcomputers in Automation	45	30	7	Doc.dr.sc. KESER TOMISLAV
S501-16	Business communication	15	15	3	Izv.prof.dr.sc. GLAVAŠ JERKO *
SAR503-17	Software Engineering	30	30	4	Izv. prof. dr. sc. GALIĆ IRENA
S502-17	Practical Training	0	200	9	Doc.dr.sc. MANDRIĆ-RADIVOJEVIĆ VANJA Mr.sc. DORIĆ DRAŽEN
S503-17	Introduction to Economics and Management	30	15	3	Izv.prof.dr.sc. CRNJAC-MILIĆ DOMINIKA

6. semester

Code	Course	L workload	E workload	ECTS	Teacher
SAIR601-17	Industrial Informatics	30	45	5.5	Prof.dr.sc. SLIŠKOVIĆ DRAŽEN
SIAE601-15	Small Electrical Machines For Special Appliance - elective	30	30	5	Dr. sc. MIKLOŠEVIĆ KREŠIMIR Dr. sc. ŠPOLJARIĆ ŽELJKO
SF601	German - facultative	30	30	4	FERČEC IVANKA
SA601-15	Process Measurements, Sensors and Actuators	45	30	5.5	Mr.sc. DORIĆ DRAŽEN
SA602-17	FPGA Programming	30	30	5	Doc.dr.sc. MATIĆ TOMISLAV (ml.)
SI601-17	Service Learning Projects - elective	15	45	5	Dr.sc. MIOKOVIĆ ŽELJKA Doc.dr.sc. ALEKSI IVAN
SIA601	Introduction to Robotics and Intelligent Control - elective	30	30	5	Prof.dr.sc. CUPEC ROBERT
SD601-17	Final Paper	0	0	10	

branch: Power Engineering

1. semester

Code	Course	L workload	E workload	ECTS	Teacher
S105-ENG	English I	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
S103	Physics	30	45	5	Dr.sc. MIOKOVIĆ ŽELJKA
S104	Engineering Graphics	15	30	4	Prof.dr.sc. MRČELA TOMISLAV
SAE107-17	Calculus I	45	30	6	HREHOROVIĆ IVAN
S105-NJEM	German I	15	15	2	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
SAE101	Fundamentals of Electrical Engineering I	45	45	7	Dr. sc. MIKLOŠEVIĆ KREŠIMIR
SAE102	Programming	30	30	5	Doc.dr.sc. KÖHLER MIRKO
S106	Physical Education I	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

2. semester

Code	Course	L workload	E workload	ECTS	Teacher
S204-ENG	English II	15	15	3	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
SAE206-17	Calculus II	45	30	7	HREHOROVIĆ IVAN
S204-NJEM	German II	15	15	3	FERČEC IVANKA LIERMANN-ZELJAK YVONNE
S203	Fundamentals of Electronics	45	45	8	Izv. prof. dr. sc. HERCEG MARIJAN Izv.prof.dr.sc. MATIĆ TOMISLAV (st.)

SAE201	Fundamentals of Electrical Engineering II	45	45	8	Dr.sc. ĆORLUKA VENCO
S206-17	Business communication	15	15	3	Izv.prof.dr.sc. GLAVAŠ JERKO *
S205	Physical Education II	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO

3. semester

Code	Course	L workload	E workload	ECTS	Teacher
SARIE301	Computer System Architecture - elective	45	30	6.5	Doc.dr.sc. KESER TOMISLAV
SE302	Electrical Installation and Lightning	30	30	6.5	KRAUS ZORISLAV
S302-16	Mathematical Statistics	30	15	5	HREHOROVIĆ IVAN
SAIE301-17	Basics of Automatic Regulation - elective	30	30	6.5	Prof.dr.sc. CUPEC ROBERT
SE301	Fundamentals of Electrical Machines	30	30	6.5	Dr. sc. ŠPOLJARIĆ ŽELJKO
SEIA301-17	Fundamentals of Power Engineering	30	30	6	KRAUS ZORISLAV
SIE301	Power Circuit Switching Devices - elective	30	30	5	Prof.dr.sc. BAUS ZORAN
S301	Physical Education III	0	30	1	Mr.sc. ŠIRIĆ ŽELJKO
SI301	Discrete Mathematics - elective	30	30	5	Doc.dr.sc. RUDEC TOMISLAV

4. semester

Code	Course	L workload	E workload	ECTS	Teacher
SIAE402-17	Electronic Measurements and Instrumentation - elective	45	15	5	Mr.sc. DORIĆ DRAŽEN
SEIA401-15	Power Electronics	45	30	6	Izv.prof.dr.sc. PELIN DENIS
SAE401	Materials and Production Processes	30	15	5	Prof.dr.sc. MRČELA TOMISLAV
SAE402-15	Measurements in Electrical Engineering	45	45	7	Mr.sc. DORIĆ DRAŽEN
SIE403-17	Software Tools in Power Engineering - elective	30	30	5	KRAUS ZORISLAV
SI401-17	Service Learning Projects - elective	15	45	5	Doc.dr.sc. ALEKSI IVAN Dr.sc. MIOKOVIĆ ŽELJKA
SIAE401-17	Recycling of Electrical Waste - elective	30	30	5	Prof.dr.sc. MRČELA TOMISLAV
SE401-15	Transformers and Electrical Rotating Machines	45	45	7	Dr. sc. ŠPOLJARIĆ ŽELJKO

5. semester

Code	Course	L workload	E workload	ECTS	Teacher
SE503-17	Power Plants and Power System	45	30	6	Doc.dr.sc. TOPIĆ DANIJEL

SE501	Electric Power Substations	30	45	6.5	Prof.dr.sc. BAUS ZORAN
SE502	Power Networks and Lines	30	30	5.5	Izv. prof. dr. sc. MARIĆ PREDRAG
S501-16	Business communication	15	15	3	Izv.prof.dr.sc. GLAVAŠ JERKO *
S502-17	Practical Training	0	200	9	Doc.dr.sc. MANDRIĆ-RADIVOJEVIĆ VANJA Mr.sc. DORIĆ DRAŽEN
S503-17	Introduction to Economics and Management	30	15	3	Izv.prof.dr.sc. CRNJAC-MILIĆ DOMINIKA

6. semester

Code	Course	L workload	E workload	ECTS	Teacher
SE601	Electric Drives	45	30	5.5	Dr. sc. MIKLOŠEVIĆ KREŠIMIR Dr. sc. ŠPOLJARIĆ ŽELJKO
SIAE601-15	Small Electrical Machines For Special Appliance - elective	30	30	5	Dr. sc. MIKLOŠEVIĆ KREŠIMIR Dr. sc. ŠPOLJARIĆ ŽELJKO
SF601	German - facultative	30	30	4	FERČEC IVANKA
SE604-17	Transmission and Distribution of Electrical Energy	30	30	5	Izv. prof. dr. sc. MARIĆ PREDRAG
SI601-17	Service Learning Projects - elective	15	45	5	Dr.sc. MIOKOVIĆ ŽELJKA Doc.dr.sc. ALEKSI IVAN
SIE603-15	Conduction of Energy Audit - elective	30	30	5	Doc.dr.sc. GLAVAŠ HRVOJE
SE603-17	Renewable Energy Technologies	30	30	4.5	Doc.dr.sc. TOPIĆ DANIJEL
SD601-17	Final Paper	0	0	10	
SIE601	Power System Protection - elective	45	15	5	Prof.dr.sc. NIKOLOVSKI SRETE

3.2. Application-oriented study programme in Electrical Engineering - Courses description

General information		
Lecturer	**Doc.dr.sc. BAUMGARTNER ALFONZO**	
Course name	SR404-17 Algorithms and data structures	
Study program	Professional study programme, branch: Informatics (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	
Explain the basic types of data structures to students; Introduce students to typical computer problems and algorithms that use specified data structures as efficient solutions to these problems; Show students how to measure algorithm complexity and what it depends on; in the exercises, students learn to implement many known algorithms using efficient data structures.	
1.2. Conditions for enrollment	
The necessary requirements to enrol in the second year of the studies.	
1.3. Learning outcomes	
1.describe basic concepts related to algorithms and data structures 2.identify a suitable algorithm for a specific problem 3.select a suitable data structure for the purpose of building a software solution 4.perform complexity analysis of simpler algorithms 5.implement and use different algorithms and data structures 6.enable the use of known algorithms in combination with built-in data structures 7.apply the acquired knowledge in shaping software support that implies data management	
1.4. Course content	
Introduction. From elementary data types to abstract data structures. The term algorithm. Algorithm complexity. Complexity analysis. “Big-O” notation. Linear data structures: arrays, linked lists, stacks, queues. Recursion. Sorting and searching algorithms and their implementation. Nonlinear data structures: multiple linked lists, trees. Binary trees and their special cases like binary search trees, Huffman trees and heaps.	
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	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	7	10
Practice – problem solving	2	2,3,4,5,6,7	Midterm exam	Evaluation of (written) exercises	20	40
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	10	20
Oral exam	1	1,2,3,4	Oral exam	Assessment of student's answers	15	30

1.10. Obligatory literature

1. Strukture podataka i algoritmi; R. Manger; Element; 2014; ISBN: 978-953-197-596-4
2. Cormen, Thomas H.; Leiserson, Charles E.; Rivest, Ronald L.; Stein, Clifford (2009) [1990]. Introduction to Algorithms (3rd ed.). MIT Press and McGraw-Hill. ISBN 0-262-03384-4.

1.11. Recommended additional literature

1. Algorithms in C: Fundamentals, Data Structures, Sorting, Searching and Graph Algorithms in C; R. Sedgewick; Addison Wesley; 2001; ISBN: 978-020-131-452-6
2. Data Structures and Algorithms in C++; Adam Drozdek; Course Technology; 2000; ISBN: 978-053-449-182-6
3. D. E. Knuth, The Art of Computer Programming, Vol. 1., Fundamental Algorithms, Addison-Wesley, Reading, MA, 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. BAUMGARTNER ALFONZO**	
Course name	SIR401-17 Graph Algorithms	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
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

Students will be introduced to the definition of a graph as a data structure, its efficient representation in the computer, and various special types of graphs. Through well-known problems with graphs and algorithms for their solution, students will become familiar, at the conceptual level, with and also practically implement some of the algorithms and thus learn how to use a graph data structure to model the actual physical problems.

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

1.3. Learning outcomes

1.describe a graph data structure and some known graph problems and graph algorithms
2.identify the graph structure in modelling many known problems and use it to solve these problems
3.perform complexity analysis for known graph algorithms
4.implement and use different algorithms for problems such as the shortest path, an Euler cycle, and the like
5.apply the acquired knowledge in designing software support where it is necesary to use graphs

1.4. Course content

Introduction and basic terms. A mathematical definition of the graph and examples. Types of graphs. An efficient way to store graphs in the computer. Rarely filled graphs. The problem of graph traversal. BFS and DFS algorithms. The problem of node connectivity in a graph. An algorithm for finding strongly connected components in a graph. The problem of the Euler cycle. The smallest spanning tree problem. The shortest path problem. The Bellman-Ford and the Dijkstra algorithm. NP-complex graph problems. The graph colouring problem. The travelling salesman problem. Network definition. The maximum flow problem in the network.

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	2	1,2,3,4,5	Lectures, Auditory	Attendance register.	7	10

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

1.10. Obligatory literature

1. Cormen, Thomas H.; Leiserson, Charles E.; Rivest, Ronald L.; Stein, Clifford (2009) [1990]. Introduction to Algorithms (3rd ed.). MIT Press and McGraw-Hill. ISBN 0-262-03384-4.

1.11. Recommended additional literature

1. R. Sedgewick, Algorithms in C++ Part 5: Graph Algorithms (3rd Edition), Addison-Wesley Professional, 2002.
2. Shimon Even, Graph Algorithms, Cambridge University Press, 2011, ISBN: 1139504150, 9781139504157

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. KESER TOMISLAV**	
Course name	SARIE301 Computer System Architecture	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (elective) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6.5
	Workload (L+(AE+LE+CE)+S)	45+(15+15+0)+0

1. Course description

1.1. Goals

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1.2. Conditions for enrollment

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1.3. Learning outcomes

1.define basic terms regarding computer architecture and computer structure
2.analyse the architecture and structural elements of a digital computer
3.define project requirements of a computer system according to demands for data processing
4.evaluate structures and relations of functional computer parts
5.explain the concepts of programmes, methods of data processing and concepts of computer processing acceleration

1.4. Course content

Microprocessor and microcomputer. Personal computer. Intel microprocessor architecture. System busses (AT/ISA, SCSI, PCI, etc.). Functional parts of a computer. Data formats. Microcomputer operation. Instruction set. Addressing modes. Instruction execution time. Memory devices. Semiconductor memories. External storage: magnetic and optic media. Memory management. Input-output functional units. Parallel input/output interface (PIO, Centronics). Direct memory access (DMA). Timing circuits and devices (CTC). Serial interface (UART, SIO). Serial busses and protocols (RS-232, RS-485, USB, IEEE-1394,IIC, etc.). MODEM. Basic input/output methods: cyclic and event driven. Interrupt system. Software development and tools. Operating system. File system. Supervision and diagnostic circuits. Microcontrollers. Local network. Internet. Modern microprocessor and computer architecture (RISC, CISC). Pipelines. Modern microprocessor examples. Multiprocessor 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	Teaching method	Assessment method	Points

		outcomes			Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1.5	1,2,4	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	10
Practice – problem solving	1.5	2,3,4	Midterm exam	Evaluation of (written) exercises	18	35
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.3	2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	25
Oral exam	1.7	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30

1.10. Obligatory literature

1. Ribarić, S. Građa računala - arhitektura i organizacija računarskih sustava. Zagreb: Algebra, 2011.ISBN: 978-953-322-074-1
2. Aharon Yadin. Computer Systems Architecture, CRC Press Taylor & Francis Group, 2016, ISBN 9781482231052

1.11. Recommended additional literature

1. R.Williams, Computer Systems Architecture, Addison Wesley, 2001
2. S. Ribarić: Arhitektura računala, Školska knjiga, Zagreb, 1990
3. B.B. Brey, The Intel Microprocessors 8086-8088, 80186-80188, 80286, 80386, 80486, Pentium Pro Processor and Pentium II, Architecture, Programming and Interfacing, Prentice Hall, 2000.
4. J.D.Carpinelli, Computer Systems Organization & Architecture, Addison Wesley, 2001.
5. Ž. Hocenski, Arhitektura računala, ETF Osijek, 2005.
6. 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	**Prof.dr.sc. SLIŠKOVIĆ DRAŽEN**	
Course name	SA501 Automatic Control	
Study program	Professional study programme, branch: Automation (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	
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1.2. Conditions for enrollment	
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1.3. Learning outcomes	
1.explain the necessity to limit the controller output value, and describe the limitation procedure 2.explain the properties of pre-control and describe the control system based on controlling and pre-controlling 3.explain composite procedures, controlling problems, structure and function of composite controllers 4.explain the problems related to control of processes with dead time 5.analyse the behaviour of complex controlling systems using Matlab 6.describe the design of a digital controller and additional functions for improving the behaviour of digital control systems 7.explain control system sensitivity, the principle of adaptive control system operation and main methods for its implementation	
1.4. Course content	
Controller design in time domain. Analytical controller design methods. Standard types of control loop characteristic equation. Closed loop zeroes and prefilter design. Fixed set-point control and servo control. Control loop behaviour with respect to reference variable and disturbance. Improvement of dynamic properties of control system by introducing feedforward and cascade control. Control of multivariable systems. Coupled processes and their decoupling. Practical examples. Controller implementation and antiwindup. Basic properties and structure of discrete control systems. Digital controller. Parameter-optimal digital control algorithms. Sampling time selection. Control of processes with dead time. Basics of process identification. Introduction to sensitivity theory. Introduction to adaptive control systems. Model reference adaptive control and self-tuning controllers. Practical examples of adaptive control application.	
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	1.2	2,3,4,5	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.5	2,3,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	24
Oral exam	1.3	1,2,3,4,6,7	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Perić, N.: Automatsko upravljanje - predavanja, Zavodska skripta, FER, Zagreb, 2004.
2. Perić, N.: Automatizacija postrojenja i procesa - predavanja, Zavodska skripta, FER, Zagreb, 2000.

1.11. Recommended additional literature

1. Franklin, G.F., J.D. Powell, A.E. Naeini: Feedback Control of Dynamic Systems, Addison - Wesley Publishing Company, 1994.
2. D'Azzo, J.J., C.H. Houpis, Linear Control System - Analysis and Design - Conventional and Modern, McGraw-Hill, Inc.,
3. Åström, K.J., B. Wittemark, Adaptive Control, Addison-Wesley Publishing Company, 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. LUKIĆ IVICA**	
Course name	SR402-15 Data Bases	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	30+(15+30+0)+0

1. Course description

1.1. Goals

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1.2. Conditions for enrollment

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1.3. Learning outcomes

1.analyse, describe and define entity relationship diagram
2.convert an ER diagram into a relational model
3.evaluate and apply the normalisation procedure to the relations, compare and distinguish between the basic relational algebra operations
4.create complex relations using SQL
5.create a database, forms for data entry and writing queries and views, and evaluate final database release
6.connect to the database, make queries in the appropriate programming language and evaluate usage of different programming languages

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	2	1,2,3,4	Lectures, Auditory	Attendance register.	4	8

Lectures, Auditory exercises, Laboratory exercises			exercises, Laboratory exercises	Mandatory attendance percentage is: 70%.		
Practice – problem solving	1.5	1,2,3,4,5	Midterm exam	Evaluation of (written) exercises	16	32
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	3,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	20
Oral exam	2.5	1,2,3,4,5,6	Oral exam	Assessment of student's answers	20	40

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	**Doc.dr.sc. KESER TOMISLAV**	
Course name	SAR301 Digital Electronics	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	45+(0+30+0)+0

1. Course description

1.1. Goals

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1.2. Conditions for enrollment

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1.3. Learning outcomes

1.define and apply a basic facts and laws of Boolean algebra and binary arithmetics
2.distinguish and compare technical and technological features of digital circuit functionality
3.evaluate and explain the structural and functional architecture of basic digital logic circuits
4.understand the basics of information coding

1.4. Course content

Digital circuit and system features. Development survey. Number systems and conversions. Digital arithmetic. Logic functions. Logic function simplification. Logic symbols and standards. Logic functions realisation. NAND and NOR logic. Integrated logic circuits. Modern logic circuit technologies and characteristics. Combination circuits. Integrated logic circuit examples. Sequential circuits. Asynchronous and synchronous flip-flops. Counters and dividers. Register types. Memories. Semiconductor memories: bipolar and MOS. Static and dynamic RAM memories. Magnetic media. Optical media. Programmable logic circuits: features, programming and applications. Visual displays. A/D and D/A conversion. Microprocessors and microcontrollers. Digital circuit and system software design tools. Development and testing of digital circuits and equipment. Digital circuit reliability. Digital electronic diagnostics.

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	1.7	1,2,3,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	10

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	0	25
Oral exam	2.3	1,2,3,4,5	Oral exam	Assessment of student's answers	18	35
Lectures	0.7	1,2,4	Lectures	Oral exam	0	30

1.10. Obligatory literature

1. Hocenski, Ž. Digitalna elektronika. Osijek: ETF, 2005.
2. Floyd, Thomas L. Digital Fundamentals. Pearson, 2011, ISBN 9788131734483
3. U.Peruško, Digitalna elektronika, Školska knjiga, Zagreb, 1991.

1.11. Recommended additional literature

1. Ž. Hocenski, G.Martinović, M.Antunović, Digitalna elektronika- Priručnik za laboratorijske vježbe, ETF Osijek, 2003.
2. D.C.Green, Digital electronics, Addison Wesley Longman, 1999.
3. R.L.Tokheim, Digital Principles, McGraw-Hill, 1988.
4. Ž. Hocenski, Digitalna elektronika, 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. MANDRIĆ-RADIVOJEVIĆ VANJA**	
Course name	SR502-17 Digital Communications	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7.5
	Workload (L+(AE+LE+CE)+S)	45+(30+15+0)+0

1. Course description	
1.1. Goals	
Present analogue and digital signals in time and frequency domain, as well as discretisation of the analogue signal and AD converters. Introduce students to digital signal formats and parameters, spectral characteristics, noise sensitivity, error detection capability, and digital signal synchronisation. Introduce students to discrete modulation, pulse modulation and digital modulation procedures. Introduce students to the principles and procedures of source coding and channel encoding. Elaborate and explain the transmission of digital signals in the basic and transposed range and operation of time (TDMA), frequency (FDMA) and coding (CDMA) multiplex systems. Explain source encoding, channel and block coding procedures. Introduce students to the basic types of communication channels and their parameters, filters and methods of filtering digital signals as well as noise in digital communication systems.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the third year of the study programme	
1.3. Learning outcomes	
1.define the basic concepts that appear in digital communication systems 2.analyse the spectral composition of digital signals as well as their synthesis using knowledge of the spectral composition 3.calculate the probability of a bit error when transmitting digital signals of different formats in the basic range and describe and distinguish different digital signal formats 4.apply three Nyquist criteria to prevent intersymbol interference in basic digital signal transfer systems 5.define basic procedures and principles of discrete modulation and pulse modulation. Define and describe M-ary discrete modulation of the sinusoidal signal, impulse modulation and digital modulation (PCM and DM) methods 6.define and describe time, frequency, and code multiplex systems. explain and describe source encoding and channel encoding	
1.4. Course content	
Analysis of deterministic and random signals in time and frequency domains. Continuous signal discretisation. Formats and basic digital signal parameters. Spectral characteristics, noise sensitivity, error detection capability and digital signal synchronisation. M-ary signal. Basic principles of digital modulation procedures. Introduction to digital communication systems. Discrete modulation methods (ASK and MASK modulation, FSK, CPFSK MFSK modulation, PSK, MSK and MPSK modulation). Complex modulation schemes. Impulse modulation procedures (pulse amplitude (PAM), pulse width (PDM), pulse positioning (PPM) and pulse frequency (PFM) modulation). Digital modulation procedures (pulse-coded modulation (PCM) and delta modulation (DM)). Modulation of orthogonal signals (Walsh signals, wavelet signals). Transmission of digital signals in the basic bandwidth. Interference between symbols. Shading noise in the basic range. Transmission of digital signals in the transposed range. Spectral effectiveness and chance of error (BER) of digital communication systems. Signal / noise ratio (S/N), channel bandwidth and speed in digital communication systems. Impulse modulation of single - harmonic signal. Time multiplexing systems -TDMA and frequency multiplexer systems - FDMA. Source encoding. Channel encoding. Block encoding. Complex encoding schemes. Basic types of communication channels. Reconstruction of the carrier. Reconstruction in time domain: phase, clock, and signal edge detection. Filters and digital signal filtering procedures. Noise in digital communication systems. Detection of signal when noise is present.	
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	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	5	10
Practice – problem solving	2	2,3,4	Midterm exam	Evaluation of (written) exercises	16	32
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.4	1,2,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	26
Oral exam	2	1,2,3,4,5,6	Oral exam	Assessment of student's answers	16	32

1.10. Obligatory literature

1. Ž. Novinc, Digitalni prijenos informacija. Zagreb: Kigen, 2009.
2. Gallager, Principles of Digital Communication. Cambridge Univesity Press, 2008.

1.11. Recommended additional literature

1. G. Lukatela, Digitalne telekomunikacije, Građevinska knjiga, Beograd, 1988.
2. B. Modlic: Visokofrekvencijska elektronika - Modulacija, modulatori, sintezatori frekvencije, Školska knjiga, Zagreb 1982.
3. J. G. Proakis, Digital Communications, 4th ed., McGraw Hill, N.Y., 2000.

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. LIVADA ČASLAV**	
Course name	SIR601-17 User Interface Design	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	3	
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

Introduce students to basic procedures of designing a user interface; Show to students design standards needed for visual formatting of applications; Explain to students the importance of respecting user needs for better information organisation and better user experience; Stress a planned approach of user interface design aiming at easier interaction between people and computers; Introduce students to accompanying tools used to create visual elements of a website or application.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.plan how to create a user interface from the idea to the final layout of the user interface
2.define user interface design requirements with respect to specific user needs
3.design a graphical user interface for one's own application or website
4.master the accompanying tools for creating visual elements
5.perform analysis and evaluate user experience for a specific user interface

1.4. Course content

Planning the layout of the user interface. User interface design tools. Supporting tools for creating visual elements and computer image processing. User interface design and development methods. User experience analysis and evaluation.

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	1.5	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	5	10
Writing pre-lab write-ups, results analysis and writing laboratory	1	1,2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises,	15	30

reports				evaluation of written reports		
Oral exam	1.5	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Solving tasks in laboratory exercises	1	1,2,3,4	Laboratory exercises	Evaluation of exercises	15	30

1.10. Obligatory literature

1. E. N. McKay - UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication, Morgan Kaufman, 2013.
2. J. Tidwell – Designing Interfaces: Patterns for Effective Interaction Design, O'Reilly Media, 2011.

1.11. Recommended additional literature

1. J. Anderson, J. McRee, R. Wilson, and T. E. Team, Effective UI: The Art of Building Great User Experience in Software, O'Reilly Media, 2010.
2. S. Krug, Don't Make Me Think: A Common Sense Approach to Web Usability, Pearson, 2013.

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	SIR402-17 Object-Oriented Software Design	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
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

The goal of this course is to enable students to employ advanced, language independent, object-oriented programming concepts in software development. This primarily concerns the S.O.L.I.D. principles and the design patterns that enable the fulfilment of the former. The utilised languages are Java and/or C#.

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

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 various frequently used design patterns and explain the problems they solve
4.identify an appropriate design pattern in code or when presented with a specific problem
5.apply the design patterns while developing software
6.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.). Clean code. Code smells. 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. Object-relational mapping.

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	1.8	1,2,3,4,5,6	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Writing pre-lab write-ups,	0.7	2,3,4,5	Laboratory practice	Assessment of pre-lab	0	15

results analysis and writing laboratory reports				write-ups, supervision of laboratory exercises, evaluation of written reports		
Oral exam	1	1,2,3,4,5	Oral exam	Assessment of student's answers	20	40
Problem solving	1	2,4,5,6	Revision exams (written exam)	Evaluation of exercises	15	30
Homeworks/Seminars	0.5	1,2,3,4,5,6	Solving homework or writing a seminar paper	Checking solutions	7	15

1.10. Obligatory literature

1. Head first design patterns, Freeman E. et al., O'Reilly Media, 2004, 0596007124
2. Clean code: A Handbook of Agile Software Craftsmanship, Robert C. Martin, Prentice Hall, 2008, 0132350882

1.11. Recommended additional literature

1. Refactoring, Martin Fowler, Addison-Wesley, 2001, 0201485672
2. Agile Software Development: Principles, Patterns, and Practices; Robert C. Martin, Prentice Hall, 2002, 0135974445
3. Design Patterns: Elements of Reusable Object-Oriented Software, Gamma E. et al., Addison-Wesley Professional, 1994, 0201633612

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. TOPIĆ DANIJEL**	
Course name	SE503-17 Power Plants and Power System	
Study program	Professional study programme, branch: Power Engineering (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

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.categorise basic characteristics and types of power plants
2.evaluate technical characteristics of conventional and non-conventional power plants
3.categorise short circuit currents in the power system
4.compare and estimate basic characteristics (i.e. power, energy, efficiency and capacity factor) of different types of power plants
5.simulate power flows and short circuits in a power system and distinguish the main parts of power plants

1.4. Course content

Basic features of power plants. Hydro power plants. Thermal power plants. Nuclear power plants. Alternative energy sources. Electrical schemes of power plants. Voltage stability of power network. Voltage control. Short circuit in the power network. Physical basics of short circuits. Treatment of the power network neutral. Short circuit current calculations. Short circuit current reduction. Line to ground failure. Protection, localisation and elimination of line to ground failure. Power transmission stability. Static stability. Transient stability. Basic physical rules of the power system operation. Power plant active power and voltage control by operating on the own network. Power plant active power and frequency control by parallel operation with the system.

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	2.5	1,2,3	Lectures, Auditory	Attendance register.	0	10

Lectures, Auditory exercises, Laboratory exercises			exercises, Laboratory exercises	Mandatory attendance percentage is: 70%.		
Practice – problem solving	0.8	3,4	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.5	3,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	10
Oral exam	1.7	1,2,3	Oral exam	Assessment of student's answers	25	50

1.10. Obligatory literature

1. M. i K. Ožegović, Električne energetske mreže IV, FESB Split, 1999
2. L. Jozsa: Osnove regulacije u elektroenergetskom sistemu, skripta, Elektrotehnički fakultet Osijek, 1994
3. Nag, P.K. Power Plant Engineering, 4th edition. McGraph Hill Education, 2014.

1.11. Recommended additional literature

1. S. Nikolovski, Elektroenergetske mreže – zbirka riješenih zadataka, ETF Osijek, 1998.
2. Elgred, D. Electric Energy Systems Theory, Mc-Graw Hill, N.Y. 1983.
3. H. Požar, Visokonaponska rasklopna postrojenja, Tehnička knjiga Zagreb, 1990.
4. B. Stefanini, Prijenos električne energije II dio - mreže, Skripta FER Zagreb, 1971
5. L. Jozsa: Kratki spoj - dijelovi predavanja, interna skripta, ETF Osijek, 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	**KRAUS ZORISLAV**	
Course name	SE302 Electrical Installation and Lightning	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6.5
	Workload (L+(AE+LE+CE)+S)	30+(15+0+15)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.compare grounding systems in low-voltage installations, explain types of protection against direct and indirect voltage contact in low-voltage installations, explain elements and the system of operation in advanced 2.explain the basic lighting-related measures, compare light sources with respect to technology, interpret interior and exterior lighting characteristics as well as control and monitoring systems 3.calculate voltage drop and select cross-section of connection lines. Calculate indirect contact protection 4.examine the safety of low voltage installation, design a lighting project for a classroom, sports hall and an intersection	
1.4. Course content	
Electrical energy demands. Consumption devices. Basic components in low current electrical lines, installation and equipment. Load flow calculation in radial lines and equipment: normal operation and a short circuit. Short circuit, overload and overvoltage protection. Grounding. Danger voltage existing on device housing or other metal surfaces, differential current switch protection. Reactive power compensation. Electric lines, installation and equipment in houses, industrial and special buildings. Electric lines, installation and equipment in special industrial objects. Light measurements and space light distribution and units. Lamps, light sources, stabilisations and pre-connection gadgets for light sources. Designing and calculating indoor lighting, illumination measures and calculation, colour and spectrum diffusion, mixing and reproduction of colours, lighting calculation for spot and line light sources. Outdoor lighting, public lighting, application of isocandela diagram rules, composition of A, B and C planes for light space distribution, average merit, uniformity and strength of area illumination. Lamps, light armatures and towers for outdoor lighting, entrance or reflector lighting, reflectors. Ultraviolet radiation, calculation and usage of ultraviolet radiation and lighting economics.	
1.5. Teaching methods	Lecture Auditory 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, Design exercises	2	1,2,3,4	Lectures, Auditory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	10
Practice – problem solving	1.5	3	Midterm exam	Evaluation of (written) exercises	15	30
Oral exam	2.5	1,2,3	Oral exam	Assessment of student's answers	20	40
Problem-solving related to design exercises	0.5	4	Design exercises	Evaluation of problem solving exercises	10	20

1.10. Obligatory literature

1. N. Srb, Električne instalacije i niskonaponske mreže (Electrical Installations and low voltage power networks), Tehnicka knjiga Zagreb 1982.

1.11. Recommended additional literature

1. Eduard Sirola, Cestovna rasvjeta, Grafika Hrasce, 1997. (Road Lighting)
2. Eduard Sirola, Javna rasvjeta, preporuke, Tehnicka knjiga Zagreb, 1979. (Public Lighting), symposium papers
3. Koncar;, Tehnički priručnik, V izdanje, Zagreb 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	**Dr. sc. ŠPOLJARIĆ ŽELJKO, Dr. sc. MIKLOŠEVIĆ KREŠIMIR**	
Course name	SA401-15 Electrical Machines and Electric Drives	
Study program	Professional study programme, branch: Automation (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	
Present the basic laws and phenomena the operation of electrical motors is based upon. Understand the construction, mode and principle of electrical machines. Display the electromechanical drive control and regulation techniques. Introduce students to basic concepts related to the conversion of mechanical energy into electrical and vice versa. Explain the mode and types of electrical machines. Introduce students with the basics of block presentation. Explain the analysis of the electromechanical drive. Understand basic numerical calculations with DC, asynchronous and synchronous machines. Demonstrate the connection of control and measuring devices when testing electrical machines. Enable students to measure electrical and mechanical value.	
1.2. Conditions for enrollment	
The necessary requirements to enrol in the second year of the studies.	
1.3. Learning outcomes	
1.describe the construction and operation principle of asynchronous, synchronous and DC machines 2.propose the operating state of the selected electrical machine that meets the specified operating mode of the electric drive 3.recommend power and control characteristics of electronic power inverters that meet certain drive 4.recommend the control mode for the selected application of an electrical machine 5.calculate and interpret selected numerical examples in the field of electrical machines and drive 6.interpret the collected measurement data and results on electrical machines and drives in unloaded and voltage conditions 7.organise prescribed basic measurements of electrical, mechanical and thermal data on an electrical machine	
1.4. Course content	
Fundamentals of mechanical energy conversion into electrical energy and vice versa. Magnetic circuit of electric machines. Machine models for DC voltages and DC current. Machine models for AC voltages and AC current. Magnetomotive force of alternating current and polyphase excitation. Rotating magnetic field. Developed torque and induced voltage. Synchronous machine. Basic properties and types. Physical processes and equivalent circuit. Output curve of a synchronous motor. Induction machine. Basic properties and types. Physical processes. Equivalent circuit and speed-torque curve. Single-phase induction motor. DC machine. Basic properties. Physical processes. Types and characteristics. Small electric machines. Designs, parameters and usage. Electric drive. Basic principles, structure and system. Drive states, characteristics of operating machines and motors, static stability. Electromechanics of drives. Static characteristics, motor operation, separately and shunt-connected excited DC, synchronous and asynchronous motors. Converters for DC motors. Converters for AC motors. Speed control of AC and DC motors. Regulated electric motor drives. Automation of electric drives. Servo drives. Motor selection. Drive protection. Maintaining electric motor drives. Laboratory exercises: introduction into the work in the electric machines and drives laboratory. Synchronous generator. Basic data, winding terminal markings, winding resistance. No-load test. Short-circuit test. Induction motor. Basic data, winding terminal markings, winding resistance. No-load test. Short-circuit test. DC machine. Basic data, winding terminal markings, winding resistance. Output curves of separately-excited DC generator and motor.	
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	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	7
Practice – problem solving	1.5	5	Midterm exam	Evaluation of (written) exercises	14	28
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	10	21
Oral exam	1.5	1,2,3,4,5,6,7	Oral exam	Assessment of student's answers	15	30
Writing seminar papers	0.5	1,2,3,4,5,6,7	Working of seminar papers from electrical machines and drives	Oral presentation of seminar papers	7	14

1.10. Obligatory literature

1. Mandić, I; Komljenović, V; . Pužar, M. Sinkroni i asinkroni električni strojevi. Zagreb: Tehničko veleučilište u Zagrebu, ISNB: 975-953-7048-26-6, 2012.
2. Krause, Paul C; Wasynczuk, Oleg; Sudhoff, Scott D. Analysis of Electric Machinery and Drive Systems. Wiley-IEEE Press, 2013., ISBN 978-1-118-02429-4
3. R. Wolf: Osnove električnih strojeva, Školska knjiga, Zagreb, 1985.
4. B. Jurković, Elektromotorni pogoni, Školska knjiga, Zagreb, 1990.

1.11. Recommended additional literature

1. L. M. Piotrovskij, Električni strojevi, Tehnička knjiga, Zagreb 1970.
2. N. Marinović, Elektromotorna postrojenja, Školska knjiga, Zagreb, 1986.
3. N. Mohan,T. Undeland, W. Robins, Power Electronics: Converters, Applications and Design, Wiley, New York, 2008.
4. M.E. El-Hawary , Principles of Electric Machines with Power Electronic Applications, Wiley-Interscience, New York, 2002.
5. D. W. Hart, Introduction to Power Electronics; Prentice Hall, New York,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	**Prof.dr.sc. BAUS ZORAN**	
Course name	SE501 Electric Power Substations	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	6.5
	Workload (L+(AE+LE+CE)+S)	30+(15+0+30)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.understand the classification and basic schemes of power offsets 2.evaluate all elements of the power plant according to their purpose 3.evaluate the calculated currents of the joints in the plant 4.select the elements of a power plant according to current, voltage, thermal loads and the forces acting on the elements of the plant 5.create the grounding system of the plant 6.assess the types of protection in power plants	
1.4. Course content	
Basic concepts related to power switching substations. Substation lifetime, influence on and from the environment, substation classifications. Substation structure: main (primary) and auxiliary (secondary) substation. Basic substation schemes and basic construction materials. Historical development. Strain in substations, voltage and power dimensioning, fault currents. Elements of the main substation. Conductors. Insulators. Power cables. Disconnects. Circuit breakers and switches. High-voltage fuses. Overvoltage protection. Voltage and current transformers. Power transformers. Inductors. Capacitors. Resistors. Low-voltage substations. Grounding system. Auxiliary substation subsystems. Condition, alarm and position signalisation. Measurement. Protection. Device control. Blocking. Control. Local and remote control. Telecommunications. AC and DC auxiliary voltage supply. Substation design, installation, operation and maintenance. Reliability. Regulations regarding substation installation, operation and maintenance. High-voltage, primary and secondary low voltage substations, auxiliary substations. Installation, operation and maintenance. Safety and health protection at work, first aid, fire-alarm system, environmental protection. Quality assurance. Extensive damage in substation.	
1.5. Teaching methods	Lecture Auditory 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, Design exercises	2.5	1,2,4,6	Lectures, Auditory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.5	3,4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.7	1,2,3,4,5,6	Oral exam	Assessment of student's answers	25	50
Problem-solving related to design exercises	0.8	1,2,3,4,5	Design exercises	Evaluation of problem solving exercises	5	10

1.10. Obligatory literature

1. H.Požar: Visokonaponska rasklopna postrojenja, Tehnička knjiga-Zagreb, 1990.
2. B.Belin: Uvod u teoriju električnih sklopnih aparata, Školska knjiga-Zagreb, 1978

1.11. Recommended additional literature

1. D.Keler, M.Maričević, V.Srb: Elektromonterski priručnik. Tehnička knjiga-Zagreb, 1987
2. M.Kalea: Transformatorske stanice 35/10 kV. Elektroslavonija-Osijek, 1979

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. MARIĆ PREDRAG**	
Course name	SE502 Power Networks and Lines	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5.5
	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.describe types, operation and components of power networks 2.categorise equivalent schemes of power system components and transmission equations 3.evaluate geometric mean distance method calculation of unit inductance and capacitance 4.evaluate calculation of current and voltage conditions on the transmission line using an equivalent PI-scheme and transmission equations 5.make mechanical calculations of an overhead line 6.interpret current and voltage conditions on different power system nodes and branches	
1.4. Course content	
Electrical networks and parts of electrical networks. Purpose and progress of power systems. Types of electrical networks. Overview of power transmission theory. Line characteristic quantities. Transmission equations. Ideal transmission line. Real transmission line. Symmetrical conditions - line constants determination. Resistance. Skin effect. Inductance and capacitance. Mean geometric distances method. Line transposition. Line conductance. Corona. Equivalent schemes of power system elements for symmetrical conditions. Equivalent scheme of lines. Transformer equivalent scheme. Generator equivalent scheme. Load equivalent scheme. Four terminal in power transmission theory. General constants of basic four terminal. Steady state calculation of electrical networks. Numerical quantities of calculation. Absolute values method. Per unit method. Overhead lines. Elements and types of lines. Conductors. Conductor mechanical calculation. Insulators. Accessories. Line towers. Grounding. Overhead line projecting. Overhead lines – operation problems. Cables. Constructive elements of cables. Criteria regarding cable selection. Cable losses, cable warming and cooling. Low and middle voltage cables. High and very high voltage cables. Hyper-conductive and superconductive cables. Cable size selection. Cable burring, assembling and finalising.	
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	1,2	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.7	1,2,3,4,5	Midterm exam	Evaluation of (written) exercises	25	50
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.2	2,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	5
Oral exam	1.6	1,2,6	Oral exam	Assessment of student's answers	23	45

1.10. Obligatory literature

1. Prof.dr.sc. Lajos Jozsa, Nadzemni vodovi, skripta ETF, Osijek, 1995.
2. Weedy, B. M.; Cory; B. J; Jenkins, N; Ekanayake, J. B; Strbac, G. Electric Power Systems ,5 th Edition. Wiley, 2012.
3. M. Ožegović, K. Ožegović, Električne energetske mreže I, FESB, Split, 1996.

1.11. Recommended additional literature

1. V. Srb, Kabelska tehnika, priručnik, Tehnička knjiga, Zagreb, 1970.

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	**Dr. sc. MIKLOŠEVIĆ KREŠIMIR, Dr. sc. ŠPOLJARIĆ ŽELJKO**	
Course name	SE601 Electric Drives	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	3	
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.observe the difference between the basics elements, characteristics and operating conditions of electric motor drives
2.propose operating conditions of the selected electric motor that meet the requirements of an electric motor drive
3.determine the static and dynamic characteristics of DC, asynchronous and synchronous motor
4.recommend energy and control characteristics of an electronic frequency converter for default operating requirements
5.specify which modulation method should be chosen for the selected control principle of the electrical machine
6.propose the optimal working point of an electric motor depending on the required mechanical characteristics of load
7.design and choose the type and power of an electric motor suitable for usage in a given electric motor drive

1.4. Course content

Tasks, structure and types of electric drives. Basic properties and power states. Static stability. Power system mechanics and reduction of mechanical dimensions. Mechanical transients. Static characteristics of working and breaking for DC motors and three-phase asynchronous and synchronous motors. Synchronous motors with permanent excitation. General electromechanical model of an electrical motor. Variable voltage supply for DC motors. Regulated electric drives. Cascade regulation. Energy flow and optimisation of an electric drive. Choice of a motor. Protection and maintenance of drives. Trends of development.

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	2.5	1,3,4,5	Lectures, Auditory	Attendance register.	0	0

Lectures, Auditory exercises, Laboratory exercises			exercises, Laboratory exercises	Mandatory attendance percentage is: 70%.		
Practice – problem solving	1	2,3,6,7	Midterm exam	Evaluation of (written) exercises	18	36
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	4,5,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	24
Oral exam	1	1,3,5	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Jurković, B., Elektromotorni pogoni, Školska knjiga, Zagreb, 1990
2. Srb, N. Elektromotori i elektromotorni pogoni. Zagreb: Graphi, 2007, ISBN 978-953-6647-78-1
3. Boldea, Ion; Nasar, S. A. Electric Drives CRC Pres. Boca raton Florida, 2006. ISBN 978-0-8493-4220-2

1.11. Recommended additional literature

1. Grupa autora, Elektromotorni pogoni, TE/4 JLZ, Zagreb, 1973.
2. Marinović, N., Elektromotorna postrojenja, Šk. knjiga, Zagreb, 1986.
3. Gugić, P., Električni servomotori, Školska knjiga, Zagreb, 1987.

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	**Mr.sc. DORIĆ DRAŽEN**	
Course name	SIAE402-17 Electronic Measurements and Instrumentation	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (elective)	
Course status	Elective	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	45+(0+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.develop a measurement concept and technique for the purpose of conducting accurate and repetitive complex measurements using electronic instrumentation, as well as sensors, signal adjustment circuits, operational amplifiers and digital input output circuits 2.distinguish and evaluate the properties of different electronic instrumentation devices 3.make virtual instruments with specialised hardware and software and include them in a measuring system 4.specify measurement and test instruments that meet the requirements and task budget	
1.4. Course content	
Open and closed loop measurement systems, Static and dynamic properties of the measuring system, Noise and interference in Measurement. Measuring Amplifiers, Transducers, Time Bases, Frequency Bases, Sampling Sets, Analogue-to-Digital Converters, Memory, Dana loggers, Analogue and Digital Indicators, Microprocessors in Measurement Function. Measuring Power Supply with Continuous Frequency Change (Sine Wave Sources, Measurement Oscillators, Function Generators, Pulse Generators, Digital Data Generators) Power Sources with Discrete Frequency Change, Stabilized Sources of Voltage and Current. Attenuators and Input Circuit Amplifiers, Instruments based on Electronic Voltmeter. Numerical Systems, Logic Elements and Combination Logic, Basic Digital Circuits in Measuring Instrument systems, Digital Counters, Digital voltmeter and Multimeter. Digital Oscilloscopes, Waveform Spectrum Analyzers, Voblers, electronic component analyzer, Logic Analyzers. Magnetic Registration, Digital Signaling Devices. Communication of Measurement Instruments and PC, Automatic Measurement&Test Systems, LabView. Process Measurement Techniques in Process Monitoring and Control, Measurement in Process Automation Automation.	
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	1.5	1,2,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	2	10
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	30
Oral exam	1.3	1,2,3,4	Oral exam	Assessment of student's answers	20	40
Seminar paper	1.2	1,2	Writing a seminar paper on a given topic	Scoring: Form - 2%, Content - 40%, Conclusion - 20%, Literature - 20%	0	20

1.10. Obligatory literature

1. Šantić, A Elektronička Instrumentacija. Zagreb: Školska knjiga, 1993. ISBN: 978-953-0-30664-6

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. PELIN DENIS**	
Course name	SEIA401-15 Power Electronics	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (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.classify the terms in conversion technique regarding their importance in the process of understanding power frequency conversion
2.choose models of conversion components of a PES for a sufficiently accurate and mathematically less demanding analysis
3.evaluate power electronic converters (PEC) with respect to indicators of power conversion quality
4.expound the basic connections as well as cascade connection of PEC on their subsystems
5.identify the individual types of PEC (DC/DC converters, rectifiers, inverters) from the example of practice

1.4. Course content

Power converters. Basic concepts. Basic properties. The concept of a conversion device. Constitutive devices and topology of power converters. Implementation of the following: uncontrolled switch, unilateral current, unilateral voltage and bilateral switches. DC converters. One-quadrant direct and indirect dc converters. Four -quadrant dc converters. Isolated dc converters. Rectifiers. Basic properties. Uncontrolled rectifiers. Phase-controlled rectifiers. Inverter mode of operation. Voltage-source inverter.

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	1	1,2,3	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	10

exercises						
Practice – problem solving	1.5	2,3	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	20	20
Oral exam	1	1,2,3	Oral exam	Assessment of student's answers	15	30
Group activity	0.5	4,5	Checkout of recognition converters from practice.	Supervision of a teacher. Checking solutions	0	10

1.10. Obligatory literature

1. I.Flegar, Energetski elektronički pretvarači , KIGEN, Zagreb, 2010
2. 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. B.Bose, Power Electronic and Variable Frequency Drives:Technology and Applications; Wilwy-IEEE Press, 1997.
3. 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	**FERČEC IVANKA, LIERMANN-ZELJAK YVONNE**	
Course name	S105-ENG English I	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
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

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1.2. Conditions for enrollment

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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 compose shorter texts based on provided key words
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.summarise texts, arguments and definitions in a written form
6.summarise diagrams, schemes, figures and mathematical formulas orally and in written form

1.4. Course content

Academic English. What is engineering? Atom. Materials in electrical engineering. The electric circuit. Transistors. 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 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	2,3,4,5,6	Midterm exam	Evaluation of (written) exercises	25	50
Oral exam	0.5	3,4,6	Oral exam	Assessment of student's answers	20	40
Grammar-related exercises/Short essays	0.1	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	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. Bošnjak Terzić, B. (2009). Study Technical English 1. Zagreb: Školska knjiga
2. 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	**FERČEC IVANKA, LIERMANN-ZELJAK YVONNE**	
Course name	S204-ENG English II	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	3
	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.compare the differences between general and technical English language based on the selected 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
6.provide a critical review of a specialized topic in both written and oral form

1.4. Course content

Branches Power Engineering and Automation: Measuring instruments. Resistors. Diodes. Inside an electric motor. Introduction to the energy business. Comparing and contrasting. Function of an item. Relative clauses. Reduced relative clauses. Conditional clauses. Making questions. Question tags. Usage of sequence words. Branch Informatics: Computer users. Computer architecture. Peripherals: magnetic storage, optical storage, flash memory. Former student. Operating systems. 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	1,2,3,4,5,6	Lectures, Auditory 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	25	50
Oral exam	0.7	2,3,4,5,6	Oral exam	Assessment of student's answers	20	40
Grammar-related exercises/Short essays	0.2	3,4,5,6	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	0	5
Active class participation	0.1	1,2,3,4,5,6	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. Campbell, S. (2009). English for the Energy Industry. Oxford: Oxford University Press (Express Series)
2. Glendinning, Eric H.; McEwan, J. (2006). Oxford English for Information Technology. Oxford University Press
3. Esteras, S.R. (2008). Infotech - English for Computer Users. Cambridge University Press
4. Bošnjak Terzić, B.: Study Technical English 1, Školska knjiga, Zagreb, 2009.

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	**Dr.sc. MIOKOVIĆ ŽELJKA**	
Course name	S103 Physics	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(30+15+0)+0

1. Course description	
1.1. Goals	
Present and explain to the students the basic concepts and laws of classical physics in the field of mechanics and fluid mechanics, mechanical oscillations and waves, heat and thermodynamics, which explain many natural phenomena and processes; Demonstrate the approach to solving physical problems (tasks), which includes relating basic physical (and mathematical) knowledge and skills and the importance of discussing the obtained solution; Point out the importance of experimental work, interpretation of measurement results, and the discrepancies between theoretical and experimental results in physics by using computer simulations of some physical phenomena and by conducting experiments; In that way, students will be able to gain access to physical resources and will be prepared to further upgrade their knowledge of engineering.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.determine and differentiate between kinematic and dynamic physical quantities when describing the momentum of a particle, the system of particles, the momentum of a rigid body and fluids 2.illustrate and apply Newton's laws of mechanics and laws of energy conservation, momentum and angular momentum to the real processes and phenomena 3.interpret physical quantites of thermodynamics and thermal laws by means of kinetic molecular theory 4.interpret the dependence between physical quantities presented by mathematical relations and graphs 5.specify and apply basic laws of physics concerning mechanics of particles and rigid bodies, fluids, oscillations and waves, heat and thermodynamics, geometric and wave optics to solve simple problem tasks 6.interpret the results of experimental evaluation of basic laws of physics referring to mechanics, mechanics of fluids, heat and thermodynamics, oscillation and waves, geometric and wave opticsptics 7.explain the differences between theoretical results and the results of experimental research in physics	
1.4. Course content	
Introduction to physics (physical quantities and units of measurements). Kinematics of a particle. Dynamics of a particle. Newton's laws. Fundamental forces and force fields in nature (gravity and gravitational field; inertial and non-inertial systems). Non-fundamental forces in nature. Applications of Newton's laws. Work, power, energy. Laws of conservation of energy and momentum for a system of particles. Two-body collisions. Mechanics of rigid bodies. Mechanics of fluids (statics and dynamics of fluids). Heat and thermodynamics (ideal gas, kinetic-molecular theory of heat, laws of thermodynamic, heat transfer). Mechanical oscillations and waves: undamped, damped and forced mechanical oscillator systems. Sound waves.	
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	1.3	1,2,3,4,5,6,7	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	2	4
Practice – problem solving	1.2	4,5	Midterm exam	Evaluation of (written) exercises	15	30
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	12	25
Oral exam	1.2	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Homework	0.2	4,5,6,7	Individual assignments	Evaluation of exercises	1	5
Concept test	0.1	1,2,3,4,5	Solving a multiple-choice test	Checking answers	0	6

1.10. Obligatory literature

1. Kulišić, Petar. Mehanika i toplina.Zagreb: Školska knjiga, 2011.
2. Young, H.D; Freedman, R.A.; Ford, A. Lewis. Sears and Zemansky's University Physics with Modern Physics, 12th edition. Pearson Education, 2008.
3. V. Henč - Bartolić, P. Kulišić, Valovi i optika, Šk. knjiga, Zagreb (1991.)
4. Ž. Mioković, Fizika 1, Priručnik za laboratorijske vježbe, Sveučilište J.J. Strossmayera u Osijeku, ETF, 2013.

1.11. Recommended additional literature

1. P. Kulišić i dr., Riješeni zadaci iz mehanike i topline, Šk. knjiga, Zagreb (1985.) 2. V. Henč-Bartolić, P. Kulišić, Riješeni zadaci iz valova i optike, Šk. knjiga, Zagreb (1991.) 3. N. Cindro, Fizika 1, mehanika, valovi i toplina, Šk. knjiga, Zagreb (1991.) 4. Berkeley Physics Course, vol, 1, 4. Tehnička knjiga, Zagreb (1983.)
2. V. Henč - Bartolić, P. Kulišić, Riješeni zadaci iz valova i optike, Šk. knjiga, Zagreb (1991.)
3. N. Cindro, Fizika 1, mehanika, valovi i toplina, Šk. knjiga, Zagreb (1991.)
4. Berkeley Physics Course, vol, 1, 4. Tehnička knjiga, Zagreb (1983.)

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	SAIR601-17 Industrial Informatics	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Informatics (elective)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5.5
	Workload (L+(AE+LE+CE)+S)	30+(15+30+0)+0

1. Course description	
1.1. Goals	
Introduce students to the aims of controlling a complex production process by introducing informatisation and automatic process control systems (ranging from the relationship with a technical process and control system to the process monitoring system and production itself). Present the application of programmable logic controllers (PLCs), SCADA system and industrial communication system all of which are the foundations for the practical realisation of the automatic process control systems, industrial systems, transport systems, etc.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the third year of the study programme	
1.3. Learning outcomes	
1.describe the means of controlling a complex production process and explain the terms of informatisation and automation in process control 2.describe the structure and working principles of a process computer and its realisation in terms of programmable logic controller (PLC) 3.write a simple control/user programme for PLC 4.describe the advantages and disadvantages of decentralisation in the realisation of automatic process control systems 5.describe the role and structure of SCADA as well as its main interfaces 6.define the requirements for the communication system on different control levels and choose the appropriate communication mean for a certain purpose 7.establish communication (with several communication standards) using Simatic equipment	
1.4. Course content	
Production system and industrial plant. Tasks of production system control and their stratification. Informatisation and automation of production systems. Basic structure of process automation system. Practical examples. System for acquisition and representation of process values. Automatic process control system. Digital implementation of controller. Process computer and programmable logic controller (PLC). Connecting process computer to the process. Operate unit – central unit in the process automation system. Operate unit structures: central and decentral, hierarchical and distributed. Supervisory unit – subsystem for operator-production system interface, including the process database. Structures of supervisory unit. Automation components for building of operate and supervisory unit. Communication systems in industry. General purpose information transfer technologies/standards typically used as basis of some industrial communication standards. Communication technologies at the process level. PLC networks. Software and programming tools in automation systems. Examples of complete control and supervision systems in automated production. Design and maintenance of automation 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	5
Practice – problem solving	1.1	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	1.3	2,3,5,6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	25
Oral exam	0.6	1,2,4,5,6	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Mohammad Ayoub Khan: Handbook of Research on Industrial Informatics and Manufacturing Intelligence: Innovations and Solutions; IGI Global, 2012
2. Crispin, A. J.: Programmable Logic Controllers and their Engineering Applications, McGraw-Hill Publishing Company, 1997.

1.11. Recommended additional literature

1. Perić, N.: Automatizacija postrojenja i procesa - predavanja, Zavodska skripta, FER, Zagreb, 2000.

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**	
Course name	SR604-17 Information Security	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
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

Familiarise students with security issues in modern information and communication systems and networks (i.e. understanding of the existing threats, attacks and risks); Teach students how to understand basic principles of modern cryptographic systems and the mode of their practical application in different security protocols; Train students to properly plan and implement appropriate security mechanisms in wired and wireless networks.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.understand and describe basic principles of modern cryptographic systems and their application possibilities
2.interpret and describe existing security threats, attacks and risks in modern computer and communication systems
3.categorise and apply different security systems and mechanisms in a computer network
4.interpret and apply modern Internet security protocols
5.evaluate security requirements and implement security mechanisms in different types of wireless networks

1.4. Course content

Basic security premises and terms. Basic cryptographic terms. Substitution and transposition ciphers. Symmetric cryptosystems and their application. Block cipher operating modes. Asymmetric cryptosystems and their application. Cryptographic hash functions. Digital signature. Key management. Security aspects of the IPv4 and the IPv6 protocol. Transport layer security. Security threats and malware. Types of attack and possible countermeasures. Security in wireless networks. E-mail security. Types and configuration of firewalls. Virtual private networks. Intrusion detection and prevention.

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	1.5	1,2,3,4,5	Lectures, Auditory exercises, Laboratory	Attendance register. Mandatory attendance	1	4

exercises, Laboratory exercises			exercises	percentage is: 70%.		
Practice – problem solving	1	1,2,4	Midterm exam	Evaluation of (written) exercises	16	32
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	3,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	24
Oral exam	1	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Seminar paper	0.5	1,2,3,4,5	Creation and presentation of seminar work	Grading a seminar paper and results presentation	6	10

1.10. Obligatory literature

1. A. Dujella, M. Maretić, Kriptografija, Element, Zagreb, 2007.
2. W. Stallings, Cryptography and Network Security – Principles and Practice, Paerson, Boston, 2016.

1.11. Recommended additional literature

1. W. Stallings, Network Security Essentials – Applications and Standards, Prentice Hall, New Jersey, 2013.

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, Doc.dr.sc. GRGIĆ KREŠIMIR**	
Course name	SAR401-17 Information Systems and Computer Networks	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	2	
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	
Familiarise students with basic terms in information theory; Explain practical significance and the purpose of entropy and error control coding, and introduce students to the application of basic error control codes; Teach students how to properly interpret reference layered network models and understand protocol functions of particular layers; Train students to individually plan and implement a local network with a possibility of Internet connection (solving thereby routing and addressing problems); Familiarise students with basic characteristics of different mobile network generations; Teach students how to apply basic network security mechanisms, depending on network security requirements.	
1.2. Conditions for enrollment	
The necessary requirements to enrol in the second year of the studies.	
1.3. Learning outcomes	
1.define and explain basic terms in information theory 2.understand and interpret basic methods and procedures of entropy and error control coding 3.interpret reference layered networking models and present protocol functions layer by layer 4.plan implementation of a local area network, including solving routing, addressing and Internet connectivity problems 5.interpret characteristics and basic principles of 2G, 3G and 4G mobile networks 6.evaluate advantages and disadvantages of certain network security mechanisms depending on security requirements	
1.4. Course content	
The concept and meaning of information and information systems. Information content and properties. Entropy and its properties. Types and properties of information sources. Markov sources. A model and description of a communication system. Discrete information systems. Information transmission and channel capacity. Entropy coding. Optimal coding. Arithmetic coding. Fundamentals of error control coding. Block codes. Binary linear codes. Hamming codes. Cyclic codes. The concept and types of communication networks. Network topology. Network function layering. Layered models: OSI and TCP/IP. Physical principles of data transmission. Physical layer. Types and characteristics of transmission media. Line codes. Access networks and technologies. Data link layer. Error control and flow control. Medium access in wired and wireless networks. MAC sublayer. A local area network and protocols. Ethernet. Wireless local area networks. Bluetooth. Wireless sensor networks. Network routing and routing protocols. Internetworking. Internet. IP protocol (IPv4 and IPv6). IP addressing. Internet control protocols. ICMP protocol. Internet transport protocols (TCP and UDP). Application layer protocols. Internet services. Public mobile networks. Data protection and network security.	
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		Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0

1.10. Obligatory literature

1. I. S. Pandžić i dr., Uvod u teoriju informacije i kodiranje, Element, Zagreb, 2007.
2. A. S. Tanenbaum, D. J. Wetherall, Computer networks (5. izdanje), Prentice Hall, Boston, 2011.

1.11. Recommended additional literature

1. R. M. Gray, Entropy and Information Theory, Springer-Verlag, NewYork, 2013.
2. A. Bažant i dr., Osnovne arhitekture mreža, Element, 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	**Doc.dr.sc. GRBIĆ RATKO**	
Course name	SIR606-17 Internet of Things	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(0+15+15)+0

1. Course description

1.1. Goals

Familiarise students with basic theoretical knowledge and practical skills in the field of the Internet of Things and enable them to work both independently and in teams on the projects of collecting, storing, processing and visualising the data in accordance with the Internet of Things paradigm.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.describe the basic elements of the IoT system
2.use the basic tools to develop a program code for the microcontroller system
3.apply appropriate libraries for the use of sensors in the microcontroller system
4.apply appropriate libraries for sending, retrieving and storing data on different platforms
5.apply the theoretical basis for making a simple system in the Internet of Things

1.4. Course content

Introduction to the Internet Things (IoT). IoT technologies (elements, circuits, communications, platforms and development environments). The IoT architecture and infrastructure. Hardware-based objects (microcontrollers, single-board computers and other embedded systems). Data collection and storage (mechanisms, protocols, applications and services). Data access. User interfaces and data visualisation. Understanding the context. Security in IoT systems. IoT applications: industry, meteorology, agriculture, medicine, smart homes, smart cities.

1.5. Teaching methods	Lecture 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, Laboratory exercises, Design	1.4	1	Lectures, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	7	10

exercises						
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	15	30
Oral exam	1	1,2,3,4,5	Oral exam	Assessment of student's answers	18	35
Problem-solving related to design exercises	1.6	2,3,4,5	Design exercises	Evaluation of problem solving exercises	10	25

1.10. Obligatory literature

1. A. Bahga, V. Madisetti, Internet of Things: A Hands-on-Approach, Arshdeep Bahga & Vijay Madisetti, 2014.

1.11. Recommended additional literature

1. Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things, Springer, 2011.
2. Charalampos Doukas, Building Internet of Things with the Arduino: 1, CreateSpace Independent Publishing Platform, 2012.
3. H. Zhou, The Internet of Things in the Cloud: A Middleware Perspective, Boca Raton, CRC Press, 2012.
4. A. McEwen, Hakim Cassimally, Designing the Internet of Things, John Wiley & Sons, 2013.
5. Elecia White, Making Embedded Systems, O'Reilly, 2012.
6. Teri Karvinen, Kimmo Karvinen, Ville Valtokari, Make: Sensors, Maker Media Inc., 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	**Prof.dr.sc. MRČELA TOMISLAV**	
Course name	S104 Engineering Graphics	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	4
	Workload (L+(AE+LE+CE)+S)	15+(0+0+30)+0

1. Course description

1.1. Goals

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1.2. Conditions for enrollment

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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.draw sketches of orthogonal and isometric projections and cross sections
4.make a technical drawing in DraftSight. Draw orthogonal projections, isometry and a cross section
5.draw a scheme in AutoCAD falling within the scope of electrical engineering

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	Teaching method	Assessment method	Points

		outcomes			Min	max
Attendance Lectures, Design exercises	1.5	1,2,3,4,5	Lectures, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Oral exam	0.6	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Problem-solving related to design exercises	1	1,2,3,4,5	Design exercises	Evaluation of problem solving exercises	8	15
Visual, drawings	0.3	1,2,3,4	Visual, drawings	Direct observing	6	10
Homework	0.3	5	Visual, drawings	Observation	6	10
Revision exam	0.3	4	Written exam	Evaluation of sketches	18	30

1.10. Obligatory literature

1. Opalić, M; Kljajin, M; Sebastijanović, S. Zrinski Čakovec: Tehničko crtanje, 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. MATIĆ TOMISLAV (ml.), Doc.dr.sc. ALEKSI IVAN**	
Course name	SIR302-17 Hardware Description Languages	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
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

Introduce students to hardware description languages (HDL). Present practical examples of VHDL and Verilog hardware description languages in Xilinx ISE design suite. Introduce students to simulation of the described digital circuits and implementation procedures on available development boards.

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

1.3. Learning outcomes

1.define hardware description languages
2.develop and analyse different digital circuits with VHDL and Verilog language
3.distinguish different phases of hardware description processes with VHDL and Verilog languages
4.use Xilinx ISE design suite to simulate and implement described digital circuits
5.design digital circuits with VHDL and Verilog language, demonstrate and test the designed circuit on the available development system

1.4. Course content

Introduction. Hardware Description Languages. VHDL and Verilog, usage and differences. Describing simple digital circuits. Parallel code for digital circuit descriptions. Conditional statements and branches in the parallel code. Sequential code for digital circuit descriptions. Conditional statements and branches in the sequential code. Describing complex digital circuits. FSM description of circuits. Simulation of the described digital circuits. Implementation and testing of the described circuits on the available development systems.

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	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	2	5

Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	11	30
Oral exam	1	1,2,3,4	Oral exam	Assessment of student's answers	18	35
Problem solving	1	2,4,5	Revision exams (written exam)	Evaluation of exercises	15	30

1.10. Obligatory literature

1. V. A. Pedroni: Circuit Design and Simulation with VHDL, MIT Press, 2010.
2. P. P. Chu: FPGA Prototyping Using Verilog Examples, John Wiley & Sons Inc, 2008.

1.11. Recommended additional literature

1. S. Monk: Programming FPGAs: Getting Started with Verilog, McGraw-Hill Education, 2016.
2. P. P. Chu: FPGA Prototyping by VHDL Examples, Wiley-Interscience 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	**Dr. sc. MIKLOŠEVIĆ KREŠIMIR, Dr. sc. ŠPOLJARIĆ ŽELJKO**	
Course name	SIAE601-15 Small Electrical Machines For Special Appliance	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (elective)	
Course status	Elective	
Year of study	3	
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	
Present additional content in the field of small and special electrical machines. Introduce students to specific requirements related to the operation of small and special electric motors. Explain the analysis of the electromechanical drive. Show basic numerical calculations on small and special electrical machines. Understand how to connect control and measuring devices while testing them. Enable students to measure electrical and mechanical value. Show ways of connecting and testing small and special electrical machines.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the third year of the study programme	
1.3. Learning outcomes	
1.describe the types of different constructions, operating principles and the types of control of small and special electrical machines 2.analyse various construction requirements for the application of small and special electrical machines 3.propose the type of standard permanent magnets that meet the required specific requirements and are installed in DC servomotors 4.determine the static and dynamic characteristics of small and special electrical machines 5.propose the type of an optimal small or special electrical machine that meets the default dynamic speed profile of an electric drive 6.organise fundamental measurements of electrical, mechanical and thermal data on the tested step or servo moto	
1.4. Course content	
Definition of small engines. Types of constructions and parameters. Areas of application of small and special electrical motors for the automation of devices and facilities, household drive devices, computer and machine tools. Application in positioning drive. Synchronous small motor. Hysteresis, reluctance and inductor motor. Electronically switched motor. Continuous DC and AC servomotor. Sources of losses in DC servomotors. Permanent magnets in DC servomotors. Selection of servomotors. Measurement of servomotor parameters. Contemporary stepper motors. Excitation circuits of contemporary stepper motor. Disk motor. Linear motor. Tachogenerators. Encoders. Control circuit schemes. Static and dynamic characteristics of small and special electrical 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 outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	1.5	1,2,3,4	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	7
Practice – problem solving	1	5	Midterm exam	Evaluation of (written) exercises	14	28
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	21
Oral exam	1	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30
Writing seminar papers	0.5	1,2,3,4,5,6	Working of seminar papers from electrical machines and drives	Oral presentation of seminar papers	7	14

1.10. Obligatory literature

1. Miller, T.J.E. Electronic Control of Switched Reluctance Machines;Newnes. 2001; ISBN 9780750650731
2. P. Gugić, Električni servomotori, Školska knjiga, Zagreb, 1987.
3. R. Wolf, Osnove električnih strojeva, Školska knjiga, Zagreb, 1985.

1.11. Recommended additional literature

1. B. K. Bose, Modern Power Electronics and AC Drives, Pearson Education, Oxford, 2003.
2. Jean-Paul Louis, Control of Synchronous Motors, Wiley-ISTE , New York, 2011.
3. T.Kenjo, Stepping Motors and Their Microprocessor Controls, Oxford - Clarendom Press, New York, 1984.
4. W.Leonhard, Control of Electrical Drives, Springer, New York, 1996.
5. T.Kenjo, Permanent-magnet and brushless DC motors, Oxford - Clarendon Press, New York, 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	**HREHOROVIĆ IVAN**	
Course name	SAE107-17 Calculus I	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power 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+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define, classify and graphically draw elemental functions 2.compare and explain the features of elementary functions 3.create and analyse the derivative of the function 4.compare, calculate and create vectors, and evaluate and solve matrix tasks 5.analyse and determine equations of a line and plane in space 6.analyse and determine a solution to a system of linear equations	
1.4. Course content	
Function. Graph of a function. Composite function. Inverse function. Elementary functions (polynomial, rational function, exponential and logarithmic function, power function, trigonometric and inverse trigonometric functions, hyperbolas and area functions). Sequences. Convergence of sequences. Basic theorems on convergence. Limits and continuity of functions. Asymptotes. Derivative of a function. Derivative as velocity. Derivative and the tangent. Differential. Derivatives of elementary functions. Rules of differentiation. Derivatives of composite functions. Higher derivatives. Basic theorems of differential calculus (Fermat's, Rolle's, Langrange's, Cauchy's theorem). Taylor's theorem. Approximation functions by a polynomial. Local extremes. Convexity, concavity and inflection points. Curvature. L'Hospital's rule. Methods for numerical solution of equations (direct and iterative methods). Vector as a class of directed line segments. Addition of vectors. Multiplication of a vector by a scalar. Vector space. Basis of a vector space. Scalar product. Vector product. System of linear equations. Gaussian elimination method. Matrix representation of a system of linear equations. Theorem of Kronecker-Capelli. A set of solutions to equation F(x,y)=0: circle, ellipse, parabola, hyperbola.	
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	1.3	3,4,5,6	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.7	1,2,3,5,6	Oral exam	Assessment of student's answers	25	50
Homework	1	3,4,5,6	Independent problem solving	Checking the tasks solved	0	10

1.10. Obligatory literature

1. R. Galić, M. Crnjac, I. Galić; Matematika za stručne studije, ETF Osijek i Veleučilište Požega.
2. Demidović, B. P. - Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke. Zagreb: Tehnička knjiga, 2003.

1.11. Recommended additional literature

1. B. Apsen, Repetetitorij više matematike, Tehnička knjiga, Zagreb, 2000.
2. R. Scitovski, D. Jukić, Matematika, Matematički odjel, Osijek, 2001.

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	**HREHOROVIĆ IVAN**	
Course name	SAE206-17 Calculus II	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
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.express and analyse the results of differential and integral calculus of a function of one variable
2.for a given mathematical problem, create an integral, solve it and interpret the solution
3.create a procedure by which we define the surface, arc length and the volume of the body
4.compare a differential equation with the basic types of differential equations and create a general solution
5.analyse the given series, compare it with known series, and examine and determine convergence

1.4. Course content

Primitive of a function. Indefinite integral. Methods of integration: the method of substitution, integration by parts. Integration of rational functions. Riemann integral. Newton-Leibniz formulae. Trapezoid rule. Simpson's rule. , Length of the arc of a curve. Volume and surface of a solid of rotation. Problems in engineering referring to use of differential equations. Solution methods for differential equations. The existence theorem. Separation of variables. Homogenous differential equation. Linear differential equation of the first degree. Linear differential equation of the second degree with constant coefficients. Application of differential equations (simple harmonic oscillations, spring vibrations, damped vibrations, forced vibrations, simple electric networks). Numerical methods for solving differential equations. Series. Convergence of series. Criterion of convergence of the series with positive terms (comparison, d'Alembert, Cauchy's criterion). Leibniz's criterion for series with alternating signs. Convergence area. Power series. Convergence interval. Taylor and Mac Lauren series. Fourier series.

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	2	1,2,3,4,5	Lectures, Auditory	Attendance register.	0	0

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

1.10. Obligatory literature

1. Jukić, D; Scitovski, R: Matematika.Osijek: Matematički odjel Osijek, 2000.
2. Demidović, B. P. - Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke. Zagreb: Tehnička knjiga, 2003.
3. B. Apsen, Repetetitorij više matematike, Tehnička knjiga, Zagreb, 2000.

1.11. Recommended additional literature

1. R. Scitovski, D. Jukić, Matematika, Matematički odjel, Osijek, 2001.
2. P. Javor, Matematička analiza, Školska knjiga,Zagreb, 2000.

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	**HREHOROVIĆ IVAN**	
Course name	SR107 Calculus I	
Study program	Professional study programme, branch: Informatics (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

Teach students the basic concepts and definitions, as well as how to solve tasks in the field of logic, set theory, function theory, and derivative of a function. Prepare students for lifelong learning and use of mathematical structures, relationships and operations as tools in application.

1.2. Conditions for enrollment

Requirements met for enrolling in the study programme

1.3. Learning outcomes

1.explain the basics of the language of traditional logic, mathematical logic and set theory, and create a truth table for a given statement
2.learn number records in different databases and compute in them
3.define and explain the properties of elementary functions
4.explain the meaning of derivation and apply the derivation
5.solve basic mathematical operations and apply them to linear equations

1.4. Course content

Basics of traditional logic. Mathematical logic. Alphabet and formulas of propositional logic. Truth tables. Basic definitions of set theory. Subset, power set, empty set. Set operations. Number records in different number databases. Concept of a function. Graph function. Function composition. Inverse Function. Elementary functions (polynomial function, rational function, exponential and logarithmic function, general power, trigonometric function). Limits and continuity. Derivation of a function - Newton's speed problem. Derivatives of elementary functions. Derivative rules. Derivation of a complex function. Higher order derivatives. Local extrema of functions. Flow test of a function. System of linear equations. Gaussian elimination method. Representing systems of linear equations using matrices.

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	2	1,2,3,4,5	Lectures, Auditory	Attendance register.	0	0

Lectures, Auditory exercises			exercises	Mandatory attendance percentage is: 70%.		
Practice – problem solving	1	3,4,5	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1	1,2,3,5	Oral exam	Assessment of student's answers	25	50
Homework	1	2,3,4	Independent problem solving	Checking the tasks solved	0	10

1.10. Obligatory literature

1. R. Galić, M. Crnjac, I. Galić; Matematika za stručne studije, ETF Osijek i Veleučilište Požega.
2. Demidović, B. P. - Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke. Zagreb: Tehnička knjiga, 2003.

1.11. Recommended additional literature

1. B. Apsen, Repetetitorij više matematike, Tehnička knjiga, Zagreb, 2000.
2. D. Jukić, R. Scitovski, Matematika, Matematički odjel, Osijek, 2000.

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	**HREHOROVIĆ IVAN**	
Course name	SR206 Calculus II	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description

1.1. Goals

Teach students the basic concepts and definitions, as well as how to solve tasks in the field of integrals, differential equations and numerical methods for solving mathematical problems. Prepare students for lifelong learning and use of mathematical structures and integrals and differential equations as tools in application.

1.2. Conditions for enrollment

Requirements met for enrolling in the study programme

1.3. Learning outcomes

1.express and correctly interpret the results of differential and integral calculus
2.apply integration rules and calculate indefinite and definite integralsn
3.apply an integral to calculate the surface, arc length and volume of solids
4.name and explain the methods of solving first and second order differential equations
5.explain and apply numerical methods for solving specific mathematical problems

1.4. Course content

Primitive function. An indefinite integral. Newton-Leibniz formula. Numerical solving of a given integral. Shape area surface. Arc length. Volume of solids of revolutions. Problems in engineering that require the use of differential equations. The concept and basic properties of differential equations. Solving differential equations by employing different computer, numerical and algebraic methods. Numerical solving of nonlinear equations. The least squares method in computer science.

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	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	2	2,3	Midterm exam	Evaluation of (written) exercises	20	40

Oral exam	2	1,4,5	Oral exam	Assessment of student's answers	25	50
Homework	1	2,3,5	Independent problem solving	Evaluation of exercises	0	10

1.10. Obligatory literature

1. Jukić, D; Scitovski, R: Matematika.Osijek: Matematički odjel Osijek, 2000.
2. Demidović, B. P. - Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke. Zagreb: Tehnička knjiga, 2003.
3. B. Apsen, Repetitorij više matematike, Tehnička knjiga, Zagreb, 2000.

1.11. Recommended additional literature

1. P. Javor, Matematička analiza, Školska knjiga,Zagreb, 2000.

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	**HREHOROVIĆ IVAN**	
Course name	S302-16 Mathematical Statistics	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	2	
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

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1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.define the concepts of permutation, combinations and variations, and know how to analyse, compare and define which terms refer to a particular task
2.define the concepts of a probability of occurrence and conditional probability, and define the adopted properties of these terms to interpret the task solution
3.distinguish the discrete and continuous distribution, be able to explain binomial, poisson, hypergeometric, normal, uniform, exponential distribution as well as solve tasks from that area
4.explain the terms statistical set and frequency distribution, and create groups for the given statistics tasks
5.calculate and interpret measures of statistical data types
6.calculate and interpret the results of tasks in the field of point and interval estimates of the parameters of the basic set

1.4. Course content

Algebra of events. Probability of events. Basic probability properties. Classic definition of probability. Conditional probability and independence. Discrete probabilistic space. Discrete random variable. Binominal and Poisson distribution. Continuous random variable. Normal distribution. Normal distribution parameters. t distribution. Empirical one-dimensional and two-dimensional distribution. Sample and parameter samples. Basic statistical methods. Statistical estimation theory. Statistical decision making. Hypotheses testing. Basics of correlation theory.

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	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.3	1,2,3,4,5,6	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.5	1,2,3,4,5,6	Oral exam	Assessment of student's answers	25	50
Homework 1	0.5	1,2,3	Learn the theoretical part of the lesson	Written exam with two assignments in the class	0	5
Homework 2	0.5	3,4,5,6	Acquire theoretical knowledge of the course content	Written exam with two exercises in the class	0	5

1.10. Obligatory literature

1. Pavlić, I. Statistička teorija i primjena. Zagreb: Tehnička knjiga, 2ooo ;
2. R. Galić, Vjerojatnost i statistika. Osijek: ETF, 2013;
3. V. Bahovec, K.Dumičić et al, Statistika. Zagreb: Element, 2014
4. R: Galić, Statistika, ETF, Osijek, 2004

1.11. Recommended additional literature

1. Ž.Pauše,Uvod u matematičku statistiku, Školska knjiga,Zagreb,1993
2. Ž.Pauše,Vjerojatnost,informacija,stohastički procesi,Školska knjiga,Zagreb,1988

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	SAE401 Materials and Production Processes	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	2	
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

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1.2. Conditions for enrollment

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1.3. Learning outcomes

1.explain the structure of the basic types of materials in electrical engineering
2.interpret the main mechanical, thermal, electrical and magnetic properties of electrical materials and basic testing methods
3.assess basic requirements for selecting materials used in electrotehnical products
4.explain the basic applications of conducting, magnetic, dielectric and semiconducting materials
5.propose the main processing procedures of electrical materials and their application

1.4. Course content

Structure of crystals, amorphous, liquid crystals, polimers. Structure of metals and alloys. Material properties and testing – mechanical, electrical, magnetic, thermal and manufacturing. Influence structure to properties. Diffusion. Conducting materials – low-resistance conducting materials, high-resistance conducting materials, thermoelements, thermocouple, contacts, circuit breakers. Superconductors. Semiconducting materials. Magnetic materials – soft and hard magnetic materials. Ferrites. Materials for thermo-magneto-optic memory. Electrical insulating materials. Polarisation. Inorganic, organic and compound insulating materials. Influence manufacturing processes to properties. Plastic deformation. Heat treatment. Powder metallurgy. Joint technologies and materials. Manufacturing semiconductors and integrated circuit. Surface treatment. Processing of polymers, composites and ceramics.

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	1.5	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance	6	10

exercises				percentage is: 70%.		
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.1	2,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	25
Oral exam	1.2	1,2,3,4,5	Oral exam	Assessment of student's answers	18	35
Written exam.	1.2	1,2,3,4,5	Written exam	Checking solutions	0	30

1.10. Obligatory literature

1. Filetin, T ; Kovačiček, F; Indof, J. Svojstva i primjena materijala. Zagreb: Fakultet strojarstva i brodogradnje, 2009.
2. Kalpakjian, S.; Schmid, S. Manufacturing Engineering and Technology (7th Edition).Upper Saddle River NJ: Prentice Hall, 2013.
3. V. Knapp, P. Colić, Uvod u električna i magnetska svojstva materijala, Školska knjiga Zagreb, 1990

1.11. Recommended additional literature

1. R. M. Brick i dr., Structure and Properties of Engineering Materials, McGraw Hill, 1977.
2. V. Bek, Tehnologija elektromaterijala, skripta ETF u Zagrebu, Sveučilišna naklada, Zagreb
3. T. Filetin: Materijali i tehnologijski razvoj, Akademija tehničkih znanosti Hrvatske, Zagreb, 2002.
4. Solymar, L. Walsh, D.Electrical Properties Of Materials, OUP, 1998
5. W. D. Callister, Materials science and engineering: an introduction, John Wiley & Sons, New York, 2000.
6. T. Fischer, Materials Science for Engineering Students, Elsevier, London, 2009.
7. A. Pintarić, Materijali u elektrotehnici - laboratorijske vježbe, ETF, Osijek, 2007.
8. T. Filetin: Suvremeni materijali i postupci, Hrvatsko društvo za materijale i tribologiju, Zagreb, 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. KESER TOMISLAV**	
Course name	SA502-16 Microcomputers in Automation	
Study program	Professional study programme, branch: Automation (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(0+30+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

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1.3. Learning outcomes

1.define and elaborate on the term "micro-computer" and "embedded computer" system
2.analyse control systems and define sensor and actuator demands
3.to design and optimize micro-computer system according demands defined by implementation environment
4.evaluate and explain the specific architecture of the selected embedded microcomputer system according to process control requirements
5.evaluate process control results and quality with and without microcomputer systems

1.4. Course content

Signal types and system features. Process computer and PLC. Transmitters and sensors. Data acquisition subsystem. A/D and D/A converters. Data acquisition software. Interrupt system. Output devices. Monitoring and registering process data. Software in process control. Software for processing process data. Hardware and software approach. Measuring and controlling algorithms. Digital controller. System programmes. Real time operating systems. Application programmes and databases. Visualisation and control based on processed data. Manipulation and process control. Man-machine interface. Data and state visualisation. Data archive. Methods for control system reliability increase. Centralised and distributed system control. Computer-based control system design. Data flows. Realising and testing control system. System maintenance.

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	1.3	1,2,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance	0	10

exercises				percentage is: 70%.		
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.8	1,2,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	20
Oral exam	1	1,2,3,4,5	Oral exam	Assessment of student's answers	20	40
Project task development	1.4	2,3,5	Project assignment	Developing a test micro-computer system	0	30

1.10. Obligatory literature

1. Russell, David . Introduction to Embedded Systems: Using ANSI C and the Arduino Development Environment. Morgan & Claypool, 2010, ISBN 9781608454983
2. J.G.Bollinger, N.A.Duffie, Computer Control of Machines and Processes, Addison-Wesley, 1988.

1.11. Recommended additional literature

1. Crispin, A. J.: Programmable Logic Controllers and their Engineering Applications, McGraw-Hill Publishing Company, 1997.Smiljanić, G.
2. Računala i procesi, Školska knjiga, Zagreb, 1991. .
3. F.Jović, F.: Kompjutersko vođenje procesa, Zveza organizacij za tehničko kulturo Slovenije, Ljubljana, 1988.
4. P.S.Buckley, Techniques of Process Control, John Wiley&Sons, 1964.
5. P.Katz, Digital Control using Microprocessors, Prentice/Hall, 1982.
6. Perić, N.: Automatizacija postrojenja i procesa - predavanja, Zavodska skripta, FER, Zagreb, 2000.

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. KESER TOMISLAV**	
Course name	SIR403-17 Microcomputer Systems	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
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

The main aim of this course is to show and explain to the students programming, application and adaptation methods of microcomputer systems in real-world process control and surveillance applications, to teach them how to apply real-time programming methods, and to explain and demonstrate microcomputer system design methods for adaptation to special applications. The goals are also to teach the students and to demonstrate techniques and rules of sensor and actuator periphery design as well as of design of stand-alone microcontroller-based “small” computers.

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

1.3. Learning outcomes

1.differentiate computer systems based on microprocessors and microcontrollers
2.explain the application specificities of microcontrollers and microcomputers in embedded systems
3.define and select a microcomputer system according to application requirements
4.select sensor and actuator peripherials according to application requirements
5.synthesise software support according to application requirements
6.design hardware of an embedded computer system by using CAD tools

1.4. Course content

Basic terms referring to microcomputer systems. Architecture and organisation of microcomputers and microcontrollers. Embedded computer systems. Characteristic features and specificities of embedded computer systems. Embedded computing system structure and design. Hardware design and development. Printed circuit board design. Software support equipment. Reliability, testing and validation of microcomputer systems. Application in intelligent measurement processes. Application in control processes. Application in surveillance, acquisition and data distribution systems.

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	2	1,2,3,4,5,6	Lectures, Laboratory	Attendance register.	2	5

Lectures, Laboratory exercises			exercises	Mandatory attendance percentage is: 70%.		
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	11	30
Oral exam	1	1,2,3,4	Oral exam	Assessment of student's answers	18	35
Problem solving	1	2,3,5,6	Revision exams (written exam)	Evaluation of exercises	15	30

1.10. Obligatory literature

1. E. White, Making Embedded Systems, O'Reilly Media, 2011. (ISBN 978-1-4493-0214-6)
2. E. A. Lee, S. A. Seshia, Introduction to Embedded Systems, A Cyber-Physical Systems Approach, Edition 1.5, 2014. (ISBN 978-0-557-70857-4)

1.11. Recommended additional literature

1. Roger Young, How Computers Work: Processor and Main Memory, Roger Stephen Young, 2001.
2. Sophocles J. Orfanidis, Optimum Signal Processing, Rutgers University, 2nd Edition, 2007., eBook (free)
3. Michael J. Pont, Patterns for Time-Triggered Embedded Systems, Addison-Wesley, 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	**Mr.sc. DORIĆ DRAŽEN**	
Course name	SAE402-15 Measurements in Electrical Engineering	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	7
	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.participate in legal measurement 2.compare characteristics of different measurement devices 3.select instrument measurement scale depending of mesurement value 4.estimate total measurement ucertainty of completed measurement procedure 5.select adequate measurement method 6.to select adequate test and measurement equipment according tasks and budget 7.complete test and measurement routine in safe way 8.detect anomaly and interferences that can influent to measurement result and take actions for lowering such to acceptable level	
1.4. Course content	
Temeljni pojmovi i nazivi (mjerne veličine i mjerne jedinice, pogonska sredstva, označavanje sustava niskonaponskih mreža, vrste kvarova, mreža i instalacija). Važeći elektrotehnički propisi i standardi, inozemni propisi, značaj norme EN 50160. Mjere zaštite na radu, zaštitu od indirektnog i direktnog napona dodira. Pojmovi vodova i mreža niskog napona (djelatni otpor, kapacitet, induktivitet i odvod kroz izolaciju), vrste vodova, izvedbe niskonaponskog voda, izvedbe instalacijskih i kabelskih vodova. Pad napona na vodu i izbor voda s obzirom na opterećenje. Vrste trošila i potrošačka postrojenja, utjecaj trošila na prilike u niskonaponskim mrežama i instalacijama kao i ekološki utjecaj pri upotrebi trošila. Razvoj novih električnih mreža i instalacija, uvođenje novih tehnologija u cilju smanjenja utjecaja na okoliš. Klase rasvjete. Kriteriji kvalitete rasvjete. Propisi. Javna i cestovna rasvjeta. Upravljanje rasvjetom. Rasvjeta vanjskih dijelova objekata. Rasvjeta interijera. Standardizacija i tipizacija. Uštede. Projektiranje rasvjete.	
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	2.3	1,2,3,5,6,7,8	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	5
Practice – problem solving	0.7	2,3,4,8	Midterm exam	Evaluation of (written) exercises	10	20
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,4,6,7	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	7	25
Oral exam	1	1,2,3,4,5,6,8	Oral exam	Assessment of student's answers	25	50

1.10. Obligatory literature

1. Bego, V.: Mjerenja u elektrotehnici, Graphis, Zagreb, 2003. ISBN: 953-6647-46-X
2. D. Karavidović: Električna mjerenja -1 i 2, Sveučilište u Osijeku, 1990.

1.11. Recommended additional literature

1. D. Karavidović, D. Dorić: Upute za laboratorijske vježbe iz električnih mjerenja, Elektrotehnički fakultet, 1998.
2. D. Karavidović. Zbirka zadataka, skripta, Elektrotehnički fakultet, 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. VRANJEŠ MARIO**	
Course name	SR601 Multimedia Technique	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	45+(0+15+15)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.select the characteristics of still image, speech, audio and video signal important for the application in multimedia systems 2.explain diffferent compression methods for still images, voice, audio and video signals 3.list and describe the most important network protocols used for the transmission of multimedia signals through different networks 4.evaluate different compression processes for particular media in terms of efficiency and complexity 5.propose the way and the parameters for coding of media for different multimedia applications 6.choose an appropriate lossless and lossy compression method for compression of different types of media 7.create a multimedia web site by using an arbitrary tool	
1.4. Course content	
Introduction: definitions, types of media, area of applications. Multimedia data types: text, graphics, images, video, animations. Audio: sampling, real-time processing, filtering, coding. Image: bitmap and vector graphics, colour presentation, image processing. Video: video standards and coding of colour information, digital video file formats. Components of a multimedia system - hardware and software. Hypermedia, interactive documents. Preparation of a multimedia content for CD-ROM and WWW. Broadband and intelligent networks: aspects of creation, implementation, management and realisation of multimedia communications services. Communication protocols for multimedia, quality of services. Laboratory practice: file formats and still image compression; digitalisation and audio signal compression; design of a website with multimedia contents; preparation of CD/DVD with multimedia contents.	
1.5. Teaching methods	Lecture 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, Laboratory exercises, Design exercises	1.5	1,2,3	Lectures, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	6	10
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	8	20
Oral exam	2	1,2,3,4,5,6	Oral exam	Assessment of student's answers	25	50
Problem-solving related to design exercises	1	5,6,7	Design exercises	Evaluation of problem solving exercises	6	20

1.10. Obligatory literature

1. Ohm, J., Multimedia Signal Coding and Transmission (Signals and Communicatio technology).Berlin Heidelberg, Springer, 2015.
2. S. Rimac-Drlje: Multimedijska tehnika - upute za laboratorijske vježbe, zavodska skripta, Eleketrotehnički fakultet, Osijek, 2003.

1.11. Recommended additional literature

1. K. R. Rao, Multimedia Communication Systems: Techniques, Standards, and Networks, Prentice Hall PTR, 2002.
2. N. Chapman, J. Chapman, Digital mulimedia, John Wiley & Sons, Chichester, 2000.
3. S. Rimac-Drlje: Multimedijska tehnika - predavanja, zavodska skripta, Eleketrotehnički 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	**FERČEC IVANKA**	
Course name	SF601 German	
Study program	Professional study programme, branch: Automation (facultative) Professional study programme, branch: Power Engineering (facultative) Professional study programme, branch: Informatics (facultative)	
Course status	Facultative	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	4
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description	
1.1. Goals	
According to the Common European Framework of Reference for Languages for Level A1 (Basic User – Breakthrough or Beginner), students can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type, introduce themselves and others, ask and answer questions about personal details (such as where he/she lives, people they know and things they have), interact in a simple way (provided the other person talks slowly and clearly and is prepared to help).	
1.2. Conditions for enrollment	
None	
1.3. Learning outcomes	
1.relate the basic concepts used in everyday private and business environments that are thematically related to the topics discussed in the course (introducing oneself, family, activities, food and drink, traffic, travelling, counting) 2.formulate everyday activities in the private and business environments that are thematically related to the topics discussed in the course, and compare the rules of Croatian and German 3.apply new grammar-related knowledge (e.g. Personalpronomen, Possessivartikel, definiter und indefiniter Artikel, Negativartikel, Zahlen, Verb: Präsens, W-Fragen, Ja/Nein Fragen, Perfekt mit sein und haben, Modalverben können, mögen) 4.write simple and short texts thematically related to the topics discussed in the course	
1.4. Course content	
Modul 1 Hallo! Ich bin Nicole… Ich bin Journalistin. Das ist meine Mutter. Modul 2 Der Tisch ist schön! Was ist das? Das ist ein F. Ich brauche kein Büro. Modul 3 Du kannst wirklich toll…! Kein Problem. Ich habe Zeit! Ich möchte was essen, Onkel Harry. Modul 4 Ich steige jetzt in die U-Bahn ein. Was hast du heute gemacht? Was ist denn hier passiert? Gramatičke i jezične strukture Alphabet, Zahlen 1-100, Verbkonjugation, W-Fragen, Negation mit nicht, Wortbildung –in, Ja/Nein Fragen, ja-nein-doch, Possessivartikel mein/dein, Verben mit Vokalwechsel Zahlen 100-1.000.000, Adjektve, definiter Artikel der/die/das, Personalpronomen er/sie/es, indefiniter Artikel ein/eine/ein, Negativartikel kein/keine/kein, Sg/Pl, Akkusativ Uhrzeiten, Tageszeiten, Wochentage, Modalverb können, Satzklammer, Verbposition im Satz, temporale Präpositionen am, um, Konjugation mögen, Wortbildung Nomen+Nomen Jahreszeiten, Monate, trennbare Verben, Perfekt mit haben, temporale Präpositionen von…bis, ab, Perfekt mit sein, temporale Präposition im	
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	1.4	1,2,3,4	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.2	1,2,3,4	Midterm exam	Evaluation of (written) exercises	25	50
Oral exam	1	1,2,3	Oral exam	Assessment of student's answers	20	40
Homework	0.2	1,2,3,4	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	0	5
Active class participation	0.2	1,2,3,4	Self-initiated participation in teaching in the application of processed language and grammatical structures	Evidence of self-participation in classes/ verification of answers given	0	5

1.10. Obligatory literature

1. S. Evans, A. Pude, F. Specht,Menschen(A 1.1) - Kursbuch, Hueber Verlag GmbH&Co KG, Ismaning, 2012.
2. S. Glas-Peters, A. Pude, M. Reimann. Menschen (A 1.1) – Arbeitsbuch. Hueber Verlag GmbH&Co KG, Ismaning, 2012.

1.11. Recommended additional literature

1. S. Schlüter, Menschen (A 1) - Berufstrainer, Hueber Verlag GmbH&Co KG, München, 2015.

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	S105-NJEM German I	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
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

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1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.identify and describe the differences between general and technical German based on the chosen specialised texts and topics
2.develop reading comprehesion skills of specialised texts, analyse and interpret more 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.summarise diagrams, schemes, figures and mathematical formulae orally and in written form
6.compose shorter specialized texts based on provided key words

1.4. Course content

Mathematik. Größen. Einheiten und Kurzzeichen. Basisgrößen und Basiseinheiten. Gesetzlich abgeleitete Einheiten. Energieformen und Energieumwandlung. Zeitformen des Verbs. Konditionalsätze mit und ohne Konjunktion. Fragen. Partizip 1 und 2 als Attribut. Zusammensetzungen.

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	3,4,6	Midterm exam	Evaluation of (written)	25	50

solving				exercises		
Oral exam	0.5	1,2,3,4,5	Oral exam	Assessment of student's answers	20	40
Grammar-related exercises/Short essays	0.1	2,3,4	Grammar-related exercises/Short essays	Evalution of 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. Pavlović, B. et al. (2007). Deutsche Grammatik macht Spaß. Osijek: Lingua
2. Svi smjerovi: Steinmetz, Maria; Dintera, Heiner. Deutsch für Ingenieure: Ein DaF-Lehrwerk für Studierende Ingenieurwissenschaftlicher Fächer. Springer Vieweg, 2014.
3. Grujoski, Vanda: Deutsche Fachtexte aus der Elektrotechnik, Udžbenici Sveučilišta u Zagrebu, Zagreb, 1993.

1.11. Recommended additional literature

1. Medić, Ivo: Kleine deutsche Grammatik, Školska knjiga Zagreb, 1995.
2. Pavlović, Branka et al.: Deutsche Grammatik macht Spaß, Lingua, 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	**FERČEC IVANKA, LIERMANN-ZELJAK YVONNE**	
Course name	S204-NJEM German II	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	3
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description

1.1. Goals

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1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.develop reading comprehension skills of specialized texts
2.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.correctly apply grammatical structures in both written and spoken communication and expand and acquire new communication patterns
5.provide a critical review of a specialised topic in both written and oral form
6.summarize texts, arguments and definitions in a written form

1.4. Course content

Weg der elektrischen Energie. Sicherungen und Belastungen im Stromkreis. Wie entsteht der Kurzschluss?. Und so entsteht der Strom. Woher kommt der Strom?. Arten der Kraftwerke. Was ist Informatik?. Rechner. Das Internet. Relativsätze. Finalsätze. Infinitivkonstruktionen. Das Passiv

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	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem	1	4,5,6	Midterm exam	Evaluation of (written)	25	50

solving				exercises		
Oral exam	0.7	1,2,4,5	Oral exam	Assessment of student's answers	20	40
Grammar-related exercises/Short essays	0.2	3,4,5,6	Grammar-related exercises/Short essays	Evalution of exercises/Correcting exercises and essays	0	5
Active class participation	0.1	1,2,3,4,5,6	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. Pavlović, B. et al. (2007). Deutsche Grammatik macht Spaß. Osijek: Lingua
2. Grujoski, Vanda: Deutsche Fachtexte aus der Elektrotechnik, Udžbenici Sveučilišta u Zagrebu, Zagreb, 1993.

1.11. Recommended additional literature

1. Medić, Ivo: Kleine deutsche Grammatik, Školska knjiga 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. LUKIĆ IVICA, Doc.dr.sc. KRPIĆ ZDRAVKO**	
Course name	SIR607-17 Database Design	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	3	
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

The aim of this course is to clarify the process of database design according to different models, as well as design of interfaces and background applications that will make use of the created database. Students will be introduced to various development environments used in database design, depending on the database model. Students will be introduced to the state-of-the-art tools for rapid development of upgradable databases of high quality, by using a relational model and the latest NoSQL databases.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.compare different database models
2.compare different technologies for database design
3.use complex logical database models, upgrade them according to needs for different database management systems
4.analyse and solve a specific problem, combine different technologies and development environments for database design
5.understand and implement simple and complex queries depending on the database model
6.maintain database, make backup and documentation for users and database administrators

1.4. Course content

Design databases using different technologies and software solutions. Introduction to NoSQL databases. Database utilisation in various technologies such as JavaScript (Angular, NodeJS), PHP (Laravel, Zend). The advantages and disadvantages of relational databases compared to NoSQL databases. Advanced applications and applications in practice. Part of the course conducted through independent research work, as well as monitoring of basic sources and the latest technologies.

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	2	1,2,3,4,5,6	Lectures, Laboratory	Attendance register.	6	10

Lectures, Laboratory exercises			exercises	Mandatory attendance percentage is: 70%.		
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	15	20
Oral exam	1	1,2,3	Oral exam	Assessment of student's answers	20	40
Project	1	3,4,5,6	Development of web application	Verification of solved tasks	15	30

1.10. Obligatory literature

1. Churcher, Clare . Beginning Database Design, 2nd Edition.New York, Apress, 2012.
2. Shackelford, Adam. Beginning Amazon Web Services with Node.js. New York: Apress, 2015.

1.11. Recommended additional literature

1. K. Williamson, Learning AngularJS, Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North Sebastopol, CA 95472, 2015.
2. R. Nixon, Learning PHP, MySQL & JavaScript With jQuery, CSS & HTML5, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472, 2014.
3. C. Pitt, Pro PHP MVC, Apress, Apress Media LLC 233 Spring Street New York, NY 10013, 2012.
4. L. Ullman, PHP Advanced and Object-Oriented Programming: Visual QuickPro Guide (3rd Edition), Peachpit Press, 1301 Sansome Street, San Francisco, CA 94111, 2012.
5. Sadalage, Pramod J.; Fowler, Martin, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence 1st Edition, RR Donnelley in Crawfordsville, Indiana, November 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	**Prof.dr.sc. MARTINOVIĆ GORAN**	
Course name	SR401 Operating Systems	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	2	
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.understand and analyse the principles, system and programme operating mechanisms of operating systems in current computer systems
2.apply the adopted principles, mechanisms and algorithms used in operating systems to develop and understand more advanced system and application solutions in suitable programming environments and languages
3.analyse, evaluate and plan the use of current operating systems according to the environment and user requirements
4.use the current operating systems at the advanced user, administrative, system and programme level

1.4. Course content

Development and an overview of operating systems. Hardware requirements on operating systems, system calls, APIs. Processes and threads: properties, interprocess communication, scheduling. Deadlocks: algorithms for deadlock detection and prevention. Memory management: sharing, virtual memory, paging algorithms, segmentation. Input-output devices. File system: realisation, examples (FAT, NTFS, etc.). Operating system security: cryptography, user authentication, attacks to systems and protection mechanisms. Fundamentals of operating systems design: software tools, timing requirements, reliability, user interface requirements, and performance evaluation. Modern operating systems using examples: UNIX, Linux, Windows, mobile OSs.

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	2	1,2,3,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance	3	6

exercises				percentage is: 70%.		
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	24
Oral exam	1	1,2,3,4	Oral exam	Assessment of student's answers	20	40
Written exam and laboratory exercises revision exam	1	1,2,3,4	Written exam and laboratory exercises revision exam	Knowledge and skills assessment on a written exam and revision exam during laboratory exercises	15	30

1.10. Obligatory literature

1. Budin, L; Golub M; Jakobović, D; Jelenković, L. Operacijski sustavi. Zagreb: Element, 2011.
2. Tanenbaum, A.S. Modern Operating Systems (3rd Ed.). Pearson, 3rd Ed., 2013.
3. L. Budin, M. Golub, D. Jakobović, L. Jelenković, Operacijski sustavi, Element, Zagreb, 2011.

1.11. Recommended additional literature

1. W. Stallings, Operating Systems, Internals and Design Principles, Pearson Education, 7th Ed., 2011.
2. S. Das, Your UNIX: The Ultimate Guide, McGraw-Hill Science, 2000.
3. C. Schroder, Linux Cookbook, O'Reilly, New York, 2004.
4. J.M. Hart, Windows System Programming (3rd Ed.), Addison Wesley Professional, Boston, 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	**Doc.dr.sc. LIVADA ČASLAV**	
Course name	SIR304-17 Basics of 3D Modelling	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
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

Introduce students to different ways of modelling and making textures. Explain various types of 3D models according to the quality, speed of creation and obtained results. Train students to successfully use the desired topology for the purpose of modelling and later implementations. Students will focus on model optimisation in terms of 3D model classification in terms of simple polygons. Introduce students to digital sculpting, textures and materials as well as light sources in 3D space. Clarify the influence of local and global lighting, the importance of composition, virtual camera and rendering techniques.

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

1.3. Learning outcomes

1.identify functions and algorithms of 3D modelling
2.explain algorithms, methods in designing and manipulating 3D models
3.apply the theoretical basis for creating a 3D project assignment (2D model –> 3D model)
4.prepare a 3D model for further processing (games, animation, 3D printing)
5.interpret and analyse the 3D model design

1.4. Course content

Introduction to 3D (overview of key steps and processes through 3D application), elaboration of various types of modelling, primitive modelling. Polygon modelling (sub-d modelling). Hard surface modelling. Procedural modelling. Low-poly modelling. Materials. Texture maps. Modelling textures (normal, displaced, bump, etc.). Method of application of material and texture. Texture preparation. Types of renderings. Evaluation of rendered models.

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	1.5	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	5	10

Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1.5	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30
Solving a project task	1	1,2,3,4	Laboratory exercises	Aluation of project task solutions	0	30

1.10. Obligatory literature

1. Blender 3D: Noob to Pro, dostupno online besplatno: https://upload.wikimedia.org/wikipedia/commons/2/20/BlenderDocumentation2.pdf
2. J. M. Blain - The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC Press, 2016.

1.11. Recommended additional literature

1. G. Fisher - Blender 3D Basics Beginner's Guide Second Edition, Pack Publishing, 2014.
2. O. Villar - Learning Blender: A Hands-on Guide to Creating 3D Animated Characters, Addison-Wesley, 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	**Prof.dr.sc. CUPEC ROBERT**	
Course name	SAIE301-17 Basics of Automatic Regulation	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (elective)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6.5
	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.explain the dynamic behaviour of the system and its dynamic mathematical model
2.carry out a simple analysis of dynamic system in a time area, complex variable area and frequency area
3.describe the structure of a control loop and the role of its individual parts
4.recognise the influence of particular control loop elements on its overall behaviour
5.analyse behaviour of simple dynamic systems using MATLAB
6.synthesise a controller by using some of the practical synthesis procedures

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. Linearisation 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 indexes in time and ferquency domain. Basic controller types. Control loop synthesis. Fixed set-point control. Classic methods of synthesis of linear continuous control systems. Synthesis in time and frequency domain. Empirical rules for setting the controller parameters. 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	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	2	6
Practice – problem solving	1	1,2,4,6	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.3	2,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	24
Oral exam	0.7	1,2,3,4,6	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Tomac, J.: Osnove automatske regulacije - predavanja, Fakultetska skripta, ETF, Osijek, 2004.

1.11. Recommended additional literature

1. Perić, N.: Automatsko upravljanje - predavanja, Zavodska skripta, FER, Zagreb, 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	**Dr. sc. ŠPOLJARIĆ ŽELJKO**	
Course name	SE301 Fundamentals of Electrical Machines	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6.5
	Workload (L+(AE+LE+CE)+S)	30+(15+0+15)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.interpret the elements necessary for the realisation of electromechanical energy conversion, and recognise and distinguish the types of electric machines with respect to their purpose (i.e. motor or generator) 2.interpret and link different operating principles, machine parts and their function in DC and AC types of electric machines 3.explain magnetic circuit, current covering, flow and rotating magnetic field and calculate magnetic circuit, current covering and flow for DC and multiphase machines 4.interpret and reconstruct the way of developing and calculating induced voltage and torque depending on whether the machine works as a motor or as a generator applicable to all types of electric machines 5.organise and measure electrical and mechanical values in order to determine the main parameters of electric machines and their magnetising curve as well as distinguish the basic structure elements and data of all kinds of electric machines 6.organise the analysis and procedure for testing the basic operating states of electric machines	
1.4. Course content	
Classification and common characteristics of electric machines. Fundamentals of mechanical energy conversion into electric energy and vice versa. Implementation of conversion. The magnetic circuit of electric machines. Machine models for DC voltages and DC current. Machine models for AC voltages and AC current. Linear current density and magnetomotive force. Magnetomotive force of AC and polyphase excitation. Rotating magnetic field. Developed torque. Operation conditions. Design exercises: introduction into the work of the Electric machines and drives laboratory. DC machine. Design, basic data and measurement of winding resistance. Magnetic curve. AC machine. Design and basic data. Short circuit. Synchronous machine. Basic data and measurement of winding resistance.	
1.5. Teaching methods	Lecture Auditory 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, Design exercises	1.5	1,2,3,4,5,6	Lectures, Auditory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1	3,4,6	Midterm exam	Evaluation of (written) exercises	15	30
Oral exam	2	1,2,3,4,6	Oral exam	Assessment of student's answers	20	40
Problem-solving related to design exercises	1	1,2,4,5,6	Design exercises	Evaluation of problem solving exercises	15	30

1.10. Obligatory literature

1. Mandić, I; Komljenović, V; . Pužar, M. Sinkroni i asinkroni električni strojevi. Zagreb: Tehničko veleučilište u Zagrebu, ISNB: 975-953-7048-26-6, 2012.
2. Pyrhonen, Juha; Tapani Jokinen; Hrabovcova, Valeria. Design of Rotating Electrical Machines. John Wiley & Sons, ISBN: 978-0-470-74008-8, 2009.
3. R. Wolf, Osnove električnih strojeva, Školska knjiga, Zagreb 1991.

1.11. Recommended additional literature

1. L. M. Piotrovskij, Električni strojevi, Tehnička knjiga, Zagreb 1970.
2. M. Pužar, I. Mandić, Osnove električnih strojeva, nastavni materijal na Moodle-u, Elektrotehnički fakultet Osijek, 2010.
3. A. Dolenc i dr., Električni strojevi, 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	**lzv. prof. dr. sc. HERCEG MARIJAN, lzv.prof.dr.sc. MATIĆ TOMISLAV (st.)**	
Course name	S203 Fundamentals of Electronics	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	8
	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.understand the physical fundamentals of semiconductors
2.understand the basic working principals of diodes and transistors
3.evaluate electronic circuits in static and dynamic working conditions
4.based upon the known structure and working principle, design power amplifiers of class A, B and C
5.evaluate fundamental operational amplifier based circuits
6.analyse and evaluate impulse electronic circuits

1.4. Course content

Physical fundamentals of semiconductors. Junction-diodes. Basic diode devices. Bipolar and unipolar transistors. Thyristors. Other semiconductor elements for switched operating modes. Fundamentals of amplifiers. Basic amplifiers with bipolar and unipolar transistors. Feedback circuits (amplifiers). Power circuits and systems: class A, AB and B amplifiers. Operational amplifiers and basic circuits with operational amplifiers. Pulse electronic circuits: transistor switch, multivibrators, waveshaping and waveform generators.

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	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory	Attendance register. Mandatory attendance	0	0

exercises, Laboratory exercises			exercises	percentage is: 70%.		
Practice – problem solving	1.7	2,3,5	Midterm exam	Evaluation of (written) exercises	20	40
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.3	2,3,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	20
Oral exam	3	1,2,3,4,5,6	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Boylestad, Robert L; Nashelsky, Louis. Electronic Devices and Circuit Theory (11th Edition). Pearson, 2013.
2. Modlic, B.Modlic: Visokofrekvencijska elektronika - Modulacija, modulatori, sintezatori frekvencije, Školska knjiga, Zagreb 1982.

1.11. Recommended additional literature

1. G.Lukatela, Digitalne telekomunikacije, Građevinska knjiga, Beograd, 1988.
2. J.G.Proakis, Digital Communications, 4th ed., McGraw Hill, N.Y., 2000.
3. E.Kamen, Introduction to Signals and Systems, Macmillan Pub. Comp. New York, 1987.

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	SR101 Fundamentals of Electrical Engineering	
Study program	Professional study programme, branch: Informatics (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 and understand the basic concepts and physical quantities of electrostatic and electromagnetic field 2.describe and explain the laws of electromagnetic and electrostatic fields (induction, self-induction, Ampère's circuital law, potential, Coulomb's force ...) 3.analyze and synthesize DC networks by applying the basic laws and methods 4.analyse and synthesise capacitor networks 5.analyse and synthesise simple magnetic circuits 6.measure and evaluate electrical quantities in DC circuits	
1.4. Course content	
Structure of matter and electrical charge. Electrical field. Imaging with field lines. Electrical potential and voltage. On capacitance, capacitance of plane capacitors. Energy in electrostatic field. Electric circuit, intensity, direction and density of current. Electricity and conductance, influence of temperature. Ohm's law. Kirchhoff's laws. Power and energy in circuits, Joule's law. Maximum of usable power and efficiency. Magnetic field. Force on a moving charge. Density of the magnetic flux, the magnetic field vector, magnetic flux. Ampere's law. Permeability, ferromagnetism, magnetisation curve and hysteresis loop. Magnetic field around a linear conductor. Vector superposition. Faraday's law. Inductance and mutual inductance. Energy of the magnetic field. Currents and voltages changing in time. Basic effects of alternating currents. Average and RMS values. Current and voltage relations on resistor, capacitor, and inductor. Usage of complex calculation for analysis of sinusoidal current networks. Impedance and admittance. True, reactive and apparent power.	
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	3	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1	3,4,5	Midterm exam	Evaluation of (written) exercises	25	50
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	0	10
Oral exam	2	1,2,3,4,5	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Pinter, V. Osnove elektrotehnike I i II. Zagreb:Tehnička knjiga, 1994.
2. Alexander, Charles K; Sadiku, Matthew N.O. Fundamental of Electric Circuits. McGraw-Hill Education, 5 edition. 2012, ISBN: 0073380571
3. B. Kuzmanović, Osnove elektrotehnike I i II, Element, Zagreb, 2000.
4. Felja, Koračin, Malić, Zbirka zadataka i rješenih primjera iz Osnova elektrotehnike, I. i II. dio, 1991

1.11. Recommended additional literature

1. Šehović, Felja, Tkalić, Osnove elektrotehnike zbirka primjera prvi dio, Školska knjiga, Zagreb, 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	**Dr. sc. MIKLOŠEVIĆ KREŠIMIR**	
Course name	SAE101 Fundamentals of Electrical Engineering I	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	7
	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 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.combine basic laws, mathematical expressions and models to solve simpler problems in electrical and magnetic fields, magnetic circuits and real current circuits with DC resistors and capacitors 3.analyse and solve complex DC electric circuits with linear resistances and capacities in steady state and magnetic circuits with and without a ferromagnetic core 4.select an optimal method and theorem for solving DC circuits with linear elements in a steady state 5.interpret problem tasks solved in electrical and magnetic fields and simple magnetic circuits 6.compare analytical and numerical mathematical models of DC electric circuits with linear elements in the steady state using Kirchhoff's laws and magnetic circuits with and without a ferromagnetic core 7.test simple DC electrical circuits with real resistors, coils and capacitors 8.organise basic electrical measurements in DC electric circuits	
1.4. Course content	
Structure of matter. Conductors and insulators. Coulomb's law. Electric field. Gauss's law. Electric potential and voltage. Electric circuit and electric current. Electric resistance. Ohm's law. Kirchhoff's laws. Power and energy in a current circuit, Joule's law. Methods and theorems for solving electric networks. Material in the electric field. Electric flux vector. Capacitance and capacitors. Energy of the electrostatic field. Electrostatic networks. Magnetic field, flux density and magnetic field intensity. Magnetic force on a current-carrying conductor. Biot-Savart's law. Ampere's law. Electromagnetic induction. Material in the magnetic field. Magnetic circuits. Self- and mutual inductance. Energy of the magnetic field. Laboratory practice: Work in the laboratory. Ohm's law. Kirchhoff's laws. Complex direct current networks. Electrostatic networks. Magnetic field and coil inductance. Faraday's law.	
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%.	3	6
Practice – problem solving	2	3,4,5,6	Midterm exam	Evaluation of (written) exercises	16	32
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	7,8	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	9	18
Oral exam	1.3	1,2,3,4,5,6	Oral exam	Assessment of student's answers	19	38
Written exam at the beginning and end of the semester	0.2	1	Written exam at the beginning and end of the semester	Checking solutions	0	6

1.10. Obligatory literature

1. Kuzmanović, B. Osnove elektrotehnike I, Element, , 2000. , Zagreb, ISBN 953-197-128-5
2. Prasad, Rajendra . Fundamentals of Electronic Engineering, Cengage Learning. 2012., ISBN 9781408072615
3. V. Pinter: Osnove elektrotehnike I i II, Tehnička knjiga, Zagreb, 1989.
4. Šehović, Felja, Tkalić: Osnove elektrotehnike, zbirka primjera prvi dio, Školska knjiga, Zagreb 1980.

1.11. Recommended additional literature

1. Felja, Koračin, Zbirka zadataka i riješenih primjera iz osnova elektrotehnike, 1. dio, Školska knjiga, Zagreb, 1985.
2. M. Pužar, I. Mandić, M. Božić, Osnove elektrotehnike I, nastavni materijal na moodleu, Elektrotehnički fakutet Osijek, 2006.

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	**Dr.sc. ĆORLUKA VENCO**	
Course name	SAE201 Fundamentals of Electrical Engineering II	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	8
	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.compare the mean, mean electrolytic and effective values of time-varying currents and voltages 2.explain the mathematical and graphical time dependence of voltage and current for transient phenomena in the coupling and discharge of the L and C elements connected to rectangular input voltage 3.choose the correct mode of representation in the phase-like impedance and circuit admitance with elements R, L and C connected to the alternating sinusoidal voltage 4.compare the terms for the current and voltage resonant frequency of the R-L-C circuit connected to the alternating sinusoidal voltage 5.derive expressions for apparent, active and reactive power in sinusoidal networks 6.derive expressions for phase and line voltages, make the three-phase asymmetric star-connected model and draw an appropriate scheme of the connection 7.derive expressions for phase and line currents, make the three-phase asymmetric delta-connected model and draw an appropriate scheme of the connection 8.describe the compound scheme and write the expression for the degree of a real transformer action loaded with work resistance	
1.4. Course content	
Current and voltage changing in time. Periodic magnitudes. Complex numbers and phasor concept. Sinusoidal voltage on R, L and C. Impedance and admittance. Electric power and power factor. Resonance. Non-sinusoidal waves. Three-phase system. Transformer principles and equivalent circuit. Electromechanical energy conversion. Transients in RLC circuits. Laboratory practice: impedance, admittance and electric power in alternating current circuits. Frequency changing in alternating networks. Three-phase symmetric networks. Three-phase unsymmetrical networks. Single-phase transformer.	
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	3	1,2,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	5
Practice – problem solving	1.3	1,3,4,6,7	Midterm exam	Evaluation of (written) exercises	18	35
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	4,5,6,7,8	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	20
Oral exam	1.7	1,2,3,4,5,6	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. Kuzmanović, B. Osnove elektrotehnike II, Element, , 2000., Zagreb.
2. V. Pinter: Osnove elektrotehnike I i II, Tehnička knjiga, Zagreb, 1989.
3. Felja, Koračin: Zbirka zadataka i riješenih primjera iz osnova elektrotehnike, 1. i 2. dio, Školska knjiga, Zagreb, 1985.

1.11. Recommended additional literature

1. M. Pužar, Osnove elektrotehnike II, predavanja na Moodle-u, Elektrotehnički fakultet 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	**KRAUS ZORISLAV**	
Course name	SEIA301-17 Fundamentals of Power Engineering	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (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+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.determine forms and sources of energy and classify them
2.describe and analyse conventional and renewable energy sources and energy consumption in the world, Europe and Croatia
3.determine and compare conversion of energy forms from a primary form to a useful form of energy
4.compare the impact of conventional and renewable energy sources on climate change and global warming from the ecological perspective
5.understand the energy policy and strategy of Croatia and the European Union

1.4. Course content

The importance of new energy sources. Forms and classification of new energy sources. Non-renewable new energy sources (oil, natural gas, nuclear and geothermal). Renewable new energy sources (hydro power, biomass, wind, solar and other). Basics of new energy transformations. Primary to useful energy conversion (chemical and nuclear energy conversion to internal thermal caloric energy, internal thermal caloric energy conversion to mechanical energy, mechanical energy conversion to electrical energy, direct energy conversions to the electrical energy, and electrical energy conversion to other energy forms). New energy sources for transportation. Storage for new energy sources. Total energy consumption and new energy sources contribution. Environmental impact of new energy sources. Life-cycle usage (pollution and climate change). Sustainable development and new energy sources (damage and benefit from energy use, savings and efficiency).

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	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	4	10
Practice – problem solving	1.5	2,3,4	Midterm exam	Evaluation of (written) exercises	15	30
Oral exam	1	3,4,5	Oral exam	Assessment of student's answers	20	40
Seminar paper	0.5	3,4	Written exam	Evaluation of exercises	0	20

1.10. Obligatory literature

1. B. Udovičić: Energetika, Školska knjiga, Zagreb, 1993.
2. H. Požar: Osnove energetike 1, 2 i 3, Školska knjiga, Zagreb, 1992
3. De Oliveira, Silvio Jr. Exergy: Production, Cost and Renewability. London: Springer-Verlag, 2013.

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.

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	S206-17 Business communication	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	3
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description

1.1. Goals

Presentation of the basic elements of business communication, communication techniques, communication management process skills, and the ability to work efficiently in a business environment.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.understand the basic concepts in business communication, communication competence and communication skills
2.develop written and computer-mediated communication for message formatting and exchange
3.evaluate one's own presentation and negotiation skills and skills for conducting meetings
4.recommend and critically evaluate assertive communication skills

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.

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	0.6	1,2,3,4	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	4	10
Practice – problem solving	0.5	1,2,3,4	Midterm exam	Evaluation of (written) exercises	15	30

Oral exam	0.8	1,2,3,4	Oral exam	Assessment of student's answers	15	30
Seminar paper	0.6	2,3,4	Essays, presentations	Seminar presentation	10	20
Activity in classes	0.5	2,3,4	Participation in classes	Participation in classes	0	10

1.10. Obligatory literature

1. BOVEE, Courtland L.; THILL, John V. Suvremena poslovna komunikacija. Zagreb: Mate doo, 2012.
2. Guffey, Mary Ellen; Loewy Dana. 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. Pease A. & B., Komunikacija za sva vremena, Lisac & Lisac, Zagreb, 2007.
8. Lamza – Maronić, M., Glavaš, J.,Poslovno komuniciranje, Ekonomski fakultet u Osijeku, Osijek, 2008.
9. R. Fox, Poslovna komunikacija, Hrvatska sveučilišna naknada, Zagreb, 2006.

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	S501-16 Business communication	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	3
	Workload (L+(AE+LE+CE)+S)	15+(15+0+0)+0

1. Course description

1.1. Goals

Presentation of the basic elements of business communication, communication techniques, communication management process skills, and the ability to work efficiently in a business environment.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.understand the basic concepts in business communication, communication competence and communication skills
2.develop written and computer-mediated communication for message formatting and exchange
3.categorise grounding systems of transmission and distribution networks
4.recommend and critically evaluate assertive communication skills

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.

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	0.6	1,2,3,4	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	4	10
Practice – problem solving	0.5	1,2,3,4	Midterm exam	Evaluation of (written) exercises	15	30

Oral exam	0.8	1,2,3,4	Oral exam	Assessment of student's answers	15	30
Seminar paper	0.6	2,3,4	Essays, presentations	Seminar presentation	10	20
Activity in classes	0.5	2,3,4	Participation in classes	Participation in classes	0	10

1.10. Obligatory literature

1. BOVEE, Courtland L.; THILL, John V. Suvremena poslovna komunikacija. Zagreb: Mate doo, 2012.
2. Guffey, Mary Ellen; Loewy Dana. 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. Pease A. & B., Komunikacija za sva vremena, Lisac & Lisac, Zagreb, 2007.
8. Lamza – Maronić, M., Glavaš, J.,Poslovno komuniciranje, Ekonomski fakultet u Osijeku, Osijek, 2008.
9. R. Fox, Poslovna komunikacija, Hrvatska sveučilišna naknada, Zagreb, 2006.

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. MARIĆ PREDRAG**	
Course name	SE604-17 Transmission and Distribution of Electrical Energy	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	3	
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.analyse topology and operating conditions on transmission and distribution network lines 2.apply equivalent schemes of power system components, methods and principles of power system protection 3.categorise grounding systems of transmission and distribution networks 4.make a calculation of radial and double fed networks and more complex meshed networks 5.interpret load flow and short-circuit calculation in transmission and distribution networks 6.interpret system losses, reactive power compensation, transient states during short-circuit	
1.4. Course content	
Power transmission. Power transmission network types. AC and DC power transmission. Components of power transmission systems. Equivalent schemes of power transmission lines. Conditions on ideal transmission line. Travelling waves on long transmission lines. Conditions on real transmission line. Exact equivalent schemes of transmission lines. Transformer and generator in power transmission system. Electrical networks calculation. Voltage regulation. Stability. Power and energy losses. Economic problems. Short circuit conditions. Short circuit protection. Transmission and distributive network grounding. Power distribution. Distribution networks topology. Types of distributive networks. Voltage drop on distributive grid element. Calculation of single supplied, double supplied and complex networks with ring structure. Distributed and lumped load. Complex networks with ring structure. Load flow, short circuit and reliability calculation. Grounding types and touch voltage safety requirements in low voltage networks. Cable and overhead line networks. Networks planning, load growth, location of new transformer stations in network. Voltage regulation in distributive networks, reactive power compensation, availability and reliability of distributive networks. Cable distribution systems. Distribution systems in rural areas. Distribution system protection. Overvoltages in distributive 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	1,2,3	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.5	4,5	Midterm exam	Evaluation of (written) exercises	25	50
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.1	4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	5
Oral exam	1.4	1,2,3,6	Oral exam	Assessment of student's answers	23	45

1.10. Obligatory literature

1. The Electric Power Engineering Handbook, ELECTRIC POWER GENERATION, TRANSMISSION, AND DISTRIBUTION, Third Edition. Edited by LEONARD L. GRIGSBY, CRC Press Taylor & Francis Group, 2012
2. M.i K. Ožegović: Električne mreže I, II, III i IV skripta ETF Split, 1996.
3. S. Nikolovski: Elektroenergetske mreže â€ zbirka riješenih zadataka, ETF Osijek, 1998

1.11. Recommended additional literature

1. Bergen, Vitall Power system analysis Prentice Hall 2000.
2. B. Štefić, S.Nikolovski: Prijenos i distribucija električne energije, Skripta, ETF Osijek 2001.

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. GRBIĆ RATKO, Prof.dr.sc. SLIŠKOVIĆ DRAŽEN**	
Course name	SIR404-17 Applied Machine Learning	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
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

Familiarise students with the principles and methods in the field of machine learning and enable them to work with development tools and services that enable data analysis and machine learning.

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

1.3. Learning outcomes

1.define basic terminology and the concept of machine learning
2.apply theoretical knowledge to solving a simple machine learning problem
3.use program implementations of machine learning methods and algorithms
4.apply exploratory data analysis techniques
5.apply data clustering algorithms
6.apply algorithms to solve classification and regression problems

1.4. Course content

Introduction to machine mearning. Unsupervised and supervised learning. Parametric and nonparametric methods. Regression and classification methods. Model complexity. Model selection. Result evaluation. Different methods/algorithms of supervised machine learning: neural networks, support vector machines, decision trees, deep learning, etc. Data clustering algorithms. Data dimensionality reduction algorithms. An overview of current machine learning development environments. Model implementation. Different applications of machine learning (text processing, image processing, recommendation systems, etc.) and examples.

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	1.5	1,2,3,4,5,6	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	7	10

Writing pre-lab write-ups, results analysis and writing laboratory reports	1.5	2,3,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1.5	1,2,4,6	Oral exam	Assessment of student's answers	18	35
Solving a project task	0.5	2,3,4,5,6	Project	Evaluation of project task solutions	0	25

1.10. Obligatory literature

1. S. Raschka, Python Machine Learning, Packt Publishing, 2015.
2. E. Alpaydin, Introduction to Machine Learning, MIT Press, 2014.

1.11. Recommended additional literature

1. W. McKinney, Python for Dana Analysis, O'Reilly, 2013.
2. C. Rossant, IPython Interactive Computing and Visualization Cookbook, Packt Publishing, 2014.
3. G. James, D. Witten, T. Hastie, R. Tibshirani, An Introduction to Statistical Learning with Applications in R, 6th Ed., Springer, 2013.

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	**Mr.sc. DORIĆ DRAŽEN**	
Course name	SA601-15 Process Measurements, Sensors and Actuators	
Study program	Professional study programme, branch: Automation (mandatory)	
Course status	Mandatory	
Year of study	3	
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.describe the elements of a control supervisory system
2.define standard signals of a control supervisory system
3.understand working principle, characteristics and way of using process instrumentation in process and power measurement
4.fill in qustionary sheet of mesurement device and using software tools for device selection
5.understand working principle, characteristics and way of using process instrumentation in process and power plants
6.to implement data telemetry technology in supervisory and control systems
7.to integrate sensor and actuator devices in automation control

1.4. Course content

Measurement of process values: distance, position, angle, angular velocity, force, torque, level, pressure, flow, temperature, pH value and other process values. Signal transfer technologies. Disturbances and their sources. Measurement error. Signal processing. Sensors in control systems. Actuators: DC, AC and step motors, pneumatic, electropneumatic, hydraulic and electrohydraulic devices, pumps, compressors and valves. Thyristor converters and transistor converters. Static and dynamic characteristics of sensors and actuators. Intelligent sensors. Input-output units and interfaces in sensors and actuators.

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	2	1,2,3,5,7	Lectures, Auditory	Attendance register.	3	10

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

1.10. Obligatory literature

1. VALTER, Z: Procesna mjerenja , Elektrotehnički fakultet, Osijek, 2008. ISBN 978-953-6032-59-4

1.11. Recommended additional literature

1. Šantić, A., Elektronička instrumentacija, Školska knjiga, Zagreb, 1988.,
2. Tomac, J., Osnove automatske regulacije - predavanja, Fakultetska skripta, ETF, Osijek, 2004.
3. Šurina, T., Analiza i sinteza servomehanizama i procesne regulacije, Školska knjiga, Zagreb, 1974.
4. Kovačić, Z., S. Bogdan, Elementi automatizacije procesa - predavanja, Zavodska skripta, Zavod za APR, FER, Zagreb,
5. Fraden, J., Handbook of Modern Sensors - Physics, Designs, and Applications, Second edition, AIP Press, NY 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. KÖHLER MIRKO**	
Course name	SAE102 Programming	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power 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	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.compare and/or explain complex data types and functions by using an example 2.select or design a suitable algorithm to solve a simple problem by using different data and structural elements 3.compare and/or explain, by means of an example, how to use pointers, fields of pointers, dynamic memory allocation and files 4.define and explain the basic concepts of object-oriented programming 5.develop ones own software solution, examine and analyse the developed software solution in a developing environment 6.suggest advanced algorithmic approaches to problem solving	
1.4. Course content	
Principles of working of computer hardware and software components. The basics of algorithms, time and space complexity. The fundamentals of software engineering, programming, programming language elements, software development and development tools. An overview of programming languages and models. Programming language C through examples: software structure, keywords, data types, preprocessor commands, variables, arithmetic and logical expressions, input and output data, branching and repetition in the software, functions, pointers, fields, pseudo-random numbers, dynamic memory allocation, working with files. The basics of object-oriented programming. Objects, classes, templates. Programming language C++. Development of one's own software solutions.	
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	1.5	1,2,3,4,5,6	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,3,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1.5	1,2,3,4	Oral exam	Assessment of student's answers	18	35
Solving programming problems in written form	1	2,3,4	Written exam	Knowledge assessment by a written exam or mid-term exams	15	30

1.10. Obligatory literature

1. Šribar, J.; Motik B., Desmistificirani C++, 3. dopunjeno izdanje, 2010.
2. Kochan, S.G., Programming in C (Developer's Library), 4th Ed., Addison-Wesley Professional, 2014.,
3. Kusalić D., 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. R. Sedgewick, K. Wayne, Algorithms (4th Edition), Addison-Wesley Professional, 2011.
3. A. S. Tanenbaum, T. Austin, Structured Computer Organization (6th Ed.), Pearson, 2012.
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	**Izv. prof. dr. sc. NENADIĆ KREŠIMIR**	
Course name	SR201-17 Programming	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	8
	Workload (L+(AE+LE+CE)+S)	45+(0+45+15)+0

1. Course description	
1.1. Goals	
Introduce students to ways of recording integer and real numbers in a registry. Explain to students the specificity of using complex data types. Show students how to use pointers with complex data types and functions. Enable students to use sequential and binary files. Show students the ability to use complex types of data as function arguments. Introduce students to algorithms for data searching and sorting. Explain to students the basic concepts of object-oriented programming through examples.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.describe and explain with an example complex data types, pointers, functions, file operations basics and algorithms for data searching and sorting 2.apply algorithmic approach to problem solving by using different data and structural elements 3.develop your own software solution of the given problem 4.define and explain the basic concepts of object-oriented programming principles 5.identify and apply object-oriented programming concepts in specific tasks 6.apply object-oriented programming concepts to solving problem given in the task	
1.4. Course content	
The integer and real number format in the registry. Introduction to Complex Data Formats in Programming Language C (Structure and Union). Applying a pointer to creating a specific task (pointer arithmetic, pointers to complex data types, pointers and functions, dynamically allocating memory for complex data). Organise the programme code into multiple files. How to access sequential and binary files. Use complex data as return value and as function arguments. Search and sort data algorithms. The basics of object-oriented programming in C ++ programming language. Basic concepts of OOP (class, object, property, method, constructor, destructor). Methods of encapsulation of data, access rights and aggregation of classes. The concept of inheritance in OOP. Operator and function overload. Templates and use of Standard Template Library (STL). Apply advanced programming concepts to embedded platforms (Arduino).	
1.5. Teaching methods	Lecture 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, Laboratory exercises, Design exercises	2.5	1,2,3,4	Lectures, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	5
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.5	2,3,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	25
Oral exam	1.5	1,2,3,4,5,6	Oral exam	Assessment of student's answers	20	40
Problem-solving related to design exercises	2.5	2,3,4,5	Design exercises	Evaluation of problem solving exercises	0	30

1.10. Obligatory literature

1. Šribar, J; .Motik B. Desmistificirani C++, 3. dopunjeno izdanje, 2010
2. Kochan, S.G. Programming in C (Developer's Library), 4th Ed., Addison-Wesley Professional, 2014.
3. D. Grundler, Primijenjeno računalstvo, Graphis, Zagreb, 2000.

1.11. Recommended additional literature

1. D. Patterson, J. Hennessy, Computer Organization and Design: The Hardware / Software Interface (4th. Edition), Morgan Kaufmann Publ., San Francisco, 2008.
2. A. S. Tanenbaum, T. Austin, Structured Computer Organization (6th Ed.), Pearson, 2012.
3. D. Fisher, Zbrika zadataka iz C-a, ETF Osijek (skripta), 1999.
4. Knuth, The Art of Computer Programming, Vol. 1., Fundamental Algorithms, Addison-Wesley, Reading, MA, 1997.
5. C. Horstmann, Computing Concepts with C++ Essentials (3rd Ed.), John Wiley & Sons, Inc., New York, 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	**Doc.dr.sc. MATIĆ TOMISLAV (ml.)**	
Course name	SA602-17 FPGA Programming	
Study program	Professional study programme, branch: Automation (mandatory)	
Course status	Mandatory	
Year of study	3	
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

Provide students with practical knowledge in the field of programming of embedded processor systems based on FPGA integrated circuits. Students will learn to recognise a specific design and implementation issues for PicoBlaze and MicroBlaze processors. The skills of applying computer design software tools based on softcore processors will be acquired. Also, students will acquire skills for the development of application for softcore processors.

1.2. Conditions for enrollment

Requirements met for enrolling in the study programme

1.3. Learning outcomes

1.define, identify and describe a computer system based on the softcore processor
2.develop a simple computer system with the Xilinx Platform Studio development kit
3.develop software for a computer system based on the softcore processor
4.test and analyse the execution of a designed computer system and application software
5.implement and demonstrate the application of the designed system using the available FPGA development boards

1.4. Course content

Introduction. Basic CPU architecture. Hardware description languages for CPU design. PicoBlaze 8-bit softcore microprocessor. MicroBlaze 32-bit softcore microprocessor. Programming PicoBlaze microprocessor, assembler. Programming MicroBlaze Processor. Computer system design with Xilinx Platform Studio development kit. MicroBlaze processor I/O. MicroBlaze timers/counters and interrupts. Drivers' development for simple I/O devices. Drivers' development for complex I/O devices. Testing and analysing designed computer system hardware and software. Implement and test different process controllers to the designed computer system. Process automation with softcore processors. Example applications - temperature regulation, motor control, image processing, etc.

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	2	1,2,3,4,5	Lectures, Laboratory	Attendance register.	2	5

Lectures, Laboratory exercises			exercises	Mandatory attendance percentage is: 70%.		
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	11	30
Oral exam	1	1,2,3,4	Oral exam	Assessment of student's answers	18	35
Problem solving	1	2,3	Revision exams (written exam)	Evaluation of exercises	15	30

1.10. Obligatory literature

1. R. Sass: Embedded Systems Design with Platform FPGAs: Principles and Practices, Morgan Kaufmann, 2010.

1.11. Recommended additional literature

1. P. R. Schaumont: A Practical Introduction to Hardware/Software Codesign, 2nd ed., Springer, 2013.

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	SR102 Programming I	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	7
	Workload (L+(AE+LE+CE)+S)	45+(15+30+0)+0

1. Course description	
1.1. Goals	
The aim of the course is to clarify how numbers and characters are recorded into a computer and how to convert numbers into different number systems. Explain to students the role of compilers, interpreters and browsers. Train students to develop complex programmes with different procedures. Introduce students to different types of data, input and output functions and various types of operators. Explain programme loops and flow direction commands. Show students possibilities of using 1D and 2D fields and explain their function. Introduce them to the basics of pointers and teach them to generate pseudo-random numbers. Explain the dynamic memory allocation for simple data.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.compare and/or explain complex data types and functions by using an example 2.understand algorithmic approach to problem solving and write it in the programming language using different structures and data types 3.develop your own software problem solution in the specific programming language 4.define and explain the basic concepts of object-oriented programming 5.develop ones own software solution, examine and analyse the developed software solution in a developing environment 6.use more important and effective algorithms for frequent problems	
1.4. Course content	
Basic concepts and historical overview of computer science. The number systems and characters recording in computer memory. Programming, language elements, program design, concept and examples of compilers, interpreters and browsers. Programming language C through examples: programme structure, keywords, data types, pre-processor commands, variables, arithmetic and logical expressions, input and output data, branching and repetition in the programme, functions, pointers, fields, pseudo-random numbers, dynamic memory allocation. Development of your own software solution.	
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	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	5
Practice – problem solving	0.9	1,2,3,4,5	Midterm exam	Evaluation of (written) exercises	8	15
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	10	20
Oral exam	1.5	1,2,3,4	Oral exam	Assessment of student's answers	15	30
Written problem solving of programming tasks	1.5	2,3,4	Written exam	Written exam or revision exam	15	30

1.10. Obligatory literature

1. Šribar, J.; Motik B., Desmistificirani C++, 3. dopunjeno izdanje, 2010.
2. Kochan, S.G. Programming in C (Developer's Library), 4th Ed., Addison-Wesley Professional, 2014.
3. D. Grundler, Primijenjeno računalstvo, Graphis, Zagreb, 2000.

1.11. Recommended additional literature

1. D. Patterson, J. Hennessy, Computer Organization and Design: The Hardware / Software Interface (4th. Edition), Morgan Kaufmann Publ., San Francisco, 2008.
2. A. S. Tanenbaum, T. Austin, Structured Computer Organization (6th Ed.), Pearson, 2012.
3. L. Budin, Informatika za 1. razred gimnazije, Element, Zagreb, 2001.
4. D. Fisher, Zbrika zadataka iz C-a, ETF Osijek (skripta), 1999.
5. B. Motik, J. Šribar, Demistificirani C++, Element, Zagreb, 2010.
6. C. Horstmann, Computing Concepts with C++ Essentials (3rd Ed.), John Wiley & Sons, Inc., New York, 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	**Doc.dr.sc. MATIĆ TOMISLAV (ml.), Doc.dr.sc. ALEKSI IVAN**	
Course name	SIR303-17 Programming of Small Linux Computers	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
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

Introduce students to the possibilities of using small computers with the Linux OS; Teach students how to program in the Linux/C++ programming environment using the RaspberryPi development board; Teach students how to find and customise open-source software to solve a particular problem; To introduce students to the use of internet technology for remote processing and the exchange of information between small Linux computers; Teach students to work in a Linux computing environment.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.explain the capabilities and applications of small computers with Linux OS
2.write and run a Linux/C++ computing application based on the modification of the open source program
3.develop a remote information exchange system using small Linux computers
4.develop a system with small Linux computers, sensors and actuators, USB, Bluetooth and WiFi protocols
5.write a Linux C++ program for processing and visualising data using the real RaspberryPi board

1.4. Course content

Introduction. The possibilities of using small Linux computers. Presentation of the RaspberryPi development platform with the ability to run applications on the Linux operating system. Connecting the RaspberryPi with the internet and various computer applications. Programming Linux/C++ computing applications for the RaspberryPi. Finding and adapting open-source software to solve a particular problem. Solving the problem of remote information exchange between sensors and actuators. Applying WiFi, Bluetooth and USB protocols in a small Linux computing environment.

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	2	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance	2	5

exercises				percentage is: 70%.		
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	15	30
Oral exam	1	1,2,3,5	Oral exam	Assessment of student's answers	18	35
Problem solving	1	2,3,4,5	Revision exams (written exam)	Evaluation of exercises	15	30

1.10. Obligatory literature

1. Derek Molloy, Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux, John Wiley & Sons, 2016.
2. Chris Simmonds, Mastering Embedded Linux Programming, Packt Publishing, 2015.

1.11. Recommended additional literature

1. Simon Monk, Programming the Raspberry Pi, McGraw-Hill Education TAB, 2nd ed., 2015.
2. Christopher Hallinan, Embedded Linux Primer: A Practical Real-World Approach, Prentice Hall, 2nd ed., 2010.

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. KÖHLER MIRKO**	
Course name	SR303-17 Java Programming	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	6.5
	Workload (L+(AE+LE+CE)+S)	30+(0+45+0)+0

1. Course description

1.1. Goals

The aim of the course is to clarify the basic principles of object-oriented programming and Java programming language features. Topics such as data types, loops, exceptions, IO streams, collections, object-oriented paradigms, etc. will be presented to students. Students will implement object-oriented complex task solutions by using multiple classes, each using its own methods. Students will learn how to individually build a Java application on the given topic.

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

1.3. Learning outcomes

1.edit, translate, and run a program code
2.identify the organisational structure and select elements for the object model
3.create User Data Types (Classes) and create objects from them
4.write a main program in the appropriate programming language that solves the default problem based on the object-oriented approach
5.use scientific methods to find bugs in a program code, correct them, make an executable version of software and test it
6.individually customise and create computer software solving the given problem

1.4. Course content

The basic features of the Java programming language and the differences in relation to other languages. Fundamental principles of object-oriented programming, differences in relation to procedural programming. Java programming language. The terms class and object. Variables and methods as part of an object. Class elements and access control. Basic procedures for creating and destroying an object. Lifetime of the facility. Polymorphism and inheritance. Access control over classes. Functions and class templates. Java collections. Handling exceptions. Handling databases. Elements of a graphical interface (swing). Working with files and file system. Multithreading and multithreaded applications. HTTP protocol.

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	1.8	1,2,3,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	4	8
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	1,2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	20
Oral exam	1.7	1,2,3,4,5,6	Oral exam	Assessment of student's answers	17	34

1.10. Obligatory literature

1. P. Deitel, H. Deitel; Java how to program 10th edition, 2015
2. J. T. Streib, T. Soma; Guide to Java; Undergraduate textbook, Springer-Verlag London, 2014.
3. S. Kendal, Object oriented programming using Java, 2009 (Free electronic book)

1.11. Recommended additional literature

1. B. J. Evans, D. Flanagan; Java in a Nutshell; O'Reilly Media 2009
2. Booch, Grady .Object-oriented Analysis and Design with Application. Addison Wesley, Menlo Prk, Cal., 1994
3. The Java Tutorial (http://java.sun.com/)

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	**KRAUS ZORISLAV**	
Course name	SIE403-17 Software Tools in Power Engineering	
Study program	Professional study programme, branch: Power Engineering (elective)	
Course status	Elective	
Year of study	2	
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

The aim of the course is to familiarise students with a variety of computer applications in power engineering (data collection, measurement, data processing, simulation, design). Students will be able to independently parameterise the power system in a program package, and perform a simulation of power flows, short circuits and interpret the obtained results. They will also be able to design advanced electrical installations (KNX / EIB installations).

1.2. Conditions for enrollment

The necessary requirements to enrol in the second year of the studies.

1.3. Learning outcomes

1.describe the role (different area of application) of computers in power engineering
2.define the parameters of the elements of the power system, to choose a suitable method and to model the system in the corresponding software
3.analyse and evaluate the power flow and SC flow results obtained by using simulation software
4.realise advanced KNX / EIB installations in software based on the conceptual solution and achieve PC communication with installation when checking project functionality
5.illustrate the application of computers in SCADA systems applied to power engineering

1.4. Course content

Computers in a power and network analysis. Algorithms for calculating power flows and short circuit current. Modelling and parameterising EES elements. Computer simulation of power flows and simulation of short-circuit in one of the specialised software packages. Designing advanced electrical installations (KNX/EIB) with a computer, programming the designed installation into a demonstration set and check functionality. Computers in systems for monitoring, data collection and processing of a power system (SCADA systems). The role of computers in measurement and data processing (Power Quality).

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	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	5	10
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	1.5	1,2,5	Oral exam	Assessment of student's answers	25	50
Seminar	0.5	1,2,4,5	Presenting a seminar paper	Grading a seminar paper	10	20

1.10. Obligatory literature

1. Nikolovski, S,; Barić, T;.Marić, P. Programski paketi za analizu i simulaciju rada elektroenergetskog sustava. Osijek: Elektrotehnički fakultet Sveučilišta J.J. Strossmayera u Osijeku, 2010.
2. M.Ožegović, K.Ožegović: Električne energetske mreže III, FESB, Split, 1997.
3. L.Jozsa, Z.Klaić:Inteligentne instalacije - European Installation Bus za sustave u zgradarstvu, Elektrotehnički fakultet Sveučilišta J.J. Strossmayera u Osijeku

1.11. Recommended additional literature

1. J. Arillaga Computer analysis of power systems John Wiley and Sons, New York 1990
2. Upute za rad programima EasyPower, ETS i PQ Log.

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	SAR503-17 Software Engineering	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	4
	Workload (L+(AE+LE+CE)+S)	30+(0+30+0)+0

1. Course description

1.1. Goals

Introduce the tools and methods necessary for the development of maintainable software of high quality, i.e. tools and methods for code version control, collaborative tools, software maintenance tools (bug tracking/issue tracking), tools for software documentation and task assignment and tracking; Introduce software testing methods to improve software maintainability and extensibility; Introduce software modelling methods and design as well as software development models; Clarify the effects of copyright laws on software development and licensing options for software distribution.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.demonstrate the advantages and disadvantages of some code-based tools
2.analyse available tools for error tracking and document creation
3.evaluate programme code testing methods and programme code requirements for successful testing
4.design functional tests for your own developed programme code
5.create and present (in writing and orally) a project plan, final project report and documentation (e-portfolio)

1.4. Course content

Engineering practices in software development: proper code commenting, the use of software version control systems, the use of tools and services for program code sharing and collaboration, the use of tools and services for bug tracking and documentation creation. Software testing methods. Graphical user interface testing. Test Driven Development. Software testing automation tools. Continuous integration. Continuous deployment. Requirements modelling and specification. UML design. Software development methods. Copyright in program code licensing. Open source licenses.

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	1.5	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance	5	10

exercises				percentage is: 70%.		
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.5	1,2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1.5	1,2,3,4	Oral exam	Assessment of student's answers	15	30
Solving tasks in laboratory exercises	0.5	1,2,3,4	Laboratory exercises	Examination of solved tasks from laboratory exercises and tasks	15	30

1.10. Obligatory literature

1. T. Krajina, Uvod u GIT, knjiga, dostupno online besplatno: https://tkrajina.github.io/uvod-u-git/git.pdf
2. C. Kaner, J. Falk, H. Q. Nguyen, Testing Computer Software, Wiley 2nd edition, 1999

1.11. Recommended additional literature

1. B. Okken, Python Testing with unittest, nose, pytest, Leanpub, 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. ALEKSI IVAN, Dr.sc. MIOKOVIĆ ŽELJKA**	
Course name	SI401-17 Service Learning Projects	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (elective) Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	15+(0+15+30)+0

1. Course description	
1.1. Goals	
Using the Service Learning (SL) as an educational method, the possibilities of applying, transferring and enhancing acquired academic knowledge and skills from the STEM area, primarily from the field of electrical engineering, computer science and information technology, will be presented to students in order to solve real problems in the community. This will help students understand the relevance of their knowledge and give them the feeling of doing something good, positive and beneficial to the community. Students will be encouraged to work in teams and collaborate in designing, implementing and evaluating an SL project through which they will be able to offer some technical, IT solutions and additional education in the field of basic and applied engineering knowledge and skills to specific community target groups.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.make a difference among service learning, volunteering, student practices and socially based research 2.critically evaluate the project as a structure of goals and activities and participate in team work on the project with the aim of developing technical and IT solutions that are subject to the programme of study 3.critically evaluate the methods and techniques of planning project activities and use the appropriate software tools behind design documentation (e-portfolio project) 4.manage the realisation of the project 5.create and present (in writing and orally) a project plan, final project report and documentation (e-portfolio)	
1.4. Course content	
The basic concepts of the Service Learning (SL) method, applicable technology for SL, examples of good practice from Croatia and abroad, methodology and design of the SL projects. Students will devise, prepare and work on projects during their laboratory exercises. Students will carry out projects through practical exercises. It is expected that other teachers will be involved to design and mentor projects for SL in the course plan. Designing, preparing, implementing and evaluating SL projects related to the transfer of STEM competencies in the field of electrical engineering, energy, renewable energy, robotics, automation....	
1.5. Teaching methods	Lecture 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, Laboratory exercises, Design exercises	1.5	1,2,3,4,5	Lectures, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	5	5
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	3,4,5	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	Oral exam	Assessment of student's answers	15	30
Problem-solving related to design exercises	1	1,2,3,4,5	Design exercises	Evaluation of problem solving exercises	10	25
Keeping a work diary about project implementation in the community	0.5	4,5	Practical exercises	Evaluating a student project work diary	0	10

1.10. Obligatory literature

1. N. Mikelić Preradović, Učenjem do društva znanja: teorija i praksa društveno korisnog učenja, Zagreb: Zavod za informacijske studije (2009.)

1.11. Recommended additional literature

1. E. Tsang, Projects that Matter: Concepts and Models for Service-learning in Engineering, Staylus Publishing, 2000.
2. A. R. Bielefeldt, Service Learning in Engineering, Michigan Technological University, 2012.

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	**Dr.sc. MIOKOVIĆ ŽELJKA, Doc.dr.sc. ALEKSI IVAN**	
Course name	SI601-17 Service Learning Projects	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (elective) Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	15+(0+15+30)+0

1. Course description	
1.1. Goals	
Using the Service Learning (SL) as an educational method, the possibilities of applying, transferring and enhancing acquired academic knowledge and skills from the STEM area, primarily from the field of electrical engineering, computer science and information technology, will be presented to students in order to solve real problems in the community. This will help students understand the relevance of their knowledge and give them the feeling of doing something good, positive and beneficial to the community. Students will be encouraged to work in teams and collaborate in designing, implementing and evaluating an SL project through which they will be able to offer some technical, IT solutions and additional education in the field of basic and applied engineering knowledge and skills to specific community target groups.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the study programme	
1.3. Learning outcomes	
1.make a difference among service learning, volunteering, student practices and socially based research 2.critically evaluate the project as a structure of goals and activities and participate in team work on the project with the aim of developing technical and IT solutions that are subject to the programme of study 3.critically evaluate the methods and techniques of planning project activities and use the appropriate software tools behind design documentation (e-portfolio project) 4.manage the realisation of the project 5.create and present (in writing and orally) a project plan, final project report and documentation (e-portfolio)	
1.4. Course content	
The basic concepts of the Service Learning (SL) method, applicable technology for SL, examples of good practice from Croatia and abroad, methodology and design of the SL projects. Students will devise, prepare and work on projects during their laboratory exercises. Students will carry out projects through practical exercises. It is expected that other teachers will be involved to design and mentor projects for SL in the course plan. Designing, preparing, implementing and evaluating SL projects related to the transfer of STEM competencies in the field of electrical engineering, energy, renewable energy, robotics, automation....	
1.5. Teaching methods	Lecture 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, Laboratory exercises, Design exercises	1.5	1,2,3,4,5	Lectures, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	5	5
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	3,4,5	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	Oral exam	Assessment of student's answers	15	30
Problem-solving related to design exercises	1	1,2,3,4,5	Design exercises	Evaluation of problem solving exercises	10	25
Keeping a work diary about project implementation in the community	0.5	4,5	Practical exercises	Evaluating a student project work diary	0	10

1.10. Obligatory literature

1. N. Mikelić Preradović, Učenjem do društva znanja: teorija i praksa društveno korisnog učenja, Zagreb: Zavod za informacijske studije (2009.)

1.11. Recommended additional literature

1. E. Tsang, Projects that Matter: Concepts and Models for Service-learning in Engineering, Staylus Publishing, 2000.
2. A. R. Bielefeldt, Service Learning in Engineering, Michigan Technological University, 2012.

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. GLAVAŠ HRVOJE**	
Course name	SIE603-15 Conduction of Energy Audit	
Study program	Professional study programme, branch: Power Engineering (elective)	
Course status	Elective	
Year of study	3	
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

Getting acquainted students with the energy auditing process through an analysis of legal and technical regulations, the Act on Energy Efficiency in Direct Use and the Energy Performance of Buildings Directive 2006/32 / EC. In addition to the law, students are introduced to the basics of energy of building constructions, heating systems and the power system of the building. The most important part is getting acquainted with the methodology of energy inspection of the building and determining the energy grade of the building in accordance with the regulations of the Republic of Croatia.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.understand legislation in the field of building certification
2.create an energy audit implementation plan
3.analyse the basic elements of the energy system
4.write an Energy Audit Report
5.write a proposal of applicable energy efficiency measures

1.4. Course content

Energy reviews are an integral part of the implementation of the European Union's energy policy at the lowest level. The aim of the course is to introduce students to the energy auditing process through the analysis of the energy balance in accordance with the national methodology. For the purposes of analysis, it is necessary to acquire knowledge on the formation of the energy balance based on partial energy flow data within the system.

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	1.5	1,2,3,4,5	Lectures, Auditory exercises, Laboratory	Attendance register. Mandatory attendance	0	10

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	1	1,2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1.5	1,2,3,4,5	Oral exam	Assessment of student's answers	15	30

1.10. Obligatory literature

1. UNDP, Priručnik za energetske savjetnike, Zagreb, 2008.
2. Ministarstvo zaštite okoliša, prostornog uređenja i graditeljstva, metodologija provođenja energetskog pregleda zgrada, Zagreb, 2009.
3. Directive 2006/32/Ec Of The European Parliament And Of The Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC
4. Directive 2002/91/Ec Of The European Parliament And Of The Council of 16 December 2002 on the energy performance of buildings

1.11. Recommended additional literature

1. Zakon o energiji (NN 68/01, 177/04, 76/07)
2. Zakon o Fondu za zaštitu okoliša i energetsku učinkovitost (NN107/03)
3. Zakon o prostornom uređenju i gradnji (NN 76/07)
4. Tehnički propis o uštedi toplinske energije i toplinskoj zaštiti u zgradama (NN 79/05)
5. Amir Halep, Električne instalacije i osvjetljenje, 2000.
6. E&P Neufert, Arhitects' Data, Oxford,. 2004.
7. Energy Management Handbook, seventh edition, CRC press, 2009.
8. Racknagel, Sprenger, Schramek, Tachenbuch fur Heizung + Klima Technik, Munchen, 2007
9. UNDP, Priručnik za energetske savjetnike, Zagreb, 2008.
10. Ministarstvo zaštite okoliša, prostornog uređenja i graditeljstva, metodologija provođenja energetskog pregleda zgrada, Zagreb, 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. NENADIĆ KREŠIMIR**	
Course name	SR603-17 Mobile platform application development	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(0+30+15)+0

1. Course description

1.1. Goals

Introduce students to technologies and software tools for creating mobile applications; Introduce students to different ways of defining the visual structure of the graphical user interface (layouts); Show students different ways of creating a user interface (XML, placing control in layout, dynamically in program code); Introduce students to basic components of mobile applications; Explain to students the specific ways in which application functionality works and link the user interface and functionality; Show students how to test applications on devices and the emulator; Teach students how to create source code documentation.

1.2. Conditions for enrollment

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

1.3. Learning outcomes

1.identify application-specific concepts for mobile applications
2.use a mobile application development platform
3.create a mobile application and programmatically implement a designed interface
4.implement structured and functional testing of applications on real-world mobile devices
5.create source code documentation of the application

1.4. Course content

Introduction to mobile application development tools. The main components of a mobile application. User interface design for mobile applications. Software solutions to real problems. The use of a program-specific concept to create mobile applications. Software design implementation. Software implementation of different functionalities. The use and management of sensors embedded in mobile devices. The use of a simulator to test application performance. Performing structural and functional testing on real-world mobile devices. Source code documentation generation

1.5. Teaching methods	Lecture 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, Laboratory exercises, Design exercises	2	1	Lectures, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	5
Writing pre-lab write-ups, results analysis and writing laboratory reports	0.4	2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	15
Oral exam	0.3	1,3	Oral exam	Assessment of student's answers	20	40
Problem-solving related to design exercises	1	2,3,4,5	Design exercises	Evaluation of problem solving exercises	0	10
Solving a project task	1.3	2,3,4,5	Independent work on a software solution	Testing and presentation of the created application	0	30

1.10. Obligatory literature

1. Razvoj mobilnih aplikacija, Priručnik za edukaciju, Elektrotehnički fakultet Osijek, 2013
2. Phillips, Bill ; Stewart, Chris; Hardy, Brian; Marsicano, Kristin . Android Programming: The Big Nerd Ranch Guide (2nd Edition). Atlanta: Big Nerd Ranch, LLC., 2015
3. Čukman, Tihomir; Java, Alfej Zagreb, 2009.

1.11. Recommended additional literature

1. P. Sarang, Java Programming, Oracle Press, 2012.
2. R. Cadenhead, Java 6 II izdanje, Kombib, 2008.
3. Mark L. Murphy, Android Programming Tutorials, CommonsWare, LLC, 2010.
4. D. Poo, D. Kiong, S. Ashok, Object-Oriented Programming and Java, Springer Verlag, 2007.
5. Professional Android 4 Application Development, Reto Meier, Wiley, 2012.
6. M. Gargenta, Learning Android - Building Applications for the Android Market, O'Reilly Media, 2011.

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, Doc.dr.sc. BAUMGARTNER ALFONZO**	
Course name	SIR301-17 Computer Graphics	
Study program	Professional study programme, branch: Informatics (elective)	
Course status	Elective	
Year of study	2	
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.define and illustrate the concepts of computer graphics
2.interpret and categorise matrix representations of 3D geometric transfomations and projections
3.describe the methods of modeling 3D objects
4.interpret and describe rendering
5.apply mathematical foundations and physics knowledge to computer graphics problems and evaluate the result
6.connect the acquired knowledge to create a computer graphics algorithm and interpret the result

1.4. Course content

Theoretical and practical fundamentals of applying the principles of geometric modelling, 3D graphics and computer animation. Concepts and techniques of representing three-dimensional objects and their presentation. Basic principles of interpolation, hierarchical structures needed to apply the visualisation process. Practical computer programming skills.

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	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	2
Practice – problem solving	0.5	1,2,5	Midterm exam	Evaluation of (written) exercises	9	18
Writing pre-lab write-	1.2	3,4,5,6	Laboratory practice	Assessment of pre-lab	0	30

ups, results analysis and writing laboratory reports				write-ups, supervision of laboratory exercises, evaluation of written reports		
Oral exam	1.3	1,2,3,5,6	Oral exam	Assessment of student's answers	25	50

1.10. Obligatory literature

1. Pandžić, I.S. Virtualna okruženja. Zagreb: Udžbenici Sveučilišta u Zagrebu, Element, 2004.

1.11. Recommended additional literature

1. Andrew Glassner, Principles of Digital Image Synthesis, 2 Bände, Morgan Kaufman, 1996.
2. Andrew Glassner, An Introduction to Ray-Tracing, Academic Press, 1989.
3. Foley, J., van Dam, A., Hughes, J., Phillips, R., Introduction to Computer Graphics, Addison-Wesley, 1997.
4. Alan Watt, 3D Computer Graphics, Addison-Wesley, 1999
5. Peter Shirley, Fundamentals of Computer Graphics, 2 edition, 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	**Prof.dr.sc. MRČELA TOMISLAV**	
Course name	SIAE401-17 Recycling of Electrical Waste	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (elective)	
Course status	Elective	
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.explain anthropogenic impact on the environment and the role of reverse material flows in environmental protection
2.select recycling processes for overage resources
3.propose waste treatment processes of electrical and electronic equipment
4.determine the product recyclability degree
5.interpret legislation referring to electrical and electronic waste disposal
6.propose design guidelines for improvements in the field of recycling electrical and electronic devices

1.4. Course content

Environmental impact of engineering products and processes. Sustainable development. Life cycle of the product. Waste managemant. Types of Electrical and Electronic Equipment. WEEE composition. Processing methods WEEE. Recyclability assessment. Recycling Processes. Disassembly and sorting of parts and materials. Hazardous substances. Legislation. Design for recycling.

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	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	6	10

Practice – problem solving	0.8	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	0.8	3,4,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	10	30
Oral exam	0.9	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30

1.10. Obligatory literature

1. Kljajin, M.; Opalić, M.; Pintarić, A. Recikliranje električnih i elektroničkih proizvoda. Sveučilišni udžbenik Sveučilišta u Osijeku i Zagrebu, 2006.
2. Worrell, E. Handbook of Recycling. Elsevier Science and Technology, 2014.

1.11. Recommended additional literature

1. H. Martens, Recyclingtechnik: Fachbuch für Lehre und Praxis, Springer, 2010.
2. M. Šercer, D. Opsenica, G. Barić, Oporaba plastike i gume, Topgraf, Velika Gorica, 2000.
3. V. Potočnik., Obrada komunalnog otpada – svjetska iskustva, Topgraf, Velika Gorica, 1997.
4. K. Ishii, Modularity: A Key Concept in Product Life-cycle Engineering, Handbook of Life-cycle Enterprise, Kluwer, 1998.
5. Recycling-Handbuch, Strategie – Technologie – Produkte, Düsseldorf, VDI-Verlag 1996.
6. A.J.D. Lambert, Surenda M. Gupta, Disassembly Modeling for Assembly, Maintenance, Reuse and Recycling , CRS Press, 2005.
7. R.E. Hester, R.M. Harrison; Electronic waste management, Royal Society of Chemistry, 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. BAUS ZORAN**	
Course name	SIE301 Power Circuit Switching Devices	
Study program	Professional study programme, branch: Power Engineering (elective)	
Course status	Elective	
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.understand the basic concepts related to the role, performance and purpose of circuit breakers in the power system, thermal and electrodynamic stresses, and occurence, transient voltage characteristics and switchgear characteristics relevant to the choice of electrical installation apparatus 2.analyse the basic concepts referring to the nature of the electrical arc opening and disconnection in the switchgear, the electrical breakdown in gaseous media, and concepts related to contact theory 3.evaluate basic laws, mathematical expressions and mathematical models for solving simple problems related to thermal and electrodynamic stresses in the switchgear, the fundamentals of contact theory and the choice of switchgear for installation in the power grid 4.assess the problems of the impact of switching operations in the power grid with emphasis on transient feedback voltage and its features 5.evaluate a computer simulation for selecting a switchgear in the power network in a suitable software package for solving transient phenomena caused by switching operations 6.analytically and numerically solve simpler problems related to thermal and electrode dynamics of a switchgear, the basis of contact theory and the basic transient return voltage parameters	
1.4. Course content	
Application, type and development of switching devices. Breaker, switch, contactor, disconnector and switchgear. Different construction conditions. Modern development tendencies. Switching network conditions. Switching phenomenon in short circuits. Switching of a three phase short circuit. Switching of asymmetrical short circuits. Influence of neutral grounding. Transient return voltage. Short circuits on short power lines. Load and switching operation in system (load factor influence). Single phase switching operation. Switching on and automatic restart with time delay. Switching of reactive current (current cutting phenomenon). Switching of capacitor bank. Electrical arc physics. Electrical arc in different matter. Electrical arc in vacuum. Electrical and magnetising arc characteristics. Heat signature of electrical arc. Switches - types of constructions, area of application, selection, mounting, maintenance and replacement. Air switches (pneumatic). Oil switches. SF6 switches. Vacuum switches. Disconnector. Fuse. Contactors. Surge arrestors. Switching devices remote operation and controll. Switching devices as a compact switchgear system.	
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	1,2,3,4	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	5
Practice – problem solving	1	3,6	Midterm exam	Evaluation of (written) exercises	13	25
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	15	30
Oral exam	1.5	1,2,3,6	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. B. Belin: Uvod u teoriju električnih sklopnih aparata, Školska knjiga, Zagreb 1978.

1.11. Recommended additional literature

1. Flurscheim C.H.: Power Circuit Breakers - theory and design, Peter Peregrinus, Ltd., London 1975.
2. Ragaller K.: Current Interuption in HV Networks, Plenum Press, New York, 1980.
3. CIGRE WG 13.06, Final report of the Second International Enquiry on High Voltage Circuit-Breaker Failures and Defects in service, 1994.
4. Clegg B., Ewart G., Brankin F.: Advances in Cicuit Breaker testing and condition monitoring, Proceedings IEE Monitors and condition assessment equipment, IEE digest No. 186, 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	**Doc.dr.sc. MANDRIĆ-RADIVOJEVIĆ VANJA, Mr.sc. DORIĆ DRAŽEN**	
Course name	S502-17 Practical Training	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	9
	Workload (L+(AE+LE+CE)+S)	0+(0+0+200)+0

1. Course description	
1.1. Goals	
Introduce students to a work environment in the company, the organisational structure of a manufacturing company/business system, managers and their responsibilities, production technology in the company and the prescribed workplace safety measures and procedures related to the technology used in the company; Familiarise students with engineering jobs and tasks; Mentors could supervise students who can actively participate in these jobs, taking into account all protection measures, professional and technological rules, as well as other company rules.	
1.2. Conditions for enrollment	
Requirements met for enrolling in the third year of the study programme	
1.3. Learning outcomes	
1.identify the organisational structure of a manufacturing company/business system as well as the tasks and role of a manager within the company 2.recognise engineering tasks, as well as the required knowledge and skills related to the company production technology 3.master the prescribed workplace safety measures and procedures related to manufacturing technology used in the company 4.list the most important regulations and standards related to manufacturing technology used in the company 5.master the skills of professional written communication and documentation that are important in engineering communication	
1.4. Course content	
Students are expected to complete 200 hours of professional practice experience. Every student works in a company on the jobs he/she is educated and trained for. Supervised by his/her mentor, a student is introduced to the organisational structure of a manufacturing company/business system, production technology in the company and the prescribed workplace safety measures and procedures, and gets involved in engineering jobs and tasks, taking into account all protection measures, professional and technological rules, as well as other company rules. During the period of practical training, a student keeps a work placement diary. Professional training is organised by the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek in co-operation with engineers employed in companies whose activities are in the field of electrical engineering, computer science and information technology. The Faculty appoints these engineers as mentors and arranges with them a curricular practical training programme. The organisation of practical training is regulated by the Rulebook on Professional Training for Students of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek.	
1.5. Teaching methods	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 , Design exercises	6.5	1,2,3,4	, Design exercises	Attendance register. Mandatory attendance percentage is: 70%.	32	40
Problem-solving related to design exercises	1.5	1,2,3,4	Design exercises	Evaluation of problem solving exercises	15	30
Writing a report on realized practice	1	5	Practical training	Evaluation by the subject bearer	15	30

1.10. Obligatory literature

1. Pravilnik o stručnoj praksi studenata FERIT-a
2. Propisi o zaštiti na radu u RH

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	**Doc.dr.sc. TOPIĆ DANIJEL**	
Course name	SE603-17 Renewable Energy Technologies	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	4.5
	Workload (L+(AE+LE+CE)+S)	30+(15+15+0)+0

1. Course description	
1.1. Goals	
Introduce students to technologies for electricity and heat generation from renewable energy sources as well as basic law legislation related to renewable energy sources. Present basic characteristics of renewable energy sources. Introduce students to the working principles and basic characteristics of renewable energy power plants. Introduce students to basic techno-economic calculations and simulations of renewable energy power plants.	
1.2. Conditions for enrollment	
The necessary requirements to enrol in the second year of the studies.	
1.3. Learning outcomes	
1.collect and choose valid legal regulation related to renewable energy sources 2.describe and define technical characteristics of the renewable energy power plants 3.categorise and compare different renewable energy power plants 4.estimate electricity and heat generation for different types of renewable energy power plants 5.compare techno-economic characteristics of renewable energy power plants 6.simulate operation of the renewable energy power plants in power system	
1.4. Course content	
Legislation related to renewable energy sources. Basic characteristics of solar energy. Potential of solar energy for electricity and heat generation in Croatia and the world. Basic characteristics of wind as a renewable energy source. Potential of wind energy for electricity generation in Croatia and the world. Basic characteristics of hydro power as a renewable energy source. Potential of hydro energy for electricity generation in Croatia and the world. Basic characteristics of biomass as a renewable energy source. Potential of biomass energy for electricity and heat generation in Croatia and the world. Basic characteristics of geothermal energy as a renewable energy source. Potential of geothermal energy for electricity and heat generation in Croatia and the world. Basic characteristics and working principle of solar, wind, small hydro, geothermal and biomass power plants. Basic characteristics of power plants for heat generation from renewable energy sources. Market of renewable energy power plants.	
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	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	10
Practice – problem solving	1	4,5	Midterm exam	Evaluation of (written) exercises	13	25
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	2	1,2,3,4	Oral exam	Assessment of student's answers	23	45

1.10. Obligatory literature

1. Masters, G.M. Renewable and Efficient Electric Power Systems. Wiley 2nd edition, 2013.

1.11. Recommended additional literature

1. D. Šljivac, Z.Šimić, Obnovljivi izvori energije s osvrtom na gospodarenje, HKAIG, 2008.
2. Thomas Ackermann, Wiley, Wind Power in Power System, 2007.
3. D.Pelin, D.Šljivac, D.Topić, V.Varju, ETF Osijek, Utjecaj fotonaponskih sustava na regiju, MTA RKK Pecs, 2014.
4. Važeće europske direktive i zakonska regulativa za poticanje OIE u RH

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	**Dr. sc. ŠPOLJARIĆ ŽELJKO**	
Course name	SE401-15 Transformers and Electrical Rotating Machines	
Study program	Professional study programme, branch: Power Engineering (mandatory)	
Course status	Mandatory	
Year of study	2	
ECTS credits and teaching methods	ECTS credits	7
	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.interpret the principle of operation, construction parts, the role of transformer in the power system and basic operating states of the transformer (i.e. no-load, short-circuit, loaded) as well as organise measurements of these basic operating states
2.describe, draw and apply all elements of the substitute scheme and phase diagram of an electrical transformer for the purpose of calculating all quantities needed to mathematically present the replacement transformer model
3.analyze and solve the loss calculation and calculation of transformer heating and cooling based on measurements and results obtained from laboratory experiments of no load,short circuti and loaded transformer state
4.group and interpret structural performances of three-phase transformers, transformer connections, types of failures and protection of three-phase transformers
5.interpret the features, construction, types, operating modes, parameters, supplement schemes, testings and diagrams of synchronous motors and generators
6.interpret the features, construction, types, operating modes, supplement schemes, diagrams, speed regulation, starting, reversing and breaking conditions of asynchronous motors
7.interpret the features, construction, types, operating mode, supplement schemes and diagrams of DC motors and generators
8.organise, measure and perform experiments of idling, short circuit and load condition of asynchronous, DC and synchronous machines as well as analyse and calculate all values obtained by means of these experiments

1.4. Course content

Transformer and its importance in the electrical system. Transformer principles, equivalent circuit and phasor diagram. Basic types and main parts. No-load, short-circuit test and loading. Losses, heating and cooling. Three-phase transformer. Connection symbols. Transformer operation conditions. Transformer testing. Electrical machines. Synchronous machine. Basic properties and types. Physical processes, parameters and equivalent circuit of synchronous machines. Synchronous machine testing basics. Induction machine. Basic properties and types. Physical processes. Equivalent circuit, circle diagram and speed-torque curve of an induction machine. Starting, reversing and braking. Speed control. Induction machine testing basics. Single-phase induction motor. DC machine. Basic properties. Physical processes in DC machines. Types and output curves of DC machines. Small electrical machines: construction, parameters and usage. Linear motors. Laboratory practice: One-phase transformer. Basic data. No-load test. Short-circuit test. Three-phase transformer. Determining winding connection group and transformation ratio. Synchronous generator. Measurement of winding resistance. No-load test. Short-circuit test. Induction motor. No-load test. Short-circuit test. DC machine. Output curve of a separately-excited DC motor.

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	1,2,3,4,5,6,7,8	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.5	2,3,5,6,7	Midterm exam	Evaluation of (written) exercises	15	30
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.5	1,2,4,5,6,7,8	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	0	30
Oral exam	2	1,2,3,4,5,6,7	Oral exam	Assessment of student's answers	20	40

1.10. Obligatory literature

1. R. Wolf: Osnove električnih strojeva, Školska knjiga, Zagreb, 1985.
2. I. Mandić, V. Tomljenović, M. Pužar, Sinkroni i asinkroni električni strojevi, Tehničko veleučilište u Zagrebu, Elektrotehnički odjel, Zagreb, 2012.
3. A. Dolenc, Transformatori I i II, skripta, Sveučilište u Zagrebu - Elektrotehnički fakultet, Zagreb, 1991.
4. Fitzgerald, E.; Kingsley, C; . Umans, S. D. Electric Machinery, McGraw-Hill. ISBN: 0-07-112-193-5, 2012.

1.11. Recommended additional literature

1. A. Dolenc i drugi, Transformatori, Tehnička enciklopedija, Svezak 13, Leksikografski zavod Miroslav Krleža, Zagreb, 1997.
2. D. Ban, Zbirka zadataka iz transformatora, skripta, Sveučilište u Zagrebu - Elektrotehnički fakultet, Zagreb, 1971.
3. KONČAR -grupa autora, Tehnički priručnik, KONČAR Elektroindustrija d.d., Zagreb, Fallerovo šetalište 22, 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. RUDEC TOMISLAV**	
Course name	SI301 Discrete Mathematics	
Study program	Professional study programme, branch: Automation (elective) Professional study programme, branch: Power Engineering (elective) Professional study programme, branch: Informatics (elective)	
Course status	Elective	
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 and simplify CNF and DNF
2.define, discuss and use the basic facts in the set theory
3.construct the solution for the given problem based on number theory by using Euler's and Fermat's little theorem
4.develop software solving a specific task in popular discrete mathematics related to logical reasoning

1.4. Course content

Mathematical logic. Operations in logic. Truth tables. Tautolog. Predicate calculus. Whole numbers (integers). Divisibilty, prime numbers, congruence. Euler's function. Binary relations. Equivalence relations, set partition. Order relations, networks. Binary operations. Algebraic structures. Groups. Examples of finite groups. Rings. Rings of whole numbers (integers). Boolean algebras. Representation of Boolean algebra. Boolean functions. Combinatorics. Finite sets. Product of sets. Denumeration methods. Permutations. Permutation groups. Combinations. Variations. Recursion relations. Fibonacci sequence. Stirling number. Linear recursion formulae. Block designs. Finite projection planes.

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	1,3,4	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem	2	1,2,4	Midterm exam	Evaluation of (written)	25	50

solving				exercises		
Oral exam	0.5	2,3,4	Oral exam	Assessment of student's answers	15	30
Homework	0.5	1,2,4	Homework	Discussion upon presentation	0	20

1.10. Obligatory literature

1. D. Žubrinić, Diskretna matematika, Element, Zagreb,2001
2. Anderson, I. A first Course in Discrete Mathematics. Springer Verlag, 2001.

1.11. Recommended additional literature

1. D. Veljan, Kombinatorna I diskretna matematika, Algoritam, Zagreb, 2001.
2. S. Lipschutz, Discrete Mathematics, McGraw Hill, New York, 1986. 1.

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. CRNJAC-MILIĆ DOMINIKA**	
Course name	S503-17 Introduction to Economics and Management	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (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.interpret the difference between macroeconomics, microeconomics and business economics and basic legislation related to economic theories 2.interpret the meaning and application of production function for making decisions related to production or provision of services in the companies 3.apply general knowledge in the area of enterprise theory and production function 4.define the business process and process structure of the organization, and interpret the elements of the business process, their significance and role 5.identify and explain contemporary management concepts 6.identify and be able to use contemporary management and management concepts	
1.4. Course content	
Introduction: economic science; economic theories: production, distribution, exchange and consumption, production theory, cost types, cost calculation, investment calculation, quality management (contemporary trends in theory and practice management), strategic management, business environment, business plan of enterprises, decision making, basic concepts of marketing, marketing mixes, market research, product development, promotion, financing, organisational structure of enterprises, procurement, logistics, research development work, training and personnel development, benchmarking, reengineering, electronic business, business intelligence: balance sheet, profit and loss account, liquidity account, business performance indicators.	
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	1.5	1,2,3,4,5,6	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	6	10
Practice – problem solving	0.7	1,3,4,5	Midterm exam	Evaluation of (written) exercises	10	20
Oral exam	1.3	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30
Seminar paper	1.2	6	Writing a seminar paper, making a presentation in Power Point and presenting it in the class	Grading a seminar paper done by the given instructions and grading a presentation	0	30
Attendance at the class	0.3	1,2,3,4,5	During the lesson, the teacher places students on the short questions about the topic being interrogated, thus checking student attendance and their ability to argue their standpoints.	Monitoring and recording students' activity during the course of the lesson on the basis of which points are awarded to the final grade of the subject	0	10

1.10. Obligatory literature

1. Zlatko Lacković, Uvod u ekonomiku i management, Osijek, 2005.
2. Zlatko Lacković, Marijan Karić, Ekonomika elektrotehničkih poduzeća, 2003.
3. Zlatko Lacković, Management elektrotehničkih djelatnosti, Osijek,2008.

1.11. Recommended additional literature

1. Buble, M., Management, Ekonomski fakultet, Split, 2003.
2. Buble, M., Strategijski management, Ekonomski fakultet Split, Split 1997.
3. Ferenčak,I., Počela ekonomike, Ekonomski fakultet Osijek, Osijek, 2003.
4. Lacković, Z., Management tehničkih sustava, Osijek,2005.
5. Lacković, Z., Management malog poduzeća, Osijek,2004.
6. Lacković, Z., Inženjerski menadžment, Osijek,2008.
7. Caroselli M., Vještine vodstva za menadžere, Mate d.o.o., Zagreb, 2014.
8. Cohen S. P., Vještine pregovaranja za menadžere, Mate d.o.o., Zagreb 2014.
9. Atkinson R. D., Ezell S.J., Ekonomika inovacija, Mate d.o.o., Zagreb 2014.
10. Buble M., Klepić Z., Menadžment malih poduzeća: Osnove poduzetništva, Ekonomski fakultet Sveučilišta, Mostar, 2007.
11. Certo S., Certo T., Moderni menadžment, Mate d.o.o., Zagreb, 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	**Prof.dr.sc. CUPEC ROBERT**	
Course name	SIA601 Introduction to Robotics and Intelligent Control	
Study program	Professional study programme, branch: Automation (elective)	
Course status	Elective	
Year of study	3	
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.assess the applicability of robots in production processes and services
2.formulate kinetic models of robot manipulators based on their mechanical specifications using the Denavit-Hartenberg method
3.list types of actuators and sensors which are commonly used in robotics and explain the basic applications of sensors in robotics
4.develop a simple computer programme for robot manipulator control
5.explain the basic principles of genetic algorithms
6.perform experimental testing of an artificial neural network for a particular application

1.4. Course content

Introduction to robotics: basic terms, classification and examples of robots. Description of position and orientation of a rigid body. Transformation between coordinate systems. Direct and inverse kinematics of a robot manipulator. Dynamic model of a robot manipulator. Position and force control of a robot manipulator. Sensors used in robotics. Basics of robot vision. Flexible production systems. Basics of fuzzy set theory. Fuzzy logic control. Structures of fuzzy logic controllers. Basic structures of neural networks. Static and dynamic neural networks. Learning algorithms. Neural networks in modelling, identification and control of systems. Genetic algorithms.

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	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	10
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	30
Oral exam	1.3	1,2,3,5,6	Oral exam	Assessment of student's answers	20	40
Seminar paper	0.7	1,5,6	Individual work	Grading a seminar paper	8	20

1.10. Obligatory literature

1. Kovačić, Z; Bogdan, S; V. Krajči. Osnove robotike. Zagreb: Graphis, 2002.

1.11. Recommended additional literature

1. J. J. Craig, Introduction to Robotics: Mechanics and Control, Addison
2. C. T. Lin, C. S. G. Lee, Neural Fuzzy Systems - A Neuro-Fuzzy Synergism to Intelligent Systems, Prentice Hall, 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. NENADIĆ KREŠIMIR**	
Course name	SR501-17 Web Programming	
Study program	Professional study programme, branch: Informatics (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	6.5
	Workload (L+(AE+LE+CE)+S)	30+(0+30+15)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.explain the communication between web browsers and servers, compare different web technologies and approaches to website creation
2.compare different technologies and use them in web document developing
3.identify the client and server technologies and select the appropriate technology to create a specific task in the form of a website
4.choose the right way to access the database through the web, develop your own web site solution and server and client functionality in a meaningful whole
5.analyse and solve a specific problem, combine different technologies in developing web applications and predict possible application improvements

1.4. Course content

Internet fundamentals and development. Network addressing and naming, URL, DNS servers. Basics of network programming. System support for networking. Main network services (telnet, ftp, www) and protocols (TCP/IP). Internet access: SLIP, PPP. World wide web: fundamentals, browsers, searching. Internet security: intruders and protection. Design of www documents. Client-side technologies: HTML, cascade styles, JavaScript, JavaScript and HTML, JavaScript dynamic documents, JavaApplets, XML. Server-side technologies: CGI, servlets, PHP, ASP and ASP.NET, cookies. Database access through web (PHP/SQL). Web design and application examples.

1.5. Teaching methods	Lecture 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	Teaching method	Assessment method	Points

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

1.10. Obligatory literature

1. Lukić, Ivica; Köhler, Mirko. Osnove Internet programiranja, 2011.
2. Sebesta, R.W. Programming the World Wide Web (2nd Ed.). Boston: Addison-Wesley, MA, 2004.

1.11. Recommended additional literature

1. T. Powell, Thomas, Web Design: The Complete Reference. Berkeley, CA, Osborne/McGraw-Hill, New York, NY, 2000.
2. K. Kalata, Internet Programming, Thompson Learning, London, 2001.
3. F. Halsall, Computer Networking and the Internet (5th Ed.), Addison-Wesley, Boston, MA, 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		
Course name	SD601-17 Final Paper	
Study program	Professional study programme, branch: Automation (mandatory) Professional study programme, branch: Power Engineering (mandatory) Professional study programme, branch: Informatics (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. - oral defence of work is carried out in front of Comission for defence

General information		
Lecturer	**Prof.dr.sc. NIKOLOVSKI SRETE**	
Course name	SIE601 Power System Protection	
Study program	Professional study programme, branch: Power Engineering (elective)	
Course status	Elective	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	45+(15+0+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.describe and understand the basic demands and criteria for making protection devices work 2.analyse all types of short circuits in electrical networks 3.evaluate the analysis of fault currents based upon which parameterisation of protection devices is performed 4.create, choose and evaluate appropriate protection for each element of the power system according to current-voltage conditions on these network elements 5.create outage events in the power system through the operation of protective devices	
1.4. Course content	
Basic concepts related to electrical power system (EPS) and its events; faults and failures; basic requirements for protective systems; elements of EPS protective systems; criteria for protection acting; current value, current differential, current direction criteria, active power and reactive power criteria; impedance, voltage and criteria of frequency change; non-electrical criteria for protection acting (temperature, gas, light arch); transmission line protection; LV, MV and HV lines protection; lines protection in a star and radial network; MV lines protection in different neutral point earthling ways; protection and telemetry in MV networks; automatic reactivation; synchro check, transformer protection; transformer characteristics in protection point of view; protection of transformers with small, medium and large power; Bucholz protection; bus-bar protection; bus-bar protection with spare protection of another EPS element; proprietary bus-bar protection (for example differential protection); protection of other EPS elements; chokes protection; electric machines protection; EPS frequency breakdown protection; overvoltage protection; integrated functions of protection and control systems; terminal fields; testing and starting up; necessary activities, testing equipment, procedures; maintenance activities; EPS plant event analyses through protection acting.	
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	1,2,5	Lectures, Auditory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0
Practice – problem solving	1.2	3,4	Midterm exam	Evaluation of (written) exercises	20	40
Oral exam	1.5	1,2,4,5	Oral exam	Assessment of student's answers	25	50
Presentation of a seminar paper	0.3	4	Presenting a seminar paper	Grading a seminar paper	0	10

1.10. Obligatory literature

1. S. Nikolovski: Osnove relejne zaštite u EES, Interna skripta, ETF Osijek, 2001.

1.11. Recommended additional literature

1. F. Božuta: Automatski zaštitni uređaji u elektroenergetskom sistemu, Svijetlost, I Sarajevo, 1987.
2. H. Požar: Visokonaponska rasklopna postrojenja, Tehnička knjiga, Zagreb, 1990

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).