FERIT

FACULTY OF ELECTRICAL ENGINEERING, COMPUTER SCIENCE AND INFORMATION TECHNOLOGY **OSIJEK**

Proposition

of the undergraduate professional study programme in

Computer Engineering

(pursuant to the form entitled Proposition of a study programme)

Osijek, February 2017
(version 2019/2020)

Table of contents

1. INTRODUCTION

The undergraduate university study programme in Electrical Engineering and the undergraduate university study programme in Computer Engineering have been carried out at the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek (hereinafter FERIT) since the academic year 2005/2006. The undergraduate professional study programme in Electrical Engineering, branches Automation, Power Engineering and Informatics, has been carried out since the same academic year. The graduate university study programmes in Electrical Engineering and Computer Engineering have been carried out since the academic year 2008/2009 (see Appendix 7.9).

After nearly ten years of carrying out the undergraduate professional study programme and considering the interest and the needs of labour market, wider social community, students' interest and employees' scientific advancement, we have decided to propose a new undergraduate professional study programme in Computer Engineering. The study programme is based on the current undergraduate professional study programme in Electrical Engineering, branch Informatics, i.e. the new study programme is a result of amendments to the current study programme.

1.1. Provide general information about the higher education institution (name, address, telephone number, e-mail, website)

Name of the higher education institution:
Josip Juraj Strossmayer University of Osijek
Faculty of Electrical Engineering, Computer Science and Information Technology Osijek

Address:
Kneza Trpimira 2b
31 000 Osijek

Telephone:
+385 31 224 600

E-mail address:
ferit@ferit.hr

Website:
http://www.ferit.unios.hr

1.2. Who approved the initiation of amendments to the study programme (e.g. management boards, faculty council, etc.)? Provide evidence

The Council of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek adopted the report entitled "Proposition of the undergraduate professional study programme in Computer Engineering" at its 195th session held on 20 February 2017 (the Faculty Council decision is provided in Appendix 7.1).

2. INSTITUTIONAL ASSUMPTIONS

2.0. Report on the study programme has to comprise a comparison analysis of the proposed study programme with related accredited study programmes carried out in the Republic of Croatia or European Union. The analysis has to include the minimal institutional assumptions

The proposed undergraduate professional study programme in Computer Engineering is based on the current undergraduate professional study programme in Electrical Engineering, branch Informatics, which provides an initial comparison with the quality of related accredited undergraduate professional study programmes in the Republic of Croatia and European Union.

Taking its content and acquired qualifications into account, the study programme is comparable with the undergraduate professional study programmes carried out at the following higher education institutions:

- Undergraduate professional study programme in Computer Engineering, branch Software Engineering carried out at Algebra University College (http://www.racunarstvo.hr/). Learning outcomes of the following courses are comparable with the learning outcomes of the proposed study programme:
    - Database Administration;
    - Computer Architecture;
    - Application Development for Mobile Devices;
    - Final Thesis/Practical Training;
    - Java Web Programming;
    - Cryptography;
    - LDAP Systems;
    - Advanced Development of Open Operating Systems;
    - Object-oriented Programming;
    - Database Development;
    - Operating Systems;
    - Basics of Business Communication;
    - Programming;
    - Java Programming I and II;
    - Software Engineering;
    - Web Application Development;
    - Security of Information Systems;
    - Data Structures and Algorithms;
    - Introduction to Databases;
    - Introduction to Computer Networks.

- Undergraduate professional study programme in Information Technology carried out at the University of Split, University Department of Professional Studies (https://www.oss.unist.hr/studiji/preddiplomski-stru%C4%8Dni-studij-informacijske-tehnologije/nastavni-program-redoviti-studenti). Learning outcomes of the following courses are comparable with the learning outcomes of the proposed study programme:
    - Computer Architecture;
    - Databases;
    - Digital and Microprocessor Technology;
    - Object-oriented Modelling;
    - Web Design;

- Object Programming;
- Operating Systems;
- Programming on the Internet;
- Java Programming;
- Programming Methods and Abstractions;
- Computer Networks;
- Computer and Data Security;
- Data Structures and Algorithms;
- Introduction to Programming.

- Undergraduate professional study programme in Computer Engineering, branch Software Engineering carried out at Zagreb University of Applied Sciences (http://www2.tvz.hr/studiji/strucni-studij-racunarstva/). Learning outcomes of the following courses are comparable with the learning outcomes of the proposed study programme:
  - Computer Architecture;
  - Databases;
  - Communication Skills;
  - Object-oriented Programming;
  - Operating Systems;
  - Computer Application;
  - Programming;
  - Java Programming;
  - Web Application Design;
  - Computer Networks;
  - Android Application Development;
  - Computer Games Development;
  - Introduction to Web Technologies.

Furthermore, the study programme is comparable with study programmes carried out at European higher education institutions as follows:

- Hochscule Albstadt-Sigmaringen, (Albstadt–Sigmaringen University, Albstadt–Sigmaringen Germany), Bachelorstudiengang Technische Informatik: http://www.hs-albsig.de/studium/Seiten/bachelorstudiengaenge2014.aspx

- University of Ljubljana, Faculty of Computer and Information Science, Computer and Information Science, first cycle professional study programme: https://www.fri.uni-lj.si/en/study-programme/computer-and-information-science-0

- University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia, undergraduate applied studies, Software and Information Technologies: http://www.ftn.uns.ac.rs/1897470380/softverske-i-informacione-tehnologije--novi-sad-

The study programmes are completely comparable because they last for three years, students acquire the same number of ECTS credits (180) and the academic title of the Bachelor of Computer Engineering is comparable in the Republic of Croatia and European Union. A proof of comparability are successful incoming and outgoing mobility activities carried out within the Erasmus mobility programme which will be continued because the basic assumptions on the Bologna process harmonisation have not been altered.

In addition to other Faculty employees, the teaching process quality will be ensured by two Faculty departments that will mainly be involved in teaching classes as follows:

• Department of Software Engineering which consists of the Chair of Programming Languages and Systems and the Chair of Visual Computing;
• Department of Computer Engineering and Automation which consists of the Chair of Computer Engineering and the Chair of Automation and Robotics.

High quality computing, measuring and simulation equipment is provided in these Departments. The equipment will be used in the teaching laboratories which have continually being upgraded. The laboratories in question are the Laboratory for Computer Graphics and Mathematical Image Processing, Samsung Smart Apps Lab, Laboratory for Programming Languages and Systems, Laboratory for Automation and Robotics, Laboratory for Digital Electronics and Computer Architecture, etc.

The existing quality assurance system should also be stressed, which refers to the teaching process at the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, i.e. continuous monitoring and assessment of student performance, student questionnaires evaluating the teaching process and teacher performance as well as other action plans and continuous activities to improve the quality of the studies.

Based upon the comparison of the proposed undergraduate professional study programme in Computer Engineering, it can be concluded that there is a high level of compatibility of this study programme with the study programmes considered, which will certainly facilitate the flow of students between Josip Juraj Strossmayer University of Osijek, other Croatian universities and most European universities.

3. GENERAL INFORMATION ON THE STUDY PROGRAMME

3.1. Name of the study programme

Undergraduate professional study programme in Computer Engineering

3.2. Provider of the study programme

Josip Juraj Strossmayer University of Osijek, Faculty of Electrical Engineering, Computer Science and Information Technology Osijek

3.3. Type of the study programme

Undergraduate professional study

3.4. Level (1- undergraduate professional programme/2-specialist graduate professional programme or 1-undergraduate university programme/2-graduate university programme/3-postgraduate specialist or postgraduate university programme

1- undergraduate professional study programme

3.5. Scientific or artistic area

Technical Sciences

3.6. Scientific or artistic field

Computer Engineering

3.7. Scientific or artistic branch

2.09.01 Computer Systems Architecture
2.09.02 Information Systems
2.09.03 Data Processing
2.09.04 Artificial Intelligence
2.09.05 Process Computing
2.09.06 Software Engineering

3.8. Admission requirements

Students can enrol in the study programme pursuant to a vacancy announcement.

The undergraduate professional study programme in Computer Engineering can be enrolled into by students who graduated from four-year secondary school and passed the obligatory state graduate exams. Selection of candidates is carried out based on the admission procedure consisting of the following:
1. grades acquired during secondary education and state graduation exam results;
2. additional points (for example, if a student won the first, second or third place on a state competition in Maths, Physics or Informatics, points earned for taking exams in elective courses of Physics and Informatics on the state graduate exam).

3.9. Duration of study

The undergraduate professional study programme lasts for three years (six semesters). A student has to obtain 180 ECTS credits.

3.10. Academic/expert title awarded upon completion of the study programme

Upon completion of the undergraduate professional study programme in Computer Engineering, students are awarded an academic title of Bachelor of Computer Engineering.

3.16. List the competencies students acquire and activities they can perform upon completion of the study programme

Upon completion of the undergraduate professional study programme in Computer Engineering at the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, students will be able to:

- build and maintain advanced computer systems and software;
- apply and maintain advanced computer systems, software and computer networks in business, industrial and other branches;
- design, implement and programme advanced computer systems, software and computer networks;
- provide professional support to laboratory research;
- develop application and system software solutions in advanced programming languages, technologies and software for embedded, ubiquitous, network, Internet, service and mobile environment;
- test the quality and software support;
- develop advanced hardware computer architectures and embedded, ubiquitous, network and service environment architectures;
- design and develop safe information systems;
- design and develop user and server-based software solutions (web interface, databases);
- design and develop mobile applications;
- design and develop user interfaces;
- design and develop computer games;
- design and develop solutions in visual computing including image processing;
- apply computer intelligence in advanced computer environments.

Based on acquired knowledge and skills, students who complete the undergraduate professional study programme in Computer Engineering will be eligible to continue their education by enrolling in graduate specialist professional study programmes in Computer Engineering in Croatia and abroad.

3.17. Describe the mechanisms used to ensure vertical mobility of students in national and international higher education space. If focusing on the first level of professional or undergraduate study programmes, list specialist graduate professional study programmes or graduate university study programmes students can enrol in the provider of the study programme or other higher education institutions in the Republic of Croatia

The current configuration of the study programmes (Figure 1) is based on the adjustments of the study programmes carried out prior to the Bologna declaration and similar current study programmes carried out at related European higher education institutions.

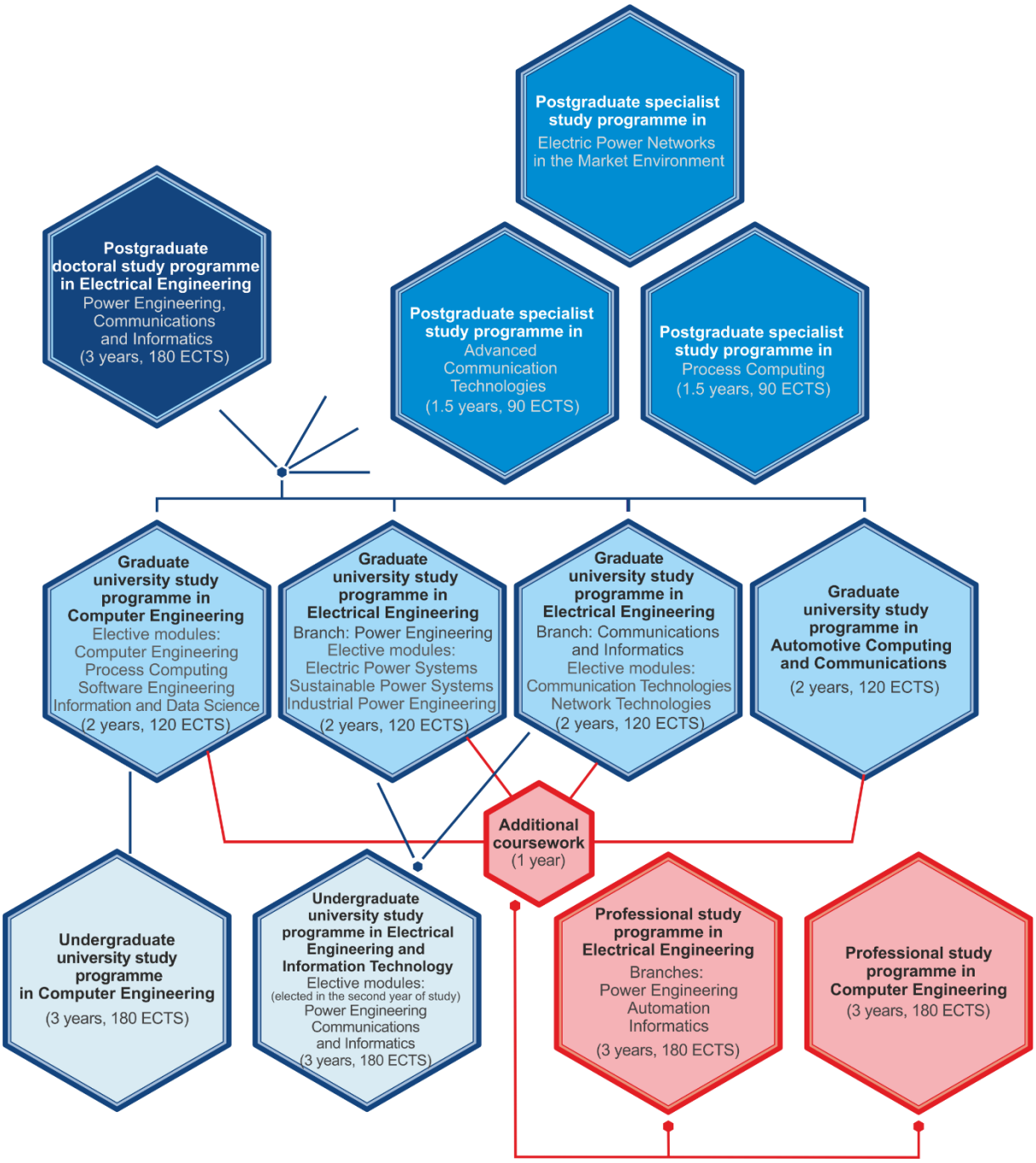

Figure 1. Vertical studying scheme at FERIT

During the studies, international student mobility is provided by the ERASMUS student mobility programme and the EUROWEB+ scholarship programme, that have been carried out at the University since the academic years 2009/2010 and 2015/2016, respectively (for details, see 3.24). Mobility within the Republic of Croatia is provided by the Student Mobility Agreement concluded on 14 July 2016 by and between the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Josip Juraj Strossmayer University of Osijek (FERIT), Faculty of Electrical Engineering and Computing, University of Zagreb (FER), Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture in Split (FESB), Faculty of Mechanical Engineering in Slavonski Brod, Josip Juraj Strossmayer University of Osijek (SFSB) and the Faculty of Engineering, University of Rijeka (RITEH).

3.17.1 Courses students can take and enrol in other University constituent units

Students can choose optional courses offered at Josip Juraj Strossmayer University of Osijek. For example, in the academic year 2016/2017, there were 38 courses offered by 17 University constituent units. However, ECTS credits earned in this way are not included in the 180 ECTS needed to complete a degree.

3.17.2. List of courses offered in a foreign language

A list of courses offered in a foreign language is provided in Chapter 4.4. There are 13 courses to be taken in the English language.

3.17.3. Criteria and conditions for the transfer of ECTS credits

The Faculty organises and carries out the Erasmus International Mobility Programme. The Erasmus International Mobility Programme enables students to spend one part of their studies at a foreign higher education institution or undergo practical training, which significantly contributes to their independence, cultural enrichment, foreign language skills and capability to work in a multicultural environment. Implementation and basic principles of incoming and outgoing student mobility, students' rights and obligations, rights and obligations of the University Committee for the Erasmus International Mobility Programme and the institutional Erasmus coordinator, as well as other questions relevant for the implementation of the mobility programme have been specified in the Regulations on the Erasmus Mobility Programme. On the recommendation of the Erasmus coordinator, the Academic and Student Affairs Committee lays down the criteria and conditions for ECTS recognition for students participating in the Mobility Programme.

3.18. Explain the relationship of the proposed professional/university study programme with fundamental and contemporary skills and field

The proposed undergraduate professional study programme in Computer Engineering was designed based on our own recognition of the need to innovate teaching contents, keeping up with requests put forward by the wider local community and numerous contacts with colleagues affiliated to other Croatian and foreign higher education institutions. The undergraduate professional study programme in Computer Engineering carried out at the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek is based on contemporary professional programmes carried out at Croatian and European higher education institutions. Taking its content and acquired qualifications into account, the study programme is comparable with undergraduate professional study programmes carried out at Croatian and European higher education institutions.

The undergraduate professional study programme in Computer Engineering is designed to educate experts to design, develop and maintain advanced software, hardware and communication solutions of contemporary computer systems to be in line with the market needs and applicable in all areas (industry, business sector, public sector, specific applications in medicine, transport systems and intelligent environment). That being said, the study programme provides fundamental knowledge in mathematics, electrical engineering and electronics all of which are necessary for understanding the basic principles of computer and software engineering as well as information technologies. Furthermore, the programme provides fundamental and advanced knowledge in imperative and object-oriented programming, algorithms and data structures, computer architecture, information systems and computer networks,

operating systems, software engineering, databases, web programming, basics of machine learning and multimedia technologies. The fundamental and advanced knowledge is accompanied by more advanced and applicable knowledge in the fields of programmable hardware environment, embedded computer systems, 3D modelling, Internet of things, advanced design of object-oriented programmes and software support modelling, mobile applications design, advanced solutions for databases and web based on contemporary principles of software engineering as well as security and information system efficiency demands.

Providing students with a number of elective courses, knowledge in the said field is broadened. The aim is to develop and use advanced software and hardware solutions in contemporary information and programming ubiquitous environment.

3.19. Explain the relationship of the study programme with the needs of a local community (economy, enterprises, civil society, etc.)

A link between the study programme and the needs of the local community is partly shown in 2.4, which describes participation of labour market representatives in the development of higher education institutions. It is also expected that the study programme will meet the needs of the local community for new jobs (see 3.20).

Namely, the analysis of labour market data in Croatia shows that experts who complete the undergraduate professional study programme in Computer Engineering find employment much faster even in conditions of high unemployment. The field of computer engineering constitutes an important foundation for the development of every society and the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek is an institution with the longest tradition in education of experts in this field in Eastern Croatia and the largest numbers of such students, which is then in turn the foundation for future successful education of experts in the fields of computer engineering, but also for retention and recruitment of highly educated staff, as well as economic growth and development both in the region and in Croatia as a whole.

With regard to numerous companies in Osijek, its surroundings, and Croatia in general, that deal with computer engineering, as well as the industry, local self-government and civil society, the study programme is closely related to the needs of the labour market. Namely, over the last few years, numerous companies dealing with the development of software solutions in modern computer environment, processing of data for business, industrial and other community and worldwide applications arrived to or were opened in Osijek. Upon completion of the undergraduate professional study programme in Computer Engineering, graduates would have the appropriate level of knowledge and competencies for the said field and the local community would benefit from graduates. Conversations with companies, students, and graduates have implied great interest in launching such study programme in computer engineering.

The undergraduate professional study programme in Computer Engineering is a contemporary study which responds to the challenges imposed by the development of the modern Croatian society. A study of this kind will provide students with competences which will make them competitive on the labour market. The curriculum is harmonised with demands and competences required by the local community. All skills students will acquire are related to all areas of human lives and strategic areas important for community sustainability. The undergraduate professional study programme in Computer Engineering provides students with knowledge and skills in programming which is a leading employment generator in our local community. Even in times of recession, the field of computer engineering did not record employment decrease and new and more dynamic demands are expected. The study programme meets the challenge

of rapid development of new technologies and their applications in automotive industry, as well as demand for new skills, human potential development aimed at employment and economic growth.

The undergraduate professional study programme in Computer Engineering creates a logical unit and rounds up the education of experts in this field. Students completing this study will be capable of dealing with complex problems of applying new technologies in computer engineering and IT sector thus having a wide range of employment opportunities from working in huge systems to small enterprises.

3.21. Compare the proposed professional/university study programme with foreign accredited study programmes in respected higher education institutions especially in the European Union

Albstadt-Sigmaringen University, Germany covers the following fields in its undergraduate professional study programme in Technical Informatics:
- Development and Maintenance of Software Systems and Solutions, i.e. Software Engineering;
- Embedded Computer Systems;
- Computer Systems Management;
- Information Safety.

The courses comparable to ours are as follows:
- Einführung Informatik;
- Programmierung 1;
- IT Security 1;
- Programmierung 2;
- Betriebssysteme und Netzwerke 1;
- Algorithmik;
- Datenbanken 1;
- Softwaretechnik;
- Bildverarbeitung;
- Mobile Systeme und Cloud;
- Datenbanken 2;
- GUI Development;
- Offensive Sicherheitsmethoden;
- Mobile Systeme und Cloud.

The Faculty of Computer and Information Science, University of Ljubljana, Slovenia covers the following areas at its undergraduate professional study programme in Computer and Information Science comparable to our study programme:
- Software Engineering;
- Advanced Computer Architecture;
- Data Systems and Processing;
- Information Systems;
- Visual Analytics.

The courses comparable to ours are as follows:
- Computer Architecture;
- Programming 1;
- Programming 2;
- Databases;
- Computer Communications;

- Operating Systems;
- Algorithms and Data Structures;
- Computer Graphics;
- Information Systems;
- Game Technology and Virtual Reality;
- Multimedia Technologies;
- User Interfaces.

The Faculty of Technical Sciences Novi Sad, University of Novi Sad, Serbia covers the following areas at its undergraduate professional study programme in Software and Information Technologies comparable to our study programme:
- Software Engineering and Technologies;
- Advanced Computer Architecture;
- Information Systems.

The courses comparable to ours are as follows:
- Basics of Programming;
- Basics of Computers;
- Introduction to Object-oriented Programming;
- Internet Networks;
- Basics of Databases;
- Basics of Web Programming;
- Development of Graphics and Multimedia Applications;
- Programming of Mobile Systems and Devices;
- Computer Networks Security;
- Web Design;
- Basics of User Interface Development.

The high level of correspondence of the proposed undergraduate professional study programme in Computer Engineering with the considered study programmes ensures exchange and flow of computer engineering students and teachers between Josip Juraj Strossmayer University of Osijek and other European universities.

3.22. Describe the providers' experience in carrying out the same or similar professional/university study programmes

The graduate university study programme in Computer Engineering has been carried out since the academic year 2008/2009 as a continuation of the undergraduate university study programme in Computer Engineering which has been carried out since academic year 2005/2006. Furthermore, the undergraduate professional study programme in Electrical Engineering, branches Automation, Power Engineering and Informatics, has also been carried out since academic year 2005/2006.

During the thirty-eight years of the Faculty's existence, over 4000 students have earned their degrees:
- pre-Bologna professional study programme in Electrical Engineering: 1065
- pre-Bologna university study programme in Electrical Engineering: 949
- undergraduate university study programme in Electrical Engineering: 760
- undergraduate university study programme in Computer Engineering: 567
- undergraduate professional study programme in Electrical Engineering: 1334
- graduate university study programme in Electrical Engineering: 586

- graduate university study programme in Computer Engineering: 350
- postgraduate doctoral study programme in Electrical Engineering: 58

Amendments to the study programme are proposed based on experience and understanding about the need to modernise and harmonise contents with the labour market needs, provided feedback by peers affiliated to related Croatian and foreign higher education institutions, results on studying success and alumni feedback.

3.23. If applicable, list partners, other than higher education institutions (economy, public sector, etc.), who would participate in carrying out the proposed study programme

The proposed undergraduate professional study programme in Computer Engineering is based upon a better connection with the economy and it follows the latest technology developments. Companies dealing with computer engineering would participate in the proposed study programme by carrying out field work, through implementation of practical training and writing of final papers.

As stated in Chapter 2.4, on 1st May 2016, the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek launched a special web-portal called "Stup" for students and employers (stup.ferit.hr). Companies can use "Stup" to inform students about job vacancies, open internships, opportunities to write their final papers and Master's theses and all other activities that are of interest to FERIT students.

Currently, there are over 200 companies using "Stup" and the greatest number of companies are involved in computer engineering (among others MONO, Span d.o.o., Farmeron d.o.o., Adacta d.o.o., Končar – electronics and informatics d.o.o., Siemens CVC, Danieli-Systec d.o.o., Osijek Software City, RT-RK Osijek, ATO Inženjering, Bel-Tel d.o.o., Siemens d.d., TEO-Belišće, Rimac Automobili, Intesa San Paolo, etc.), which we consider partners in carrying out the study since they have offered over 200 internships as well as dozens of final paper and Master's thesis topics and other activities which are of interest to our students.

4. STUDY PROGRAMME DESCRIPTION

4.1. Attach a list of obligatory and elective courses with corresponding workload and ECTS credits

See Appendix 7.4.

4.1.1. Attach a description of each course

See Appendix 7.5.

4.1.2. General course information

See Appendix 7.5.

4.1.3. Course description

See Appendix 7.5.

4.2. Describe the study structure, pace and requirements for enrolment in the following semester or trimester as well as the requirements for each course or a group of courses

The undergraduate professional study programme in Computer Engineering is a semester-based study, which consists of six semesters, i.e. three years of study. It is based on the current undergraduate professional study programme in Electrical Engineering, branch Informatics.

In semesters 3, 4 and 6, students have the opportunity to choose one elective course, while in semester 5, students are obliged to undergo practical training which lasts for five weeks. If an exam consists of a written and oral part, the student may be denied the right to take the oral exam in case he/she has not passed the written part. The study is completed when the student writes and defends his/her Final paper.

Out of the total of 180 ECTS credits, students earn 146 ECTS and 15 ECTS by passing 29 obligatory and three elective courses, respectively. Furthermore, practical training carries 9 ECTS while the Final paper carries 10 ECTS.

According to the University Regulations on Studies and Studying, students advance through the study when they enrol in the successive year in accordance with the conditions laid down every year by the University Senate.

4.2.1 Beginning and end of classes

The beginning and end of each academic year is defined by the University Senate's Decision on the Academic Calendar which is an integral part of the curriculum.

4.2.2 Requirements for enrolment in the successive academic year

The requirements for enrolment in the successive academic year has been determined by the Regulations on Studies and Studying of Josip Juraj Strossmayer University of Osijek as well as the University Senate's Decision on Requirements for Enrolment in the Successive Year, and they refer to the following:

- regular fulfilment of obligations determined in the study programme;
- the number of ECTS credits earned by passing the exams.

4.2.3 General and specific terms and conditions of studying

Students are subject to general and specific terms and conditions of studying defined by the Statute and Regulations on Studies and Studying of Josip Juraj Strossmayer University of Osijek and they refer to the following:

- acquiring student status (full-time students, guest students, special student status: categorised athletes and top artists, exceptionally successful students);
- transferring from other related study programmes;
- resuming interrupted studies;
- mobility within the University;
- students' rights and obligations (e.g. right to a leave of absence);
- student workload (ECTS);
- advancement during the study (enrolment in the successive year, cancelling the enrolled course, repeating a year of study, semester validation and teacher's signature, examinations and other types of assessment, grade complaints, recognition of exams passed at other universities);
- termination of student status.

4.2.4 Student status

The undergraduate professional study programme in Computer Engineering can be enrolled as a full-time or part-time study.

4.3. Attach a list of courses students can enrol in other study programmes

See Chapter 3.17.1.

4.4. Attach a list of courses which can be taught in a foreign language

Computer System Architecture;
Digital Electronics;
Java Programming;
Discrete Mathematics;
Hardware Description Languages;
Basics of 3D Modelling;
Applied Machine Learning;
Microcomputer Systems;
Multimedia Technique;
English Language I;

English Language II;
German Language I;
German Language II.

4.5. Describe the completion of the course of study

A student completes the undergraduate professional study programme in Computer Engineering by passing all the exams, preparing and defending a final paper as defined in Faculty's Regulations on Final Papers and Master's Theses.

4.6. List the requirements for resuming interrupted studies

Students who have interrupted their studies or have lost their student status may continue their studies under conditions defined by the Statute, i.e. the Regulations on Studies and Studying of Josip Juraj Strossmayer University of Osijek.

5. REQUIREMENTS FOR CARRYING OUT THE STUDY PROGRAMME

5.1. Locations for carrying out the study programme

The Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Josip Juraj Strossmayer University of Osijek has 8,500 m^2 at its disposal on three different locations, providing sufficient space for all types of curricular and extracurricular activities. The Faculty's facilities are located on the following addresses:
- Kneza Trpimira 2b (5140 m^2)
- Cara Hadrijana 10b (3260 m^2)
- Cara Hadrijana bb (barracks – building no. 14) (265 m^2).

7. APPENDICES

7.4. List of compulsory and elective courses with the number of hours of active teaching required for their performance and the number of ECTS credits

Table 1.

1. YEAR OF STUDY PROGRAM

1. semester – Mandatory courses

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 1	45	45	7	Doc.dr.sc. LUKIĆ IVICA
S106	Physical Education I	0	30	1	KERŽE PETAR

2. semester – Mandatory courses

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 2	45	60	8	Izv. prof. dr. sc. NENADIĆ KREŠIMIR
S205	Physical Education II	0	30	1	KERŽE PETAR

2. YEAR OF STUDY PROGRAM

3. semester – Mandatory courses

Code	Course	L workload	E workload	ECTS	Teacher
SARIE301	Computer System Architecture	45	30	6.5	Izv.prof.dr.sc. KESER TOMISLAV
SAR301	Digital Electronics	45	30	6	Izv.prof.dr.sc. KESER TOMISLAV
S302-16	Mathematical Statistics	30	15	5	HREHOROVIĆ IVAN
SR303-17	Java Programming	30	45	6.5	Doc.dr.sc. KÖHLER MIRKO
S301	Physical Education III	0	30	1	KERŽE PETAR
	Elective course			5	

Elective courses

Code	Course	L workload	E workload	ECTS	Teacher
SIR302-17	Hardware Description Languages - elective	30	30	5	Doc.dr.sc. MATIĆ TOMISLAV (ml.) Doc.dr.sc. ALEKSI 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
SIR301-17	Computer Graphics - elective	30	30	5	Izv. prof. dr. sc. GALIĆ IRENA Izv. prof. dr. sc. BAUMGARTNER ALFONZO
SI301	Discrete Mathematics - elective	30	30	5	Doc.dr.sc. RUDEC TOMISLAV

2. YEAR OF STUDY PROGRAM

4. semester – Mandatory courses

Code	Course	L workload	E workload	ECTS	Teacher
SR404-17	Algorithms and data structures	45	30	6	Izv. prof. dr. sc. BAUMGARTNER ALFONZO
SR402-15	Data Bases	30	45	7	Doc.dr.sc. LUKIĆ IVICA
SAR401-17	Information Systems and Computer Networks	45	30	7	Prof.dr.sc. ŽAGAR DRAGO Izv. prof. dr. sc. GRGIĆ KREŠIMIR
SR401	Operating Systems	30	30	5	Prof.dr.sc. MARTINOVIĆ GORAN
	Elective course			5	

Elective courses

Code	Course	L workload	E workload	ECTS	Teacher
SIR401-17	Graph Algorithms - elective	30	30	5	Izv. prof. dr. sc. BAUMGARTNER ALFONZO
SIR402-17	Object-Oriented Software Design - elective	30	30	5	
SIR403-17	Microcomputer Systems - elective	30	30	5	Izv.prof.dr.sc. KESER TOMISLAV
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	Izv. prof. dr. sc. NENADIĆ KREŠIMIR Izv. prof. dr. sc. BARUKČIĆ MARINKO doc. dr. sc. ALEKSI IVAN Dr.sc. MIOKOVIĆ ŽELJKA

3. YEAR OF STUDY PROGRAM

5. semester – Mandatory courses

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

6. semester – Mandatory courses

Code	Course	L workload	E workload	ECTS	Teacher
SR604-17	Information Security	30	30	5	Izv. prof. dr. sc. GRGIĆ KREŠIMIR
SR601	Multimedia Technique	45	30	5	Izv. prof. dr. sc. VRANJEŠ MARIO
SR603-17	Mobile platform application development	30	45	5	Izv. prof. dr. sc. NENADIĆ KREŠIMIR
SD601-17	Final Paper	0	0	10	
	Elective course			5	

Elective courses

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 and Automation - elective	30	45	5	Prof.dr.sc. SLIŠKOVIĆ DRAŽEN
SIR606-17	Internet of Things - elective	30	30	5	Doc.dr.sc. GRBIĆ RATKO
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
SIR608-18	Blockchain Application - elective	30	30	5	Doc.dr.sc. LUKIĆ IVICA

SI601-17	Service Learning Projects - elective	15	45	5	Dr.sc. MIOKOVIĆ ŽELJKA Izv. prof. dr. sc. NENADIĆ KREŠIMIR Izv. prof. dr. sc. BARUKČIĆ MARINKO doc. dr. sc. ALEKSI IVAN

7.5. Description and general information of each subject

Table 2.

General information		
Lecturer	Izv. prof. dr. sc. BAUMGARTNER ALFONZO	
Course name	SR404-17 Algorithms and data structures	
Study program	Professional study programme in Computer 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
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. â€śBig-Oâ€ť 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		0	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 R. Manger Strukture podataka i algoritmi Element; 2014; ISBN: 978-953-197-596-4
2 Cormen, Thomas H.; Leiserson, Charles E.; Rivest, Ronald L.; Stein, Clifford Introduction to Algorithms (3rd ed.) MIT Press and McGraw-Hill. ISBN 0-262-03384-4. (2009) [1990]

1.11. Recommended additional literature

1 R. Sedgewick Algorithms in C: Fundamentals, Data Structures, Sorting, Searching and Graph Algorithms in C Addison Wesley; 2001; ISBN: 978-020-131-452-6
2 Adam Drozdek Data Structures and Algorithms in C++ 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	Izv. prof. dr. sc. BAUMGARTNER ALFONZO	
Course name	SIR401-17 Graph Algorithms	
Study program	Professional study programme in Computer 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		
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 Lectures, Auditory exercises, Laboratory exercises	2	1,2,3,4,5	Lectures, Auditory exercises, Laboratory exercises		7	10
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 Introduction to Algorithms (3rd ed.) MIT Press and McGraw-Hill. ISBN 0-262-03384-4. (2009) [1990]

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	Izv.prof.dr.sc. KESER TOMISLAV	
Course name	SARIE301 Computer System Architecture	
Study program	Professional study programme in Computer Engineering (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	
-	
1.2. Conditions for enrollment	
-	
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 outcomes	Teaching method	Assessment method	Points	
					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	Izv. prof. dr. sc. LUKIĆ IVICA	
Course name	SR402-15 Data Bases	
Study program	Professional study programme in Computer Engineering (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

-

1.2. Conditions for enrollment

-

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 Lectures, Auditory exercises, Laboratory exercises	2	1,2,3,4	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	4	8
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	Izv.prof.dr.sc. KESER TOMISLAV	
Course name	SAR301 Digital Electronics	
Study program	Professional study programme in Computer Engineering (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

-

1.2. Conditions for enrollment

-

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	Izv. prof. dr. sc. MANDRIĆ-RADIVOJEVIĆ VANJA	
Course name	SR502-17 Digital Communications	
Study program	Professional study programme in Computer Engineering (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		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 in Computer Engineering (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		5	10
Writing pre-lab write-ups, results analysis	1	1,2,3,4	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises,	15	30

and writing laboratory 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		
Course name	SIR402-17 Object-Oriented Software Design	
Study program	Professional study programme in Computer 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 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, faÄ§ade, 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			Lectures, Laboratory exercises			

1.10. Obligatory literature

1 Freeman E. et al. Head first design patterns O Reilly Media, 2004, 0596007124 2 Robert C. Martin Clean code: A Handbook of Agile Software Craftsmanship Prentice Hall, 2008, 0132350882
1.11. Recommended additional literature
1 Martin Fowler, Refactoring Addison-Wesley, 2001, 0201485672 2 Robert C. Martin Agile Software Development: Principles, Patterns, and Practices Prentice Hall, 2002, 0135974445 3 Gamma E. et al. Design Patterns: Elements of Reusable Object-Oriented Software 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	FERČEC IVANKA, LIERMANN-ZELJAK YVONNE	
Course name	S105-ENG English I	
Study program	Professional study programme in Computer Engineering (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	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.identify and describe the differences between general and technical English language based on the chosen specialised texts and topics 2.recognise essential elements (key words) from a complex specialised text and 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 â€śasâ€ť. 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. Study Technical English 1 Zagreb: Školska knjiga 2009.
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 in Computer Engineering (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. English for the Energy Industry Oxford: Oxford University Press (Express Series), 2009.
2 Glendinning, Eric H.; McEwan, J. Oxford English for Information Technology Oxford University Press, 2006.
3 Esteras, S.R. Infotech - English for Computer Users Cambridge University Press, 2008.
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 in Computer Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(30+15+0)+0

1. Course description	
1.1. Goals	
The objective of the course is empowerment of the students for individual preparation and implementation of the projects, in particular those projects which will be financed from EU or other sources. The objective is also to teach students how to prepare project proposals with designing concepts and strategies according to PCM metodology.	
1.2. Conditions for enrollment	
There are no specific requirements.	
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	
The subject will cover the following areas: 1. The institutional framework of the EU 2. Introduction to EU policy - a strategic framework 3. Other concepts (project, the phase of the project cycle, stakeholders) 4. Development of project ideas - problem analysis, goal analysis, logical matrix 5. Project Application - Tender Documents	
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 Brigljević, K.; Brnčić A.; Gotovac I.; Očuršćak M Mali leksikon europskih integracija Zagreb 2010.,
2 Europska komisija, Ured za suradnju EuropeAid Smjernice za upravljanje projektnim ciklusom 2010.

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	Prof.dr.sc. SLIŠKOVIĆ DRAŽEN	
Course name	SAIR601-17 Industrial Informatics and Automation	
Study program	Professional study programme in Computer Engineering (elective)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	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 â€“ central unit in the process automation system. Operate unit structures: central and decentral, hierarchical and distributed. Supervisory unit â€“ 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		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	0.8	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	Izv. prof. dr. sc. GRGIĆ KREŠIMIR	
Course name	SR604-17 Information Security	
Study program	Professional study programme in Computer 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	
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 exercises, Laboratory exercises	1.5	1,2,3,4,5	Lectures, Auditory exercises, Laboratory exercises		1	4
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, Izv. prof. dr. sc. GRGIĆ KREŠIMIR	
Course name	SAR401-17 Information Systems and Computer Networks	
Study program	Professional study programme in Computer 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+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	2	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises		1	4
Practice – problem solving	1.5	2,3,4,6	Midterm exam	Evaluation of (written) exercises	16	32
Writing pre-lab write-ups, results analysis and writing laboratory reports	1	2,3,4,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of laboratory exercises, evaluation of written reports	12	24
Oral exam	2	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30
Seminar paper	0.5	2,3,4,5,6	Creation and presentation of seminar work	Grading a seminar paper and results presentation	6	10

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 in Computer Engineering (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 exercises	1.4	1	Lectures, Laboratory exercises, Design exercises	Attendance register. Mandatory attendance percentage is: 25%.	7	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	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 in Computer Engineering (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

To provide students with a statistical conclusion based on the understanding of statistical models and methods using statistical software tools.

1.2. Conditions for enrollment

There are no specific requirements.

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

Introduction to R. Depending on the databases that will be included in the seminars (after consultation students on the direction of their research) areas of multivariate methods. Particular emphasis will be placed on the choice of distribution modelling on linear and nonlinear regression.

1.5. Teaching methods	Lecture Construction exercises
1.6. Comments	

1.7. Student obligations

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

1.8. Course assessment

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

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

Student's activity	**ECTS**	**Learning outcomes**	**Teaching method**	**Assessment method**	**Points**	
					Min	**max**
Attendance Lectures, Design exercises	1.5	1,2,3,4,5	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 W. K. Härdle, L. Simar Applied Multivariate Statistical Analysis Springer, 2012.
2 M. Benšić, N. Šuvak Uvod u vjerojatnost i statistiku Sveučilište J.J. Strossmayera, Odjel za matematiku, Osijek, 2014.

1.11. Recommended additional literature

1 D.C. Montgomery, G.C. Runger Applied Statistics and Probability for Engineers John Wiley & Sons, Inc., 2010.
2 M. Benšić, N. Šuvak Primijenjena statistika Sveučilište J.J. Strossmayera, Odjel za matematiku, Osijek, 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. MATIĆ TOMISLAV (ml.), doc. dr. sc. ALEKSI IVAN	
Course name	SIR302-17 Hardware Description Languages	
Study program	Professional study programme in Computer 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

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			Lectures, Laboratory exercises			

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	HREHOROVIĆ IVAN	
Course name	SR107 Calculus I	
Study program	Professional study programme in Computer Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	5
	Workload (L+(AE+LE+CE)+S)	30+(30+0+0)+0

1. Course description

1.1. Goals

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.create track records in different databases, and be able to calculate in these bases
3.compare and explain the features of elementary functions
4.create and analyse the derivative of a function
5.compare, calculate and create matrices, and evaluate and solve the system using matrices

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 Lectures, Auditory exercises	2	1,2,3,4,5	Lectures, Auditory exercises		0	0
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	3,4,5	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 in Computer Engineering (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.for the given integral, define the type and develop a procedure for its 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.determine and create a numerical model 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		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 in Computer Engineering (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

-

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, 2000
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	Izv.prof.dr.sc. KESER TOMISLAV	
Course name	SIR403-17 Microcomputer Systems	
Study program	Professional study programme in Computer 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 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 â€śsmallâ€ť 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 Lectures, Laboratory exercises			Lectures, Laboratory exercises			

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	Izv. prof. dr. sc. VRANJEŠ MARIO	
Course name	SR601 Multimedia Technique	
Study program	Professional study programme in Computer Engineering (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		Teaching method	Assessment method	Points

		Learning outcomes			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	1.5	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 in Computer Engineering (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 â€“ 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 Nicoleâ€¦ Ich bin Journalistin. Das ist meine Mutter. Modul 2 Der Tisch ist schÄ¶n! Was ist das? Das ist ein F. Ich brauche kein BÄĽro. Modul 3 Du kannst wirklich tollâ€¦! Kein Problem. Ich habe Zeit! Ich mÄ¶chte was essen, Onkel Harry. Modul 4 Ich steige jetzt in die U-Bahn ein. Was hast du heute gemacht? Was ist denn hier passiert? GramatiÄŤke i jeziÄŤne strukture Alphabet, Zahlen 1-100, Verbkonjugation, W-Fragen, Negation mit nicht, Wortbildung â€“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 kÄ¶nnen, Satzklammer, Verbposition im Satz, temporale PrĂ¤positionen am, um, Konjugation mÄ¶gen, Wortbildung Nomen+Nomen Jahreszeiten, Monate, trennbare Verben, Perfekt mit haben, temporale PrĂ¤positionen vonâ€¦bis, ab, Perfekt mit sein, temporale PrĂ¤position 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 in Computer Engineering (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	
-	
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. GrĂ¶Ăźen. Einheiten und Kurzzeichen. BasisgrĂ¶Ăźen und Basiseinheiten. Gesetzlich abgeleitete Einheiten. Energieformen und Energieumwandlung. Zeitformen des Verbs. KonditionalsĂ¤tze 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 solving	0.6	3,4,6	Midterm exam	Evaluation of (written) exercises	25	50

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. Deutsche Grammatik macht Spaß Osijek: Lingua, 2007.
2 Steinmetz, Maria; Dintera, Heiner Deutsch für Ingenieure: Ein DaF-Lehrwerk für Studierende Ingenieurwissenschaftlicher Fächer Springer Vieweg, 2014. (svi smjerovi)
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 in Computer Engineering (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.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. RelativsÄ¤tze. FinalsÄ¤tze. 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 solving	1	4,5,6	Midterm exam	Evaluation of (written) exercises	25	50

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. Deutsche Grammatik macht Spaß Osijek: Lingua, 2007.
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	Izv. prof. dr. sc. LUKIĆ IVICA, Doc.dr.sc. KRPIĆ ZDRAVKO	
Course name	SIR607-17 Database Design	
Study program	Professional study programme in Computer Engineering (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 Lectures, Laboratory exercises	2	1,2,3,4,5,6	Lectures, Laboratory exercises		6	10
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 in Computer 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+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 exercises	2	1,2,3,4	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	3	6

Writing pre-lab write-ups, results analysis and writing laboratory reports	1	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 in Computer 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

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		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	15	30

1.10. Obligatory literature

1 Blender 3D: Noob to Pro dostupno online besplatno: https://upload.wikimedia.org/wikipedia/commons/2/20/BlenderDocumentation2
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 Beginners 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	Izv. prof. dr. sc. HERCEG MARIJAN, Izv.prof.dr.sc. MATIĆ TOMISLAV (st.)	
Course name	S203 Fundamentals of Electronics	
Study program	Professional study programme in Computer 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.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 exercises, Laboratory exercises	1	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	0	0

Practice – problem solving	2.7	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 in Computer Engineering (mandatory)	
Course status	Mandatory	
Year of study	1	
ECTS credits and teaching methods	ECTS credits	6
	Workload (L+(AE+LE+CE)+S)	30+(30+15+0)+0

1. Course description	
1.1. Goals	
-	
1.2. Conditions for enrollment	
-	
1.3. Learning outcomes	
1.define 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, Ampre'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		Teaching method	Assessment method	Points

		Learning outcomes			Min	max
Attendance Lectures, Auditory exercises, Laboratory exercises	2.5	1,2,3,4,5,6	Lectures, Auditory exercises, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 70%.	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	1.5	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	Izv.prof.dr.sc. GLAVAŠ JERKO	
Course name	S206-17 Business communication	
Study program	Professional study programme in Computer Engineering (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: 60%.	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	Doc.dr.sc. GRBIĆ RATKO, Prof.dr.sc. SLIŠKOVIĆ DRAŽEN	
Course name	SIR404-17 Applied Machine Learning	
Study program	Professional study programme in Computer 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	
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		7	10
Writing pre-lab write-ups, results analysis	1.5	2,3,4,5	Laboratory practice	Assessment of pre-lab write-ups, supervision of	15	30

and writing laboratory reports				laboratory exercises, evaluation of written reports		
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	Izv. prof. dr. sc. LUKIĆ IVICA	
Course name	SIR608-18 Blockchain Application	
Study program	Professional study programme in Computer Engineering (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 the blockchain technology and principles which they are based on (ledger). Familiarise them with the benefits of P2P networks and distributed ledger. Explain different approaches to blockchain creation and present advantages and disadvantages of the most common approaches. Give an overview of the hash function. Present the differences between blockchain and cryptocurrencies, public and private chains, and blockchain technology and directed acyclic graph (DAG). Teach the basics of different algorithms for cryptocurrencies mining. Provide insights on the application of blockchain technology and its effect on the future of private and public sectors.	
1.2. Conditions for enrollment	
Requirements for the enrolment in the study programme	
1.3. Learning outcomes	
1.explain the reasons for using the blockchain technology 2.describe the benefits of new technology and their applications 3.analyse existing technology applications and understand their advantages and disadvantages 4.use already existing blockchains 5.create one's own blockchain 6.create new software solutions for specific problems by applying acquired knowledge	
1.4. Course content	
An introduction to the blockchain technology. Applications of the blockchain technology in the public and private sector. A comprehensive approach to the technology through business solutions and cryptocurrencies. The concept of the main book and the advantage of its combination with P2P network architecture. An introduction to encrypting information and using hash functions. Definition of decentralization; advantages and disadvantages of decentralised systems. Anonymity in blockchain. Cryptocurrencies as the most commonly application of blockchain. Bitcoin and other alternative cryptocurrencies. Different types of consensus, the most common algorithms for cryptocurrencies mining, the future of blockchain, cryptocurrencies and other technology of distributed main books.	
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		Teaching method	Assessment method	Points

		Learning outcomes			Min	max
Attendance Lectures, Laboratory exercises	1.5	1,2,3,4,5	Lectures, Laboratory exercises		0	0
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	10	20
Oral exam	1	1,2,3,5,6	Oral exam	Assessment of student's answers	20	40
Homeworks / Seminars	1.5	1,2,3,4,5,6	Solving homework or writing seminar papers	Evaluation of (written) exercises	20	40

1.10. Obligatory literature

1 M. Swan Blockchain Blueprint for a New Economy O Reilly Media; January 2015
2 A. M. Antonopoulos Mastering Bitcoin: Programming the Open Blockchain
3 A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder; Bitcoin and Cryptocurrency Technologies Princeton University; textbook; 2016.
4 W. Stallings Cryptography and Network Security – Principles and Practice Paerson, Boston, 2016.

1.11. Recommended additional literature

1 Developer Documentation - https://bitcoin.org/en/developer-guide
2 Satoshi Nakamoto Bitcoin: A Peer-to-Peer Electronic Cash System - white paper

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. LUKIĆ IVICA	
Course name	SR102 Programming I	
Study program	Professional study programme in Computer Engineering (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		3	5
Practice – problem solving	1.5	2,3,4	Midterm exam	Evaluation of (written) exercises	15	30
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	0.9	1,2,3,4,5	Written exam	Evaluation of problem solving exercises	8	15

1.10. Obligatory literature

1 Šribar, J.; Motik B. Desmistificirani C++, 3. dopunjeno izdanje 2010.
2 Kochan, S.G. Programming in C (Developers 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	Izv. prof. dr. sc. NENADIĆ KREŠIMIR	
Course name	SR201-17 Programming 2	
Study program	Professional study programme in Computer Engineering (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 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	1,2,4,5	Lectures, Laboratory exercises, Design exercises		0	5
Writing pre-lab write-ups, results analysis and writing laboratory reports	1.5	2,3,5,6	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	2,3,4,6	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 (Developers 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.), doc. dr. sc. ALEKSI IVAN	
Course name	SIR303-17 Programming of Small Linux Computers	
Study program	Professional study programme in Computer 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

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 exercises			Lectures, Laboratory exercises			

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 in Computer 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+(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	Classes can be taught in a foreign language (English).

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		Teaching method	Assessment method	Points

		Learning outcomes			Min	max
Attendance Lectures, Laboratory exercises			Lectures, Laboratory exercises			

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	Izv. prof. dr. sc. GALIĆ IRENA	
Course name	SAR503-17 Software Engineering	
Study program	Professional study programme in Computer Engineering (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 exercises	1.5	1,2,3,4,5	Lectures, Laboratory exercises	Attendance register. Mandatory attendance percentage is: 60%.	5	10

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	Izv. prof. dr. sc. NENADIĆ KREŠIMIR, Izv. prof. dr. sc. BARUKČIĆ MARINKO	
Course name	SI401-17 Service Learning Projects	
Study program	Professional study programme in Computer Engineering (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			Lectures, Laboratory exercises, Design exercises			
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
Attendance Lectures (PR), Laboratory exercises (LV), Design exercises (KV)	1.5	1,2,3,4,5	Lectures (PR), Laboratory exercises (LV), Design exercises (KV)	Lectures (PR), Laboratory exercises (LV), Design exercises (KV)	5	5
Keeping a work diary about project implementation in the community	0.5	4,5	Practical exercises	Evaluating a student project work diary	5	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, Izv. prof. dr. sc. NENADIĆ KREŠIMIR	
Course name	SI601-17 Service Learning Projects	
Study program	Professional study programme in Computer Engineering (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		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	5	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	Izv. prof. dr. sc. NENADIĆ KREŠIMIR	
Course name	SR603-17 Mobile platform application development	
Study program	Professional study programme in Computer Engineering (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 Reto Meier Professional Android 4 Application Development 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, Izv. prof. dr. sc. BAUMGARTNER ALFONZO	
Course name	SIR301-17 Computer Graphics	
Study program	Professional study programme in Computer 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

-

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-ups, results analysis	1.2	3,4,5,6	Laboratory practice	Assessment of pre-lab write-ups, supervision of	0	30

and writing laboratory reports				laboratory exercises, evaluation of written reports		
Oral exam	1.3	1,2,3,5,6	Oral exam	Assessment of student's answers	25	50
Attendance	2	1	Lectures (PR), Auditory exercises (AV), Laboratory exercises (LV)	Evidence of presence. The minimum required for signature is: 70 %	0	2

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	Izv. prof. dr. sc. MANDRIĆ-RADIVOJEVIĆ VANJA, Mr.sc. DORIĆ DRAŽEN	
Course name	S502-17 Practical Training	
Study program	Professional study programme in Computer Engineering (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			, Design exercises			
Attendance , Design exercises (KV)	6.5	1,2,3,4	Design exercises (KV)	Design exercises (KV)	32	40
Performing assignments set by the mentor	1.5	1,2,3,4	Practical training	Evaluation by the subject bearer	15	30
Writing a report on realized practice	1	5	Professional practice	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. RUDEC TOMISLAV	
Course name	SI301 Discrete Mathematics	
Study program	Professional study programme in Computer Engineering (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

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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 solving	2	1,2,4	Midterm exam	Evaluation of (written) exercises	25	50
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.

1.12. 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. CRNJAC-MILIĆ DOMINIKA	
Course name	S503-17 Introduction to Economics and Management	
Study program	Professional study programme in Computer Engineering (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	
1.4. 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		6	10
Practice – problem solving	0.3	1,3,4,5	Midterm exam	Evaluation of (written) exercises	10	20
Oral exam	0.7	1,2,3,4,5,6	Oral exam	Assessment of student's answers	15	30

Seminar paper	0.4	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	0.1	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, Marijan Karić 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	Izv. prof. dr. sc. NENADIĆ KREŠIMIR
Course name	SR501-17 Web Programming

Study program	Professional study programme in Computer 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+(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 outcomes	Teaching method	Assessment method	Points	
					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 in Computer Engineering (mandatory)	
Course status	Mandatory	
Year of study	3	
ECTS credits and teaching methods	ECTS credits	10
	Workload (L+(AE+LE+CE)+S)	0+(0+0+0)+0

1. Course description

1.1. Goals

-

1.2. Conditions for enrollment

-

1.3. Learning outcomes

1.create a research challenge and conduct research independently
2.create a methodological framework for Research
3.evaluate the research plan
4.evaluate research results
5.draw conclusions

1.4. Course content

Students will solve problems from the field of one's studies. Writing of a final paper will be supervised by a tutor. By successfully carrying out research and writing a final paper, students will prove that knowledge acquired at the Faculty can be successfully applied in one's practical work.

1.5. Teaching methods

1.6. Comments

1.7. Student obligations

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

1.8. Course assessment

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

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

Student's activity	ECTS	Learning outcomes	Teaching method	Assessment method	Points	
					Min	max
Attendance	0	1		Attendance register. Mandatory attendance percentage is: 25%.	5	10

1.10. Obligatory literature

1.11. Recommended additional literature
1.12. Monitoring of students
According to the Regulations on final and master thesis: - oral defence of work is carried out in front of Comission for defence