U N I V E R S I T Y   O F   S P L I T

FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE

# DETAILED PROPOSAL OF THE STUDY PROGRAMME

## UNDERGRADUATE VOCATIONAL STUDY IN ELECTRICAL ENGINEERING

SPLIT, June 2017

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# GENERAL INFORMATION OF HIGHER EDUCATION INSTITUTION

| | |
|---|---|
| Name of higher education institution | FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE |
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| Phone | 021 305 777 |
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| Internet address | htpp://www.fesb.hr |

# GENERAL INFORMATION OF THE STUDY PROGRAMME

| | | | |
|---|---|---|---|
| Name of the study programme | ELECTRICAL ENGINEERING | | |
| Provider of the study programme | FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE | | |
| Other participants | | | |
| Type of study programme | Vocational study programme ☒ | University study programme ☐ | |
| Level of study programme | Undergraduate ☒ | Graduate ☐ | Integrated ☐ |
| | Postgraduate ☐ | Postgraduate specialist ☐ | Graduate specialist ☐ |
| Academic/vocational title earned at completion of study | Vocational Bachelor in Electrical Engineering | | |

# 1. INTRODUCTION

## 1.1. Reasons for starting the study programme

Electrical engineering is a field of science and engineering that encompasses the research and application of electrical phenomena. Similar to other branches of engineering, electrical engineering serves as a link between mathematics, physics and other natural sciences on one part, and on the other part, their practical applications. Widely diverse forms of practical applications of electrical engineering can be in the general sense divided into two basic groups: applications related to electrical energy and applications related to information.

The area of electrical engineering has become exceptionally wide and interdisciplinary, and there is virtually no human activity in which electrical engineering does not contribute, significantly fostering their development. One of the main features of the field of electrical engineering is its rapid development. The demands of the developed society for electrical energy are continually growing, creating constant demand for development of devices for energy conversion and seeking new and environmentally acceptable systems for distribution of electrical energy. Striking development of the electronic computers technology enabled their application in nearly all areas of human activity. Development of microelectronics and computer technology enabled the development of the area of information and telecommunication technology, which became one of the most promising sectors of economy. Information transfer, i.e. image, voice and data transfer came to represent one of major prerequisites for the development of modern society. State-of-the-art computer technology enables major breakthroughs in the quality of automated control in the processing industry, control of vessels and aircrafts, complex robots and modern medical devices. Continuous and rapid development of this area, driven by new findings and achievements, necessarily requires corresponding educational processes. Well-educated professionals are an essential prerequisite for progress and keeping pace with the developed countries.

The goal of the proposed study programme in Electrical Engineering is to educate professional staff in the area of electrical engineering, to meet the demands of the industry, governmental and other public institutions.

## 1.2. Relationship with the local community (economy, entrepreneurship, civil society, etc.)

The goal of the proposed undergraduate vocational study programme in Electrical Engineering is to educate professional staff in the area of electrical engineering, to meet the demands of the industry, governmental and other public institutions. One of the basic tasks of the Faculty is the education of young professionals who will use their knowledge, skills and abilities to become stakeholders in the economic and general development of local and wider community. Having been training leading professionals for more than 55 years, the Faculty successfully accomplished its task, providing necessary human resources to participate in the development of economy sectors based on different branches of engineering. The Faculty trained professionals who significantly contributed to economic development in the region, thus supporting the region to initiate and successfully develop high-tech based production activities with its own human resources potential. Successful development of the Dalmatian region power system was facilitated by the efforts of power engineering professionals trained at FESB. Of special importance is the influence FSB had on development of IT sector in the region. Early developments started back in 1966, with the purchase of the first computer funded by local enterprises and establishment of the Computer Centre at FESB. This was the first computer purchased in town and the first installed computer at a higher education institution in Croatia, representing a major breakthrough which allowed for gaining valuable experience, not only in teaching and research activities at the Faculty, but also in IT education and can be considered as the starting point in development of IT sector in the region. Professionals trained at FESB are the founders of a number of ICT companies in the Split-Dalmatia County and town of Split.

## 1.3. Compatibility with requirements of professional organizations

The study programme is compatible with the requirements of the Croatian chamber of electrical engineers.

## 1.4. Name possible partners outside the higher education system that expressed interest in the study programme

FESB is a signatory to a number of cooperation agreements with the aim of promoting academic and educational activities, concluded with private enterprises and public organisations, e.g. Ericsson Nikola Tesla, Hrvatska elektroprivreda (national power company), Split-Dalmatia County, Ministry of Defence, Energy institute “Hrvoje Požar”, Croatian Telecom, Croatian academic and research network - CARNet, Technology Centre Split, Brodosplit, Siemens, VIPnet, Microsoft Croatia, etc. It is important to note that the Croatian Armed Forces expressed a special interest in cooperation, since prospective officers are trained at the Faculty.

## 1.5. Financing

The study programme is financed by the Ministry of Science and Education.

## 1.6. Comparability of the study programme with other accredited programmes in higher education institutions in the Republic of Croatia and EU countries

During the implementation of the study programme in Electrical Engineering, the Faculty is actively pursuing the process of development in higher education on global level, and especially in Europe. When developing the new curriculum, special attention was given to consolidating the curriculum and course contents with other renowned foreign higher education institutions. The educational systems in the field of electrical engineering differ a lot, both worldwide and in Europe, and there are practically no countries with identical educational systems. The former applies to almost all components of education: type and organisation of studies, fields of study, duration of studies, titles and degrees awarded at individual institutions, names of higher education institutions, etc. As a rule, the first stage is acquiring knowledge of mathematics and fundamental natural sciences, followed by core courses in electrical engineering and information technology and specific specialist courses related to particular branches of electrical engineering. In addition, the programme includes a number of non-engineering courses. The study programme proposal is consolidated with the recommendations given in the framework of the ERASMUS project THEIERE (Towards the Harmonisation of Electrical and Information Engineering Education in Europe, http://www.eaeeie.org/theiere/). Based on the analysis of the study programmes in Electrical Engineering and Information Technology at 87 European universities, a proposal was prepared for organisation of the study programme in Electrical Engineering and the ratio of each of the mentioned components. The organisation of the proposed study programme is comparable with related study programmes at the following European institutions:

- Techniche Univerzität Wien/ Engineering University Vienna, Austria
  http://www.tuwien.ac.at/informationen_fuer/studierende
- Fachhochschule Regensburg, Regensburg/ Regensburg University of Applied Sciences, Germany
  https://www.oth-regensburg.de/

## 1.7. Openness of the study programme to student mobility (horizontal, vertical in the Republic of Croatia, and international)

Undergraduate vocational study programme in Electrical Engineering enables vertical and horizontal mobility of students. In terms of vertical mobility, the graduate university study programme in Electrical Engineering can primarily be followed undergraduate vocational study programme in Mechanical Engineering can be followed by the specialist graduate vocational study programme implemented at the University Department of Professional Studies. If they pass differential exams and acquire additional ECTS credits, students may be admitted to one of the graduate university study programmes at FESB. In terms of horizontal mobility, undergraduate vocational study programme in Electrical Engineering is open for mobility of students of related studies at all Croatian universities and higher education institutions in Croatia. Students have the opportunity to complete a part of the study programme at a similar institution in Croatia or abroad. The comparability of the study programme with similar study programmes enables the students to fulfil a part of their course requirements at other higher education institutions in Croatia or abroad.

## 1.8. Compatibility of the study programme with the University mission and the strategy of the proposer, as well as with the strategy statement of the network of higher education institutions

Undergraduate vocational study programme in Electrical Engineering conforms with the Strategy of the University of Split 2015-2020. In addition to mission and vision of the University of Split, in the process of defining strategic goals, the following strategic documents were taken into account as guidelines:

- EUROPA 2020 strategy for smart, sustainable and inclusive growth,
- Strategic documents of the European Research Area (ERA),
- Strategic documents of the European Higher Education Area (EHEA),
- Strategy of Education, Science and Technology of the Republic of Croatia.

Preparation of the study programme was done in line with the mission, vision and goals which are partly derived from the Scientific Strategy of the University of Split 2009 – 2014, document which promotes creation of internal development plans at the level of University constituents.

Undergraduate vocational study programme in Electrical Engineering conforms with the development guidelines of the Faculty, as well as mission, vision and strategic goals defined in the FESB Development Strategy for the period 2012 – 2016, and is the only programme of this type at the University of Split and the wider region.

The proposed study programme conforms with the strategic document Network of Higher Education Institutions and Study Programmes in the Republic of Croatia, which encourages launching new study programmes in STEM area, as electrical engineering is one of STEM disciplinary program areas.

## 1.9. Current experiences in equivalent or similar study programmes

FESB has extensive experience in delivering courses at similar programmes. Faculty of Electrical Engineering in Split was established in 1960, implementing a 2$^{nd}$ level study programme in electrical engineering, with programme duration of 8 semesters. After the integration with the studies in mechanical engineering and naval architecture, the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB) was established in 1971. Since 1974 the Faculty has been a constituent part of the University of Split.

Continuous work at developing the curricula resulted in establishing a number of study programmes at undergraduate and graduate level. At the undergraduate study programmes in Electrical Engineering the programme is implemented in the following fields of study: Power Engineering and Electronic Engineering. The first three semesters of the study programme are identical for both fields of study, and the following semesters provide specialist courses with elective disciplines of study. The disciplines of study in Power Engineering are: Electric Drives and Facilities and Power Engineering Systems, and in Electronic Engineering: Automation and Systems, Electronic Communication Systems, Applied Electronic Engineering and Computer Technology.
In 1979 vocational study programmes were established at the Faculty (former level VI study programme) which are implemented since, with a pause during years 1998-2001.

Postgraduate study in the scientific field of electrical engineering was implemented at the Faculty, providing specialisation in the areas of telecommunications and computer information systems, electronics, power engineering and electromechanical engineering, automation and computing.

# 2. DESCRIPTION OF THE STUDY PROGRAMME

## 2.1. General information

| | |
|---|---|
| Scientific/artistic area of the study programme | Engineering sciences |
| Duration of the study programme | 3 years |
| The minimum number of ECTS required for completion of study | 180 |
| Enrolment requirements and admission procedure | Completed 4-year high school programme and state graduation exam. Rankings are formed based on the grade point average achieved in high school and the state exam results in the fields of mathematics and physics.<br>Students of related undergraduate studies may also be admitted, with at least 30 ECTS credit recognition. |

## 2.2. Learning outcomes of the study programme (name 15-30 learning outcomes)

The learning outcomes of the study programme are directly related to the learning outcomes of an individual course and represent learning outcomes to be achieved by each student who completes the undergraduate vocational study programme in *Electrical Engineering*. The learning outcomes are aligned with the Croatian Qualification Framework Act and are listed as common learning outcomes for both fields of study and additional learning outcomes depending on the selected field of study, in the areas of knowledge, skills and corresponding independence and responsibility.

KNOWLEDGE

1. To apply appropriate mathematical, physical and engineering principles in solving practical problems in the field of electrical engineering.
2. To apply appropriate analytical methods in presenting and solving highly complex electrical networks.
3. To consolidate the theoretical knowledge and practical skills in solving problems in the field of electrical engineering.
4. To recognise the possibilities and limitations of applied techniques and methods.

SKILLS

5. To apply the techniques, skills and advanced engineering tools necessary in the engineering work.
6. To conduct experiments and measurements in laboratory and industrial facilities, using state-of-the-art measuring devices.
7. To analyse collected data and measurement results from laboratories and industrial facilities.
8. To apply the knowledge of engineering and skills of effective problem solving of engineering problems, both independently and as a part of team.
9. To prepare design documents and technical reports, using modern technologies.
10. To participate in the work of multidisciplinary and international teams.
11. To use the literature, databases and other sources of information.
12. To give public oral presentation, to prepare written reports and present project results, in Croatian and English language.

INDEPENDENCE

13. To manage projects in the area of electrical engineering, from the preparation stage to completion.
14. To adapt to new techniques and technologies.
15. To work in the field under unforeseen conditions.

RESPONSIBILITY

16. To demonstrate awareness of the influences of engineering practice on the individual, society and environment.
17. To demonstrate professional and ethical responsibility in unforeseen conditions.
18. To demonstrate awareness on health, safety and legal issues related to the individuals and social groups.
19. To recognise the need for participating in life-long learning and acquiring the knowledge about new technologies.

ADDITIONAL LEARNING OUTCOMES FOR THE FIELD OF STUDY ELECTRIC POWER ENGINEERING

1. To design creative solutions for development, design, implementation and analysis of power engineering components, electrical machines and power electronics devices.
2. To plan the development, production, testing, safety, maintenance and monitoring of power engineering systems, electrical machines and facilities.
3. To monitor the production and testing of electrical equipment, devices and facilities, in accordance with design solutions.
4. To calculate energy ratios in systems conventional and renewable energy sources systems.
5. To manage maintenance of electrical and industrial facilities.
6. To select electrical machines for electro-mechanic conversion of energy.
7. To select transformers, overhead lines and switching equipment for transmission and distribution of electrical power.

ADDITIONAL LEARNING OUTCOMES FOR THE FIELD OF STUDY ELECTRONICS

1. To design creative solutions for development, design, implementation and analysis of analogue and digital electronic components and units.
2. To model electro-mechanical systems.
3. To manage automated systems.
4. To apply various methods of signal processing with the aim of optimal information transfer in communication systems.
5. To select topology and elements required for implementation of communication networks.
6. To solve complex tasks of simulating linear and non-linear systems.
7. To prepare a business plan in the field of engineering entrepreneurship with all necessary technological, commercial and financial parameters.
8. To apply regulations in the area of company law in managing company activities.

## 2.3. Employment possibilities

Following the completion of studies, the acquired knowledge enables the students to find employment in the industry, electric power industry, software and ICT companies, education, service industry, etc. There is virtually no working environment in which experts with completed undergraduate vocational degree in Electrical Engineering could not find employment and the labour market demand for this profile of experts are very high. This is especially relevant in this moment, with social and economic changes driving the development of new, small and medium technologically advanced enterprises that could serve as the new driving force for economic development. Graduates who complete the undergraduate vocational study programme in Electrical Engineering acquire the knowledge and skills necessary for work in various areas: power engineering, electromechanical engineering, automation, computing and ICT. Following the completion of studies, the students are capable of testing, maintenance, designing, monitoring and controlling of circuits and devices in production, automated, power engineering and ICT systems and the use of corresponding software tools and equipment. The demand for experts with these competences considerably exceeds the available number of educated experts in the region, Croatia and the world.

## 2.4. Possibilities of continuing studies at a higher level

After completing the undergraduate vocational study programme in Electrical Engineering, graduates may continue their studies at the specialist graduate vocational study programme at the University Department of Professional Studies or at other HEI offering that level of education. After completing differential exams and acquiring additional ECTS credits, students may be admitted to a graduate university study programme at FESB.

## 2.5. Name lover level studies of the proposer or other institutions that qualify for admission to the proposed study

## 2.6. Structure of the study

The study programme is structured per semesters, lasting 6 semesters, two in each academic year. Each semester corresponds to 30 ECTS credits. During the first year of the studies, the students acquire fundamental knowledge in mathematics and natural sciences and fundamental knowledge in electrical engineering and information technology and the programme is implemented jointly for all students of this undergraduate vocational study. When students enrol in the second year, they choose one of the following fields of study:

- Electrical power engineering and
- Electronics.

The final component of the study programme is preparing and defending the final thesis. The conditions for enrolling a course are listed in the course table. Lectures are delivered in groups up to 100 students, auditory exercises and seminars in groups of 30 students and laboratory exercises in groups of 10 students.

## 2.7. Guiding and tutoring through the study system

During the course of study programme activities, students have access to all the Faculty services. For the purpose of timely and effective communication, notifications and information are provided to students through the e-learning portal.

## 2.8. List of courses that the student can take in other study programmes

Students may enrol courses from other study programmes only as elective courses which are not included in the standard workload of 30 ECTS credits per semester.

## 2.9. List of courses offered in a foreign language as well (name which language)

Course tables for individual courses list the option of teaching a course in a foreign language.

## 2.10. Criteria and conditions for transferring the ECTS credits

Transfer or recognition of ECTS credits between related university or vocational study programmes is allowed. The criteria and conditions for transferring the ECTS credits are regulated by the *Regulations on Studies and Study System at the University of Split*.

## 2.11. Completion of study

| | | |
|---|---|---|
| *Final requirement for completion of study* | Final thesis ☒<br>Diploma thesis ☐ | Final exam ☐<br>Diploma exam ☐ |
| *Requirements for final/diploma thesis or final/diploma/exam* | The requirement for applying for the final thesis is acquired 120 ECTS credits. | |
| *Procedure of evaluation of final/diploma exam and evaluation and defence of final/diploma thesis* | The final thesis is evaluated by the mentor (supervisor) and the defence of the final thesis is conducted orally, in the presence of the mentor and students who also defend their final thesis with the same mentor. | |

## 2.12. List of mandatory and elective courses

| List of courses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year of study: 1. | | | | | | | | | |
| Semester: I. | | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FEMY03 | Mathematics | 45 | 0 | 45 | 0 | 0 | 7 |
| | FEMO01 | Physics | 30 | 0 | 15 | 15 | 0 | 5 |
| | FESY01 | Introduction to Computer Applications | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO01 | Fundamentals of Electrical Engineering 1 | 45 | 0 | 30 | 15 | 0 | 7 |
| | FELO01 | Electrotechnical Materials and Technologies | 30 | 0 | 0 | 15 | 0 | 4 |
| | FEOO02 | English Language 1 | 0 | 30 | 0 | 0 | 0 | 2 |
| | Total | | 180 | 30 | 90 | 75 | 0 | 30 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | No elective courses | | | | | | | |

| List of courses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year of study: 1. | | | | | | | | |
| Semester: II. | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FEMY02 | Applied Mathematics | 30 | 0 | 30 | 0 | 0 | 5 |
| | FELO02 | Introduction to Programming | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO28 | Fundamentals of Electrical Engineering 2 | 30 | 0 | 30 | 15 | 0 | 6 |
| | FELO42 | Electronic Devices | 30 | 0 | 30 | 15 | 0 | 6 |
| | FENO24 | Electrical Measurements | 30 | 0 | 0 | 30 | 0 | 5 |
| | FEOO03 | English Language 2 | 0 | 30 | 0 | 0 | 0 | 3 |
| | Total | | 150 | 30 | 90 | 90 | 0 | 30 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | No elective courses | | | | | | | |

## Modul A

| List of courses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year of study: 2. | | | | | | | | | |
| Semester: III. | | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FENO04 | Electrical Machines and Transformers | 45 | 0 | 30 | 15 | 0 | 8 |
| | FENO05 | Electrical Networks | 30 | 0 | 15 | 15 | 0 | 5 |
| | FENO06 | Electrical Power Switchgears | 45 | 0 | 15 | 15 | 0 | 6 |
| | FENO07 | Power Electronics | 45 | 0 | 0 | 30 | 0 | 6 |
| | FENO08 | Control Engineering | 30 | 0 | 15 | 15 | 0 | 5 |
| | Total | | 195 | 0 | 75 | 90 | 0 | 30 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | No elective courses | | | | | | | |

| List of courses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year of study: 2. | | | | | | | | | |
| Semester: IV. | | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FENO09 | Electrical Drives | 30 | 0 | 15 | 15 | 0 | 5 |
| | FENO10 | Electrical Installations | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO11 | Measurements in Power System | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO12 | Electrical Distribution Networks | 30 | 0 | 15 | 15 | 0 | 5 |
| | FENO13 | Application of Industrial Computers | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO14 | Protection and Control Systems in Substation | 30 | 0 | 15 | 15 | 0 | 5 |
| | Total | | 180 | 0 | 45 | 135 | 0 | 30 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | No elective courses | | | | | | | |

| List of courses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year of study: 3. | | | | | | | | |
| Semester: V. | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FENO15 | Electrical Safety | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO16 | Measurements of Process Quantities | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO18 | Maintenance and Testing of Electrical Power Equipment | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO21 | Electronic Converters for Power Supplies | 30 | 0 | 15 | 15 | 0 | 5 |
| | | Elective Course 1*. | | | | | | |
| | | Elective Course 2*. | | | | | | |
| | Total | | 120 | 0 | 15 | 105 | 0 | 20 |
| Elective* | FENO25 | Design of Low Voltage Facilities | 15 | 0 | 0 | 45 | 0 | 5 |
| | FENO29 | Renewable Energy Sources | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO26 | Marine Electrical Engineering | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO20 | Protection at Substations | 30 | 0 | 15 | 15 | 0 | 5 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | * Two elective courses are selected. | | | | | | | |

| List of courses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year of study: 3. | | | | | | | | |
| Semester: VI. | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FEYY03 | Professional Training | | | | | | 10 |
| | | Elective Course 1*. | | | | | | |
| | | Elective Course 2*. | | | | | | |
| | FEYY01 | Final Thesis | | | | | | 10 |
| | Total | | | | | | | 20 |
| Elective* | FENO17 | Control of Electrical Drives | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO19 | High Voltage Engineering | 30 | 0 | 15 | 15 | 0 | 5 |
| | FENO22 | Power System and Environment | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO23 | Energy Sources | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO31 | Instrumentation for Smart Grid | 30 | 0 | 0 | 30 | 0 | 5 |
| | FENO30 | Microprocessors | 30 | 0 | 0 | 30 | 0 | 5 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | * Two elective courses are selected. | | | | | | | |

**Modul B**

| List of courses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year of study: 2. | | | | | | | | |
| Semester: III. | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FELO04 | Electronic Circuits | 45 | 0 | 45 | 30 | 0 | 9 |
| | FELO05 | Signals and Systems | 45 | 0 | 15 | 15 | 0 | 6 |
| | FELO06 | Automation | 45 | 0 | 30 | 15 | 0 | 8 |
| | FESY03 | Introduction to Entrepreneurship | 30 | 0 | 15 | 0 | 0 | 3 |
| | FELO07 | Optoelectronics | 30 | 0 | 0 | 15 | 0 | 4 |
| | Total | | 195 | 0 | 105 | 75 | 0 | 30 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | No elective courses | | | | | | | |

| List of courses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year of study: 2. | | | | | | | | |
| Semester: IV. | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | FELO10 | Communication Systems | 45 | 0 | 30 | 15 | 0 | 8 |
| | FELO11 | Digital Techniques | 45 | 0 | 15 | 30 | 0 | 7 |
| | FELO27 | Electronic Cad | 30 | 0 | 0 | 30 | 0 | 5 |
| | | Elective Course 1. | | | | | | |
| | | Elective Course 2. | | | | | | |
| | Total | | 120 | 0 | 45 | 75 | 0 | 20 |
| Elective* | FELO12 | Process Control | 30 | 0 | 15 | 15 | 0 | 5 |
| | FELO29 | Elements of Robotics | 30 | 0 | 15 | 15 | 0 | 5 |
| | FELP08 | Computer Networks | 30 | 0 | 15 | 15 | 0 | 5 |
| | FELO16 | Antennas | 30 | 0 | 15 | 15 | 0 | 5 |
| | FELO19 | Multimedia | 30 | 0 | 0 | 30 | 0 | 5 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | Two elective courses are selected. | | | | | | | |

| List of courses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year of study: 3. | | | | | | | | | |
| Semester: V. | | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Mandatory | | Elective PRAKTIKUM 1 | | | | | | |
| | | Elective PRAKTIKUM 2 | | | | | | |
| | | Elective Course 1. | | | | | | |
| | | Elective Course 2. | | | | | | |
| | | Elective Course 3. | | | | | | |
| | | Elective Course 4. | | | | | | |
| | Total | | | | | | | |
| Elective | | **Elective PRAKTIKUM** | | | | | | |
| | FELO44 | Biomechanics Practicum | 15 | 0 | 0 | 45 | 0 | 5 |
| | FELO33 | Practicum in Digital Image Processing | 15 | 0 | 0 | 45 | 0 | 5 |
| | FELO48 | Mechatronics Practicals | 15 | 0 | 0 | 45 | 0 | 5 |
| | FELO46 | Practicum in Electromagnetic Simulations | 15 | 0 | 0 | 45 | 0 | 5 |
| | | **Elective Course** | | | | | | |
| | FELO47 | Electronic Circuits Design | 15 | 0 | 15 | 30 | 0 | 5 |
| | FELO20 | Electronic Instrumentation | 15 | 0 | 0 | 45 | 0 | 5 |
| | FELO21 | Electromagnetic Compatibility | 30 | 0 | 0 | 30 | 0 | 5 |
| | FELO22 | Computer Architectures | 30 | 0 | 0 | 30 | 0 | 5 |
| | FELO23 | Modelling and Simulation | 30 | 0 | 0 | 30 | 0 | 5 |
| | FELP16 | Computer and Data Security | 30 | 0 | 0 | 30 | 0 | 5 |
| | FELP17 | Designing and Using Computer Networks | 30 | 0 | 0 | 30 | 0 | 5 |
| | FELO18 | Control System Design | 30 | 0 | 0 | 30 | 0 | 5 |
| | FELO30 | Radio Communications | 30 | 0 | 15 | 15 | 0 | 5 |
| | FELO31 | Computer Aided Analysis of Radiating Structures | 30 | 0 | 0 | 30 | 0 | 5 |
| | FELO32 | Human Exposure to Electromagnetic Radiation | 30 | 0 | 0 | 30 | 0 | 5 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | Two elective praktikum and four elective courses are selected | | | | | | | |

| List of courses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year of study: 3. | | | | | | | | | |
| Semester: VI. | | | | | | | | | |
| STATUS | CODE | COURSE | HOURS IN SEMESTER | | | | | ECTS |
| | | | L | S | AE | LE | DE | |
| Elective | FEEE14 | Commercial Law | 30 | 0 | 0 | 0 | 0 | 2 |
| | FEYY03 | Professional Training | | | | | | 10 |
| | | Elective Course 1. | | | | | | |
| | | Elective Course 2. | | | | | | |
| | FEYY01 | Final Thesis | | | | | | 10 |
| | Total | | 30 | 0 | 0 | 0 | 0 | 22 |
| Elective* | FELO35 | Internet Programming | 30 | 0 | 0 | 15 | 0 | 4 |
| | FELO36 | Sensors and Transducers | 30 | 0 | 0 | 15 | 0 | 4 |
| | FELO37 | Mobile Communication Networks | 30 | 0 | 0 | 15 | 0 | 4 |
| | FELO45 | Optical Communications | 30 | 0 | 0 | 15 | 0 | 4 |
| | FETO01 | Hydraulic and pneumatic systems | 30 | 0 | 0 | 15 | 0 | 4 |
| | FELO39 | Microcontrollers and embedded network systems | 30 | 0 | 0 | 15 | 0 | 4 |
| | FELO40 | Maritime Radiocommunications | 30 | 0 | 0 | 15 | 0 | 4 |
| | FELO41 | High-Frequency Electronics | 30 | 0 | 0 | 15 | 0 | 4 |
| | L = lectures, S = seminars, AE = auditory excercise, LE = laboratory excercise, DE = design excercise | | | | | | | |
| | Three elective courses are selected. | | | | | | | |

## 2.13. Course description

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **ANTENNAS** | | | | | | |
| **Code** | FELO16 | Year of study | 2. | | | | |
| **Course teacher** | Antonio Šarolić, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Niko Ištuk, mag. ing. el. | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | | 15 | 15 | |
| Status of the course | elective | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding the phenomena of radiation<br>- analysis of antennas as radiating structures<br>- application of antennas in wireless communication systems |
| Course enrolment requirements and entry competences required for the course | None. |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- utilize the antenna parameters as the basis for antenna application in ICT<br>- elaborately assess the applicability of a certain antenna for specific purpose<br>- calculate the electromagnetic field in the surrounding of simple antenna structures<br>- analyze the parameters of linear antennas<br>- analyze simple uniform antenna arrays |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction. Antenna parameters. Polarization. Radiation pattern. | 2 | 1 |
| Directivity. Gain. Antenna impedance. Effective area. | 2 | 1 |
| Effective length. Antenna factor. Relations linking the antenna parameters. Friis equation. | 2 | 1 |
| Elementary electrical dipole (EED). Field around the EED. | 2 | 1 |
| Radiated power and radiation resistance of EED. Efficiency of EED. | 2 | 1 |
| Zones surrounding the antenna – near and far field. | 2 | 1 |
| Resonant dipoles. Halfwave dipoles. Fullwave dipoles. | 2 | 1 |
| Electrically short dipole and unipole. | 2 | 1 |
| Mutual impedance of dipoles. | 2 | 1 |
| Antenna array. Uniform linear antenna array. | 2 | 1 |
| Wideband antennas. | 2 | 1 |
| Overview of antennas w.r.t. frequency and wireless communication system. | 2 | 1 |
| Practical examples of antenna installations in use – field trip. | 2 | 1 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Introduction. Antenna parameters. Polarization. Radiation pattern. Directivity. Gain. Antenna impedance. Effective area. | 2 |
| Effective length. Antenna factor. Relations linking the antenna parameters. Friis equation. Elementary electrical dipole (EED). Field around the EED. | 2 |

| | | |
|---|---|---|
| | Radiated power and radiation resistance of EED. Efficiency of EED. Zones surrounding the antenna – near and far field. | 2 |
| | Resonant dipoles. Halfwave dipoles. Fullwave dipoles. Electrically short dipole and unipole. | 2 |
| | Mutual impedance of dipoles. Antenna array. Uniform linear antenna array. | 2 |
| | Array with uniform amplitude distribution. Arrays with non-uniform amplitude distribution. | 2 |
| | Practical examples of antenna installations | 1 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☒ field work | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | Student is required to attend the lectures and auditory exercises in the amount of at least 70% of the schedule. Student is required to attend the laboratory exercises in the amount of 100% of the schedule and to complete all tasks associated with laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2 | Research | | Practical training | 0,5 |
| | Experimental work | | Report | | Laboratory exercises | 0,5 |
| | Essay | | Seminar essay | 0,5 | Individual work | 0,5 |
| | Mid-exam | 0,5 | Oral exam | | (Other) | |
| | Written exam | 0,5 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | During the semester, two mid-exams will be held. The first mid-exam will be held in the middles of the semester, while the second will be held after the lectures and exercises are completed, schedules to be agreed with the students.<br>The first mid-exam is based on the first half of the course material. The second mid-exam is based on the first second half of the course material.<br>To pass at each mid-exam, min. 50% of points must be earned from the part of the exam containing numerical problems (material from auditory exercises) and min. 50% of points must be earned from the part of the exam containing theory (material from the lectures).<br>To earn the right to approach the second mid-exam, min. 30% of points must be earned from the part of the first mid-exam containing numerical problems (material from auditory exercises) and min. 30% of points must be earned from the part of the first mid-exam containing theory (material from the lectures).<br>If a student earns the positive grades on both mid-exams, he/she is considered to have passed the whole exam with the grade calculated as average from both mid-exams.<br>At the first exam term, students may choose to take the exam containing only that half of the material that they haven't passed at mid-exams.<br>At all other exam terms, students must take the whole exam, containing all the course material.<br>Approaching the exams is subject to fulfilling the requirements on student responsibilities.<br>The overall point percentage defining the overall grade is calculated as the average of points earned in all exam questions, corrected by the result of oral verification:<br>Percentage -> Grade<br>50% - 62,4% -> sufficient (2)<br>62,5% - 74,9% -> good (3)<br>75% - 87,4% -> very good (4)<br>87,5% - 100% -> excellent (5) |

<table>
<tr><td></td><td colspan="3">Final grade can be supplemented by performing practical project work involving individual and experimental work, in agreement with the teacher.<br>Exam terms: according to the academic year calendar</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>E. Zentner: Antene i radiosustavi, Graphis, Zagreb 2001.</td><td></td><td></td></tr>
<tr><td>Constantine A. Balanis: Antenna Theory: Analysis and Design, Wiley, 1997.</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">- V. Roje: Antene I dio, skripta, Sveučilište u Splitu 1981.<br>- Handbook of antennas in wireless communications, CRC Press, 2002.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">Surveys providing student feedback</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">APPLICATION OF INDUSTRIAL COMPUTERS</td></tr>
<tr><td>Code</td><td>FENO13</td><td>Year of study</td><td colspan="5">2</td></tr>
<tr><td>Course teacher</td><td>Ozren Bego, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Danijel Jolevski, Ph.D., Assistant Professor</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding terms and concept of industrial automation,<br>- understanding working principles of programable logic controllers (PLC), sensors and actuators,<br>- programing PLCs.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- define and describe automation system,<br>- select sensors according to defined criteria,<br>- analyze pneumatic and hydraulic actuators in automation system,<br>- program PLC.</td></tr>
<tr><td rowspan="16">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="3">Course content</td><td colspan="2">L or S hours</td><td colspan="3">AE hours</td></tr>
<tr><td colspan="3">Introduction in course. Basics of industrial automation. Technical process definition, classification, examples. Historical overview of automation. Examples of industrial automation: hydro power plant, ladle furnace, concrete plants.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Differences in machine and plant automation. Central and decentral control structure. Communication between industrial computers. Redundancy.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Process computer structures and requirements. CPU, peripherals. Process signal types.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Signal processing (multiplexing, filtering). Analog-to-digital convertors, ADC types. Digital-to-analog convertors.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Sensors – types, static and dynamic characteristics, transfer of digital and analog signals, galvanic isolation, noise suppression.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Proximity sensors (mechanical, inductive, capacitive, optical). Linear and rotate movement and speed measurement.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Temperature, pressure, flow and level measurement.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">First midterm exam</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Actuators – types. Electromechanical actuators, step motors.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Pneumatic actuators. Hydraulic actuators.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Introduction in PLC programming. Program structure and blocks in PLCs. Functions of blocks (organization, function, data,…). Method of calling blocks. Binary arithmetic.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Conversion and data transfer instructions. Jump and call instructions. Integer and float point arithmetic instructions. Float point format. Counters and timers.</td><td colspan="2">2</td><td colspan="3"></td></tr>
<tr><td colspan="3">Serial and parallel data transfer. Industrial communication standards RS 232 and RS 485. Network topology. Network access technique. Modbus protocol.</td><td colspan="2">4</td><td colspan="3"></td></tr>
<tr><td colspan="3">Second midterm exam</td><td colspan="2">2</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td rowspan="7"></td><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">Introduction in LOGO! programable relay.</td><td>3</td></tr>
<tr><td colspan="6">Programing LOGO!</td><td>3</td></tr>
<tr><td colspan="6">Programing PLC – binary instructions, timers, counters, data conversions</td><td>3</td></tr>
<tr><td colspan="6">Programing PLC – analog signal measurements</td><td>3</td></tr>
<tr><td colspan="6">Sequential control, analog control</td><td>6</td></tr>
<tr><td colspan="6">Programing LOGO! – individual assignments</td><td>8</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="4">☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="7"></td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td colspan="2"></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Laboratory attendance</td><td colspan="2">1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Independent work</td><td colspan="2">2.2</td></tr>
<tr><td>Tests</td><td>0.2</td><td>Oral exam</td><td></td><td>Preparation for laboratory work</td><td colspan="2">0.5</td></tr>
<tr><td>Written exam</td><td>0.1</td><td>Project</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm and final test consists of 10 questions. In the final exams students that did not pass the midterm exams take part. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,05 NP + 0,35 LV + 0,3 (M1 + M2)<br>the activities in percentage:<br>• NP - attendance at lectures,<br>• LV – laboratory assessment (independent/group work),<br>• M1, M2 – test results.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td colspan="2">Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">O. Bego: Predavanja iz predmeta Primjena procesnih računala, FESB</td><td colspan="2"></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="7">-</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="7">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers,<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="7"></td></tr>
</table>

| NAME OF THE COURSE | **APPLIED MATHEMATICS** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FEMY02 | Year of study | 1 | | | | |
| **Course teacher** | Ivančica Mirošević, M.Sc., Lectuter | Credits (ECTS) | 5 | | | | |
| Associate teachers | Lea Dujić | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | | 30 | | |
| Status of the course | obligatory | Percentage of application of e-learning | 10 | | | | |

**COURSE DESCRIPTION**

| | | | |
|---|---|---|---|
| Course objectives | Training students for:<br>- application of mathematical concepts and tools from the area of ordinary differential equations, numerical mathematics, statistics and probability to analyze and solve engineering problems. | | |
| Course enrolment requirements and entry competences required for the course | Good knowledge of High School mathematics and passed State Exam in Mathematics. | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- state definitions and theorems from the enitre course,<br>- illustrate theorems with examples,<br>- solve some first and second order differential equations,<br>- apply Laplace transform to linear differential equations<br>- find approximate solution of a nonlinear equation<br>- approximate function with Lagrange interpolation polynomial<br>- approximate empirical data with constant, linear or quadratic function<br>- solve definite integral and Cauchy problem of the first order approximately<br>- use statistical techniques in data analysis<br>- find probability distributions of random variables in random experiments | | |
| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
| | 1. Introduction to Differential Equations. Basic concepts and definitions. Equations with separable variables. | 2 | 2 |
| | 2. Homogeneous differential equations. Linear differential equations of the first order. | 2 | 2 |
| | 3. Differential equations of ¸the second order. Linear differential equations of the second order with constant coefficients. | 2 | 2 |
| | 4. Laplace transform – definition and basic properties. Inverse Laplace transform and basic properties. | 2 | 2 |
| | 5. Solving linear differential equations with with constant coefficients using Laplace transform. | 2 | 2 |
| | 6. Introduction to Numerical mathematics. Solving nonlinear equations. Graphical method. Bisection method. Iterative method. | 2 | 2 |
| | 7. Lagrange interpolation polynomial | 2 | 2 |
| | 8. Least square method. Approximating empirical data with constant, linear or quadratic function. | 2 | 2 |
| | 9. Numerical integration. Trapezoidal rule. Simpson's rule. Euler's method for Cauchy problems. | 2 | 2 |
| | 10. Descriptive statistics. Discrete data and continuous data. Numerical characteristics. | 2 | 2 |
| | 11. Introduction to Probability theory. Elementary outcomes. Basics of Combinatorics. | 2 | 2 |
| | 12. Discrete random variable. Expectation and variance. Binomial distribution. Poisson distribution. | 2 | 2 |
| | 13. Continuous random variable. Expectation and variance. Normal distribution. | 2 | 2 |

<table>
<tr><td rowspan="2"></td><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6"></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="4">☒ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="7">Regular attendence to and active participation in lectures and excercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2</td><td>Research</td><td></td><td>Practical training</td><td colspan="2"></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Self study</td><td colspan="2">2.6</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Tests</td><td>0.2</td><td>Oral exam</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Written exam</td><td>0.2</td><td>Project</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">During semester two mid-term exams are held. The first exam is scheduled after 7 weeks of lectures, and the second in the week following the lectures. At each mid-term exam students can get 40 points, while the remaining 20 points are attained through assignements during lectures and excercises. The condition for passing the course is minimum 20 points on each mid-term exams and a total of at least 50 points.<br><br>After semester, two final exams and a correction exam are held.<br>Students which did not pass one mid-term exam, can take only this part of the exam during final exams.<br><br>Students which did not pass any mid-term exam, take the final exam with comprehensive course content. In that case, maximum numbers of available points is 80. The condition for passing the course is minimum 40 points in the final exam and a total of at least 50 points.<br>The grade is formed after the second final exam according to article 75 of the Statute of FESB:<br><br>15% of the best students get the mark excellent (5),<br>next 35% students get the mark very good (4),<br>next 35% students get the mark good (3),<br>and the last 15% students get thet mark sufficient (2).<br><br>Students who did not pass the course after final exams, and have obtained total of at least 10 points, can attend the correction exam. On the correction exam maximal number of points is 100, and the minimum requirement for a passing grade is 50 points. Mid-term exams, final exams and correction exams are held according to the exam schedule.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="5">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="5">Lecture materials on FESB e-learning portal.</td><td></td><td>https://elearning.fesb.hr/</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="7">T. Bradić, J. Pečarić, R. Roki, M. Strunje: Matematika za tehnološke fakultete, Element, Zagreb, 1998.<br>B. P. Demidovič: Zbirka zadataka iz više matematike, Školska knjiga, Zagreb 1998.<br>Ivo Pavlić, Statisticka teorija i primjena, Zagreb, 1971</td></tr>
</table>

| | |
|---|---|
| Quality assurance methods that ensure the acquisition of exit competences | - homework<br>- short tests<br>- quizzes<br>- mid-term exams<br>- final exam<br>- student questionnaires |
| Other (as the proposer wishes to add) | |

| **NAME OF THE COURSE** | **AUTOMATION** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Code** | FELO06 | Year of study | 2. | | | | | |
| **Course teacher** | Josip Music, Ph.D., Assistant Professor | Credits (ECTS) | 8 | | | | | |
| Associate teachers | Ana Kuzmanić Skelin, Ph.D., Assistant Professor | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 45 | 0 | 30 | 15 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding basic principles and laws in the area of analysis of automatic control systems.<br>- application of acquired knowledge on solving basic problems of system analysis in time and in frequency domains. |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define the fundamental phenomena, the quantities and the laws for automatic control systems.<br>- apply fundamental laws of electrical engineering and mechanics for modelling. electro-mechanical systems (and their analogies).<br>- apply (inverse) Laplace transform for solving differential equations.<br>- solve for system's time response for given input function.<br>- apply block algebra for calculation of transfer function of a complex systems.<br>- sketch Bode and Nyquist diagrams.<br>- analyze system stability in time and frequency domain.<br>- analyze sensitivity and accuracy of a given system.<br>- analyze systems using modeling on digital computers. |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | Introduction. Automation. Control and regulation. Analysis and synthesis of control systems. | 3 | 2 |
| | Mathematical description of dynamical systems. System description with differential equations, classical solution. System analysis in time domain. Transition function. Time response of basic systems. | 3 | 2 |
| | Analysis in complex domain. Laplace transformation. Function transformation and operator transformation. Inverse transformation. | 3 | 2 |
| | Solving differential equations using Laplace transformation. Transfer function. | 3 | 2 |
| | Block algebra. | 3 | 2 |
| | Analysis in frequency domain. Sinus transfer function. Frequency response. | 3 | 2 |
| | Graphical depiction of frequency response: Bode plots of basic systems. | 3 | 2 |
| | Graphical depiction of frequency response: Nyquist diagram. | 3 | 2 |
| | System stability analysis: Nyquist and Bode criteria. | 3 | 2 |
| | System stability analysis: Hurwitz and Routh criteria. | 3 | 2 |
| | System accuracy analysis, steady state errors. Sensitivity analysis. | 3 | 2 |
| | Electro-mechanical analogies. | 3 | 2 |
| | System analysis via modelling on digital computer. | 3 | 2 |

| | List of laboratory or design exercises | LE or DE hours |
|---|---|---|
| | System analysis in time domain. | 2 |
| | First order system analysis. | 2 |
| | Second order system analysis. | 2 |
| | Steady state error. | 2 |
| | System analysis in frequency domain. | 2 |
| | Stability analysis. | 2 |
| | Sensitivity analysis. | 2 |
| | System modelling on digital computer. | 1 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 3 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 3,5 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,7 |
| | Tests | 0,3 | Oral exam | | Preparation for laboratory exercises | 0,3 |
| | Written exam | 0,2 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | During the semester there are two midterm exams. The first midterm exam is after 7 weeks of lectures and the second one is after 13 weeks of lectures. Each midterm test (as well as the final test) is carried out in a written format with duration of 90 minutes. It consists of both theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The final exam test consists of 8 theoretical questions and numerical problems. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on average midterm exam ((M1 + M2)/2) or the final exam (with at least 25% of points from theoretical and numerical problems each). Students are allowed to have at least 45% of total points on each midterm exams, as long as the final midterm average is at least 50% of total points.<br>Grade (in percentage) is formed according to the formula:<br><br>Grade(%) = 0,25L + 0,375(M1 + M2)<br><br>where:<br>• L – laboratory assessment,<br>• M1, M2 – midterm test results.<br><br>Final grade (based on percentages) is formed as follows:<br>Percentage Grade<br>50% do 62% sufficient (2)<br>63% do 74% good (3)<br>75% do 86% very good (4)<br>87% do 100% excellent (5)<br><br>According to Article 65. of Faculty's Bylaw, student is required to participate in all teaching activities attending at least 70% of lectures, and 100% of laboratory exercises. In accordance with that student is required to solve and turn over for grading 100% of all laboratory exercises. If student does not meet these criteria, she |

<table>
<tr><td></td><td colspan="3">or he won't be able to take part in the final exam, and will be required to enroll in the course the next year.</td></tr>
<tr><td rowspan="6">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Mandić, I.: Automatika, Liber, Zagreb, 1983.</td><td>2</td><td></td></tr>
<tr><td>Mandić I.: Zbirka zadataka sa repetitorijem iz linearnih dinamičkih sustava, FESB, interna skripta, Split, 1983.</td><td>1</td><td></td></tr>
<tr><td>V. Zanchi: Automatika, FESB, Split, 1989.</td><td>1</td><td></td></tr>
<tr><td>A. Kuzmanić Skelin, Guidelines for laboratory exercises, FESB</td><td></td><td>e-learning portal</td></tr>
<tr><td>V. Papić, J. Musić: Authorized lecture notes, FESB</td><td></td><td>é-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">1. Božičević, J. : Temelji automatike 1, Školska knjiga , Zagreb, 1989.<br>2. Šurina, T.: Automatska regulacija, Školska knjiga, Zagreb, 1972.<br>3. Marasović, J.: Temeljni postupci u automatici, Interna skripta, FESB, Split, 2001.<br>4. Kuo. B.C.: Automatic Control System, Prentice Hall, Englewood Cliffs, New Jersey, 1995.<br>5. V. Zanchi: Simulacija, FESB, 1996.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Keeping records of student attendance.<br>- Annual analysis of course statistics in terms of midterm and finals exams<br>- Evaluation of results in accordance with the above mentioned learning outcomes.<br>- Feedback from students via surveys.<br>- Feedback from graduated students (or senior students) on course content relevance.<br>- Self-evaluation of teachers.<br>- Periodic institutional evolution of course teachers.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3">/</td></tr>
</table>

| NAME OF THE COURSE | BIOMECHANICS PRACTICUM | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELO44 | Year of study | 3. | | | | |
| **Course teacher** | Josip Musić, Ph.D., Assistant Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Tea Marasović, PhD | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 15 | 0 | 0 | 45 | 0 |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | | |
|---|---|---|
| Course objectives | Training students for:<br>- understanding basic principles and terminology in the area of biomechanics.<br>- application of acquired knowledge on design and conduction of experiments with emphasis on used measurement equipment. | |
| Course enrolment requirements and entry competences required for the course | None | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- recognize technical systems used in biomechanical measurements.<br>- calculate human anthropometric parameters.<br>- apply appropriate measurement equipment for human gait measurements, as well as ground reaction forces, EMG and range of movement measurements.<br>- analyze human gait kinematics.<br>- calculate forces and moments in human joints using inverse kinematics.<br>- illustrate application of computer vision in biomechanics. | |
| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours |
| | Introduction to biomechanics; Overview of technical systems for measurement of human biomechanical parameters. | 1 |
| | Measurement methods and procedures in biomechanics. | 1 |
| | Human anthropometric parameter identification. | 1 |
| | Gait analysis: terminology and measurements. Human gait parameter measurements; Kinematics and Kinetics. | 2 |
| | Position and balance of human body during the gait. | 1 |
| | Ground reaction forces during the gait. | 1 |
| | Electromyography, measuring muscle activity during human movement. | 3 |
| | Inverse kinematics for identification of muscle activity. | 2 |
| | Application of computer vision in biomechanics. | 1 |
| | List of laboratory or design exercises | LE or DE hours |
| | Introductory lecture on laboratory protocols, available measurement equipment as well as tasks during laboratory exercises. | 4 |
| | Measurement of human anthropometric parameters via finite element method. | 5 |
| | Measurement of human gait parameters via fast cameras. | 6 |
| | Measurement of ground reaction forces during the gait via force plate. | 6 |
| | Measurement of EMG signals during the gait. | 6 |
| | Estimation of muscle activity and joint moments during human gait based on measured kinematic parameters and ground reaction forces; comparison with measured EMG signals. | 6 |
| | Measurement of range of motion of cervical spine via inertial sensor units. | 6 |
| | Application of computer vision for classification and automatic translation of Croatia sign language. | 6 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| Class attendance | 0,5 | Research | | Practical training | |
| Experimental work | | Report | | Individual work | 2 |
| Essay | | Seminar essay | | Laboratory exercises | 2 |
| Tests | 0,1 | Oral exam | | Preparation for laboratory exercises | 0,3 |
| Written exam | 0,1 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

During the semester there are two midterm exams. The first midterm exam is after 7 weeks of lectures and the second one is after 13 weeks of lectures. Each midterm test (as well as the final test) is carried out in a written format with duration of 90 minutes. It consists of both theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The final exam test consists of 6 theoretical questions and numerical problems. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on average midterm exam ((M1 + M2)/2) or the final exam. Students are allowed to have at least 40% of total points on each midterm exams, as long as the final midterm average is at least 50% of total points.
Grade (in percentage) is formed according to the formula:

Grade(%) = 0,5L + 0,5(M1 + M2)

where:
- L – laboratory assessment,
- M1, M2 – midterm test results.

Final grade (based on percentages) is formed as follows:

| Percentage | Grade |
|---|---|
| 50% do 62% | sufficient (2) |
| 63% do 74% | good (3) |
| 75% do 86% | very good (4) |
| 87% do 100% | excellent (5) |

According to Article 65. of Faculty's Bylaw, student is required to participate in all teaching activities attending at least 70% of lectures, and 100% of laboratory exercises. In accordance with that student is required to solve and turn over for grading 100% of all laboratory exercises. If student does not meet these criteria, she or he won't be able to take part in the final exam, and will be required to enroll in the course the next year.

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | Winter D.A.: The Biomechanics and Motor Control of Human Gait, University of Waterloo Press, Waterloo, 1991. | | teacher |
| | V. Zanchi, J. Musić: Biomehanika I dio, internal script, FESB, 2005. | | teacher |

| | | | |
|---|---|---|---|
| | V. Zanchi, V. Papić, T. Šupuk: Biomehanika II dio, internal script, FESB, 2005. | | teacher |
| | T. Marasović, Guidelines for laboratory exercises, FESB | | e-learning portal |
| | J. Musić: Authorized lecture notes, FESB | | é-learning portal |
| Optional literature (at the time of submission of study programme proposal) | 1. J. Perry: Gait Analysis: Normal and Pathological Function, Slack Inc. 1992<br>2. R. J. Jagacinski, J. M. Flach: Control Theory for Humans: Quantitative Approaches to Modeling Performance, Lawrence Erlbaum Associates Inc., 2003<br>3. Zanchi V., Cecić M., Grujić T., Kuzmanić A., Papić V. : Laboratory for Identification of Human Movement with LaBACS Software Support, International Congress on Computational Bioengineering, ICCB'03, 24-26 September 2003., Zaragoza, Spain, p.p. 155-161. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance.<br>- Annual analysis of course statistics in terms of midterm and finals exams<br>- Feedback from students via surveys.<br>- Feedback from graduated students (or senior students) on course content relevance.<br>- Self-evaluation of teachers.<br>- Periodic institutional evolution of course teachers. | | |
| Other (as the proposer wishes to add) | / | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">COMMERCIAL LAW</td></tr>
<tr><td>Code</td><td>FEEE14</td><td>Year of study</td><td colspan="5">3</td></tr>
<tr><td>Course teacher</td><td>Zlatko Ćesić, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">2</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td></td><td>0</td><td></td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- specific business tasks in corporate governance and work in companies<br>- participate in economic activities - primarily about trade agreements, as a basis of modern economic relations.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- define basic terms and legal sources of commercial contract law,<br>- interpret basic principles of commercial contract law,<br>- apply the rules that govern the contracting activities of traders,<br>- conclude commercial contracts with the use of instruments for contractual reinforcing the position of the parties,<br>- define the basic concepts of company law,<br>- apply regulations on the organization and functioning of company persons,<br>- apply regulations on the organization and functioning of joint stock companies,<br>- apply regulations on the organization and functioning of a limited liability company,<br>- apply regulations on the protection of intellectual property rights.</td></tr>
<tr><td rowspan="11">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Introduction to Commercial Law. Demarcation of trade and other branches of law. History and legal sources of commercial law.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">The concept and the subject company. Legal and natural persons. Legal and business capacity.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Sole trader. Company. Company persons.</td><td>4</td><td>0</td></tr>
<tr><td colspan="5">A limited liability company.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Joint Stock Company.</td><td>4</td><td>0</td></tr>
<tr><td colspan="5">Status changes. Entrepreneurial contracts.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Commercial contract law. Term commercial contracts. Conclusion, amendment and cancellation of contracts. Interpretation of commercial contracts.</td><td>4</td><td>0</td></tr>
<tr><td colspan="5">Commercial contract law - special part. Some trade agreement law.</td><td>4</td><td>0</td></tr>
<tr><td colspan="5">Right securities. Division of Securities. Traffic securities.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">The basics of intellectual property rights.</td><td>2</td><td>0</td></tr>
<tr><td rowspan="2"></td><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6"></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ on line in entirety</td><td colspan="4">X independent assignments<br>☐ multimedia<br>☐ laboratory<br>☐ work with mentor</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">☐ partial e-learning<br>☐ field work</td><td colspan="2">☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td>0</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Independent assignments</td><td>0.2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>0,4</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0,4</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and numerical problems and final tests consist of 20 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,05 NP + 0,05 SR + 0,4 (M1 + M2)<br>the activities in percentage:<br>• NP - attendance at lectures,<br>• SR – independent assignments<br>• M1, M2 – test results.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">Horak, H., Dumančić, K., Šafranko, Z., Preložnjak, B.: UVOD U TRGOVAČKO PRAVO, dostupno na linku:<br>http://www.fer.unizg.hr/_download/repository/Uvod_u_trgovacko_pravo_1.pdf</td><td></td><td></td></tr>
<tr><td colspan="4">Jurilj M. - Ćesić Z., Trgovačko ugovorno pravo – opći dio, Sveučilište u Mostaru, Mostar, 2009.</td><td></td><td></td></tr>
<tr><td colspan="4">Ćesić Z., Pravo trgovačkih društava, Knin, 2008.</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Z. Ćesić - V. Gorenc - H. Kačer i dr., Komentar Zakona o obveznim odnosima, RRiF, Zagreb, 2005.<br>V. Gorenc - Z. Ćesić - V. Buljan, Komentar Zakona o trgovačkim društvima, RRiF, Zagreb, 2008.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

| NAME OF THE COURSE | COMMUNICATION SYSTEMS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Code** | FELO10 | Year of study | 2. | | | | | |
| **Course teacher** | Matko Šarić, Ph.D., Assstant Professor | Credits (ECTS) | 8 | | | | | |
| Associate teachers | Petar Šolić, Ph.D., Assstant Professor | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 45 | 0 | 30 | 15 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- The acquisition of basic theoretical knowledge of communication systems<br>- The adoption of practical knowledge about the most frequently used communication systems |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>1. Define the model of the communication system and describe the properties of the signals in communications<br>2. Define and explain the analog and digital modulations<br>3. Describe the topology of communication networks<br>4. Describe wideband access networks |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L hours | AE hours |
|---|---|---|
| The history of communication systems. Overview of communication systems. The quality of transmission. The quality of service. Digital and analog systems. | 3 | 2 |
| OSI communication model. Communication channel model. Basic characteristics of signals in communications. | 3 | 2 |
| Modulation. Amplitude modulation. Types of amplitude modulation. Frequency multiplexing. Amplitude-shift keying. | 3 | 2 |
| The frequency and phase modulation. The width of the channel at the FM system. | 3 | 2 |
| The digital angle modulation. MSK. The phase shift keying. QPSK. QAM. | 3 | 2 |
| Pulse Systems. Time multiplexing. Digital systems. PCM. Nonlinear quantization. A law and μ law for quantization. | 3 | 2 |
| Line coding. Natural code. Symmetric code. Gray code. NRZ, RZ code. AMI code. HDBN code. | 3 | 2 |
| First midterm exam | | |
| Decoding PCM signal. DPCM. DM. | 3 | 2 |
| Signal transmission through real channels. Equalisation. Nyquist criteria. The correlation filter. | 3 | 2 |
| Equalization. The echo and echo cancellation. Scrambling and scrambler. PN generator. | 3 | 2 |
| Clock synchronization and frame. The hierarchical organization of the telecommunications networks. | 3 | 2 |
| Switching channels, messages and packages. Switching element. Types of switching elements. | 3 | 2 |
| Access Technologies, a mobile wireless communications | 3 | 2 |
| Second midterm exam | | |

| List of laboratory exercises | LE hours |
|---|---|
| The voice signal | 2 |

<table>
<tr><td rowspan="4"></td><td colspan="5">Spectrum of the FM signal</td><td>2</td></tr>
<tr><td colspan="5">FSK modulation</td><td>2</td></tr>
<tr><td colspan="5">QPSK modulation</td><td>2</td></tr>
<tr><td colspan="5">PCM</td><td>2</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>3</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>3,7</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>0,5</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,5</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester there are two mid-term exams and the final exam. Mid-term and final exams consist of questions and tasks. In the final exams students that did not pass the midterm exams take part.<br><br>The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br><br>Grade (%) = 2/3 * (0.5 * M1 + 0,5 * M2) + 1/3 * L;<br><br>M1, M2 - points at the mid-term expressed as a percentage, and L - points from the laboratory (with completed all lab. Exercises) expressed as a percentage.<br>The final evaluation is determined as follows:<br><br>percentage Rating<br>50% to 61% is sufficient (2)<br>62% to 74% good (3)<br>75% to 87% of very good (4)<br>88% 100% Excellent (5)</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">L. W. Couch II: Digital and Analog Communication Systems</td><td></td><td></td></tr>
<tr><td colspan="4">S. Benedetto: Principles of digital transmission: with wireless application</td><td></td><td></td></tr>
<tr><td colspan="4">J. Proakis: Digital Communication, IV. Ed.</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6"></td></tr>
<tr><td>Quality assurance methods that ensure</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys</td></tr>
</table>

| | |
|---|---|
| the acquisition of exit competences | - Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="6">COMPUTER AIDED ANALYSIS OF RADIATING STRUCTURES</td></tr>
<tr><td>Code</td><td>FELO31</td><td>Year of study</td><td colspan="5">3.</td></tr>
<tr><td>Course teacher</td><td>Vicko Dorić, Ph.D.,<br>Associate Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Maja Škiljo, Ph.D.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td></td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding of basic principles and laws of electromagnetics,<br>- knowing basic terms and principles of antennas and EM waves propagation,<br>- using commercial software packages for wire antenna analysis.<br>- developing computer models of typical antenna systems</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Mathematics, Fundamentals of Electrical Engineering.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- define the fundamental terms in electromagnetic theory,<br>- classify numerical methods for engineering problems,<br>- name and explain basic antenna parameters,<br>- recognize characteristic parameters of the radiation pattern,<br>- use software package SuzANA,<br>- use software package NEC.</td></tr>
</table>

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction. Electric field. Magnetic field. Maxwell equations in differential form. Wave equations. | 2 | 0 |
| Electrical properties of the materials. Isotropic, linear and homogenous materials. Boundary conditions. | 2 | 0 |
| Electromagnetic waves. Plane wave propagation in free space. Reflection of the perfectly conducting boundary. | 2 | 0 |
| Electromagnetic radiation. Hertz dipole. Image method. | 2 | 0 |
| Introduction to the numerical modeling. Frequency and time domain analysis. Domain discretization methods. Boundary discretization methods. | 2 | 0 |
| Introduction to the Finite element method. | 2 | 0 |
| Introduction to the antenna theory. Antenna parameters. Polarization. | 2 | 0 |
| Radiation pattern. Directivity. Gain. | 2 | 0 |
| Radiated power and radiation resistance. Near and far field. | 2 | 0 |
| Typical antenna systems. | 2 | 0 |
| Antenna design. | 2 | 0 |
| Basics of antenna modeling in frequency domain. | 2 | 0 |
| Basics of antenna modeling in time domain – direct and indirect approach. | 2 | 0 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| EM waves propagating in dielectric | 2 |
| EM wave incident to the PEC ground | 2 |
| Short dipole radiated EM field | 2 |
| Software package SuzANA – frequency domain | 4 |
| Software package SuzANA – time domain | 4 |
| Software package NEC | 6 |

<table>
<tr><td rowspan="2"></td><td colspan="6">Design and analysis of a commercial antenna system using NEC software</td><td>10</td></tr>
<tr><td colspan="6"></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="4">☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="7">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2,0</td><td>Research</td><td></td><td>Practical training</td><td colspan="2"></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td colspan="2">1,0</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td colspan="2">1,5</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td colspan="2">0,2</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students take tests they didn’t pass on the midterm exams. First midterm test lasts for the 75 min. and consists of 10 questions or problems. For the second midterm exam student is required to present computer model of a commercial antenna system developed during laboratory exercises. In order to pass the exam, students are required to finish all laboratory exercises, gain at least 50% of total points at first midterm exam and positive evaluation of the second midterm exam. Final score is determined in following way:<br><br>Score(%) = 0,5 (M1 + M2)<br><br>where M1 and M2 are midterm exams score.<br><br>Final grade is determined according the final score:<br><br>Score Grade<br>50% to 62% sufficient (2)<br>63% to 75% good (3)<br>76% to 88% very good (4)<br>89% to 100% excellent (5)<br><br>In the final exams students take tests they didn’t pass on the midterm exams. Exam is performed in the written form for the first part and in the oral form for the second part of the course. In order to pass the exam, students are required to gain at least 50% of total points at written exam and positive evaluation of the oral exam. The final grade is then determined as explained above.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="5">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="5">Poljak, D., Dorić, V., Antonijević S.: Modeliranje žičanih antena primjenom računala, Kigen, Zagreb, 2009.</td><td></td><td></td></tr>
<tr><td colspan="5">G. J. Burke, A.J. Poggio, "Numerical Electromagnetics Code NEC Method of Moments – Part III: User’s guide", Lawrence Livermore National Laboratory, 1981.</td><td></td><td></td></tr>
<tr><td colspan="5">E. Zentner: Antene i radiosustavi, Graphis, Zagreb 2001.</td><td></td><td></td></tr>
</table>

| | | | |
|---|---|---|---|
| | Poljak, D., Dorić, V., Antonijević S.: Modeliranje žičanih antena primjenom računala, Kigen, Zagreb, 2009. | | |
| Optional literature (at the time of submission of study programme proposal) | D.Poljak, *Teorija elektromagnetskih polja s primjenama u inženjerstvu*, Šk. knjiga Zagreb, 2014.<br>D.Poljak N.Kovač, V. Dorić, Numeričke metode u elektrotehnici – interna skripta, FESB-Split 2006.<br>Macnamara, T.: Handbook of Antennas for EMC, Artech House, 1995. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

| NAME OF THE COURSE | COMPUTER AND DATA SECURITY | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELP16 | Year of study | 3 | | | | |
| **Course teacher** | Julije Ožegović, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Lada Sartori, Senior Lecturer, Vesna Pekić, Ph.D., Ante Kristic, Ph.D. | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 0 | 30 | 0 |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | |
| **COURSE DESCRIPTION** | | | | | | | |
| Course objectives | Training students for:<br>- Course provides basic knowledge of computer systems, networks and data security. | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define security on the information system management level<br>- classify networked system differences<br>- explain operating systems weaknesses<br>- use hardened operating systems<br>- apply computer supported security management<br>- adapt computer security policy | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | Information system security organization in project and implementation phases | 2 | 0 |
| | Deep defense methodology. Windows computer hardening. | 2 | 0 |
| | Physical computer security. Password strength. Event logging. | 2 | 0 |
| | Malicious programs. Denial of service and spoofing attacks. | 2 | 0 |
| | UNIX server hardening. | 2 | 0 |
| | Web browser weaknesses. Security parameters. SSL. | 2 | 0 |
| | Active web page, mail server and DNS risks. | 2 | 0 |
| | Communications networks protocols. Wireless transfer technology. | 2 | 0 |
| | Wireless networks protection. Encryption, authentication. NAT. | 2 | 0 |
| | Firewall. | 2 | 0 |
| | Intrusion detection systems. | 2 | 0 |
| | Cryptography essentials. | 2 | 0 |
| | Confidentiality, integrity and authentication. | 2 | 0 |
| | Denial of service attacks. Connection hijacking. | 2 | 0 |
| | Security policies. Government regulations. Persona data integrity. | 2 | 0 |
| | List of laboratory or design exercises | | LE or DE hours |
| | Security properties of Windows operating system. | | 6 |
| | Windows operating system hardening. | | 6 |
| | Implementation of Ethereal system. | | 6 |
| | Security properties of Linux operating system. | | 6 |
| | Linux operating system hardening. | | 6 |
| Format of instruction | ☒ lectures | ☒ independent assignments | |

| | | |
|---|---|---|
| | ☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | Attend all forms of teaching, pass ingress and egress tests, perform 100% laboratory exercises, pass preliminary exams or full exam (numeric and theory). | |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| | Class attendance | 1 | Research | | Practical training | 1 |
| | Experimental work | | Report | | Auditory exercises | |
| | Essay | | Seminar essay | | Individual learning | 3 |
| | Tests | | Oral exam | | (Other) | |
| | Written exam | | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | Continuous assessment: laboratory tests, practical tests, knowledge tests, preliminary exams. Exam: written and oral (numeric and theory) as unity. |

| Required literature (available in the library and via other media) | Title | Number of copies in the library | Availability via other media |
|---|---|---|---|
| | 1. Klasić, K.: Zaštita informacijskih sustava, Biblioteka inženjera sigurnosti, Iproz , Zagreb, 2002. | | |
| | 2. Benak, M.: Plan oporavka u slučaju katastrofe, Savjetovanje CASE 12, Opatija, 2000. | | |
| | 3. Dragičević, D.: Kompjutorski kriminalitet i informacijski sustavi, Informator, Zagreb, 1999. | | |
| | 4. Ellis, J. i Speed, T.: The Internet Security Guidebook from Planning to Deployment, Academic Press, 2001. | | |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | - Lecture notes, continuously upgraded<br>- Upute za laboratorijske vježbe, Internet |
| Quality assurance methods that ensure the acquisition of exit competences | - Lecture attending evidence<br>- Annual exam passing analysis<br>- Student feedback with teacher evaluation<br>- Teacher self-evaluation<br>- Graduated students feedback |
| Other (as the proposer wishes to add) | |

| **NAME OF THE COURSE** | **COMPUTER ARCHITECTURES** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELO22 | Year of study | 2 | | | | |
| **Course teacher** | Sven Gotovac, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Dunja Gotovac | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | | | 30 | |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>1. Understand digital computer architecture.<br>2. Define difference between different computer architecture on assembler level.<br>3. Understand computer architecture on the digital circuits level.<br>4. Understand and apply different computer architecture according to the application problem. |
| Course enrolment requirements and entry competences required for the course | C programming language<br>Digital electronics and circuits |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>1. Understand difference between computer architecture from the Instruction Set Point of view (ISA)<br>2. Identify the properties and performance of different architectures at the level of logic circuits<br>3. Select and apply the appropriate computer architecture according to the problem being solved.<br>4. Evaluate the impact of architecture on a software solution (advantages and disadvantages). |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction. Different views on the computer. | 2 | |
| Data and instructions. Classification of Computers and Their Instructions, Instruction set. Instruction format. Addressing Modes. CISC. RISC. | 2 | |
| Instruction level processor design (Instruction Set Architecture) | 2 | |
| Arithmetical and Logical instructions, Instruction for Data Transfer. | 2 | |
| Flow control instructions, Translation from C to assembler and then to binary code. | 2 | |
| Processor design on digital circuits level. Single bus microarchitecture. | 2 | |
| Data Path Implementation, Logic Design for the 1-Bus Microarchitecture. | 2 | |
| Control Unit design, 2-Bus and 3-Bus Microarchitecture | 2 | |
| Pipeline architecture. | 2 | |
| Instruction-Level Parallelism – Problems and Solutions | 2 | |
| Memory System Design, Memory System Components, Two-Level Memory Hierarchy. | 2 | |
| Cache, Associative cache, Direct Mapped Cache, 2-way Cache. | 2 | |
| U/I system design. | 2 | |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| ARM Architecture - Introduction. | 2 |
| ARM Instruction Set Architecture, Registers, Memory, Stack. | 2 |

<table>
<tr><td rowspan="6"></td><td colspan="5">Atmel Studio IDE. Program Structure</td><td>2</td></tr>
<tr><td colspan="5">Instruction Set, Arithmetical and Logical Instructions, Dana Transfer Instructions, Branch Control Instructions</td><td>8</td></tr>
<tr><td colspan="5">Procedures</td><td>2</td></tr>
<tr><td colspan="5">Program Examples</td><td>10</td></tr>
<tr><td colspan="5">Problems for Exercise and Test</td><td>4</td></tr>
<tr><td colspan="5"></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="2">☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="4">☒ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled.<br>Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Laboratory exercises</td><td>2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Preparation for laboratory exercises</td><td></td></tr>
<tr><td>Tests</td><td>0,4</td><td>Oral exam</td><td></td><td>Self-study</td><td>0,5</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test lasts 60 minutes and consists of 5 to 7 theoretical questions and numerical problems and final tests consist of 6 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,33 LV + 0,33 (M1 + M2)<br>the activities in percentage:<br>• LV – laboratory assessment,<br>• M1, M2 – test results.<br>The final grade will be determined after the first test term by applying a relative ECTS grading system in accordance with the Regulations on the study and study system of the University of Split. The group of students who passed the exam is divided into four groups: 15% of the best gets the grade A (excellent), 35% of the following B (very good), the next 35% rating C (good), and the last 15% rating D, E ). A group of students who did not pass the exam gains FX score (additional work is required), or F (significant additional work is required). In accordance with the Rulebook for Exam, only two exam periods are organized in the exam period after the completion of classes.<br>According to Article 65 of the Statute of the Faculty, the student is obliged to participate in all forms of teaching and attend: lectures at least 70% of teaching hours and laboratory exercises 100% of teaching hours. If you do not meet these conditions, the student will not be able to access the exam</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">Heuring, V.P., Joredan, H.F.: Computer Systems Design and Architecture, 2rd edition, AddisonWesley, 2003</td><td>2</td><td>Electronic copy<br>On e-learning</td></tr>
<tr><td colspan="4">S.Gotovac Authorized lectures from the Digital Computer Architecture</td><td></td><td>On e-learning</td></tr>
</table>

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | Hennesy & Patterson, "Computer Architecture: A Quantitative Approach", 5rd edition, Morgan Kaufmann, 2011 |
| Quality assurance methods that ensure the acquisition of exit competences | 1. Class attendance records.<br>2. Evaluation of results in accordance with the above learning outcomes<br>3. Feedback from students via surveys<br>4. Self-evaluation of teachers<br>5. Feedback from students who have already graduated.<br>6. Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">COMPUTER NETWORKS</td></tr>
<tr><td>Code</td><td>FELP08</td><td>Year of study</td><td colspan="5">2</td></tr>
<tr><td>Course teacher</td><td>JulijeOžegović, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Stipe Braica, Lecturer, Mario Mornar, Lecturer, Vesna Pekić, Ph.D., Ante Kristic, Ph.D.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>15</td><td>15</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory 550<br>Elective 510</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- Course provides fundamental knowledge of computer networks as computer engineering core.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- clasify fundamental terms and architecture of computer networks<br>- describe ISO/OSI and TCP/IP protocol stacks<br>- explain TCP/IP protocol stack on application layer<br>- implement IP protocol, IP addressing and IP routing<br>- use LAN protocols and their functionality on physical and data layers<br>- use WAN protocols and their functionality on physical and data layers<br>- describe addressing on physical, data, network and transport layers</td></tr>
<tr><td rowspan="20">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Development of data communications networks. Switching methods.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Importance of standardization. Open systems. Network elements.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Computer network architecture. Hierarchical layered structures. ISO model.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Protocols. Protocol mechanism: synchronization, addressing. Error control.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Traffic and congestion control, flow control.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Physical level: DTE-DCE interface, RS232, X.24. Modem connections, intelligent modems. Signal codes.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Local networks. Access methods. Ethernet.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Wireless local networks. Digital subscriber networks.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Data level: Error control.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Character and bit oriented protocols.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Local networks: MAC, LLC. Ethernet.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Wireless local networks.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Network level: Packet networks. Traffic routing.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Internet. IP protocol (v4, v6), addressing, intranet, routing.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Transport level: TCP and UDP Internet protocols. TCP protocol flow control.</td><td>2</td><td>1</td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">DTE DCE interface.</td><td>2</td></tr>
<tr><td colspan="6">Modem - data transfer using analogue telephone channel.</td><td>2</td></tr>
<tr><td colspan="6">Local network Ethenet.</td><td>2</td></tr>
</table>

<table>
<tr><td rowspan="5"></td><td colspan="5">Connecting computer to Internet subnetwork.</td><td>2</td></tr>
<tr><td colspan="5">Connecting subnetwork to public Internet.</td><td>2</td></tr>
<tr><td colspan="5">Virtual local networks.</td><td>2</td></tr>
<tr><td colspan="5">Wireless local networks</td><td>2</td></tr>
<tr><td colspan="5"></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Attend all forms of teaching, pass ingress and egress tests, perform 100% laboratory exercises, pass preliminary exams or full exam (numeric and theory).</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td>0,5</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Auditory exercises</td><td>0,5</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Individual learning</td><td>3</td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment: laboratory tests, practical tests, knowledge tests, preliminary exams. Exam: written and oral (numeric and theory) as unity.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">1. Turk, S.: Računarske mreže, Školska knjiga, Zagreb, 1991..</td><td></td><td></td></tr>
<tr><td colspan="4">2. Rožić, N.: Informacije i komunikacije: kodiranje s primjenama, Zagreb 1992.</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">- Ožegović, J. Računalne mreže, Veleučilište u Splitu, 2000<br>- Lecture notes: Ožegović, J., Računalne mreže, continuously upgraded<br>- A. Kristić, V. Pekić: Upute za laboratorijske vježbe, Internet</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Lecture attending evidence<br>- Annual exam passing analysis<br>- Student feedback with teacher evaluation<br>- Teacher self-evaluation<br>- Graduated students feedback</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="6">CONTROL ENGINEERING</td></tr>
<tr><td>Code</td><td>FENO08</td><td>Year of study</td><td colspan="5">2</td></tr>
<tr><td>Course teacher</td><td>Mateo Bašić, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>15</td><td>15</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding and application of basic principles of automatic control,<br>- analysis and synthesis of automatic control systems.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- solve by calculation specific engineering problems in the field of automatic control,<br>- describe the basic components of automatic control systems<br>- sketch Nyquist and Bode plots of automatic control systems,<br>- apply Laplace transform and block algebra in the analysis and synthesis of automatic control systems,<br>- calculate the stability and quality indicators of automatic control,<br>- carry out the experimental analysis and synthesis of the passive R-C elements typically found in automatic control systems,<br>- experimentally test the dynamic quality indicators of an air-temperature control system,<br>- explain the basic features of digital control systems.</td></tr>
<tr><td rowspan="14">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Basic concepts of automatic control and classification of automatic control systems</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Laplace transform, elements of a control circuit and evaluation of the time function properties</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Frequency domain analysis: Nyquist and Bode methods</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Transfer functions and time responses of elementary linear elements</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Frequency characteristics of circuits with operational amplifiers</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">DC machine as an object of control</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Transfer functions of multiloop automatic control systems (block algebra)</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">First midterm exam</td><td></td><td></td></tr>
<tr><td colspan="5">Stability of automatic control systems. Stability criterions by Hurwitz, Nyquist, and Bode.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Control quality indicators</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">PID controllers: subtypes and discrete form. Ziegler–Nichols method of tuning the PID controller parameters.</td><td>2</td><td>1</td></tr>
<tr><td colspan="5">Experimental synthesis of a cascade speed-control system of a DC motor</td><td>1</td><td>1</td></tr>
<tr><td colspan="5">Synthesis of linear systems of automatic control (serial and parallel correction)</td><td>1</td><td>1</td></tr>
</table>

| | | | |
|---|---|---|---|
| | Digital control: z-transform, sampling process and digital control systems | 2 | 1 |
| | State-space representation of a system | 2 | 1 |
| | Second midterm exam | | |
| | List of laboratory exercises | | LE hours |
| | Passive circuits with R-C elements | | 3 |
| | Active circuits with R-C elements | | 3 |
| | Bode magnitude and phase plots | | 3 |
| | Air-temperature control system | | 3 |
| | Speed control system of a separately-excited DC motor | | 3 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ **(other)** |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2.7 |
| | Essay | | Seminar essay | | Laboratory exercises | 0.5 |
| | Midterm exams | 0.2 | Oral exam | | Auditory exercises | 0.5 |
| | Written exam | 0.1 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

During the semester, two midterm exams are held - the first after 7 weeks of lectures and the second after 13 weeks of lectures. Each midterm exam consists of 4 problems, either theoretical or numerical. In the final exams, students take those parts of the course which they did not pass in the midterm exams.

The requirement for passing grade is that the sum of the laboratory exercises' grade (L) and the midterms' grades (M1 and M2), expressed as a percentage, is 50% or more. The sum is calculated as

$$\text{Grade (\%)} = 0.25L + 0.375(M1 + M2)$$

where the number of points achieved in each midterm exam has to be at least 50%.

The students that do not pass the midterm exams take the final written exam which consists of 4 problems. The requirement for a positive evaluation of the final exam is at least 50% points achieved. In the final exam, the students that did not pass one of the midterm exams are presented with 4 problems from the corresponding part of the course. Subsequently, the grade is determined as follows:

$$\text{Grade (\%)} = 0.25L + 0.75(I)$$

where I is the number of points achieved in the final written exam (at least 50%).

The final grade for the course is determined as follows:

50% to 61% - Sufficient (2)
62% to 74% - Good (3)
75% to 87% - Very good (4)
88% 100% - Excellent (5)

| Required literature (available in the | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| library and via other media) | - Vukadinović, D., „Predavanja iz Regulacijske tehnike za šk. god. 2010/11“, FESB, Split, 2014. | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | - Goodwin, G.C., Graebe, S.F., Salgado M.E., „Control System Design“, Prentice Hall, 2001. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance<br>- Annual analysis of the performance at laboratory exercises<br>- Annual analysis of the performance at midterm exams and final exams<br>- Feedback from students via surveys<br>- Self-evaluation of teachers | | |
| Other (as the proposer wishes to add) | | | |

| **NAME OF THE COURSE** | **CONTROL OF ELECTRICAL DRIVES** | | |
|---|---|---|---|
| **Code** | FENO17 | Year of study | 3 |
| **Course teacher** | Mateo Bašić, Ph.D., Assistant Professor | Credits (ECTS) | 5 |
| Associate teachers | | Type of instruction (number of hours) | L: 30, S: 0, AE: 0, LE: 30, DE: 0 |
| Status of the course | Elective | Percentage of application of e-learning | 0 |

| Type of instruction (number of hours) | L | S | AE | LE | DE |
|---|---|---|---|---|---|
| | 30 | 0 | 0 | 30 | 0 |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding and application of basic control principles in DC and AC electrical drives,<br>- synthesis and commissioning of a controlled electrical drive. |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- solve by calculation specific engineering problems in the field of control of electrical drives,<br>- sketch functional schemes of control systems with electrical motors,<br>- demonstrate experimentally the control of a DC motor,<br>- carry out the simulation and experimental synthesis of a controlled DC electrical drive,<br>- demonstrate the scalar control of an induction motor on the simulation level,<br>- explain the basic principles used in vector-controlled AC electrical drives,<br>- operate modern digital converters for DC and AC electrical drives. |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L hours |
|---|---|
| Basic concepts and definitions of electrical drives. Steady-state characteristics and selection of motors for electrical drives. | 2 |
| DC motor as an object of control | 2 |
| Power converters for DC drives | 2 |
| Control structures with a separately-excited DC motor | 2 |
| Power converters for AC drives | 3 |
| Induction motor as an object of control | 3 |
| First midterm exam | |
| Scalar control of induction motors | 2 |
| Vector control of induction motors | 4 |
| Synchronous motor as an object of control | 2 |
| Scalar control of synchronous motors | 2 |
| The application of computers in the simulation and implementation of electrical drives | 2 |
| Second midterm exam | |

| List of laboratory exercises | LE hours |
|---|---|
| Simulation modelling and determination of mechanical characteristics of a separately-excited DC motor | 4 |
| Experimental determination of mechanical characteristics of a separately-excited DC motor | 4 |
| Simulation synthesis of a cascade speed-control system of a separately-excited DC motor | 4 |

| | | |
|---|---|---|
| | Experimental synthesis of a cascade speed-control system of a separately-excited DC motor | 4 |
| | Commissioning and speed control of a separately-excited DC motor by utilizing a commercial power converter | 4 |
| | Determination of mechanical characteristics of a scalar-controlled induction motor on the simulation level | 4 |
| | Scalar speed control of a squirrel-cage induction motor by utilizing a commercial frequency converter - open loop application | 4 |
| | Scalar speed control of a squirrel-cage induction motor by utilizing a commercial frequency converter - closed loop application | 2 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2.7 |
| | Essay | | Seminar essay | | Laboratory exercises | 1 |
| | Midterm exams | 0.2 | Oral exam | | (Other) | |
| | Written exam | 0.1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | During the semester, two midterm exams are held - the first after 7 weeks of lectures and the second after 13 weeks of lectures. Each midterm exam consists of 4 problems, either theoretical or numerical. In the final exams, students take those parts of the course which they did not pass in the midterm exams.<br><br>The requirement for passing grade is that the sum of the laboratory exercises' grade (L) and the midterms' grades (M1 and M2), expressed as a percentage, is 50% or more. The sum is calculated as<br><br>Grade (%) = 0.25L + 0.375(M1 + M2)<br><br>where the number of points achieved in each midterm exam has to be at least 50%.<br><br>The students that do not pass the midterm exams take the final written exam which consists of 4 problems. The requirement for a positive evaluation of the final exam is at least 50% points achieved. In the final exam, the students that did not pass one of the midterm exams are presented with 4 problems from the corresponding part of the course. Subsequently, the grade is determined as follows:<br><br>Grade (%) = 0.25L + 0.75(I)<br><br>where I is the number of points achieved in the final written exam (at least 50%).<br><br>The final grade for the course is determined as follows:<br><br>50% to 61% - Sufficient (2)<br>62% to 74% - Good (3)<br>75% to 87% - Very good (4)<br>88% 100% - Excellent (5) |

| | | | |
|---|---|---|---|
| Required literature (available in the | **Title** | **Number of copies in the library** | **Availability via other media** |

| | | | |
|---|---|---|---|
| library and via other media) | - Bašić, M., „Predavanja iz predmeta Upravljanje elektromotornim pogonima (511)“, FESB, Split, 2014. | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | - Leonhard, W.: „Control of Electrical Drives“, Springer - Verlag, 1996.<br>- Wach, P.: „Dynamics and Control of Electrical Drives“, Springer, 2011.<br>- Bose, B.K.: „Modern Power Electronics and AC Drives“, Prentice Hall, 2002. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance<br>- Annual analysis of the performance at laboratory exercises<br>- Annual analysis of the performance at midterm exams and final exams<br>- Feedback from students via surveys<br>- Self-evaluation of teachers | | |
| Other (as the proposer wishes to add) | | | |

| NAME OF THE COURSE | CONTROL SYSTEM DESIGN | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELO18 | Year of study | 3 | | | | |
| **Course teacher** | Mojmil Cecić, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Marko Lete, mag. ing. | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 0 | 30 | 0 |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding and application of basic principles and laws of the automatic control,<br>- design the control systems in the time and frequency domain,<br>- application the computer in the analysis and synthesis of control systems,<br>- permanent adoption and deepening of knowledge in the field of control systems. |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- analyse the phase-lead and phase-lag compensators in the time and frequency domain,<br>- design the phase-lead and phase-lag compensator,<br>- design the feedback compensator,<br>- analyse the PI, PD and PID controller in the time and frequency domain,<br>- determine the controller gains using one of several analytic methods,<br>- simulate various control systems using VISSIM,<br>- use MATLAB in the analysis and synthesis of the control systems. |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Approaches to system design | 2 | |
| Positioning system, operational amplifier, DC motor | 4 | |
| Compensators, Phase-lead, phase-lag compensator | 4 | |
| PI, PD, PID controllers | 4 | |
| Root locus | 2 | |
| Design using the root locus, serial and parallel compensation | 8 | |
| System design using control design software | 2 | |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Identification of DC motor parameters | 2 |
| Operational amplifier | 2 |
| Positioning system | 2 |
| Phase-lead and phase-lag compensators | 4 |
| PI, PD, PID controllers | 4 |
| Serial compensation | 2 |
| Parallel compensation | 2 |
| Root locus –MATLAB | 2 |
| System design using MATLAB and VISSIM | 6 |

| Format of instruction | | |
|---|---|---|
| | ☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor |

| | | | | | | |
|---|---|---|---|---|---|---|
| | ☐ partial e-learning<br>☐ field work | | ☐ (other) | | | |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled.<br>Performed all required laboratory exercises. | | | | | |
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2,0 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,5 |
| | Essay | | Seminar essay | 0,2 | (Other) | |
| | Tests | 0,2 | Oral exam | | (Other) | |
| | Written exam | 0,1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks.<br><br>The requirement for passing grade is the positive assessment of laboratory exercises and 50% points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade [%] =0,25*L+0.375* (M1 + M2)<br>where L is laboratory assessment and M1 and M2 are the results of the midterm exams in percentage.<br><br>Each midterm test consists of 10 theoretical questions and numerical problems and final test also consists of 10 theoretical questions and numerical problems divided into two groups (the first and the second part). The requirement for passing grade is 50% of the total number of questions. The students who did not pass the midterm exams take part in the final exam. The midterm and final exams are carried out as written tests. Finally grade is determined as follows:<br>from 50% to 62.5% - dovoljan (2)<br>from 62.5% to 75% - dobar (3)<br>from 75% to 87.5% - vrlodobar (4)<br>from 87.5% to 100% - izvrstan (5)<br><br>Midterm and final exams are held in the terms provided by the time table. |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | Cecić, M.: Sinteza regulacijskih sustava, authorized lectures, FESB, Split, 2001. | | e-learning portal |
| | Rohrs, C.E.; Melsa, J.L.; Schults, D.G.: Linear Control Systems, McGraw-Hill International Edition, New York, 1993., 2d edition | 1 | |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | D'Azzo, J.J.; Houpis, C.H.: Linear Control System Analyses and Design, McGraw-Hill International Editio, New York, 1995. |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| NAME OF THE COURSE | DESIGNING AND USING COMPUTER NETWORKS | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELP17 | Year of study | 3 | | | | |
| **Course teacher** | Julije Ožegović, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Lada Sartori, Senior Lecturer, Vesna Pekić, Ph.D., Ante Kristic, Ph.D. | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 0 | 30 | 0 |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- Course provides basic knowledge of computer networks design, implementation and management. |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- list basic parts of computer network project<br>- design computer network project obeying investor's parameters<br>- perform measurements on structural cabling of computer network<br>- connect active and passive network equipment<br>- adjust basic network services<br>- handle with implemented computer network<br>- analyze computer network operational problems |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Architecture and technology of local computer networks. | 2 | 0 |
| Structural cabling architecture. | 2 | 0 |
| Wired and optical local networks components. | 2 | 0 |
| Implementation prerequisites and installation measurements. | 2 | 0 |
| Project documentation parts and design. | 2 | 0 |
| Network elements tagging system. | 2 | 0 |
| Work groups as network project basis. | 2 | 0 |
| Virtual local networks design and management. | 2 | 0 |
| Internet protocols, IP addressing. | 2 | 0 |
| Internet routing. | 2 | 0 |
| Virtual private networks. | 2 | 0 |
| Computer networks virtualization. | 2 | 0 |
| Network services and functions. | 2 | 0 |
| Network management. | 2 | 0 |
| Computer network security projecting. | 2 | 0 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Structural cabling. | 2 |
| Data link measurements. | 4 |
| IP addressing and subnetworks. | 4 |
| TCP/IP protocol stack and routing. | 2 |
| Internet routing protocols. | 4 |
| Access lists, NAT, DHCP. | 3 |
| Switch management, STP. | 3 |
| VLAN management. | 2 |
| Wireless local networks. | 2 |

<table>
<tr><td></td><td colspan="5">Complex network system implementation (final test)</td><td>4</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Attend all forms of teaching, pass ingress and egress tests, perform 100% laboratory exercises, pass preliminary exams or full exam (numeric and theory).</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td>1</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Auditory exercises</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Individual learning</td><td>3</td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment: laboratory tests, practical tests, knowledge tests, preliminary exams. Exam: written and oral (numeric and theory) as unity.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">1. Turk, S.: Računarske mreže, Školska knjiga, Zagreb, 1991..</td><td></td><td></td></tr>
<tr><td colspan="4">2. Rožić, N.: Informacije i komunikacije: kodiranje s primjenama, Zagreb 1992</td><td></td><td></td></tr>
<tr><td colspan="4">3. Ožegović, J., Pezelj I. Projektiranje i upravljanje računalnim mrežama, Veleučilište u Splitu, 2000.</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">- Lecture notes: Ožegović, J., Projektiranje i korištenje računalnih mreža, continuously upgraded<br>- Upute za laboratorijske vježbe, Internet</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Lecture attending evidence<br>- Annual exam passing analysis<br>- Student feedback with teacher evaluation<br>- Teacher self-evaluation<br>- Graduated students feedback</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="4">DESIGN OF LOW VOLTAGE FACILITIES</td></tr>
<tr><td>Code</td><td>FENO25</td><td>Year of study</td><td colspan="2">3.</td></tr>
<tr><td>Course teacher</td><td>Marin Despalatović, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="2">5</td></tr>
<tr><td>Associate teachers</td><td></td><td>Type of instruction (number of hours)</td><td colspan="2">L: 15 | S: | AE: | LE: 45 | DE:</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="2">0</td></tr>
<tr><td colspan="5">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="4">Training students to:<br>- Independently prepare project documentation,<br>- Design simple low voltage installations.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="4">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="4">Students will be able to:<br>1. List the relevant regulations and standards in electrical engineering,<br>2. Explain the role of an authorized electrical engineers in preparation of design documentation,<br>3. Classify symbols and labels of electrical elements in the project documentation,<br>4. Use computer tools for creating electrical wiring diagrams,<br>5. Classify the elements of low voltage facilities,<br>6. Describe the procedure of designing of low voltage facilities,<br>7. Use computer tools for the calculation of electrical networks,<br>8. Choose elements for protection of low voltage facilities,<br>9. Compare theoretical knowledge of low voltage switching equipment with the experimental results obtained in the laboratory,<br>10. Discover the causes of errors and instability in the observed system.</td></tr>
<tr><td rowspan="10">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="3">Course content</td><td>L or S hours</td></tr>
<tr><td colspan="3">Introduction, regulations and standards in electrical engineering, standardization and product safety. Legislation in designing, Croatian Chamber of Electrical Engineers, authorized electrical engineer.</td><td>1</td></tr>
<tr><td colspan="3">Project substrate, specification of requirements, analysis of the construction conditions, project task. Elements of preliminary, main and detailed design. The estimation of project costs.</td><td>1</td></tr>
<tr><td colspan="3">Symbols and labeling of electrical elements, single-pole and three-pole wiring diagrams. Computer tools for project documentation.</td><td>1</td></tr>
<tr><td colspan="3">Electric cables and wires: labeling, laying, connections.</td><td>1</td></tr>
<tr><td colspan="3">Power distribution systems and low voltage equipment for electrical installations: transformers, chokes, compensations, passive and active filters, electrical machinery, controlled and uncontrolled electric drives, lighting, heaters.</td><td>1</td></tr>
<tr><td colspan="3">Low voltage switchgear equipment: signaling, disconnectors, fuses, circuit breakers, contactors, relays, thermal and numerical relays, voltage and/or frequency converters, computer tools for the selection and sizing of components.</td><td>1</td></tr>
<tr><td colspan="3">Distribution cabinets: selecting the size and cooling, layout elements, electromagnetic compatibility, computer tools for selection and sizing of cabinets.</td><td>1</td></tr>
<tr><td colspan="3">First midterm exam</td><td>1</td></tr>
<tr><td colspan="3">Coordination of insulation. Calculation of electrical networks: simplification, reduced size, voltage drops, power flows, sudden and</td><td>1</td></tr>
</table>

| | | |
|---|---|---|
| | sustained short circuit, component selection based on the mechanical and thermal strength. | |
| | Computer tools for calculations of short-circuit, voltage drops and other parameters necessary for the design of LV installations. | 1 |
| | Explosion protection: explosive atmospheres, labeling and certification, classification of areas endangered by explosive atmospheres. | 1 |
| | The errors in the system: identification, avoidance, causes and remedy. | 1 |
| | Selected examples of design of LV system - automated electric motor drive, pump station. | 1 |
| | Selected examples of design of LV system - electric elevator, small hydroelectric power plant. | 1 |
| | Second midterm exam | |
| | List of laboratory or design exercises | LE or DE hours |
| | 1. Building-technical regulations for vocational area of electrical engineering. | 3 |
| | 2. Computer tools for project documentation. | 9 |
| | 3. Electric cables and distribution cabinets. | 6 |
| | 4. Low voltage switchgear. | 9 |
| | 5. Computer tools for the calculation of electric networks. | 9 |
| | 6. Selected examples of the design of low voltage installations. | 9 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70% of the times scheduled. Performed all laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 0,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,3 |
| | Essay | | Seminar essay | | Laboratory exercises | 1,5 |
| | Tests | 0,1 | Oral exam | | Preparation for laboratory exercises | 0,5 |
| | Written exam | 0,1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterm exams during semester. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. By midterm exams students can pass the entire exam. On the exam (final, correctional and commission) students take the parts of material which they did not pass on the midterm or previous exams. A separate part of the material means the material of each midterm exam. The exams are carried out as written tests. The duration of the midterm exams are 60 minutes, while exams are 2x60 minutes.<br><br>The requirement for passing grade is at least 50% of points on each (midterm) exam and the positive assessment (minimum 50% of points) of all laboratory exercises. Grade (in percentage) is formed as follows:<br><br>Grade(%) = (ME1 + ME2 + LE) / 3<br>where<br>ME1, ME2 - points obtained at (midterm) exams expressed in percentages<br>LE - average grade of all laboratory exercises expressed in percentages<br><br>The final grade is determined as follows: |

| | | | |
|---|---|---|---|
| | Percentage    Grade<br>0% to 49%    insufficient (1)<br>50% to 61%    sufficient (2)<br>62% to 74%    good (3)<br>75% to 87%    very good (4)<br>88% to 100%    excellent (5)<br><br>Exam group: 14<br>Examinations are held in accordance with the course calendar schedule. | | |
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | M. Despalatović: Autorizirana predavanja, FESB | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | N. Srb: Elektroinženjerski priručnik (2. izdanje), Kigen, Zagreb, 2009.<br>J. Weidauer, R. Messer: Electrical Drives - Principles, Planning, Applications, Solutions, Publicis Publishing, Erlangen, 2014.<br>SINAMICS - Low Voltage Engineering Manual, Siemens, 2014.<br>Switching, Protection and Distribution in Low-Voltage Networks (2nd Ed), SIEMENS, Publicis-MCD-Verlag, Munchen, 1994. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of students course attendance<br>- Annual review of the performance of the examinations<br>- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

| **NAME OF THE COURSE** | **DIGITAL TECHNIQUES** | | |
|---|---|---|---|
| **Code** | FELO11 | Year of study | 510-2, 550-1 |
| **Course teacher** | Julije Ožegović, Ph.D., Full Professor | Credits (ECTS) | 7 |
| Associate teachers | Stipe Braica,Lecturer, Vesna Pekić, Ph.D., Ante Kristic, Ph.D. | Type of instruction (number of hours) | L: 45, S: 0, AE: 15, LE: 30, DE: 0 |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 |

| Type of instruction (number of hours) | L | S | AE | LE | DE |
|---|---|---|---|---|---|
| | 45 | 0 | 15 | 30 | 0 |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- Course provides fundamental knowledge of Boolean algebra and automata theory as the digital electronics basis, with practical skills of combinatorial and sequential circuits' synthesis, including programmable structures. |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- design combinatorial and sequential logic circuit<br>- choose optimal design method<br>- use Boolean algebra properties application<br>- use small, medium and high scale integration circuits<br>- explain the information structure of the system<br>- explain the achieved results of digital system modelling and synthesis |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Digital and analog signals, information and coding. | 3 | 0 |
| Number systems. Binary number system. | 3 | 0 |
| Modulo arithmetic. | 2 | 0 |
| Logic gates. | 1 | 0 |
| Boolean algebra and logic algebra. | 2 | 0 |
| Boolean functions. Decomposition to partial functions. | 3 | 0 |
| Logic algebra complete systems | 1 | 0 |
| Minimization of Boolean function and circuit realization using logic gates. | 6 | 3 |
| Circuit realization using multiplexers and demultiplexers. | 3 | 2 |
| Multiplexer - demultiplexer structures (ROM). | 3 | 2 |
| Programmable logic structures. | 3 | 2 |
| Time relations. Bistables. Bistable synthesis. Registers, shift registers and counters. Memories (RAM). | 3 | 2 |
| Discrete finite digital automata. Specification of automata. | 3 | 2 |
| Minimization of digital automata. Structural synthesis. | 6 | 2 |
| Programmable automata. Wilkies' model. Microprogramming concept. Algorithms | 3 | 0 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Logic gates. | 4 |
| Minimization of Boolean function and circuit realization using logic gates. | 4 |
| Circuit realization using multiplexers and demultiplexers. | 4 |
| Programmable logic structures synthesis (EPROM, GAL). | 4 |
| Bistable synthesis. | 4 |
| Finite automata synthesis using logical gates and bistables. | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Finite automata synthesis using programmable logic structures (EPROM, GAL). Turing machine simulation. | | | | | 4 |
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | | | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) | | |
| Student responsibilities | Attend all forms of teaching, pass ingress and egress tests, perform 100% laboratory exercises, pass preliminary exams or full exam (numeric and theory). | | | | | |
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1,5 | Research | | Practical training | 1 |
| | Experimental work | | Report | | Auditory exercises | 0,5 |
| | Essay | | Seminar essay | | Individual learning | 4 |
| | Tests | | Oral exam | | (Other) | |
| | Written exam | | Project | | (Other) | |
| Grading and evaluating student work in class and at the final exam | Continuous assessment: laboratory tests, practical tests, knowledge tests, preliminary exams. Exam: written and oral (numeric and theory) as unity. | | | | | |
| Required literature (available in the library and via other media) | **Title** | | | | **Number of copies in the library** | **Availability via other media** |
| | 1. Ožegović, J. Digitalna i mikroprocesorska tehnika, Veleučilište u Splitu, 2002. | | | | | Yes |
| | 2. Župan-Tkalić-Kunštić: Logičko projektiranje digitalnih sustava, Školska knjiga, Zagreb, 1984, 1995. | | | | | |
| Optional literature (at the time of submission of study programme proposal) | - Ožegović, J. Digitalna i mikroprocesorska tehnika, upute za laboratorijske vježbe, interna skripta, FESB Split 1995.<br>- Lecture notes: Ožegović, J., Digitalna elektronika, continuously upgraded | | | | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Lecture attending evidence<br>- Annual exam passing analysis<br>- Student feedback with teacher evaluation<br>- Teacher self-evaluation<br>- Graduated students feedback | | | | | |
| Other (as the proposer wishes to add) | | | | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="4">ELECTRICAL DISTRIBUTION NETWORKS</td></tr>
<tr><td>Code</td><td>FENO12</td><td>Year of study</td><td colspan="2">2</td></tr>
<tr><td>Course teacher</td><td>Damir Jakus, Ph.D.<br>Assistant Professor</td><td>Credits (ECTS)</td><td colspan="2">5</td></tr>
<tr><td>Associate teachers</td><td>Josip Vasilj, Ph.D.</td><td>Type of instruction (number of hours)</td><td colspan="2">L: 30 | S: 0 | AE: 15 | LE: 15 | DE: </td></tr>
<tr><td>Status of the course</td><td>Mandatory</td><td>Percentage of application of e-learning</td><td colspan="2">30</td></tr>
<tr><td colspan="5">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="4">Training students for:<br>- Understanding the specifics related to the network structure, grid planning and operation as well as network element construction<br>- Development of models for the distribution network analysis under stationary conditions<br>- Understanding the specifics related to the distribution network neutral earthing<br>- Calculation of short circuit currents in distribution networks<br>- Selection of network elements while respecting the technical requirements and ability to propose measures for the network operation improvements<br>- Understanding the effects of distribution generation connection on network conditions<br>- Deepening the basic knowledge in the field of electricity transmission and distribution</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="4">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="4">Students will be able to:<br>- Identify the typical structures of the distribution networks and their components with all their specifics<br>- Define the classic single line diagram and disposition of distribution substations<br>- Determine the equivalent circuits of distribution network elements for different type of calculations<br>- Perform the distribution network power flow and voltage conditions analysis using specialized software packages<br>- Simulate the impact of distributed generation connection on distribution network conditions<br>- Parametrize the distribution network elements to ensure normal network operation<br>- Select low voltage network protection devices and dimensioned TS 10 / 0.4 kV earthing system<br>- To carry out a techno-economic analysis of the excessive consumption of reactive power and to propose measures for power factor improvement<br>- Simulate the operation of the distribution network and to calculate energy losses</td></tr>
<tr><td rowspan="4">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="2">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="2">1. DISTIRIBUTION NETWORK POSITION AND ROLE IN ELECTRIC POWER SYSTEMS:<br>- production, transmission and distribution of electrical energy<br>- basic characteristics and differences of transmission and distribution networks</td><td>2</td><td></td></tr>
<tr><td colspan="2">2. DISTIRBUTION NETWORK TOPOLOGY AND STRUCTURE:<br>- Middle voltage network structure<br>- Low voltage network structure</td><td>2</td><td></td></tr>
<tr><td colspan="2">3. DISTIRBUTION NETWORK SUBSTATIONS:<br>- Distribution substations</td><td>2</td><td></td></tr>
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| | | | | |
|---|---|---|---|---|
| | | - Examples of real distribution substations 110/35 V, 35/10 kV and 10/0.4 kV | | |
| | **4.** | BASIC ELECTRIC PARAMETERS AND EQUVIVALNET SCHEMES FOR NETWORK ELEMENTS<br>- Symmetrical components system<br>- Physical interpretation of direct, inverse and zero system<br>- Calculation of element impedances<br>- Equivalent schemes | 2 | |
| | **5.** | DISTRIBUTION NETWORK FAULT ANALYSIS (PART 1)<br>- Three phase fault<br>- Two phase fault<br>- Single phase faults<br>- Single phase faults in low voltage grid | 3 | |
| | **6.** | DISTRIBUTION NETWORK FAULT ANALYSIS (PART 2)<br>- Transformer earthling options in middle voltage distribution networks<br>- Single phase faults<br>- Single phase faults in networks earthed using low-ohm resistors<br>- ground faults in unearthed networks<br>- Examples of fault analysis calculations | 2 | |
| | **7.** | APROXIMATIVE NETWORK ANALYSIS UNDER STATIONARY CONDITIONS<br>- Approximate  load flow calculations in radial distribution networks<br>- Approximate  voltage drop calculations<br>- Rating power lines and transformers based on load flow and voltage drop calculations<br>- Examples of load flow and voltage profile calculations | 2 | |
| | **8.** | LOAD FLOW CALCULATION USING BACKWARD-FORWARD METHOD<br>- Formation of incidence matrix: BIBC, BCBV, DLF<br>- Load flow calculations in radial distribution networks<br>- Load flow calculations in weakly meshed distribution networks | 3 | |
| | **9.** | LOW VOLTAGE DISTRIBUTION NETWORKS (PART 1)<br>- Specificities of low voltage distribution networks<br>- Low voltage distribution network types based on earthing type<br>- Load modeling and load flow calculations<br>- Load flow / voltage conditions calculations | 2 | |
| | **10.** | LOW VOLTAGE DISTRIBUTION NETWORKS (PART 2)<br>- Planning and design of low voltage networks<br>- Network protection and fuse selection criteria<br>- Grounding system calculation in low voltage distribution networks | 2 | |
| | **11.** | ACTIVE POWER/ENERGY LOSS CALCULATION<br>- Power/energy loss classification<br>- Power losses in transformers and power lines<br>- Energy loss calculations using approximate approach and using load duration curve | 2 | |
| | **12.** | REACTIVE POWER COMPENSATION<br>- Individual/group/central/mixed compensation<br>- Positive effects of reactive power compensation<br>- Dimensioning of capacitors banks | 2 | |
| | **13.** | IMPACT OF DISTRIBUTED GENERATION CONNECTION<br>- Impact on network voltage conditions and control<br>- Impact on network losses<br>- Impact on network protection<br>- Higher harmonics, voltage/current asymmetry, flickers… | 2 | |
| | **14.** | DISTIRBUTION NETWORK OPERATION AND CONTROL<br>- Supervision, control, SCADA<br>- Network reliability and energy not served<br>- MTU system | 2 | |

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| | List of laboratory or design exercises | LE or DE hours |
| | **1.** Preparing for the lab. exercises and demonstration of software tools used in exercises | 2 |
| | **2.** Load flow / voltage conditions/ power losses analysis and compensation of reactive power in the distribution networks | 3 |
| | **3.** The preparatory exercise for the load flow calculations in low-voltage distribution networks | 3 |
| | **4.** Low-voltage distribution network project: load modeling / load flow / voltage calculations; selection and rating of lines and transformers, short circuit analysis, selection and compliance testing of fuses, ground resistance calculation and design of pole mounted substation 10/0.4 kV earthing (Part 1) | 2 |
| | **5.** Low-voltage distribution network project: load modeling / load flow / voltage calculations; selection and rating of lines and transformers, short circuit analysis, selection and compliance testing of fuses, ground resistance calculation and design of pole mounted substation 10/0.4 kV earthing (Part 2) | 2 |
| | **6.** Analysis of distributed generation connection on the distribution networks | 3 |

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|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | - The presence on lectures in the amount of at least 70 % of the scheduled time.<br>- Completed all required laboratory exercises.<br>- Completed and graded seminar work assignment. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Self work | 1.5 |
| | Essay | | Seminar essay | 1 | Laboratory work | 0.5 |
| | Tests | 0.5 | Oral exam | | (Other) | |
| | Written exam | 0.5 | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | During the semester there will be two midterm exams covering lectures. The first midterm exam will be in the eighth week of summer semester, and the second one in the last week of summer semester. As a part of laboratory exercises students will be given their seminar assignments. Student can pass the class by passing two midterm exams and by completing their seminar assignments. In the two final exams in June and July, students can pass reaming part(s) which they didn't pass through midterm exams. Also, if the student passes one part of class materials through first final exam, then he is not obliged to re-take that part of the exam in the second final exam. The class subject is divided into two parts according to separation defined for midterm exams.<br><br>Students who have failed to pass the class after two final exams can try to pass the subject by taking the disciplinary exam which is organized in first part of autumn term. The last chance to pass the subject is through commission exam which will be held in the second part of the autumn exam period. During the disciplinary and commission exam students have to re-take whole exam covering both subject parts regarding their previous results in mid-term and final exams. In autumn term the requirement for positive mark is that the student has at least 50% success on the exam as well as positive mark from seminar assignment. |

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|---|---|---|---|
| | The requirement for positive mark is that the student has at least 50% points from each part of the course subject during midterm and final exams (or 50% points for the entire course subject on disciplinary and commission exam), as well as positively evaluated seminar assignment. The final score (in percentage) is formed on the basis of all activities according to the formula:<br><br>Grade (%) = 0,3xG1 + 0,3xG2 + 0,3xS + 0.1xP<br>Grade (%) = 0,6xG + 0,3xS + 0.1xP (for disciplinary and commission exam)<br><br>wherein:<br>• G1, G2 - points obtained for each subject part during midterms and(or) final exams<br>• G - points obtained during disciplinary and commission exam<br>• S – point given for seminar assignment<br>• P - presence at lectures<br>The final grade is determined as follows:<br>Grade (%) — Mark<br>50 % do 61% — sufficient (2)<br>62 % do 74 % — good(3)<br>75 % do 87 % — very good(4)<br>88 % do 100 % — excellent(5)<br><br>Exam terms:<br>The first and second final exam: June / July<br>The disciplinary and commission exam: August / September<br><br>Under the Article 65 of the Faculty Statute, the student is required to participate in all forms of teaching and attend: lectures at least 70% of scheduled time and laboratory exercises 100% of scheduled time. If you do not meet these requirements, the student will not be able to take the examination. | | |
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | Goić R., Jakus D., Penović I.: Distribucija električne energije - interna skripta, FESB, 2014. | | e-learning |
| | Goić, R. - Upute za energetske proračune u niskonaponskoj distributivnoj mreži (2009), Split, FESB | | e-learning |
| Optional literature (at the time of submission of study programme proposal) | - E. Lakaervi, E.J. Holmes: Electricity Distribution Network Design, Peter Peregrinus Lt, 1989.<br>- Abdelhay A. Sallam, Om P. Malik:Electric Distribution Systems, Wiley-IEEE Press, 2011.<br>- Dale R. Patrick, Stephen W. Fardo: Electrical Distribution Systems, The Fairmont Press, 2009.<br>- E. Lakaervi, E.J. Holmes: Electricity Distribution Network Design, Peter Peregrinus Lt, 1989.<br>- William H. Kersting: Distribution System Modeling and Analysis, CRC Press, 2002.<br>- Programski paket PowerCAD, upute za rad (2009), Split, FRACTAL d.o.o.<br>- Programski paket WINdis, upute za rad (2009), Split, FRACTAL d.o.o. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student class attendance<br>- Annual review of the exam success<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Feedback on the subject relevance from the former students who have already graduated | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTRICAL DRIVES</td></tr>
<tr><td>Code</td><td>FENO09</td><td>Year of study</td><td colspan="5">2.</td></tr>
<tr><td>Course teacher</td><td>Marin Despalatović, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Goran Majić, Ph.D</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td></td><td>15</td><td>15</td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students to:<br>- Get familiar with principle of operation and application areas of various types of electric machinery,<br>- Apply acquired knowledge in the analysis of existing and design of a new electrical drives.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Students must be prior enrolled in "Electric Machines and Transformers" course.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>1. Sketch the mechanical characteristics of various electric motors and working mechanisms (loads),<br>2. Explain the principle of operation of the voltage and/or frequency converter and methods for torque control of electric machines,<br>3. Describe experimental procedures for determining steady state and dynamic characteristics of electric machines,<br>4. Compute characteristic quantities of ED based on measurements of electrical and/or mechanical quantities,<br>5. Choose controlled or uncontrolled ED to adapt to working mechanism or technological process,<br>6. Choose an electric motor to meet technical and economic requirements of drive,<br>7. Discover the causes of errors and instability in the observed system,<br>8. Use tool for computer modeling and simulation of electric drives,<br>9. Analyze simulated responses of electric drive variables by comparing them with measurements obtained in laboratory.</td></tr>
<tr><td rowspan="5">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="3">Course content</td><td colspan="2">L or S hours</td><td colspan="2">AE hours</td></tr>
<tr><td colspan="3">Introduction, basic terms and definitions, problems and areas of application of electric drives (ED). The main states of the EDs. Working and braking modes of ED. The characteristics of the various (loads) working mechanisms. The steady state of the ED.</td><td colspan="2">2</td><td colspan="2">1</td></tr>
<tr><td colspan="3">Overview of the electric commutator machines: DC, AC, universal. Types of excitation: independent, shunt, serial, compound, permanent magnets. Steady states and external characteristics of separately and/or serial excited commutator machines.</td><td colspan="2">2</td><td colspan="2">1</td></tr>
<tr><td colspan="3">Braking states of DC motor drive: generator, counter-current and electrodynamic braking. Ward Leonard speed control system. Converter controlled DC motor drive. Comparison of DC motor drive performance when powered from the chopper, single-phase and three-phase thyristor converters.</td><td colspan="2">2</td><td colspan="2">1</td></tr>
<tr><td colspan="3">Overview of the slip ring and squirrel cage induction machines. Steady state and external (mechanical)</td><td colspan="2">2</td><td colspan="2">1</td></tr>
</table>

| | | | |
|---|---|---|---|
| | characteristics of induction machines drives. Braking states of induction motor drive: generator, counter-current, electrodynamic and DC braking. | | |
| | Converter controlled induction motor drive. Various topologies and principle of operation of frequency converters. Advantages and disadvantages of scalar, vector and direct torque control. Comparison of induction motor characteristics when operated with constant stator or mutual flux linkage, or constant stator current. Subsynchronous cascade. Thyristor converter fed induction motor for adjusting drive speed. | 2 | 1 |
| | Overview of various types of synchronous machines: round rotor, salient poles, reluctance, permanent magnet. Steady state and external (mechanical) characteristics of EDs with synchronous machines. Braking states of synchronous motor drive. | 2 | 1 |
| | Materials for permanent magnets. ED with electronically commutated motor and a synchronous motor with permanent magnets. Construction and principle of operation of special types of machines: linear, high-speed and torque motors. | 2 | 1 |
| | First midterm exam | 2 | 1 |
| | The dynamics of the EDs. The stability of operating point. Startup and sudden load of separately excited DC motor. Definition of the electro-mechanical time constant and the constant of inertia. | 2 | 1 |
| | The dynamics of induction motor drives: startup and sudden load. Energy losses under transients. | 2 | 1 |
| | Starting methods to limit starting current and torque of DC and induction machine drives. Starters, star-delta and soft (thyristor controlled) startup. | 2 | 1 |
| | The heating and cooling performance of electric machines. The types of loads in electrical drives (S1-S10). The selection of controlled or uncontrolled ED. Energy savings. | 2 | 1 |
| | Comparison of characteristics of various types and sizes of electric motors. The law of similarity. Technical and economic choice of the electric motor drive. Examples of EDs: a fan and an electric vehicle. | 2 | 1 |
| | Diagnostics, monitoring and protection of electric motor drives. The causes of errors and instability. Estimation of system state variables based on the nominal data and measurements of electrical and/or mechanical quantities, the balance of power. | 2 | 1 |
| | Second midterm exam | | |
| | List of laboratory or design exercises | | LE or DE hours |
| | 1. Steady state characteristics of separately excited DC motor. | | 2 |
| | 2. Electrodynamic braking of separately excited DC motor. | | 2 |
| | 3. Thyristor converter fed DC motor drive. | | 2 |
| | 4. Frequency converter fed induction motor drive. | | 2 |
| | 5. Electronically commutated (BLDC) motor drive. | | 1 |
| | 6. Steady state characteristics of an induction motor. | | 2 |
| | 7. Transients in DC and induction motor drives. | | 2 |
| | 8. Starting of an induction motor. | | 2 |
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) | |

<table>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70% of the times scheduled.<br>Performed all laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1,5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2,3</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>0,5</td></tr>
<tr><td>Tests</td><td>0,1</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,5</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterm exams during semester. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. By midterm exams students can pass the entire exam. On the exam (final, correctional and commission) students take the parts of material which they did not pass on the midterm or previous exams. A separate part of the material means the material of each midterm exam. The exams are carried out as written tests. The duration of the midterm exams are 60 minutes, while exams are 2x60 minutes.<br>The requirement for passing grade is at least 50% of points on each (midterm) exam and the positive assessment (minimum 50% of points) of all laboratory exercises. Grade (in percentage) is formed as follows:<br><br>Grade(%) = 0,4•(ME1 + ME2) + 0,2•LE<br>where<br>ME1, ME2 - points obtained at (midterm) exams expressed in percentages<br>LE - average grade of all laboratory exercises expressed in percentages<br>The final grade is determined as follows:<br><br>Percentage Grade<br>0% to 49% insufficient (1)<br>50% to 61% sufficient (2)<br>62% to 74% good (3)<br>75% to 87% very good (4)<br>88% to 100% excellent (5)<br>Exam group: 21<br>Examinations are held in accordance with the course calendar schedule.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">M. Jadrić, B. Terzić: Elektromotorni pogoni, Interna skripta, FESB, Split, 2007.</td><td></td><td>e-learning portal</td></tr>
<tr><td colspan="4">B. Jurković: Elektromotorni pogoni, Školska knjiga, Zagreb, 1990.</td><td>6</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">I. Boldea, S. A. Nasar: Electric Drives, Taylor & Francis, Boca Raton, 2006.<br>B. K. Bose: Power Electronics and Variable Drives, IEEE Press, New York, 1997.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Keeping records of students course attendance<br>- Annual review of the performance of the examinations<br>- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

| NAME OF THE COURSE | ELECTRICAL INSTALLATIONS | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FENO10 | Year of study | 2. | | | | |
| **Course teacher** | Rino Lucić, Ph.D., Full Professor | Credits (ECTS) | 4 | | | | |
| Associate teachers | Ante Veža, assistant | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | | | 30 | |
| Status of the course | regular | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- practical knowledge related to electrical installations,<br>- implementation of basic standards related to electrical installations,<br>- making project of simple electrical installations using AutoCAD software |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- apply relevant standards for electrical installations,<br>- explain a danger of possible electric shock in electrical installations,<br>- explain the basic requirements for correct operation of electrical installations,<br>- develop a simpler design documents for electrical installations in AutoCAD software |

**Course content broken down in detail by weekly class schedule (syllabus)**

| Course content | L or S hours | AE hours |
|---|---|---|
| Electrical regulations | 2 | |
| Basic types of low voltage networks and installations. | 2 | |
| Electrical schemes. Classification and characteristics of low voltage loads. | 4 | |
| Protective measures and protection of low voltage installations. | 6 | |
| Cable type and cross section selection. Calculation of voltage drop and short circuit current. | 6 | |
| Switching devices in low-voltage installations. | 2 | |
| Testing electrical installations | 2 | |
| Design of electrical installations. | 2 | |

| List of laboratory or design exercises | DE hours |
|---|---|
| Layout and types of project documentation (preliminary, main and detailed design) of wiring in the case of a residential building. The basic rules related to electrical installation. Valid legislation and technical regulations. | 2 |
| Basic commands in AutoCAD software used for the project documentation of electrical installations. | 2 |
| AutoCAD list of symbols used in the project and drawing. | 2 |
| Drawing single line diagrams, electrical schemes, plans, wiring, lighting installation and sockets, communication installation, grounding and lightning protection. | 3 |
| Introduction to "Ecodial" software, voltage drop, short circuit protection and protection against indirect contact. | 2 |
| Design of electrical installations according to the given plan and the terms of reference | 2 |

| Format of instruction | | |
|---|---|---|
| | ☒ lectures | ☐ independent assignments |
| | ☐ seminars and workshops | ☐ multimedia |
| | ☐ exercises | ☒ laboratory |

| | | | | | | |
|---|---|---|---|---|---|---|
| | ☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | | | ☐ work with mentor<br>☐ (other) | | |
| Student responsibilities | The presence at the lectures at least 70% of the times scheduled. Performed all required laboratory exercises. | | | | | |
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 0,7 | Research | | Practical training | |
| | Experimental work | | Report | | Independent work | 2 |
| | Essay | | Seminar essay | | Laboratory exercises | 1 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | |
| | Written exam | 0,1 | Project | | (Other) | |
| Grading and evaluating student work in class and at the final exam | During the semester there will be two tests. The first test will be at the eighth week of classes, the second at the first week of the exam period. Student can pass the entire exam by tests.<br>At the two final exams, students take parts of the curriculum that did not pass by tests. If at the first final exam student passes one of the two parts of curriculum that part of curriculum the student does not have to take on another final exam.<br>The condition for positive assessment is that the student has at least 50% of each part of the curriculum at the tests or at the final exam The final grade (in percent) is formed on the basis of all activities according to the formula:<br><br>Rating (%) = 0.1 * KV + 0.45 * (G1 + G2)<br><br>wherein the activity is expressed in percentage according to:<br><br>KV - percentage obtained by laboratory exercises,<br>G1, G2 - percentage obtained by tests or exams of the parts of curriculum given in lectures.<br><br>Students who did not pass the exam after two final exams can pass the exam at the last week of August or the first week of September. Last chance to take the exam in this school year is a commission exam. In a commission exam all students take the entire curriculum, and the condition for positive assessment is that the student has at least 50% of entire curriculum.<br><br>The final score (in percentage) is formed on the basis of all activities according to the formula:<br><br>Rating (%) = 0.1 * KV + 0.9 * G<br><br>wherein the activity is expressed in percentage according to:<br><br>KV - percentage obtained by laboratory exercises,<br>G - percentage obtained by exams of the entire curriculum given in lectures.<br><br>The final grade is determined as follows:<br><br>Rating Grade<br>50% to 61% sufficient (2)<br>62% to 74% good (3)<br>75% to 87% very good (4)<br>88% 100% excellent (5)<br><br>Under Article 48 of the Statute of the Faculty, the student is required to participate in all forms of teaching activities: lessons attendance at least 70% and 100% of | | | | | |

| | | | |
|---|---|---|---|
| | laboratory exercises. Student should make 100% of laboratory reports. If a student does not meet these requirements, s student will not be able to take the exams. | | |
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | R.Lucic: Lectures, FESB | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | - G. G. Seip: Electrical Installation Handbook-Third Edition, John&Wiley, 2000.<br>- E. Mileusnić: Testing of electrical installations of low voltage, ZIRSI,2006. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of his attendance<br>- Annual review of the performance of the examinations<br>- Student survey in order to evaluate teachers<br>- Self-evaluation of teachers<br>- Feedback from students who have already graduated from the relevance of the course content | | |
| Other (as the proposer wishes to add) | | | |

| NAME OF THE COURSE | ELECTRONIC CIRCUITS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Code** | FELO04 | Year of study | 2 | | | | | |
| **Course teacher** | Spomenka Bovan, M.Sc., Senior Lectuter | Credits (ECTS) | 9 | | | | | |
| Associate teachers | Ivan Marasović, Ph.D., Assistant Professor | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 45 | | 45 | 30 | | |
| Status of the course | Obligatory | Percentage of application of e-learning | | | | | | |

**COURSE DESCRIPTION**

| Course objectives | Training students for:<br>- Understanding and analysis of basic analog electronic circuits<br>- Understanding the operating principles of the most important pulse and digital circuits. |
|---|---|
| Course enrolment requirements and entry competences required for the course | Successfully completed course „Electronic Devices” |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- Explain the operation of rectifier circuits<br>- Apply the basic electronic device models and to calculate main properties of the simple amplifier circuits.<br>- Describe the amplifier frequency response.<br>- Specify types and applications of multivibrator circuits.<br>- Explain the operation and calculate the properties of the simple circuits with operating amplifier.<br>- Measure the main parameters of basic amplifiers. |

3333Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction. Basic principles of electronic circuit analysis. | 3 | 3 |
| Rectifier circuits and voltage stabilization circuits. | 3 | 3 |
| Introduction to electronic amplifiers. Amplification (relative and in decibels). Types of electronic amplifiers. | 3 | 3 |
| Common emitter amplifier at DC conditions. | 3 | 3 |
| Dynamic properties of common emitter amplifier. | 3 | 3 |
| Common collector and common base amplifiers. | 3 | 3 |
| FET amplifier circuits. | 3 | 3 |
| Amplifier frequency response. Cutoff frequencies. | 3 | 3 |
| Feedback circuits. Differential amplifier. | 3 | 3 |
| Operational amplifier: definition and basic properties. Examples of circuits with operational amplifier. | 3 | 3 |
| Pulse and digital electronics. Linear wave shaping. Analysis of RC and CR circuits. | 3 | 3 |
| Transistor as a switch. | 3 | 3 |
| Multivibrator circuits. Schmitt trigger. | 3 | 3 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Diode rectifier circuits. | 3 |
| Common emitter amplifier. | 3 |
| Common base amplifier. Common collector amplifier. | 3 |
| Common source and common drain amplifier. | 3 |
| Two stage amplifier. | 3 |
| Differential amplifier. | 3 |

<table>
<tr><td rowspan="4"></td><td colspan="5">Operational amplifier. Inverting amplifier.</td><td>3</td></tr>
<tr><td colspan="5">Voltage derivation circuit.</td><td>3</td></tr>
<tr><td colspan="5">Voltage integration circuit.</td><td>3</td></tr>
<tr><td colspan="5">Schmitt trigger.</td><td>3</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Students should attend at least 70% of the lectures. Students must complete all laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>3</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>4.25</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>1</td></tr>
<tr><td>Tests</td><td>0.15</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0.5</td></tr>
<tr><td>Written exam</td><td>0.1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterm exams and a final exam. The first midterm exam is scheduled after 7 weeks of classes and the second one after the following 6 weeks. Each midterm exam is written and consists of 8 theoretical questions and 3 numerical problems, which are graded independently. Each midterm exam lasts 105 minutes. To pass an exam, the student should score at least 50% both from theoretical questions and numerical problems in the midterms and also have a positive assesment of the laboratory exercises.<br><br>The final grade (in percentage) is determined according to the formula:<br>Grade(%) = 0.2(T1+T2)+0.2(P1+P2)+0.15L+0.05NP<br>where:<br>• T1, T2 – grade from theoretical questions in midterms given in percentage,<br>• P1, P2 – grade from numerical problems in midterms given in percentage,<br>• L – grade from laboratory exercises given in percentage.<br>• NV – attendance at lectures given in percentage.<br><br>Students not passing the midterm exams take part in the final exam. It consists of 14 theoretical questions and 6 numerical problems and lasts 165 minutes. For passing the final exam, students must score at least 50% both from theoretical part and from numerical problems, as well as have a positive assesment of the laboratory exercise. The grade on final exams is determined by the formula:<br>Grade(%) = 0.4(T)+0.4(P)+ 0.15L+0.05NP<br>where:<br>• T – grade from theoretical questions given in percentage,<br>• P – grade from numerical problems given in percentage,<br>• L – grade from laboratory exercises given in percentage.<br>• NV – attendance at lectures given in percentage.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">P. Slapničar, S. Gotovac: Elektronički sklopovi, FESB, Split, 2000.</td><td></td><td></td></tr>
<tr><td colspan="4">P. Biljanović: Elektronički sklopovi, Školska knjiga, Zagreb, 1989.</td><td></td><td></td></tr>
<tr><td colspan="4">I. Zulim, P. Biljanović: Elektronički sklopovi – zbirka zadataka, Školska knjiga, Zagreb, 1994.</td><td></td><td></td></tr>
</table>

| | | | |
|---|---|---|---|
| | S. Bovan: Upute za laboratorijske vježbe iz kolegija Elektronički sklopovi, autorizirana skripta, FESB, Split | | |
| Optional literature (at the time of submission of study programme proposal) | - P. Slapničar: Impulsna I digitalna tehnika, FESB, Split, 2001.<br>- P. Biljanović: Mikroelektronika, Školska knjiga, Zagreb, 1989.<br>- A.S. Sedra, K.C. Smith: Microelectronic Circuits, 6th edition, Oxford University Press, 2009.<br>- J. Millman, A. Grabel: Microelectronics, 2nd edition, McGraw-Hill, 1987.<br>- P. Horowitz, W. Hill: The Art of Electronics, Cambridge University Press, 2015. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Record of number of students attending the classes<br>- Evaluation of results in accordance with expected learning outcomes<br>- Feedback from students via student surveys<br>- Teachers self-evaluation<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTRONIC DEVICES</td></tr>
<tr><td>Code</td><td>FELO42</td><td>Year of study</td><td colspan="5">1</td></tr>
<tr><td>Course teacher</td><td>Spomenka Bovan, M.Sc., Senior Lectuter</td><td>Credits (ECTS)</td><td colspan="5">6</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td></td><td>30</td><td>15</td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5"></td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- Understanding the main properties of semiconductor materials<br>- Understanding the main properties and operating principles of the basic electronic devices.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">none</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- State the basic properties of semiconductors.<br>- Explain the operating principle and practical application of semiconductor rectifier diode.<br>- Explain the operating principle and practical application of Zener diode.<br>- Explain the operating principle and practical application of bipolar junction transistor.<br>- Explain the operating principle and practical application of junction field effect transistor.<br>- Measure the main parameters of basic electronic devices.</td></tr>
<tr><td rowspan="21">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Introduction. Classification of solid materials. Electrical properties of crystals.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Intrinsic and extrinsic semiconductors.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Basic laws of semiconductor electronics. Drift and diffusion transport.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">P-n junction.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">P-n junction under bias.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Current-voltage characteristics of p-n junction.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Breakdown voltage. Zener diode. Capacitive diode.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Bipolar junction transistor. Modes of operation.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Transistor operation in active mode.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Transistor parameters. Static characteristics.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Junction field effect transistor. Modes of operation. Static characteristics.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">MOSFET. Modes of operation. Static characteristics.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Components of optical communication system.</td><td>2</td><td>2</td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">Semiconductor rectifier diode.</td><td>3</td></tr>
<tr><td colspan="6">Zener diode.</td><td>3</td></tr>
<tr><td colspan="6">Bipolar junction transistor.</td><td>3</td></tr>
<tr><td colspan="6">Junction field effect transistor.</td><td>3</td></tr>
<tr><td colspan="6">Optocoupler.</td><td>3</td></tr>
</table>

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | Students should attend at least 70% of the lectures. Students must complete all laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2.75 |
| | Essay | | Seminar essay | | Laboratory exercises | 0.5 |
| | Tests | 0.15 | Oral exam | | Preparation for laboratory exercises | 0.5 |
| | Written exam | 0.1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterm exams and a final exam. The first midterm exam is scheduled after 7 weeks of classes and the second one after the following 6 weeks. Each midterm exam is written and consists of 16 theoretical questions and numerical problems. Each midterm exam lasts 75 minutes. To pass an exam, the student should score at least 50% both from theoretical questions and numerical problems from each midterm or final exam and also have a positive assesment of the laboratory exercises.<br>The final grade (in percentage) is determined according to the formula:<br>Grade(%) = 0,05 NP + 0,15 LV + 0,4 (M1 + M2)<br>Where:<br>• NP - attendance at lectures given in percentage<br>• LV – grade from laboratory exercises given in percentage<br>• M1, M2 – grade from midterms given in percentage<br><br>Students not passing the midterm exams take part in the final exam. It consists of 20 theoretical questions and numerical problems and lasts 90 minutes. For passing the final exam, students must score at least 50% both from theoretical part and from numerical problems, as well as have a positive assesment of the laboratory exercise. The grade on final exams is determined by the formula:<br>Grade(%) = 0,05 NP + 0,15 LV + 0,8FE<br><br>where:<br>• NP - attendance at lectures given in percentage<br>• LV – grade from laboratory exercises given in percentage<br>• FE – grade from final test given in percentage. |

| | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| Required literature (available in the library and via other media) | I. Zulim, S. Gotovac: Osnovni poluvodički elektronički elementi, FESB, Split, 1998. | | |
| | S. Bovan, I. Marasović: Poluvodički elektronički elementi – upute za laboratorijske vježbe, autorizirana skripta, FESB, Split | | |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | - P. Biljanović: Poluvodički elektronički elementi, Školska knjiga, Zagreb, 2004.<br>- B. Juzbašić: Elektronički elementi, Školska knjiga, Zagreb, 1984.<br>- S.M. Sze, K.K. Ng: Physics of Semiconductor Devices, Wiley, 2006. |

| | |
|---|---|
| Quality assurance methods that ensure the acquisition of exit competences | - Record of number of students attending the classes<br>- Evaluation of results in accordance with expected learning outcomes<br>- Feedback from students via student surveys<br>- Teachers self-evaluation<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| **NAME OF THE COURSE** | **ELECTROTECHNICAL MATERIALS AND TECHNOLOGIES** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELO01 | Year of study | 1. | | | | |
| **Course teacher** | Josip Lörincz, Ph. D., Assistant professor | Credits (ECTS) | 4 | | | | |
| Associate teachers | Marko Zubčić, mag. ing. | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | | | 15 | |
| Status of the course | Obligatory (Professional study programme, 510, 511, 512, 410, 411, 412) | Percentage of application of e-learning | 10% | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding and application of basic materials and technologies used in electrical engineering<br>- understanding and application of conducting, semiconducting, insulating and magnetic materials in electrical engineering<br>- knowledge of microelectronic and fibre-optic technologies<br>- permanent adoption and deepening of knowledge about new materials and technologies used in electrical engineering |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define and recognise the fundamental characteristics of basic materials and technologies used in electrical engineering<br>- evaluate and apply fundamental materials and technologies used in electrical engineering<br>- evaluate and apply conducting, semiconducting, insulating and magnetic materials in electrical engineering<br>- evaluate and apply basic microelectronic and fibre-optic technologies<br>- continuously acquire new knowledges and skills about new materials and technologies used in electrical engineering |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | Introduction. Structure and characteristics of materials. Characteristics of conductors. | 2 | / |
| | Materials for production of conductors: copper and corresponding alloys and aluminium. | 2 | / |
| | High-temperature melting conductors: tungsten, molybdenum, tantalum, niobium.<br>Materials for specific purposes: gold, silver, iron, platinum. | 2 | / |
| | Materials for resistors, thermocouples, thermos-bimetals, fuses, conductors through glass and electrical contacts. | 2 | / |
| | Superconductivity and superconductive materials. Semiconducting materials. Cleaning of semiconductors. Methods of creating monocrystalline semiconductors. | 2 | / |
| | General characteristics of magnetic materials. Soft-magnetic materials: iron, alloys: iron-silicon and iron-nickel. | 2 | / |
| | Soft-magnetic materials for high frequency (HF) techniques: ferromagnetic powder-like cores and ferrites. Hard-magnetic materials: Carmon-steel, dispersion alloys, ductile hard-magnetic materials and materials based o metal oxides. | 2 | / |
| | | 2 | / |

| | | | |
|---|---|---|---|
| | General characteristics of isolation materials. Characteristic overview of the commonly used isolation martials: air, isolation liquids, mica, ceramics. | 2 | / |
| | Glass, varnishes, insulation kits, fiber boards and laminates, caoutchouc and rubber, synthetic resin (thermoplastic and thermoset). Printed matter. | 2 | / |
| | The process of soft soldering. Microelectronics: Introduction and historical development. The division of integrated circuits. Planar technology: general. | 2 | / |
| | Some procedures within the planar technology: epitaxy, oxidation or passivation Si surface, diffusion and ion implantation. Metallization. | 2 | / |
| | Thin-layer technology: in general, making thin film components (resistors, capacitors, conductive paths). Thick technology: generally, manufacturing of thick components (resistors, capacitors, conductive paths). Methods for making a specific application integrated circuit (ASIC). | 2 | / |
| | Fibre optic transmission systems: historical development, the spread of light through a fibre, types of optical fibre, optical fibre protection, types of fibre optic cable and optical fibre production. | 2 | / |
| | List of laboratory or design exercises | | LE or DE hours |
| | Measuring the electrical resistivity | | 2 |
| | Resistance measurement of color-coded resistor | | 2 |
| | Varistors | | 2 |
| | Thermistors | | 2 |
| | Measuring temperature with thermocouple | | 2 |
| | Quality testing of transformer plates and measuring losses in the iron | | 2 |
| | Rated power dissipation of resistors | | 2 |
| Format of instruction | ☒ lectures<br>☒ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) | |
| Student responsibilities | The conditions for overall positive assessment are:<br>• positive assessment of laboratory exercises (above 50 %)<br>• minimum presence during 70% of overall class teaching time in a semester,<br>• presence on laboratory exercises during 100% of overall laboratory exercise time in a semester,<br>• submitted and presented seminar work,<br>• minimum 50% points at each mid-term or final exam (or correctional or commission exam). | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Independent work | 1,7 |
| | Essay | | Seminar essay | 0,5 | Laboratory exercises | 0,5 |
| | Tests | 0,2 | Oral exam | | (Other) | |

<table>
<tr><td>equal to the ECTS value of the course)</td><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester there will be two mid-term exams (tests). The 1st mid-term exam will be after 8 weeks of classes, and the 2nd after 15 weeks of classes. On the 1st and 2nd of the final exams, students take exam of those parts of the curricula which they did not pass on some of the mid-term exams. On the 3rd and 4th of the final (correctional) exam, students take exam of complete course curricula.<br><br>Rating (%) = 0.1PL + 0.2SW + 0,2LA + 0.25 (M1 + M2)<br>PL – presence on the lectures (expressed in percentage),<br>LA- grades from laboratory assessment (expressed in percentage),<br>SW - seminar work grades (expressed in percentage),<br>M1, M2- the 1st and 2nd mid-term exam grades or final exam grades (expressed in percentage),<br><br>The final grade is determined as follows:<br>percentage Rating<br>50% to 61% is sufficient (2)<br>62% to 74% good (3)<br>75% to 87% of very good (4)<br>88% 100% Excellent (5)<br><br>Independently on results obtained during the 1st or 2nd mid-term exams, on the 3rd and 4th final (correctional) exams students take exam of entire curricula content. In the case of organization of commission exam, students also take exam of entire curricula content. Requirements related to the admission on final and correctional (commission) exam is a positive assessment of laboratory exercises.<br><br>Examinations:<br>1st Final exam<br>2nd Final exam<br>3rd Final (correctional) exam<br>4th Final (correctional) exam<br>5th Final (commission) exam (organized only based on decision of Faculty council in specific academic year)</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">Milutin Kapov, Josip Lorincz, “Materials in electrical engineering”, FESB-Split internal script, 2015.</td><td></td><td>e-learning portal</td></tr>
<tr><td colspan="4">Milutin Kapov, Marija Vrdoljak, Josip Lorincz, “Materials in electrical engineering – laboratory exercises”, FESB-Split internal script, 2015.</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">1. Viktor Šunde, Zvonko Benčić, Tomislav Filetin, Materials in electrical engineering products, Graphis, Zagreb, 2012<br>2. V. Bek: „Technology of electro-materials”, ETF Zagreb, 1989.<br>3. Internet</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations<br>- Feedback from graduated students about the relevance of the course content</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6">/</td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTRICAL MEASUREMENTS</td></tr>
<tr><td>Code</td><td>FENO24</td><td>Year of study</td><td colspan="5">1.</td></tr>
<tr><td>Course teacher</td><td>Tomislav Kilić, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Tonko Garma, Ph.D.<br>Assistant Professor</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding and application of basic principles of metrology,<br>- understanding and application of electrical measuring instruments,<br>- applying of electrical measuring instruments and measuring methods,<br>- expression of measuring results and uncertainty in measurement.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>1. define the SI quantities and units,<br>2. describe the basic terms and principles of metrology,<br>3. apply rules for printing and using units,<br>4. express results and errors of measurement,<br>5. explain the principle of operation of analogue and digital instruments,<br>6. describe basic methods for measuring electrical quantities,<br>7. choose adequate measuring instrument and method,<br>8. measure DC and AC current, voltage, power, resistance and frequency.</td></tr>
<tr><td rowspan="12">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L hours</td></tr>
<tr><td colspan="6">Introduction to Measurements. Brief history of metrology. International system of quantities and units. Fundamental and Derived Units. Definitions of fundamental SI units. SI prefixes. Rules and style conventions for printing and using units.</td><td>2</td></tr>
<tr><td colspan="6">Etalons of electrical quantities. Standards of electrical quantities (resistance, capacitance, inductance and voltage).</td><td>2</td></tr>
<tr><td colspan="6">Measuring accuracy and uncertainty (absolute and relative errors, measurement result, true value, measurement uncertainty).</td><td>2</td></tr>
<tr><td colspan="6">Electromechanical (analogue) instruments. Pointers and scales. The torque equation of electromechanical instruments. Regulations for analogue instruments.</td><td>2</td></tr>
<tr><td colspan="6">The moving coil instrument. Extension of range of moving coil instruments. The moving coil instrument with rectifier.</td><td>2</td></tr>
<tr><td colspan="6">The moving iron instrument. The electrodynamometer-type instruments. Electrothermal instruments.</td><td>2</td></tr>
<tr><td colspan="6">Single-phase induction-type energy meter. Phasor diagram of single-phase induction-type energy meter. Three-phase induction-type energy meter.</td><td>2</td></tr>
<tr><td colspan="6">First midterm exam</td><td>2</td></tr>
<tr><td colspan="6">Null-methods. DC and AC bridges. Unbalanced bridges. Compensators. Instrument transformers.</td><td>2</td></tr>
<tr><td colspan="6">Theory of transformers. Potential (voltage) transformers. Current transformers. Errors introduced by transformers.</td><td>2</td></tr>
<tr><td colspan="6">Electronic instruments. Static and dynamic characteristics. Operational amplifiers (inverting, non-inverting. integration, derivation types). Differential and instrumentation amplifiers.</td><td>2</td></tr>
</table>

| | | |
|---|---|---|
| | Digital instruments. A/D converters. Digital multimeters. Digital frequency meters. | 2 |
| | Cathode ray oscilloscope. Time base generator. Dual trace oscilloscope. Vertical input. Digital oscilloscope. | 2 |
| | Methods for current, voltage, resistance and power measurement. Computer based measuring systems. | 2 |
| | Second midterm exam | 2 |
| | List of laboratory exercises | LE hours |
| | Electrical resistance measurement | 2 |
| | Measurement uncertainty of resistance measured by UI method | 2 |
| | Calibration of instruments by method of comparison | 2 |
| | Extension of range of moving coil instruments | 2 |
| | Measurement of electrical quantities with oscilloscope | 2 |
| | Error due to nonsinusoidal signals | 2 |
| | Instrument transformers | 2 |
| | Measurement of hysteresis loop | 2 |
| | Measurement of resistance with DC bridge | 2 |
| | Measurement of inductance and capacitance | 2 |
| | Measurement of three-phase power | 2 |
| | Practical skills exam | 8 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,2 |
| | Essay | | Seminar essay | | Laboratory exercises | 1 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,5 |
| | Written exam | 0,1 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and numerical problems and final tests consist of 20 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 40 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:

$$\text{Grade}(\%) = 0{,}05\ NP + 0{,}25\ LV + 0{,}35\ (M1 + M2)$$

the activities in percentage:

- NP - attendance at lectures,
- LV – laboratory assessment,
- M1, M2 – test results.

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | T. Kilić: Autorizirana predavanja, FESB | | e-learning portal |

| | | | |
|---|---|---|---|
| | S. Milun: *Električna mjerenja – skripta s predavanja*, FESB | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | • V. Bego: *Mjerenja u elektrotehnici*, 9. dopunjeno izdanje, Graphis, Zagreb, 2003.<br>• D. Vujević, B. Ferković: *Osnove elektrotehničkih mjerenja – I. i II. dio*, Školska knjiga, Zagreb, 1994.<br>• S. Tumanski: Principles of Electrical Measurement, Taylor & Francis, New York, 2005. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

| **NAME OF THE COURSE** | **ELECTRICAL NETWORKS** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FENO05 | Year of study | 2 | | | | |
| **Course teacher** | Petar Sarajčev, Ph.D., Associate Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | | 15 | 15 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- setting-up and solving problems of short-circuit analysis in power systems<br>- understanding different network earthing practices<br>- understanding static stability concepts<br>- understanding power flow solution methods |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define relationships between current and voltage phasors during different short-circuit types<br>- understand the need for different network earthing practices<br>- apply different approaches to the solution of short-circuit problems<br>- analyse and solve power flow problems |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction to the power system analysis. Symmetrical components. Per-unit system. | 3 | |
| Transmission lines. Direct, inverse and zero-sequence impedance calculations. Cables design basics. | 5 | 3 |
| Transformer modelling. Direct, inverse and zero-sequence impedance calculations. | 3 | 3 |
| Introduction to the generator modelling. | 3 | 3 |
| Telegrapher equations | 3 | |
| Analysis of short-circuits. Three-phase short circuit. Double phase short circuit. Single-pole short circuit. | 5 | 3 |
| Earth fault factor. Network earthing from the short-circuit current perspective. Relationships between currents and voltages from different short-circuit types. | 3 | |
| Power flow analysis | 5 | 3 |
| Introduction to the power system stability studies. Static stability analysis. Edith Clark method. | 3 | |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Solution of telegraphers equations in Matlab | 3 |
| Short-circuit analysis using the PowerCAD software package | 5 |
| Power flow analysis using the PowerCAD software package | 5 |

| Format of instruction | | |
|---|---|---|
| | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |

<table>
<tr><td>Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2,5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>1,0</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory excercises</td><td>1,0</td></tr>
<tr><td>Tests</td><td>0,5</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and numerical problems and final tests consist of 10 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50% points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>$$\text{Grade}(\%) = 0{,}5\ (M1 + M2)$$<br>the activities in percentage: M1, M2 – test results.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">M. Ožegović, K. Ožegović, Električne energetske mreže I, II, VI, Opal Computing, Split.</td><td>10</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">-</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **ELECTRICAL MACHINES AND TRANSFORMERS** | | | | | | | |
| **Code** | FENO04 | Year of study | 2. | | | | | |
| **Course teacher** | Ivica Jurić-Grgić, Ph.D., Associate Professor | Credits (ECTS) | 8 | | | | | |
| Associate teachers | Dino Lovrić, Ph.D., Senior Research Assistant | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 45 | 0 | 30 | 15 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students for:<br>- permanent adoption and application of basic knowledge in the field of electrical machines and transformers,<br>- managing and regulation of electrical machines and transformers under load | | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- describe basic principles of electrical machines and transformers,<br>- recalculate equivalent circuit parameters of a three-phase transformer<br>- manage with electrical machines and transformers under load,<br>- perform speed control of induction and DC motors,<br>- determine and draw a diagram of DC Motor torque-speed characteristic. | | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L hours | AE hours |
|---|---|---|---|
| | Introduction. Purpose of transformers, power transformers, construction, ideal and real transformers. | 3 | 2 |
| | Magnetic circuit of transformer, transformer voltage equations, transformer equivalent circuit and phasor diagram. | 3 | 2 |
| | Open circuit and short circuit test on transformer, load, transformer losses, three-phase transformers. | 3 | 4 |
| | Introduction in basic principles of electrical machines, electromagnetic torque, rotating magnetic field. | 3 | 0 |
| | Windings of electrical machines. | 3 | 4 |
| | Synchronous machine, construction, basic principles. | 3 | 0 |
| | Synchronous machines operation and characteristics, phasor diagram. | 3 | 4 |
| | Induction machine, construction, basic principles. | 3 | 0 |
| | Induction machine equivalent circuit and phasor diagram, induction machine characteristics. | 3 | 4 |
| | Operating characteristics of a induction motor, single-phase induction motor. | 3 | 4 |
| | DC machine, construction, basic principles. | 3 | 0 |
| | Operating characteristics of a DC motor, armature reaction in DC machines. | 3 | 2 |
| | Universal motors, brushless DC motors. | 3 | 0 |
| | List of laboratory exercises | | LE hours |
| | Determination of equivalent circuit parameters of a three-phase transformer | | 3 |
| | Open circuit and short circuit test of synchronous generator | | 3 |
| | Synchronous generator synchronization and synchronous generator under load | | 3 |
| | Determination of induction motor power flow diagram under full load | | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Determination of separately Excited DC Motor no-load and torque-speed characteristics. | | | | | 3 |
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐*on line* in entirety<br>☐ partial e-learning<br>☐ field work | | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) | | | |
| Studentresponsibilities | The presence on lectures in the amount of at least 70% of the times scheduled.<br>Performed all required laboratory exercises. | | | | | |
| Screening student work *(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 4,5 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,5 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,2 |
| | Written exam | 0,1 | Project | | (Other) | |
| Grading and evaluating student work in class and at the final exam | During the semester there will be two midterm tests. The first test will be at the eighth week of classes, the second at the first week of the exam period. Student can pass the entire exam by midterm tests.<br>At the two final exams, students take parts of the curriculum that did not pass by midterm tests. If at the first final exam student passes one of the two parts of curriculum that part of curriculum the student does not have to take on another final exam.<br>The condition for positive assessment is that the student has at least 50% of each part of the curriculum at the midterm tests or at the final exams. The final grade (in percent) is formed on the basis of all activities according to the formula:<br><br>Rating (%) = 0.1 * LV + 0.45 * (G1 + G2)<br><br>wherein the activity is expressed in percentage according to:<br><br>LV -percentage obtained by laboratory exercises,<br>G1, G2 - percentage obtained by midterm tests or final exams of the parts of curriculum given in lectures.<br><br>Students who did not pass the exam after two final exams can pass the exam at the last week of August or the first week of September. Last chance to take the exam in this school year is a so-called commission exam. In a so-called commission exam all students take the entire curriculum, and the condition for positive assessment is that the student has at least 50% of entire curriculum.<br><br>The final score (in percentage) is formed on the basis of all activities according to the formula:<br><br>Rating (%) = 0.1 * LV + 0.9 * G<br><br>wherein the activity is expressed in percentage according to:<br><br>LV -percentage obtained by laboratory exercises,<br>G - percentage obtained by exams of the entire curriculum given in lectures.<br><br>The final grade is determined as follows: | | | | | |

<table>
<tr><td rowspan="1"></td><td colspan="3">Rating Grade<br>50% to 61% sufficient (2)<br>62% to 74% good (3)<br>75% to 87% very good (4)<br>88% 100% excellent (5)</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>I. Jurić-Grgić: Lectures, FESB</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">A. Dolenc: Transformatori I i II, Interna skripta, ETF, Zagreb, 1989.<br>R. Wolf: Osnove električnih strojeva, Školska knjiga, Zagreb, 1985.<br>L.M. Piotrovskij: Električni strojevi, Tehnička knjiga, Zagreb, 1978.<br>B.S. Guru and H.R. Hiziroglu: Electric Machinery and Transformers, Oxford University Press, 2001.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Evaluation of students presence on lectures<br>- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTRICAL POWER SWITCHGEARS</td></tr>
<tr><td>Code</td><td>FENO06</td><td>Year of study</td><td colspan="5">2.</td></tr>
<tr><td>Course teacher</td><td>Tonći Modrić, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">6</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>45</td><td>0</td><td>15</td><td>15</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding the basic theoretical and practical knowledge in the electrical power switchgears,<br>- understanding the concept of different electrical power switchgear types,<br>- dimensioning and selection of basic high voltage electrical power switchgear elements,<br>- determination of equivalent circuits and impedances of elements in power system,<br>- calculation of basic fault currents in power system.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- specify the role of electrical power switchgears in power system,<br>- enumerate different electrical power switchgear types,<br>- define the currents relevant for dimensioning the electrical power switchgear elements,<br>- specify the basic high voltage elements in the electrical power switchgears,<br>- describe the basic faults in the electrical power switchgear,<br>- calculate the basic fault currents,<br>- select the basic high voltage elements in the electrical power switchgear.</td></tr>
<tr><td rowspan="9">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Role and functions of electrical power switchgears in power system. Different electrical power switchgear types. Basic high voltage elements and subsystems of electrical power switchgears (classification and graphical symbols).</td><td>3</td><td>0</td></tr>
<tr><td colspan="5">Stresses of electrical power switchgear elements caused by electrical current. Basic faults. Calculation of symmetrical and unsymmetrical fault currents using the method of symmetrical components.</td><td>5</td><td>3</td></tr>
<tr><td colspan="5">Equivalent short-circuit impedances of power system elements.</td><td>4</td><td>3</td></tr>
<tr><td colspan="5">Analysis of typical short-circuit current-time diagram. Short-circuit current components.</td><td>1</td><td>1</td></tr>
<tr><td colspan="5">Definitions and calculations of currents relevant for dimensioning of electrical power switchgear elements (peak, thermal and breaking short-circuit current).</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Voltage stresses of high voltage electrical power switchgear elements. Standard nominal and highest voltages used in power system. Overvoltages. Standard withstand voltages and testing procedures. Insulation coordination. Grounding of power system neutral point.</td><td>3</td><td>1</td></tr>
<tr><td colspan="5">Basic high voltage electrical power switchgear elements.</td><td>8</td><td>2</td></tr>
<tr><td colspan="5">Busbar system concepts, circuit configurations.</td><td>3</td><td>0</td></tr>
</table>

<table>
<tr><td rowspan="11"></td><td colspan="4">The structure of typical electrical power switchgear bays.</td><td>1</td><td>0</td></tr>
<tr><td colspan="4">The auxiliary electrical power switchgear systems. Types and elements of secondary systems. The auxiliary circuits and their functions (measurement, protection, control, interlocking, signalling).</td><td>4</td><td>1</td></tr>
<tr><td colspan="4">Sources and distribution of the auxiliary voltages in the electrical power switchgear systems.</td><td>2</td><td>0</td></tr>
<tr><td colspan="4">Typical layouts of electrical power switchgears.</td><td>3</td><td>0</td></tr>
<tr><td colspan="5">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="5">Unsymmetrical load of two-winding power transformers.</td><td>3</td></tr>
<tr><td colspan="5">Unsymmetrical load of three-winding power transformers.</td><td>3</td></tr>
<tr><td colspan="5">Measurement of power transformer impedances.</td><td>3</td></tr>
<tr><td colspan="5">Current transformer.</td><td>3</td></tr>
<tr><td colspan="5">Calculation of fault currents and voltages on a computer.</td><td>3</td></tr>
<tr><td colspan="5"></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises and submitted all written reports with measurement and calculation results.</td></tr>
<tr><td rowspan="5">Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*</td><td>Class attendance</td><td>1,7</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>3,0</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>0,6</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,4</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 3 theoretical questions and 1 numerical problem. Each final test consists of 6 theoretical questions and 2 numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises with submitted all written reports and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>$$\text{Grade (\%)} = 0{,}05\ NP + 0{,}05\ LV + 0{,}45\ (M1 + M2)$$<br>the activities in percentage:<br>• NP – attendance at lectures,<br>• LV – laboratory assessment,<br>• M1, M2 – midterm test results.<br>The final grade is determined as follows:<br>• 50 - 61 % sufficient (2)<br>• 62 - 74 % good (3)<br>• 75 - 87 % very good (4)<br>• 88 - 100 % excellent (5)</td></tr>
<tr><td>Required literature (available in the</td><td colspan="4">**Title**</td><td>**Number of copies in the library**</td><td>**Availability via other media**</td></tr>
</table>

| | | | |
|---|---|---|---|
| library and via other media) | T. Modrić: Autorizirana predavanja, FESB | | e-learning portal |
| | T. Modrić: Autorizirane auditorne vježbe, FESB | | e-learning portal |
| | I. Medić, E. Sutlović: Električna postrojenja, upute za laboratorijske vježbe, Redak, Split, 2014. | | webknjizara.hr |
| Optional literature (at the time of submission of study programme proposal) | • H. Požar: Visokonaponska rasklopna postrojenja, Tehnička knjiga, Zagreb, 1990.<br>• K. Meštrović: Sklopni aparati srednjeg i visokog napona, Graphis, Zagreb, 2007.<br>• R. Milošević: Vakuumski električni sklopni aparati, Graphis, Zagreb, 2011.<br>• A. Dolenc: Transformatori, Sveučilište u Zagrebu, 1968. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of student presence on lectures<br>- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | - | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTRICAL SAFETY</td></tr>
<tr><td>Code</td><td>FENO15</td><td>Year of study</td><td colspan="5">3.</td></tr>
<tr><td>Course teacher</td><td>Ivica Jurić-Grgić, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td></td><td></td><td>30</td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- permanent adoption and understanding of the most important technical protective measures against electric shock,<br>- adoption of the methodology, procedures and measures for protection when working with electrical equipment, machinery and plants.<br>- testing of electrical installation</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- explain the danger of possible electric shock on low and high voltage facilities,<br>- describe and define the most important technical protective measures against electric shock on low and high voltage facilities,<br>- examine the validity of protection against direct and indirect contact in low voltage and high voltage installations,<br>- examine the validity of protection against overloads and short circuits in electrical installations.</td></tr>
<tr><td rowspan="20">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L hours</td></tr>
<tr><td colspan="6">Effect of electrical current on the human body.</td><td>2</td></tr>
<tr><td colspan="6">Types of hazards associated with electrical current: direct contact, indirect contact, transferred potential, induced voltages, electric arc, static electricity, residual charge, lightning strikes, effect of electrical and magnetic fields on the human body.</td><td>4</td></tr>
<tr><td colspan="6">Technical safety performance of low voltage installations. Types of low voltage systems, grounding, grounding protection against direct or indirect contact, simultaneous protection against direct or indirect contact.</td><td>6</td></tr>
<tr><td colspan="6">Protection by electrical separation, overvoltage protection from high voltage system, protection against atmospheric and switching overvoltage. Special protection measures on construction sites and limited conductive area.</td><td>4</td></tr>
<tr><td colspan="6">Technical safety in high voltage installations.</td><td>2</td></tr>
<tr><td colspan="6">Overhead lines, safety distances and heights. Grounding of columns.</td><td>2</td></tr>
<tr><td colspan="6">Rules and safety measures when working on electrical installations.</td><td>2</td></tr>
<tr><td colspan="6">Security measures in switchyards, substations and power plants.</td><td>2</td></tr>
<tr><td colspan="6">Safety measures when working on overhead lines, cables and in underground facilities. Live-line working.</td><td>2</td></tr>
<tr><td colspan="6">List of laboratory exercises</td><td>LE hours</td></tr>
<tr><td colspan="6">Conductor continuity measurement</td><td>3</td></tr>
<tr><td colspan="6">Insulation resistance measurement</td><td>3</td></tr>
<tr><td colspan="6">Fault loop impedance measurement</td><td>3</td></tr>
<tr><td colspan="6">Line impedance and prospective short circuit current measurement</td><td>3</td></tr>
<tr><td colspan="6">Testing of RCD Protection Devices</td><td>3</td></tr>
<tr><td colspan="6">Earth Resistance Measurement</td><td>3</td></tr>
<tr><td colspan="6">Earth Resistivity Measurement</td><td>3</td></tr>
<tr><td colspan="6">Leakage Current Measurement</td><td>3</td></tr>
</table>

<table>
<tr><td></td><td colspan="5">Technical safety in high voltage installations (field work)</td><td>6</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒lectures<br>☐seminars and workshops<br>☐exercises<br>☐on linein entirety<br>☐partial e-learning<br>☒field work</td><td colspan="3">☐independent assignments<br>☒multimedia<br>☒laboratory<br>☐work with mentor<br>☐ (other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">The presence at the lectures at least 70% of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Independent work</td><td>2,5</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>1</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,2</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester there will be two midterm tests. The first test will be at the eighth week of classes, the second at the first week of the exam period. Student can pass the entire exam by midterm tests.<br>At the two final exams, students take parts of the curriculum that did not pass by midterm tests. If at the first final exam student passes one of the two parts of curriculum that part of curriculum the student does not have to take on another final exam.<br>The condition for positive assessment is that the student has at least 50% of each part of the curriculum at the midterm tests or at the final exams. The final grade (in percent) is formed on the basis of all activities according to the formula:<br><br>Rating (%) = 0.1 * LV + 0.45 * (G1 + G2)<br><br>wherein the activity is expressed in percentage according to:<br><br>LV -percentage obtained by laboratory exercises,<br>G1, G2 - percentage obtained by midterm tests or final exams of the parts of curriculum given in lectures.<br><br>Students who did not pass the exam after two final exams can pass the exam at the last week of August or the first week of September. Last chance to take the exam in this school year is a so-called commission exam. In a so-called commission exam all students take the entire curriculum, and the condition for positive assessment is that the student has at least 50% of entire curriculum.<br><br>The final score (in percentage) is formed on the basis of all activities according to the formula:<br><br>Rating (%) = 0.1 * LV + 0.9 * G<br><br>wherein the activity is expressed in percentage according to:<br><br>LV -percentage obtained by laboratory exercises,<br>G - percentage obtained by exams of the entire curriculum given in lectures.<br><br>The final grade is determined as follows:<br><br><br>Rating Grade<br>50% to 61% sufficient (2)</td></tr>
</table>

| | | | |
|---|---|---|---|
| | 62% to 74% good (3)<br>75% to 87% very good (4)<br>88% 100% excellent (5) | | |
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | I. Jurić-Grgić: Lectures, FESB | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | E. Mileusnić: Ispitivanje električnih instalacija niskog napona, ZIRS, Zagreb, 2006.<br>Siemens: Electrical Instalation Handbook-Third Edition,(Editor: Gunter G Seip) John&Wiley, 2000. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of students presence on lectures<br>- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTROMAGNETIC COMPATIBILITY</td></tr>
<tr><td>Code</td><td>FELO21</td><td>Year of study</td><td colspan="5">3.</td></tr>
<tr><td>Course teacher</td><td>Vicko Dorić, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Maja Škiljo, Ph.D.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td></td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding of basic principles of electromagnetic compatibility (EMC),<br>- understanding of basic principles of electromagnetic coupling between systems and technics used for its suppression,<br>- interpreting governing EMC standards<br>- analyzing EMC problems using adequate computational models,<br>- measuring radiated EM fields both on high and low frequencies.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Fundamentals of Electrical Engineering1 & 2.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- define the fundamental terms in electromagnetic compatibility,<br>- classify types of the electromagnetic interference,<br>- recognize potential EMC problems in practical situations,<br>- measure radiated EM fields both on high and low frequencies.,<br>- calculate basic parameters of the internal dosimetry using simple human body models,<br>- use commercial antenna simulation software for the analysis of the EMC programs,<br>- compare results obtained by calculations or measurement with relevant EMC standards.</td></tr>
<tr><td rowspan="20">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Introduction to the engineering modeling and electromagnetic compatibility.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Historical overview of EMC modeling.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Classification of the EMC problems.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Signal spectrum, radiated emissions and susceptibility.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Conducted emissions and susceptibility.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">European and international standards.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Low frequencies (LF) models with concentrated parameters.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">High frequencies (HF) models with distributed parameters.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Wire antenna analysis in the EMC applications.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Transmission line models.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Humans and equipment protection from EM radiation.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Lightning protection systems, grounding systems.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Electromagnetic compatibility of collocated radio transmission systems.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">Cable losses measurement.</td><td>3</td></tr>
<tr><td colspan="6">Frequency characteristics of the electronic circuits</td><td>3</td></tr>
<tr><td colspan="6">Non ideal behavior of the electronic components.</td><td>3</td></tr>
<tr><td colspan="6">Modulations and modulators.</td><td>3</td></tr>
<tr><td colspan="6">Crosstalk in cables.</td><td>3</td></tr>
</table>

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|---|---|---|
| | Noise measurement using induction. | 3 |
| | Shielding. | 3 |
| | Calibration of electric and magnetic field measurement probes. | 3 |
| | Measurement of electric and magnetic field of the transformer station. | 3 |
| | Calibration and measurement of the antenna parameters in GTEM cell. | 3 |

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| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

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| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2,0 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,0 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,5 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,2 |
| | Written exam | 0,1 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students take tests they didn't pass on the midterm exams. Both midterm tests last for the 75 min. and consists of 10 questions or problems. In order to pass the exam, students are required to finish all laboratory exercises and gain at least 50% of total points at both midterm exams. Final score is determined in following way:

Score(%) = 0,5 (M1 + M2)

where M1 and M2 are midterm exams score.

Final grade is determined according the final score:

| Score | Grade |
|---|---|
| 50% to 62% | sufficient (2) |
| 63% to 75% | good (3) |
| 76% to 88% | very good (4) |
| 89% to 100% | excellent (5) |

In the final exams students take tests they didn't pass on the midterm exams. Exam is performed in the written form. It lasts for the 75 min. and consists of 10 questions or problems. In order to pass the exam, students are required to gain at least 50% of total points. The final grade is then determined as explained above.
There is possibility to take a seminar instead of the test.

| Required literature (available in the library and via other media) | Title | Number of copies in the library | Availability via other media |
|---|---|---|---|
| | Clayton R. Paul: "Introduction to Electromagnetic Compatibility", Wiley, New Jersey, 2006 | | |
| | Dragan Poljak: "Advanced modeling in computational electromagnetic compatibility", Wiley Interscience, 2007. | | |
| | Poljak, D., Dorić, V., Antonijević S.: Modeliranje žičanih antena primjenom računala, Kigen, Zagreb, 2009. | | |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | 1. D.Poljak, *Teorija elektromagnetskih polja s primjenama u inženjerstvu*, Šk. knjiga Zagreb, 2014.<br>2. Tesche, F.M.: Ianoz, M.V., Karslsson, T.: EMC Analysis Methods and Computational Models, John Wiley & Sons, 1997<br>3. Macnamara, T.: Handbook of Antennas for EMC, Artech House, 1995. |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTRONIC CAD</td></tr>
<tr><td>Code</td><td>FELO27</td><td>Year of study</td><td colspan="5">2</td></tr>
<tr><td>Course teacher</td><td>Mojmil Cecić, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">-</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- application of the computer in electronics,<br>- use of the computer in analyses and synthesis of the linear and nonlinear control systems,<br>- use of the computer in analyses and synthesis of the analog and digital electronics circuits.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- use VISSIM to the analyses and synthesis of the linear and nonlinear control systems,<br>- use MATLAB - Simulink to the analyses and synthesis of the linear and nonlinear control systems,<br>- solve the complex tasks of simulation of the linear and nonlinear control systems,<br>- use EWB to simulation the different electronics circuits,<br>- use PROTEL to simulation the different electronics circuits,<br>- create schematic view, create PCB</td></tr>
<tr><td rowspan="13">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="4">Course content</td><td colspan="2">L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="4">Introduction, application of computer in electronics</td><td colspan="2">1</td><td></td></tr>
<tr><td colspan="4">VISSIM: outlines, basic elements and their characteristics</td><td colspan="2">1</td><td></td></tr>
<tr><td colspan="4">VISSIM: operations with blocks, simulation properties, basic mathematical operations</td><td colspan="2">2</td><td></td></tr>
<tr><td colspan="4">VISSIM: advanced mathematical operations, differentiation, integration, solving differential equations</td><td colspan="2">2</td><td></td></tr>
<tr><td colspan="4">VISSIM: work with complex systems, work with compound blocks, animation</td><td colspan="2">2</td><td></td></tr>
<tr><td colspan="4">Analyse and syntheses using VISSIM</td><td colspan="2">2</td><td></td></tr>
<tr><td colspan="4">MATLAB – Simulink: outlines, basic elements and their characteristics</td><td colspan="2">1</td><td></td></tr>
<tr><td colspan="4">MATLAB – Simulink: operations with blocks, simulation properties, basic mathematical operations, advanced mathematical operations, differentiation, integration, solving differential equations</td><td colspan="2">2</td><td></td></tr>
<tr><td colspan="4">ELECTRONIC WORKBENCH (EWB): outlines, basic elements and their characteristics</td><td colspan="2">1</td><td></td></tr>
<tr><td colspan="4">ELECTRONIC WORKBENCH (EWB): simulation of the analog electronic circuits</td><td colspan="2">2</td><td></td></tr>
<tr><td colspan="4">ELECTRONIC WORKBENCH (EWB): simulation of the digital electronic circuits (TTL)</td><td colspan="2">2</td><td></td></tr>
<tr><td colspan="4">ELECTRONIC WORKBENCH (EWB): simulation of the digital electronic circuits (CMOS)</td><td colspan="2">2</td><td></td></tr>
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|---|---|---|---|
| | PROTEL (Schematic Editor): outlines, basic elements and their characteristics | 2 | |
| | PROTEL (PCB Editor): outlines, basic elements and their characteristics | 2 | |
| | PROTEL: simulation of the analog and digital electronic circuits | 2 | |
| | List of laboratory or design exercises | | LE or DE hours |
| | VISSIM: operations with blocks, simulation properties, basic mathematical operations | | 2 |
| | VISSIM: simulation of simple systems | | 2 |
| | VISSIM: simulation of complex systems | | 3 |
| | MATLAB – Simulink: operations with blocks, simulation properties, basic mathematical operations | | 2 |
| | MATLAB – Simulink: simulation of simple systems | | 2 |
| | MATLAB – Simulink: simulation of complex systems | | 3 |
| | EWB: Analog Circuits Design | | 3 |
| | EWB: Digital Circuits Design | | 3 |
| | PROTEL: Schematic Editor | | 3 |
| | PROTEL: PCB Editor | | 3 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,5 |
| | Essay | | Seminar essay | 0,2 | (Other) | |
| | Tests | 0,2 | Oral exam | | (Other) | |
| | Written exam | 0,1 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks.

The requirement for passing grade is the positive assessment of laboratory exercises and 50% points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:

$$\text{Grade [\%]} = 0{,}25 \cdot L + 0.375 \cdot (M1 + M2)$$

where L is laboratory assessment and M1 and M2 are the results of the midterm exams in percentage.

Each midterm test consists of 2 programming tasks and final test consists of 4 programming tasks. The requirement for passing grade is 50% of the total number of questions. The students who did not pass the midterm exams take part in the final exam. Finally grade is determined as follows:

from 50% to 62.5% - dovoljan (2)
from 62.5% to 75% - dobar (3)
from 75% to 87.5% - vrlodobar (4)
from 87.5% to 100% - izvrstan (5)

Midterm and final exams are held in the terms provided by the time table.

<table>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>VISSIM, User Guide</td><td>1</td><td></td></tr>
<tr><td>MATLAB – Simulink, User Guide</td><td>1</td><td></td></tr>
<tr><td>Electronics Workbench, User Guide</td><td>1</td><td></td></tr>
<tr><td>Cecić, M., PROTEL, authorized lectures</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">- V. Zanchi, M. Cecić, M. Cecić: Programska podrška linearnoj teoriji automatske regulacije, FESB – Split, 1990.<br>- V. Zanchi, A. Raguž: Simulacija u MATLABu, FESB – Split, 1998.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **ELECTRONIC CIRCUITS DESIGN** | | | | | | | |
| **Code** | FELO47 | Year of study | 3. | | | | | |
| **Course teacher** | Ivan Marinović, Ph.D. Full Professor | Credits (ECTS) | 5 | | | | | |
| Associate teachers | Duje Čoko, Ph.D. | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 15 | | 15 | 30 | | |
| Status of the course | Elective | Percentage of application of e-learning | | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- synthesis of electronic circuits<br>- analysis of complex electronic circuits<br>- projecting of simple electronic device |
| Course enrolment requirements and entry competences required for the course | Finished coarse *Electronic circuits* |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- design electronic circuits<br>- construct a prototype of the projected circuit<br>- make measurements of electronic parameters applying oscilloscopes and analyzers<br>- understand principles of operation of more complex circuits |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Synthesis of electronic circuits | 2 | 2 |
| Cutoff frequencies as parameters for synthesis | 1 | 1 |
| Design of feedback amplifiers | 1 | 1 |
| Operational amplifiers, slew-rate, LM741 | 3 | 3 |
| C-class, D-class and E-class power amplifiers | 2 | 2 |
| Energy converters, rectifiers and stabilizers of voltage, LM723 | 3 | 3 |
| Switching regulators | 1 | 1 |
| Timers, NE555 | 1 | 1 |
| Oscillators | 1 | 1 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Electronic project: construction of given electronic circuit (design, simulation, PCB design and construction, soldering of components, measurements on the device, final report) | 30 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures and exercises in the amount of at least 70% of the times scheduled. Performed all required laboratory exercises. | |

| Screening student work *(name the proportion of ECTS credits for each activity so that the* | Class attendance | 2 | Research | | Practical training | |
|---|---|---|---|---|---|---|
| | Experimental work | | Report | | Exercises | 1 |
| | Essay | | Seminar essay | | Individual work | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *total number of ECTS credits is equal to the ECTS value of the course)* | Tests | | Oral exam | | (Other) | |
| | Written exam | | Project | | (Other) | |
| Grading and evaluating student work in class and at the final exam | The course should be graded according to outcomes of the project and oral exam. The absolute grading is applied. | | | | | |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | P. Biljanović: Elektronički sklopovi, Školska knjiga, Zagreb | 5 | |
| | U. Tietze, C. Schenk, Advanced electronics circuits | | |
| Optional literature (at the time of submission of study programme proposal) | | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evidence of students attendance<br>- Annual analysis of grades achieved<br>- Teachers self-evaluation<br>- Students feedback via questionnaires and surveys | | |
| Other (as the proposer wishes to add) | | | |

| NAME OF THE COURSE | ELECTRONIC CONVERTERS FOR POWER SUPPLIES | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FENO21 | Year of study | 3 | | | | |
| **Course teacher** | Dinko Vukadinović, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Mateo Bašić, Ph.D. Assistant Professor<br>Ivan Grgić, Assistant | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 15 | 15 | 0 |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding of basic principles of electronic converters for power supplies<br>- making a selection of components for electronic converters for power supplies |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br><br>1) Explain the operating principles of electronic converters in the linear and switch mode<br>2) Describe the characteristics of electronic converters components<br>3) Analyze single-phase half-wave diode rectifier loaded with the capacitor and the resistor<br>4) Analyze the impact of the power transformer leakage inductance on the natural commutation in the single-phase bridge rectifier<br>5) Calculate the minimal inductance in the DC-DC converters which ensures the operation in continuous mode<br>6) Discuss the current and voltage waveforms in isolated DC-DC converters<br>7) Derive the voltage transfer ratio for isolated DC-DC converters<br>8) Explain the active power factor correction<br>9) Compare the UPS systems which operate in normal mode of operation, in stored-energy mode of operation and bypass mode of operation |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L hours | AE hours |
|---|---|---|
| Introduction. Schemes of electronic converters for power supplies | 1 | |
| Components of electronic converters for power supplies | 1 | |
| Diode rectifiers | 3 | 3 |
| Switch-mode non-isolated DC-DC converters (buck, boost, buck-boost, Ćuk and bridge) | 3 | 4 |
| Switch-mode isolated DC-DC converters (forward, flyback, push-pull, half-bridge and bridge) | 6 | 4 |
| Single-phase and three-phase inverters | 4 | 3 |
| Frequency converters | 2 | |
| Active and passive power factor correction | 2 | 1 |
| Uninterruptable power supply | 2 | |
| Examples of electronic converters in electric drives and electric power generation | 2 | |

| List of laboratory exercises | LE hours |
|---|---|
| Single-phase half-wave diode rectifier | 4 |
| Single-phase full-wave diode rectifier | 4 |
| Non-isolated DC-DC boost converter | 4 |
| Non-isolated DC-DC buck-boost converter | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Speed control system of a separately-excited DC motor | | | | | | 3 |
| Format of instruction | x lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | | | x independent assignments<br>☒ multimedia<br>x laboratory<br>☐ work with mentor<br>**☐ (other)** | | | |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | | | | | | |
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | | |
| | Experimental work | | Report | | Individual work | 2 | |
| | Essay | | Seminar essay | | Laboratory exercises | 1 | |
| | Midterm exams | 0.3 | Oral exam | | Auditory exercises | 0.5 | |
| | Written exam | 0.2 | Project | | (Other) | | |
| Grading and evaluating student work in class and at the final exam | During the semester, two midterm exams are held - the first after 7 weeks of lectures and the second after 13 weeks of lectures. Each midterm exam consists of 4 problems, either theoretical or numerical. In the final exams, students take those parts of the course which they did not pass in the midterm exams.<br><br>The requirement for passing grade is that the sum of the laboratory exercises' grade (L) and the midterms' grades (M1 and M2), expressed as a percentage, is 50% or more. The sum is calculated as<br><br>Grade (%) = 0.25L + 0.375(M1 + M2)<br><br>where the number of points achieved in each midterm exam has to be at least 50%.<br><br>The students that do not pass the midterm exams take the final written exam which consists of 4 problems. The requirement for a positive evaluation of the final exam is at least 50% points achieved. In the final exam, the students that did not pass one of the midterm exams are presented with 4 problems from the corresponding part of the course. Subsequently, the grade is determined as follows:<br><br>Grade (%) = 0.25L + 0.75(I)<br><br>where I is the number of points achieved in the final written exam (at least 50%).<br><br>The final grade for the course is determined as follows:<br><br>50% to 61% - Sufficient (2)<br>62% to 74% - Good (3)<br>75% to 87% - Very good (4)<br>88% 100% - Excellent (5) | | | | | | |
| Required literature (available in the library and via other media) | **Title** | | | | **Number of copies in the library** | **Availability via other media** | |
| | Vukadinović, D.: Predavanja iz kolegija Elektronički pretvarači za napajanje, šk. god. 2014/15. | | | | | e-learning portal | |
| Optional literature (at the time of submission of study programme proposal) | Hase, Y.: Handbook of power systems engineering with power electronics applications, John Wiley, 2013.<br>Emadi A., Nasiri A., Bekiarov S. B.: Uninterruptable Power Supplies and Active Filters, CRC Press, New York, 2005. | | | | | | |
| Quality assurance methods that ensure | - Keeping records of student attendance<br>- Annual analysis of the performance at midterm exams and final exams | | | | | | |

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|---|---|
| the acquisition of exit competences | - Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Feedback from graduated students |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELECTRONIC INSTRUMENTATION</td></tr>
<tr><td>Code</td><td>FELO20</td><td>Year of study</td><td colspan="5">3</td></tr>
<tr><td>Course teacher</td><td>Ivan Marasović, Ph.D.<br>Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>15</td><td></td><td>0</td><td>45</td><td></td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5"></td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- Understanding the main properties of digital instrumentation chain using microcontrollers in instrumentation.<br>- Signal acquiring and conditioning, analog to digital conversion, data representation.<br>- Development of digital instrumentation chain based on the AVR ATMEL series microcontroller.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- State the basic principles of microcontrollers.<br>- Choose the basic peripheral components necessary for microcontrollers based system.<br>- Programing microcontrollers in assembler and C.<br>- Acquisition, conditioning and processing physical signals by using microcontrollers.<br>- Send processed data to computer using serial communication (RS232) and representation on the alphanumerical 16x2 display.</td></tr>
<tr><td rowspan="11">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L hours</td></tr>
<tr><td colspan="6">Introduction. Digital instrumentation chain based on the microcontrollers.</td><td>1</td></tr>
<tr><td colspan="6">Microcontroller and microprocessors. Microprocessors architecture. Program counter, instructions and operation code, pipeline and status register. Memory organization and buses.</td><td>1</td></tr>
<tr><td colspan="6">ATmega16 microcontroller architecture (internal modules, IO ports, timer/counter, USART, ADC). Registers and memory organization and addressing.</td><td>1</td></tr>
<tr><td colspan="6">System clock and clock options. Power management and sleep modes. System control and reset.</td><td>1</td></tr>
<tr><td colspan="6">General purpose input-output pins, data direction register, data register and input register. Alternate port functions. Timer/counter modules and modes of operation. Timer/counter interrupt vectors.</td><td>1</td></tr>
<tr><td colspan="6">Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART) for serial communication. USART register description. Baud rate setting.</td><td>1</td></tr>
<tr><td colspan="6">Memory programing, memory and data memory lock bits. Fuse bits, signature and calibration byes. Parallel, serial and JTAG programing.</td><td>1</td></tr>
<tr><td colspan="6">Microcontroller peripheral components, supply, reset and clock source circuits.</td><td>1</td></tr>
<tr><td colspan="6">Digital instrumentation chain. Acquiring, conditioning and signal processing. Noise and method for noise cancelling.</td><td>1</td></tr>
<tr><td colspan="6">Analog circuits in instrumentation chain, amplifiers, filters, bridges and analog-digital converters.</td><td>1</td></tr>
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| | | |
|---|---|---|
| | Data representation, LED, seven segment display, LCD alphanumerical and graphic display. Development of custom defined symbols. Connecting display to microcontroller, initialization and communication. | 1 |
| | Standard communication interfaces in digital instrumentation, USART (RS232), SPI, TWI/I2C, CAN, WIFI, Ethernet, IrDA, DALI, 1-wire | 1 |
| | ARM microcontrollers and processors. Architecture and mode of operations. | 1 |
| | List of laboratory or design exercises | LE hours |
| | Introduction to Atmel studio and STK500. I/O pins configuration, LED blinking examples in assembler and C. | 6 |
| | Program, data and EEPROM memory using. | 6 |
| | Timer/counter application. Interrupts generated by timer/counter. | 6 |
| | Executing program - monitoring module (watchdog timer). | 6 |
| | Using serial standard RS232, connecting microcontroller to computer. | 6 |
| | Analog comparator module application. | 6 |
| | Using alphanumerical 16x2 display and LM35 temperature sensor. | 3 |
| | Connecting display and temperature sensor to microcontroller and digital thermometer development. | 6 |

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| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | Students should attend at least 70% of the lectures. Students must complete all laboratory exercises. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 0,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 1.75 |
| | Essay | | Seminar essay | | Laboratory exercises | 1,5 |
| | Tests | 0.15 | Oral exam | | Preparation for laboratory exercises | 0.25 |
| | Written exam | 0.1 | Project | 0,75 | (Other) | |

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| Grading and evaluating student work in class and at the final exam | There are two midterm exams and a final exam. The first midterm exam is scheduled after 7 weeks of classes and the second one after the following 6 weeks. Each midterm exam is written and consists of 10 theoretical/numerical/programming problems. Each midterm exam lasts 90 minutes. To pass an exam, the student should score at least 50% in the midterms and also have a positive assessment of the laboratory exercises.<br>The final grade (in percentage) is determined according to the formula:<br>Grade(%) = 0.15(M1+M2)+0.4L+0,3P,<br>where:<br>• M1, M2 – grade from questions in midterms given in percentage,<br>• L – grade from laboratory exercises given in percentage.<br>• P – grade from final project given in percentage.<br>Students not passing the midterm exams take part in the final exam. It consists of 10 theoretical/numerical/programing problems and lasts 160 minutes. For passing the final exam, students must score at least 50%, as well as have a positive assessment of the laboratory exercise. The grade on final exams is determined by the formula:<br>Grade(%) = 0.3(T)+0.4L+0,3P,<br>where:<br>• T – grade from theoretical questions given in percentage,<br>• L – grade from laboratory exercises given in percentage,<br>• P – grade from final project given in percentage. |

| | Title | Number of copies in the library | Availability via other media |
|---|---|---|---|
| Required literature (available in the library and via other media) | I. Marasović – autorizirana predavanja (PowerPoint) | | e-learning portal |
| | M. Ali Mazidi, Sa. Naimi, Se. Naimi, The AVR microcontrollers and embedded systems, Using assembly and C, Prentice Hall, 2011. | | |
| | Ivo Mateljan: Virtualna instrumentacija – skripta, FESB, 2008. | | |
| | A. Šantić: Elektronička instrumentacija, 3. izdanje, Školska knjiga, Zagreb, 1993. | | |
| | Marasović, I: Digitalna instrumentacija I - Upute za laboratorijske vježbe, Skripta za internu upotrebu, | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | P. Horowitz, W. Hill: The Art of Electronics, Cambridge University Press, 2015.<br>M. Balch: Complete digital design: A comprenhensive guide to digital electronics and computer system architecture, McGRAW-HILL, 2003.<br>Timothy S. Margush: SOME ASSEMBLY REQUIRED Language Programming with the AVR Microcontroller, CRC Press, 2012.<br>Günther Gridling, Bettina Weiss: Introduction to Microcontrollers, Courses 182.064 & 182.074, Vienna University of Technology Institute of Computer Engineering Embedded Computing Systems Group, 2007 | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Record of number of students attending the classes<br>- Evaluation of results in accordance with expected learning outcomes<br>- Feedback from students via student surveys<br>- Teachers self-evaluation<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ELEMENTS OF ROBOTICS</td></tr>
<tr><td>Code</td><td>FELO29</td><td>Year of study</td><td colspan="5">2.</td></tr>
<tr><td>Course teacher</td><td>Mirjana Bonković, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Miroslav Dujmović, BSc (external collaborator)</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>15</td><td>15</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students:<br>- to understand the basic working principles and limitations of individual robot components (actuators, sensors and control units).<br>- to understand and to apply different techniques for solving problems in the robotics domain such as control and navigation, as well as programming robot to perform desired task.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- describe various mechanical configurations of robot manipulators<br>- define a kinematic model of the robot manipulator (mobile robot)<br>- comment importance of dynamics for the robot control<br>- explain different modes of mobile robot control.<br>- demonstrate the acquired knowledge by programming the robot behavior<br>- demonstrate the functionality of the simulation and be able to comment the usefulness and disadvantages of the results</td></tr>
<tr><td rowspan="17">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L or S hours</td></tr>
<tr><td colspan="6">Introduction: history of robotics. Classification of robots. Robot's paradigms. Introduction. History of robotics. Classification of robots. Robotic paradigms.</td><td>2</td></tr>
<tr><td colspan="6">Robot components. Degrees of freedom. Robot coordinates. Robot reference frames. Work space. Robot applications</td><td>2</td></tr>
<tr><td colspan="6">Robot kinematics: Robot as a mechanism. A homogeneous transformation matrix. Matrix representation Homogenous transformation matrices. Representations of transformations.</td><td>4</td></tr>
<tr><td colspan="6">Inverse of transformation matrices. Camera coordinate system.</td><td>2</td></tr>
<tr><td colspan="6">Forward and inverse kinematics of robots.</td><td>2</td></tr>
<tr><td colspan="6">Differential relationships. Jacobian.</td><td>2</td></tr>
<tr><td colspan="6">Sensors: sensor characteristics, uncertainty representation, sensor types: incremental encoders, position and orientation sensors, inertial sensors, vision sensors.</td><td>4</td></tr>
<tr><td colspan="6">Mobile robot kinematics. Drive. Mobile robot control modes: on-off control, PID controller, speed and position controller.</td><td>2</td></tr>
<tr><td colspan="6">Navigation: planning and control.</td><td>4</td></tr>
<tr><td colspan="6">Visual servoing.</td><td>2</td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">A homogeneous transformation matrix.</td><td>2</td></tr>
<tr><td colspan="6">Forward and inverse kinematics of robots.</td><td>2</td></tr>
<tr><td colspan="6">Robot Jacobian.</td><td>2</td></tr>
<tr><td colspan="6">Mobile robot programming in Arduino development environment.</td><td>2</td></tr>
<tr><td colspan="6">Digital I/O – ultrasonic sensor. Analog inputs – IR sensor.</td><td>4</td></tr>
</table>

| | | |
|---|---|---|
| | Motor control. Connection motors and sensors. | 4 |
| | Line following. | 2 |
| | Obstacle avoidance. | 2 |
| | Working on project assignments. | 6 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☒ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 0,6 |
| | Essay | | Seminar essay | 1 | Laboratory exercises | 0,8 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,2 |
| | Written exam | 0,2 | Project | | (Other) | |

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|---|---|
| Grading and evaluating student work in class and at the final exam | During the semester there are two midterm exams. The first midterm exam is after 7 weeks of lectures and the second one is after 13 weeks of lectures (in a form of presentation and defense of the project assignment).The first midterm test is carried out in a written format with duration of 90 minutes. The requirement for passing grade is the positive assessment of laboratory exercises, 50 % points for the first midterm test and positively evaluated presentation and defense of the project assignment. Students are allowed to have at least 45% of total points on midterm exams, as long as the final midterm average is at least 50% of total points.<br>Grade (in percentage) is formed according to the formula:<br><br>Grade(%) = 0,1L + 0,4M1 + 0,5M2<br><br>where:<br>• L – laboratory assessment,<br>• M1, M2 – midterm test results.<br><br>According to Article 65. of Faculty's Bylaw, student is required to participate in all teaching activities attending at least 70% of lectures, and 100% of laboratory exercises. If student does not meet these criteria, she or he won't be able to take part in the final exam, and will be required to enroll in the course the next year. |

| | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| Required literature (available in the library and via other media) | T Siegwart, R., Nourbakhsh, I. R., Scaramuzza D., Autonomous Mobile Robots, MIT Press, 2011. | | teacher/Internet |
| | Thomas Braunl, Embedded Robotics: mobile robot design and applications with embedded systems, Springer, 2006. | | teacher/Internet |
| | S. Thrun, W. Burgard, D. Fox, Probabilistic Robotics, MIT Press, 2006. | | teacher/Internet |
| | Saeed B. Niku: Introduction to Robotics: Analysis, Systems, Applications, Prentice Hall, 2001. | | teacher |

| | | | |
|---|---|---|---|
| | M. Bonković, J. Musić, I Stančić: “Mikroregulatori i ugradbeni mrežni sustavi u Arduino razvojnom okruženju”, faculty book, FESB | | e-learning portal |
| | J. Musić, M. Bonković: Authorised lecture notes, FESB | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | 1. Tadej Bajd: Osnove robotike, Fakulteta za elektrotehniko, Univerza v Ljubljani, 2000.<br><br>2. Kovačić, Laci, Bogdan, Osnove robotike, Fakultet elektrotehnike i računarstva, Zagreb, 1999. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance.<br>- Annual analysis of course statistics in terms of midterm and finals exams.<br>- Feedback from students via surveys.<br>- Teacher self-evaluation.<br>- Feedback from graduated students (or senior students) on course content relevance.<br>- Periodic institutional evolution of course teachers. | | |
| Other (as the proposer wishes to add) | / | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **ENERGY SOURCES** | | | | | | | |
| **Code** | FENO23 | Year of study | 1 | | | | | |
| **Course teacher** | Elis Sutlović, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | | |
| Associate teachers | Marin Mandić, Assistant | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | 0 | 0 | 30 | 0 | |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students for:<br>- acquiring knowledge on the characteristics, reserves and possibilities of converting renewable and non-renewable energy sources,<br>- acquiring knowledge about the processes of converting various forms of energy into electrical and environmental impacts,<br>- acquiring knowledge about the properties and the operating parameters of different types of power plants. | | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- classify energy forms,<br>- describe the basic features of primary forms of energy and the possibility of their exploitation,<br>- classify the reserves of renewable and non-renewable energy sources,<br>- analyze the advantages and disadvantages of certain forms of energy,<br>- understand conversion processes in steam turbine power plants, gas turbine power plants and combined-cycle power plants,<br>- understand conversion processes in nuclear power plants,<br>- classify different types of hydroelectric power plants, describe components of HPP,<br>- describe conversion processes in unconventional sources of electricity. | | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | | | |
|---|---|---|---|
| | Course content | | L hours |
| | History of Energy. Primary energy. Energy conversion. | | 2 |
| | Useful forms of energy. Energy balance. Energy balance of electricity. | | 2 |
| | Coal: types, acquisition, processing, environmental impact, reserves. | | 2 |
| | Liquid and gaseous fuels: acquisition, processing, environmental impact, reserves. | | 2 |
| | Nuclear energy: possibilities, impact on the environment, reserves | | 2 |
| | Steam turbine power plants. Cogeneration of heat and power. | | 2 |
| | Gas turbine power plants. Combined-cycle power plants. | | 2 |
| | First midterm exam | | |
| | Biomass as a Energy Source | | 2 |
| | Hydropower. Types of HPP. Components of HPP. | | 2 |
| | Hydropower Turbines. Calculation of HPP generation capacity | | 2 |
| | Wind energy. Wind power plants | | 2 |
| | Solar energy. Solar thermal technologies. Photovoltaic power station. | | 2 |
| | Geothermal Electricity Production. Forms of ocean energy. | | 2 |
| | Second midterm exam | | |
| | List of laboratory or design exercises | | LE hours |
| | The characteristics and features of non-renewable energy -1 | | 4 |
| | The characteristics and features of non-renewable energy -2 | | 4 |
| | The characteristics and features of renewable energy -1 | | 4 |

| | | |
|---|---|---|
| | The characteristics and features of renewable energy -2 | 4 |
| | Comparison of characteristics of non-renewable energy sources | 6 |
| | Comparison of characteristics of renewable energy sources | 6 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☒ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 1,8 |
| | Essay | | Seminar essay | 1 | Laboratory exercises | 1 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | |
| | Written exam | | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 6 theoretical questions and final tests consist of 10 theoretical questions. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam or the final exam.

Grade (in percentage) is formed according to the formula:

$$\text{Grade}(\%) = 0{,}05\ AL + 0{,}15LA + 0{,}40\ (M1 + M2)$$

the activities in percentage:

- AL - attendance at lectures,
- LA – laboratory assessment,
- M1, M2 – test results.

The final grade is determined as follows:

| Percentage | Description |
|---|---|
| 50% do 61% | Sufficient (2) |
| 62% do 74% | Good (3) |
| 75% do 87% | Very Good (4) |
| 88% do 100% | Excellent (5) |

| Required literature (available in the library and via other media) | Title | Number of copies in the library | Availability via other media |
|---|---|---|---|
| | 1. B. Udovičić. Energija i izvori energije, Građevinska knjiga 1988. | 5 | |
| | 2. B. Udovičić. Energetske pretvorbe i bilance, Građevinska knjiga 1988. | 5 | |
| | 3. E. Sutlović: Predavanja iz energetskih izvora, FESB | | e-learning portal |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | - H. Požar: Osnove energetike, svezak I, II i III, Školska knjiga, Zagreb 1992,<br>- D. Šljivac, Z. Šimić: Obnovljivi izvori energije, 2009. |
| Quality assurance methods that ensure | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys |

| | |
|---|---|
| the acquisition of exit competences | - Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **ENGLISH LANGUAGE 1** | | | | | | | |
| **Code** | FEOO02 | Year of study | 1 | | | | | |
| **Course teacher** | Mira Braović Plavša<br>senior lecturer | Credits (ECTS) | 2 | | | | | |
| Associate teachers | - | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | | 30 | | | | |
| Status of the course | Mandatory | Percentage of application of e-learning | 0 | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding and application of technical vocabulary concerning electrical engineering and information technology<br>- development of students' oral and written communication skills in English<br>- improving general English language knowledge |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- Explain basic notions of electrical engineering, electricity, electromagnetism, electrical charge and conductivity<br>- Define and explain the term electronics and explain use of semiconductors and transistors<br>- Correctly read numbers, units, equations and other mathematical expressions used in engineering<br>- Translate independently less complicated professional texts and interpret tables, diagrams and charts<br>- Use relevant grammar structures (passive, reduced relative clauses, cause and effect clauses, irregular plurals, MLU-s)<br>- Use phrasal expressions to improve English language knowledge |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | S hours | AE hours |
|---|---|---|
| Introduction to the course, U 1 - Electricity | 2 | |
| Study section 1 – introduction to characteristics of technical English | 2 | |
| U 2 – Electromagnetism | 2 | |
| Study section 2 – general and technical English | 2 | |
| U 3 – Electric charges, electrical conductivity | 2 | |
| Study section 3 – multiword lexical units | 2 | |
| U 4 - Mathematics | 2 | |
| First midterm exam | | |
| U 5 – Electronics | 2 | |
| Study section 5 – passive voice | 2 | |
| U 6 – Semiconductors | 2 | |
| Study section 6 –reduced relative clauses | 2 | |
| U 7 – Transistors | 2 | |
| Study section 7- *both, either, neither* | 2 | |
| Second midterm exam | | |

| Format of instruction | | |
|---|---|---|
| | ☐ lectures<br>☒ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☐ work with mentor<br>☐ (other) |

<table>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled.<br>Performed all required exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td></td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>1</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and a final exam. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Students who do not pass both midterm exams have to take the final exam containing learning materials from both midterm exams.<br><br>50 % of the test should be solved to have a passing grade. The grade is formed according to the score:<br><br>15 % of best solved tests - excellent (5)<br>35 % of second best solved test - very good (4)<br>35 % next solved tests - good (3)<br>15 % of lowest passing tests- sufficient (2).<br>Students who pass the final test in the third term can get only sufficient grade (2).<br>Midterm and final exams are carried out according to the academic year calendar.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">1. Štambuk, Anuška (2005). English in Electrical Engineering and Computing. Split: FESB.</td><td></td><td></td></tr>
<tr><td colspan="4">2. Glendinning, Eric H.; John McEwan (2006). Oxford English for Information Technology. Oxford:OUP</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Glendinng, Eric H.; Glendinning, Norman (2001). Oxford English for Electrical and Mechanical Engineering. Oxford: Oxford University Press.<br><br>Master, Peter (2004). English Grammar and Technical Writing. Washington: US Department of State, Office of English Language Programs.<br><br>Mc Carthy, Michael; O'Dell, Felicity. (2008). Academic Vocabulary in Use. Cambridge: Cambridge University Press.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">Evaluation of results in accordance with the above learning outcomes<br>Feedback from students via surveys<br>Self-evaluation of teachers</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">ENGLISH LANGUAGE 2</td></tr>
<tr><td>Code</td><td>FEOO03</td><td>Year of study</td><td colspan="5">1</td></tr>
<tr><td>Course teacher</td><td>Mira Braović Plavša<br>senior lecturer</td><td>Credits (ECTS)</td><td colspan="5">3</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">-</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td></td><td>30</td><td></td><td></td><td></td></tr>
<tr><td>Status of the course</td><td>Mandatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding and application of technical vocabulary concerning electrical engineering and information technology<br>- development of students' oral and written communication skills in English<br>- improving general English language knowledge</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- Explain basic notions of computer science<br>- Define and explain the structure of the computer and its performances<br>- Explain and describe types of communications and their role in everyday life<br>- Explain the function of internet technology<br>- Translate independently less complicated professional texts and interpret tables, diagrams and charts<br>- Use relevant grammar structures (passive, reduced relative clauses, cause and effect clauses, irregular plurals, MLU-s)</td></tr>
</table>

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | S hours | AE hours |
|---|---|---|---|
| | U 9 – Computer technology | 2 | |
| | Study section 9 – adjective comparison | 2 | |
| | U 10 – Computers: structure and function | 2 | |
| | Study section 10 – word formation: suffixes | 2 | |
| | U 13 - Telecommunications | 2 | |
| | Study section 13 – modal verbs | 2 | |
| | Study section 14 – modal verbs cont. | 2 | |
| | First midterm exam | | |
| | Unit 20 Electric Power System | 2 | |
| | Study section 20 – Discourse markers | 2 | |
| | Unit 21 Transformers | 2 | |
| | Study section 21 – As, when and while | 2 | |
| | Unit 22 Generators | 2 | |
| | Study section 22 – Past Participle | 2 | |
| | Second midterm exam | | |

<table>
<tr><td>Format of instruction</td><td colspan="3">☐ lectures<br>☒ seminars and workshops<br>☐ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☒ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required exercises.</td></tr>
<tr><td></td><td>Class attendance</td><td></td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
</table>

<table>
<tr><td rowspan="4">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Presentations</td><td></td></tr>
<tr><td>Tests</td><td>2</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester students are to hold a presentation from their field of profession. The presentation is evaluated according to the structure and content, delivery, nonverbal communication and visuals and takes 20% points of the overall exam grade.<br>There are two midterms and a final exam. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm exam takes 40% of the overall exam grade. Students who do not pass both midterm exams have to take the final exam containing learning materials from both midterm exams.<br><br>50 % of the test should be solved to have a passing grade. The grade is formed according to the achieved results from the presentation and the following tests score:<br><br>15 % of best solved tests - excellent (5)<br>35 % of second best solved test - very good (4)<br>35 % next solved tests - good (3)<br>15 % of lowest passing tests- sufficient (2).<br>Students who pass the final test in the third term can get only sufficient grade (2).<br>Midterm and final exams are carried out according to the academic year calendar.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">Štambuk, Anuška (2005). English in Electrical Engineering and Computing. Split: FESB.</td><td></td><td></td></tr>
<tr><td colspan="4">Glendinning, Eric H.; John McEwan (2006). Oxford English for Information Technology. Oxford:OUP</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Glendinng, Eric H.; Glendinning, Norman (2001). Oxford English for Electrical and Mechanical Engineering. Oxford: Oxford University Press.<br><br>Master, Peter (2004). English Grammar and Technical Writing. Washington: US Department of State, Office of English Language Programs.<br><br>Mc Carthy, Michael; O'Dell, Felicity. (2008). Academic Vocabulary in Use. Cambridge: Cambridge University Press.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">Evaluation of results in accordance with the above learning outcomes<br>Feedback from students via surveys<br>Self-evaluation of teachers</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **FUNDAMENTALS OF ELECTRICAL ENGINEERING 1** | | | | | | | |
| **Code** | FENO01 | Year of study | 1. | | | | | |
| **Course teacher** | Tomislav Kilić, Ph.D., Full Professor | Credits (ECTS) | 7 | | | | | |
| Associate teachers | Nedjeljka Grulović-Plavljanić, M.Sc., Senior Lectuter | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 45 | 0 | 30 | 15 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students for:<br>- understanding and application of basic principles and laws of electrical engineering,<br>- setting up and solving simple electrical circuits,<br>- permanent adoption and deepening of knowledge in the field of electrical engineering. | | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define the fundamental phenomena, the quantities and the laws of electrical engineering,<br>- apply fundamental laws of electrical engineering for the calculation of electromagnetic quantities,<br>- apply methods and techniques for solving of linear electrical networks,<br>- formulate simple electrical networks,<br>- analyse simple electrical networks,<br>- calculate quantities of simple magnetic circuits,<br>- measure basic electrical values (current, voltage, resistance). | | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L hours | AE hours |
|---|---|---|---|
| | Introduction to Electrical Engineering. Brief history of electrical engineering. SI units. Charge and physical property of matter. | 3 | 2 |
| | Fundamentals of Electric Circuits. Sources of Electricity. Electrical resistance. Ohm's Law. Circuit elements and their I-U characteristics. | 3 | 2 |
| | Temperature dependence of electrical resistance. Kirchhoff's Laws. Series Resistors and the Voltage Divider Rule. Parallel Resistors and the Current Divider Rule. | 3 | 2 |
| | Wye–Delta Transformation. Voltage and Current sources. Circuit analysis techniques. | 3 | 2 |
| | Method of loop currents. Principle of superposition. Thévenin's Equivalent Circuits. Millman's theorem. | 3 | 2 |
| | Power and energy of DC current. Joule's law. Maximum power transfer. | 3 | 2 |
| | Electrostatics. Coulomb's law. Electric field. Gauss's law. | 3 | 2 |
| | First midterm exam | 3 | 2 |
| | Electrostatic potential. Electrical influence. Electric dipole moment. Electrical polarisation. | 3 | 2 |
| | Dielectric in electrical field. Capacitors. | 3 | 2 |
| | Electrostatic energy. Capacitor switching on DC power supply. | 3 | 2 |
| | Electromagnetism. Magnetic field. Magnetic field lines. Magnetic field and electric currents. Magnetic flux. Force between magnets. Ferromagnetic materials. | 3 | 2 |

| | | | |
|---|---|---|---|
| | Faraday's Law. Self inductance and mutual inductance. | 3 | 2 |
| | Magnetic circuits. Inductor switching on DC power supply. Magnetic energy. | 3 | 2 |
| | Second midterm exam | 3 | 2 |
| | List of laboratory exercises | | LE hours |
| | Current and Voltage Measurements | | 2 |
| | Mixed resistor circuits | | 2 |
| | Electrical resistance measurement | | 2 |
| | Kirchhoff's Laws and principle of superposition | | 2 |
| | Thévenin's and Millman's theorem | | 2 |
| | Capacitor and inductor switching on DC power supply | | 2 |
| | Practical skills exam | | 3 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled.<br>Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 3,2 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,5 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,5 |
| | Written exam | 0,1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and numerical problems and final tests consist of 20 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 40 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,05 NP + 0,15 LV + 0,4 (M1 + M2)<br>the activities in percentage:<br>• NP - attendance at lectures,<br>• LV – laboratory assessment,<br>• M1, M2 – test results. |

| | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| Required literature (available in the library and via other media) | T. Kilić: Autorizirana predavanja, FESB | | e-learning portal |
| | V. Pinter: Osnove elektrotehnike, Tehnička knjiga, Zagreb, 1987. | 5 | |
| | E. Šehović, i drugi: Osnove elektrotehnike zbirka primjera (prvi dio), Školska knjiga, Zagreb, 1992. | 5 | |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | B. Jajac: Teorijske osnove elektrotehnike, svezak 1, Graphis, Zagreb, 1998.<br>B. Jajac: Teorijske osnove elektrotehnike, svezak 2, Graphis, Zagreb, 2002. |

| | |
|---|---|
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">FUNDAMENTALS OF ELECTRICAL ENGINEERING 2</td></tr>
<tr><td>Code</td><td>FENO28</td><td>Year of study</td><td colspan="5">1.</td></tr>
<tr><td>Course teacher</td><td>Silvestar Šesnić, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">6</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">-</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>30</td><td>15</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>• understanding the fundamentals of time dependant quantities in electrical engineering;<br>• solving simple AC circuits;<br>• lifelong learning in the field of electrical engineering.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>1. define basic parameters of time dependant quantities;<br>2. describe current-voltage characteristics in AC circuits;<br>3. apply vector and symbolic methods for solving AC circuits;<br>4. calculate basic parameters of simple three-phase systems;<br>5. explain mutual inductance in AC circuits;<br>6. measure fundamental AC electrical quantities.</td></tr>
</table>

<table>
<tr><td rowspan="18">Course content broken down in detail by weekly class schedule (syllabus)</td><td>Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td>Time dependant quantities. Periodical, alternating and sinusoidal currents.</td><td>2</td><td>2</td></tr>
<tr><td>Fundamental effects of alternating current. Mean value. Root-mean-square value. Basic principles of AC generator.</td><td>2</td><td>2</td></tr>
<tr><td>Current-voltage characteristics in AC circuits.</td><td>2</td><td>2</td></tr>
<tr><td>Alternating current power and energy.</td><td>2</td><td>2</td></tr>
<tr><td>Mathematical fundamentals of vector representation of sinusoidal quantities.</td><td>2</td><td>2</td></tr>
<tr><td>Complex AC circuits.</td><td>2</td><td>2</td></tr>
<tr><td>Application of complex calculus to alternating currents and voltages.</td><td>2</td><td>2</td></tr>
<tr><td>Analysis of AC circuits via complex calculus.</td><td>2</td><td>2</td></tr>
<tr><td>Complex power. Maximum power theorem.</td><td>2</td><td>2</td></tr>
<tr><td>Resonance in AC circuits.</td><td>2</td><td>2</td></tr>
<tr><td>Symmetrical and asymmetrical three-phase systems. Wye connection.</td><td>2</td><td>2</td></tr>
<tr><td>Delta connection. Power in three-phase systems.</td><td>2</td><td>2</td></tr>
<tr><td>Mutual inductance. Coil with an iron core.</td><td>2</td><td>2</td></tr>
<tr><td colspan="2">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="2">Active and inductive (capacitive) series AC circuit</td><td>2</td></tr>
<tr><td colspan="2">Active and inductive (capacitive) paralel AC circuit</td><td>2</td></tr>
<tr><td colspan="2">AC power</td><td>2</td></tr>
</table>

| | | |
|---|---|---|
| | Serial (voltage) resonance | 2 |
| | Three-phase systems – wye connection | 2 |
| | Three-phase systems – delta connection | 2 |
| | Single-phase transformer open circuit test | 2 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | Attending at least 70% of lectures and 100% of laboratory exercises. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2 | Research | | Practical training | |
| | Experimental work | | Report | | Laboratory exercises | 1 |
| | Essay | | Seminar essay | | Individual work | 2.8 |
| | Tests | 0.1 | Oral exam | | (Other) | |
| | Written exam | 0.1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | Two midterm tests will be conducted during the semester (first after 7, and second after 13 weeks of lectures). After the lectures, three final tests will be conducted (two in summer and one in autumn term). During the final tests, students take exam on the parts they didn't pass during the midterm tests. The requirement for taking the final exam is a positive grade from laboratory exercises. The requirement for passing an exam is at least 50% of points on each midterm (part of the final exam).<br>Final grade is established as follows:<br>- students that have passed during midterm exams and summer final exams;<br>best 15% – excellent (5);<br>following 35% – very good (4);<br>following 35% – good (3);<br>last 15% – satisfactory (2).<br>- students that have passed during autumn final exam – satisfactory (2). |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | Pinter, V.: Osnove elektrotehnike, Knjiga druga, Tehnička knjiga, Zagreb, 1987. | 1 | |
| | Felja, I., Koračin, D.: Zbirka zadataka i riješenih primjera iz osnova elektrotehnike, I i II dio, Školska knjiga, Zagreb | 6 | |

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| Optional literature (at the time of submission of study programme proposal) | Pinter V.: "Osnove elektrotehnike - knjiga prva", Tehnička knjiga, Zagreb, 1987 |
| Quality assurance methods that ensure the acquisition of exit competences | • record of attendance;<br>• analysis of passing percentages;<br>• student survey;<br>• head of chair evaluation. |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="8">HIGH-FREQUENCY ELECTRONICS</td></tr>
<tr><td>Code</td><td>FELO41</td><td>Year of study</td><td colspan="6">3.</td></tr>
<tr><td>Course teacher</td><td>Ivan Marinović, Ph.D. Full Professor</td><td>Credits (ECTS)</td><td colspan="6">4</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td colspan="2">DE</td></tr>
<tr><td>30</td><td></td><td></td><td>15</td><td colspan="2"></td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="6"></td></tr>
<tr><td colspan="9">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="8">Training students for:<br>- analysis of simple RF and MW circuits<br>- doing measurements on the circuits</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="8">Finished course Electronic circuits</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="8">Students will be able to:<br>- understand principles of basic RF and MW circuits<br>- do DC analysis of the circuits<br>- do AC analysis of the circuits<br>- make measurements of the basic RF and MW parameters</td></tr>
<tr><td rowspan="15">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="6">Impedance matching, filters</td><td>4</td><td></td></tr>
<tr><td colspan="6">Modulators, oscillators, frequency synthesizers</td><td>6</td><td></td></tr>
<tr><td colspan="6">C-class power amplifiers</td><td>3</td><td></td></tr>
<tr><td colspan="6">Transmission line, waveguides</td><td>6</td><td></td></tr>
<tr><td colspan="6">Smith chart</td><td>2</td><td></td></tr>
<tr><td colspan="6">S-matrices, passive structures</td><td>5</td><td></td></tr>
<tr><td colspan="6">Klystron, magnetron, IMPATT diode, GUNN diode</td><td>4</td><td></td></tr>
<tr><td colspan="7">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="7">LP and HP filters</td><td>3</td></tr>
<tr><td colspan="7">Oscillator</td><td>3</td></tr>
<tr><td colspan="7">C-class power amplifier</td><td>3</td></tr>
<tr><td colspan="7">Slotted line</td><td>3</td></tr>
<tr><td colspan="7">Directional coupler</td><td>3</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="5">☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="8">The presence on lectures and exercises in the amount of at least 70% of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td colspan="3"></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Exercises</td><td colspan="3">1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Individual work</td><td colspan="3">2</td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>(Other)</td><td colspan="3"></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="3">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after next 6 weeks. Each midterm test consists of theoretical questions and numerical problems as well as the final test. In the final exams students that did not pass the midterm exams take part. The midterms are carried out as written tests while the final exams are written and oral. The absolute grading is applied.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>I. Modlic, B. Modlic, Visokofrekvencijska elektronika, modulacija, modulatori, sintezatori frekvencije, Školska knjiga</td><td>5</td><td></td></tr>
<tr><td>I. Modlic, B. Modlic, Visokofrekvencijska elektronika, oscilatori, pojačala snage, Školska knjiga</td><td>5</td><td></td></tr>
<tr><td>I. Zanchi, Z. Blažević, Mikrovalna elektronika, FESB Split</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">-</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Evidence of students attendance<br>- Annual analysis of grades achieved<br>- Teachers self-evaluation<br>- Students feedback via questionnaires and surveys</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

| | | | |
|---|---|---|---|
| **NAME OF THE COURSE** | **HIGH VOLTAGE ENGINEERING** | | |
| **Code** | FENO19 | Year of study | 3 |
| **Course teacher** | Petar Sarajčev, Ph.D., Associate Professor | Credits (ECTS) | 5 |
| Associate teachers | | Type of instruction (number of hours) | L: 30; S: ; AE: 15; LE: 15; DE: |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding basic insulating properties of materials<br>- carrying out analysis (analytical and numerical) of power system overvoltages<br>- designing overvolatge protection of high voltage transformer stations and switchyards<br>- understanding metal-oxide surge arrester selection procedure<br>- carrying out insulation coordination procedure |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- understand layout and functioning of the high voltage testing facility<br>- explain the procedure for testing high voltage apparatus<br>- apply methods for power system overvoltage analysis<br>- select metal-oxide surge arresters for specific applications<br>- carry out insulation coordination procedure |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Gaseous, liquid and solid insulating materials | 3 | 1 |
| Townsed theory, Paschen law | 2 | 1 |
| Natural and artificial pollution of external insulation | 2 | 1 |
| High voltage testing laboratory | 3 | 1 |
| Marx generator. Generating impulse test voltages. Methods for proving nominal insulation level | 2 | 1 |
| Temporary, switching and lightning overvoltages. Analytical and numerical analysis of power system overvoltages | 6 | 5 |
| Travelling waves. Bewley's lattice | 3 | 1 |
| Backflashover, shielding failure, TLAs | 2 | 1 |
| Metal-oxide surge arresters | 3 | 1 |
| Insulation coordination | 4 | 2 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Analysis of switching overvoltages using Matlab/Simulink | 5 |
| Analysis of switching overvoltages using EMTP-ATP | 4 |
| Metal-oxide surge arresters in power system transient analysis | 3 |
| Insulation coordination of high voltage air-insulated transformer station | 3 |

Format of instruction

| | |
|---|---|
| ☒ lectures | ☐ independent assignments |
| ☐ seminars and workshops | ☒ multimedia |
| ☒ exercises | ☒ laboratory |
| ☐ *on line* in entirety | ☐ work with mentor |
| ☐ partial e-learning | ☐ (other) |
| ☐ field work | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Student responsibilities | | | | | | |
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,5 |
| | Essay | | Seminar essay | | Laboratory excercises | 0,5 |
| | Tests | 0,5 | Oral exam | | (Other) | |
| | Written exam | | Project | | (Other) | |
| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and numerical problems and final tests consist of 10 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50% points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,5 (M1 + M2)<br>the activities in percentage: M1, M2 – test results. | | | | | |

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | P. Sarajčev, Autorizirana predavanja, FESB | | e-learning portal |

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|---|---|
| Optional literature (at the time of submission of study programme proposal) | - E. Kuffel, W.S. Zaengl, J. Kuffel, High voltage engineering: Fundamentals, Second edition, Elsevier, Oxford, 2008.<br>- J. A. Martinez-Velasco (Ed.), Power system transients: Parameter determination, CRC Press, Boca Raton, 2010. |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| NAME OF THE COURSE | HUMAN EXPOSURE TO ELECTROMAGNETIC RADIATION | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Code** | FELO32 | Year of study | 3. | | | | | |
| **Course teacher** | Vicko Dorić, Ph.D., Associate Professor | Credits (ECTS) | 5 | | | | | |
| Associate teachers | Anna Šušnjara | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | 0 | 0 | 30 | | |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students for:<br>- understanding and application of basic principles of electromagnetic and thermal dosimetry,<br>- assessment of human exposure to a sources of both high frequency and low frequency electromagnetic fields,<br>- accepting knowledge from the area of the bio electromagnetics,<br>- using national and international legislation for the assessment of human exposure to EM radiation | | | | | | | |
| Course enrolment requirements and entry competences required for the course | None. | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define the fundamental terms in bio electromagnetics,<br>- measure external EM fields both on high and low frequencies,<br>- calculate external EM fields both on high and low frequencies<br>- analyze levels of human exposure to EM radiation according to national and international legislation,<br>- calculate basic parameters of the internal dosimetry using simple human body models,<br>- use commercial software packages for the internal dosimetry analysis based on the realistic human body models. | | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | Electromagnetic pollution. Ionizing and non-ionizing radiation. | 2 | 0 |
| | EM field coupling to human body. Biological effects of the EM fields. High and low frequency effects. Epidemiological and statistical studies. | 2 | 0 |
| | Basic parameters of electromagnetic dosimetry: current density, induced electric field, specific absorption rate (SAR), external fields, power density. | 2 | 0 |
| | Electromagnetic radiation protection guidelines. National and international legislation. Basic restrictions and reference levels. | 2 | 0 |
| | Methods for the theoretical and experimental dosimetry. Incident and internal field dosimetry. | 2 | 0 |
| | Characterization of the radiation sources. Calculation and measurement of the low frequency electric field. Exposure to the power lines and transformer stations. | 2 | 0 |
| | Calculation and measurement of the high frequency EM field. Exposure to the RFID antennas, mobile phones and base stations. | 2 | 0 |
| | Classification of the internal dosimetry models. Simplified and anatomical models of the human body. | 2 | 0 |
| | Electromagnetic modeling of the human body at low frequencies (LF). Whole body exposure to the LF fields. | 2 | 0 |

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|---|---|---|---|
| | Electromagnetic modeling of the human body at high frequencies (HF). Human eye and brain exposure to the nonionizing radiation. | 2 | 0 |
| | Human exposure to the transient fields. | 2 | 0 |
| | Thermal response of the human body exposed to the HF fields. Thermal response of the human eye and brain exposed to the plane wave. | 2 | 0 |
| | Biomedical applications of EM fields. Electrical stimulation of the nerves. Laser treatment of the eye. Brain stimulation methods. Transcranial magnetic stimulation (TMS) | 2 | 0 |
| | List of laboratory or design exercises | | LE or DE hours |
| | Simulation models for the human exposure to nonionizing EM radiation (frequencies up to 10 MHz) | | 4 |
| | Simulation models for the human exposure to nonionizing EM radiation (frequencies above 10 MHz) | | 4 |
| | Measurement setup and methods for the assessment of human exposure to EM fields. | | 6 |
| | LF electric fields measurement. | | 4 |
| | LF magnetic fields measurement. | | 4 |
| | HF electromagnetic fields measurement. | | 4 |
| | EM field calculation in vicinity of the base station. | | 4 |
| | | | |

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| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2,0 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,0 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,5 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,2 |
| | Written exam | 0,1 | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students take tests they didn't pass on the midterm exams. Both midterm tests last for the 75 min. and consists of 10 questions or problems. In order to pass the exam, students are required to finish all laboratory exercises and gain at least 50% of total points at both midterm exams. Final score is determined in following way:<br><br>Score(%) = 0,5 (M1 + M2)<br><br>where M1 and M2 are midterm exams score.<br><br>Final grade is determined according the final score:<br><br>Score Grade<br>50% to 62% sufficient (2)<br>63% to 75% good (3)<br>76% to 88% very good (4)<br>89% to 100% excellent (5) |

<table>
<tr><td></td><td colspan="3">In the final exams students take tests they didn't pass on the midterm exams. Exam is performed in the written form. It lasts for the 75 min. and consists of 10 questions or problems. In order to pass the exam, students are required to gain at least 50% of total points. The final grade is then determined as explained above.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>D.Poljak, Teorija elektromagnetskih polja s primjenama u inženjerstvu, Šk. knjiga Zagreb, 2014.</td><td>5</td><td></td></tr>
<tr><td>D. Poljak: Izloženost ljudi elektromagnetskom zračenju, Kigen, Zagreb, 2007.</td><td>5</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">4. D. Poljak, Advanced Modeling in Computational Electromagnetic compatibility, Wiley Interscience, New York 2007.<br>5. D. Poljak: Human Exposure to Electromagnetic Fields, WIT Press, Southampton- Boston, 2003<br>6. R.W.Y. Habash, Electromagnetic Fields and Radiation, Marcel Dekker, 2002.<br>7. D. Poljak: Exposure of Humans to Electromagnetic Radiation, SoftCOM Library 2002.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">HYDRAULIC AND PNEUMATIC SYSTEMS</td></tr>
<tr><td>Code</td><td>FETO01</td><td>Year of study</td><td colspan="5">3</td></tr>
<tr><td>Course teacher</td><td>Jani Barle, Ph.D.,<br>Full Professor</td><td>Credits (ECTS)</td><td colspan="5">4</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Alen Kovač</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>CE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>15</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">To develop ability to identify hydraulic or pneumatic system elements by symbol and function and to use that skills for fault finding and solving.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>1. Present general concepts associated with industrial application of hydraulics and pneumatics.<br>2. Identify components of the system and draw related symbols.<br>3. Combine various elements with respect to size and design concept.<br>4. Critically assess workability and supportability of complex hydraulic and pneumatic systems.<br>5. Determine faults and failure causes.</td></tr>
<tr><td rowspan="17">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L hours</td><td>LE hours</td></tr>
<tr><td colspan="5">Introduction to pneumatics. Basic physical principles of pneumatics.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Standards and Symbols. Compressed air generation and distribution.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Typical pneumatic systems demonstrations.</td><td></td><td>1</td></tr>
<tr><td colspan="5">Basic elements of pneumatic systems (check, pressure control and directional control valves).</td><td>2</td><td></td></tr>
<tr><td colspan="5">Methods for development of pneumatic systems.</td><td></td><td>2</td></tr>
<tr><td colspan="5">Basic elements of pneumatic systems (directional control valves, valve actuation types).</td><td>2</td><td></td></tr>
<tr><td colspan="5">Basic elements of pneumatic systems (cylinders and motors).</td><td>2</td><td></td></tr>
<tr><td colspan="5">Circuit assembling on pneumatic didactic table.</td><td></td><td>2</td></tr>
<tr><td colspan="5">Valve combinations. Electropneumatic systems.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Introduction to hydraulics. Basic physical principles of hydraulics. Fundamental hydraulic problems: cleanness, temperature, cavitation.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Typical hydraulic systems demonstrations.</td><td></td><td>1</td></tr>
<tr><td colspan="5">Hydraulic elements for energy conversion: cylinders, pumps and motors with constant and adjustable displacement..</td><td>2</td><td></td></tr>
<tr><td colspan="5">Basic control elements in hydraulics: check valves, direct acting and pilot operated pressure-relief valves.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Hydraulic elements and their most important parts.</td><td></td><td>2</td></tr>
<tr><td colspan="5">Basic control elements in hydraulics: direct acting and pilot operated directional control valves, pressure regulators, flow control valves.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Hydraulic cylinders - parallel and series circuit. Synchronizing cylinder movement and load.</td><td></td><td>2</td></tr>
</table>

| | | | |
|---|---|---|---|
| | Typical design solutions of hydraulic elements for energy conversion (cylinders, pumps and motors with constant and adjustable displacement). | 2 | |
| | Typical hydraulic circuits: accumulator holding, pump unloading, braking, counter balance. Hydraulic presses. | | 2 |
| | Pressure control circuits. Flow and speed control circuits. | 2 | |
| | Piloted and electrically controlled hydraulic systems. | 2 | |
| | Examples: actuator speed adjustments with throttle valve vs. speed control with flow regulators. | | 1 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ individual assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ individual project (other) |
| Student responsibilities | Minimum of 70 percent lecture attendance. Completing all the required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,0 |
| | Essay | | Seminar essay | | Preparation for exercises | 0,3 |
| | Tests | 0,2 | Oral exam | | (Other) | |
| | Written exam | | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7-week session classes and the second one is after the next 6 weeks. The midterms are carried out as written tests, made up of three questions relating to the basic issues and schematics. The oral exam is focused on the student's interpretation skills. The requirement for passing grade is the positive assessment on each midterm exam (>49%) or the final exam.

The final score is:

$$Score\ (\%) = 0,35 \times A_1 + 0,35 \times A_2 + 0,20 \times A_3 + 0,10 \times A_4$$

- *midterm 1: $A_1$ = 50 – 100 %,*
- *midterm 2 (seminal paper): $A_2$ = 50 – 100 %,*
- *oral exam: $A_3$ = 50 – 100 %.*
- *class attendance: $A_4$ = 70 – 100 %.*

| Score | Grade |
|---|---|
| 50% - 62% | sufficient (2) |
| 63% - 76% | good (3) |
| 77% - 88% | very good (4) |
| 89% - 100% | excellent (5) |

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | Barle, J.: Hydraulics and pneumatics, (student handbook and workbook in Croatian: *Hidraulika i pneumatika*), FESB, Split, 2010. | | e-learning portal |
| | Nikolić, G.: Pneumatika, Školske novine, Zagreb, 1994. | | |

| | |
|---|---|
| Optional literature (at the time of submission of study | Koroman, V.; Mirković, R.: Hidraulika i pneumatika, Školska knjiga, Zagreb, 1991.<br>Lang, R.A. (ed.): Hydraulic Trainer 1; Planning and Design of Hydraulic Power Systems, Mannesmann Rexroth AG, 1998.<br>Rabie, M.: Fluid Power Engineering, McGraw-Hill, 2009. |

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|---|---|
| programme proposal) | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="8">INSTRUMENTATION FOR SMART GRID</td></tr>
<tr><td>Code</td><td>FENO31</td><td>Year of study</td><td colspan="6">3.</td></tr>
<tr><td>Course teacher</td><td>Goran Petrović, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="6">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Juraj Alojzije Bosnić, assistant</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td colspan="2">LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td colspan="2">30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="6">50</td></tr>
<tr><td colspan="9">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="8">Training students for:<br>- using Dynamic Signal Analyser<br>- using Power Quality instruments<br>- creating simple virtual instruments.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="8">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="8">Students will be able to:<br>- use multimeter and digital oscilloscope<br>- use Dynamic Signal Analyzer<br>- use PQ meter with harmonics and flicker<br>- understand syncrophasor and their applications<br>- create virtual instrument in Labview.<br>- describe basic properties of IEC 61850 protocol</td></tr>
<tr><td rowspan="19">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td colspan="2">L hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Inductive and electronic voltage and current instrument transformers.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Analog transducers of power system quantities.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Principles of Sigma Delta and Integration type of Analog to digital converters.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Mathematical algorithms for calculation of RMS voltage and current, active and reactive power.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Mathematical algorithms for calculation of voltage and current, spectrum. Total Harmonic Distortion. Flicker.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Phasor measurement techniques. Synchrophasors and their applications.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Extensible Markup Language and IEC 61850 protocol.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">First midterm exam</td><td colspan="2"></td><td></td></tr>
<tr><td colspan="5">Introduction to LabVIEW environment. Data types. Simple LabVIEW application for acquire analyze and present data.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Using Loops and Decision-Making Structures. Shift registers. Vectors, Arrays, Matrices.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Modular programming in LabVIEW. Acquiring Measurements and signal processing with ELVIS and cDAQ Hardware.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Implementing File I/O functions to read and write data to files. Automatic report generation.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Embedded Control and Monitoring Using LabVIEW. Accessing I-O Through the FPGA</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Interfacing between the FPGA and Real-Time Processor. Finite sampling using for loop. Simple Event Triggers.</td><td colspan="2">2</td><td>0</td></tr>
<tr><td colspan="5">Second midterm exam</td><td colspan="2"></td><td></td></tr>
<tr><td colspan="7">List of laboratory exercises</td><td>LE hours</td></tr>
<tr><td colspan="7">Transient measurements with digital oscilloscope HP 54501A</td><td>3</td></tr>
</table>

<table>
<tr><td rowspan="8"></td><td colspan="6">Network analysis with Digital Signal Analyzer HP 35655A</td><td>3</td></tr>
<tr><td colspan="6">Using PQ meter ION 7650</td><td>3</td></tr>
<tr><td colspan="6">Distant measurement with ALFA via ethernet</td><td>3</td></tr>
<tr><td colspan="6">Introduction to LabVIEW environment. Data types. Using Loops, Structures.</td><td>3</td></tr>
<tr><td colspan="6">Shift registers. Vectors, Arrays, Matrices. Modular programming in LabVIEW.</td><td>3</td></tr>
<tr><td colspan="6">Connection instruments into Labview. Creating network publish variables.</td><td>3</td></tr>
<tr><td colspan="6">Automatic report generation.</td><td>3</td></tr>
<tr><td colspan="6">Practical skills exam</td><td>2</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="4">☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="7">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td colspan="2"></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td colspan="2">2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td colspan="2">0,5</td></tr>
<tr><td>Tests</td><td>0,5</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td colspan="2">0,5</td></tr>
<tr><td>Written exam</td><td>0,5</td><td>Project</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">There are one midterms exams that is carried out, after 7 weeks of lecturing. Second midterms exam is after laboratory exercises. First midterms exam is written exam and consists of 5 theoretical questions and numerical problems. Second midterm exam is evaluated as knowing Labview programing language.<br>Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,5 (M1 + M2)<br>the activities in percentage:<br>• M1, M2 – test results.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td colspan="2">Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">G. Petrović: Skripta s predavanja, FESB</td><td colspan="2"></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="7">Alan S. Morris: Signal Processing of Power Quality Disturbances, IEEE Press. 2006.<br>A.G. Phadke, J.S. Thorp Synchronized Phasor Measurements and Their Applications, Springer, 2008.<br>LabVIEW Basics I Introduction Course Manual</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="7">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="7"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">INTERNET PROGRAMMING</td></tr>
<tr><td>Code</td><td>FELO35</td><td>Year of study</td><td colspan="5">3</td></tr>
<tr><td>Course teacher</td><td>Ljiljana Šerić, Ph.D.,<br>Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">4</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Marin Bugarić, Ph.D., Senior Research Assistant<br>Andrija Sommer, mag.ing.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>15</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">30</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- Understanding the operating principles of the Internet<br>- Preparation and processing of data and information for publication on the Web<br>- Designing, editing and maintenance of the content published on the web<br>- Write simple scripts for dynamic web content on.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Completed courses:<br>Programming 1<br>Programming 2</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>1. Appoint communication protocols used on the Internet<br>2. Describe the steps of the TCP / IP protocol<br>3. Identify elements of HTML code<br>4. Design and write HTML code of Web sites consisting of several web pages<br>5. Write an external CSS document with instructions for the design of the sites<br>6. Write simple JavaScript code that dynamically modifies website<br>7. Explain the difference between client and server scripting technology</td></tr>
</table>

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction. History of the Internet. Internet Communication protocols | 6 | |
| HTML language for web page development. HTML5 | 4 | |
| CSS style language. CSS3 | 4 | |
| XML, XHTML | 2 | |
| JavaScript, DOM | 4 | |
| Ajax | 2 | |
| jQuerry | 2 | |
| PHP | 2 | |
| Overview of other tehnologijes for web page programming | 2 | |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Introduction. History of the Internet. Internet Communication protocols | 2 |
| HTML language for web page development. HTML5 | 2 |
| CSS style language. CSS3 | 2 |
| XML, XHTML | 1 |
| JavaScript, DOM | 2 |
| Ajax | 2 |
| jQuerry | 2 |
| PHP | 2 |
| Overview of other tehnologijes for web page programming | |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☒ multimedia<br>☐ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled.<br>Performed all required laboratory exercises. | |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work (Other) | 1 |
| | Essay | | Seminar essay | 1 | Laboratory exercises (Other) | 0,5 |
| | Tests | | Oral exam | | Preparation for laboratory exercises (Other) | **0,5** |
| | Written exam | | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | During the semester there will be two mid-term exams (tests). The first mid-exam will be held after 7 weeks of classes, the second after the next 6 weeks. Mid-term exams are written on a computer and consists of 20 random questions to be answered.<br>At the final exam students can take only parts of material that they did not 138ystem the mid-term exams<br>At the final exam ar autmn students take the whole subject matter of the course.<br>The requirement for passing grade is positively evaluated seminar paper and at least 60% of points achieved on the mid-term / final exam.<br>The number of points is calculated as the arithmetic average of the two mid-term exams, or the number of points the entire final exam.<br>The final grade is determined as follows:<br>Percentage Rating<br>60% to 69% is sufficient (2)<br>70% to 79% good (3)<br>80% to 89% very good (4)<br>90% 100% Excellent (5) |

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | Lj.Šerić, Programiranje za Internet, predavanj, FESB | | e-learning portal |
| | M.Bugarić, upute za laboratorijske vježbe, FESB | | e-learning portal |
| | http://www.w3schools.com | | web |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | D. Sušanj, D. Petric: „Velika knjiga o Worl Wide Webu“, Znak, Zagreb 1996. g.<br>L. Abrus ,“Irada weba, abeceda za Webmastere“,BUG✓SysPrint, Zagreb,2003<br>Comer, D.E.: The Internet Book, Prentice Hall, 2000.<br>Zeid, I.: Mastering the Internet ✓ HTML, Prentice Hall, 2000.<br>Deitel, Deitel ✓ Neto, Internet ✓ WWW – How to Program, Prentice Hall, 2000. |
| Quality assurance methods that ensure the acquisition of exit competences | • Keeping records of the class attendance<br>• Annual review of the performance of exam<br>• Student survey in order to evaluate teachers<br>• Self-evaluation of teachers<br>• Feedback from students who have already graduated from about the relevance of the course content |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">INTRODUCTION TO COMPUTER APPLICATIONS</td></tr>
<tr><td>Code</td><td>FESY01</td><td>Year of study</td><td colspan="5">1.</td></tr>
<tr><td>Course teacher</td><td>Goran Petrović, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Josip Vasilj, PhD.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- using internet, e-learning, and protection from malicious software.<br>- using computers as office tool<br>- using computers as engineer’s tool</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- Identify and discuss the main functions of computer: IO, processing, storage.<br>- Identify and discuss main hardware parts of personal computer.<br>- Describe the operating system functions and some OS services.<br>- Use office application for word processing,<br>- Use office application for spreadsheet and presentation,<br>- Identify and discuss some engineer’s tools.</td></tr>
<tr><td rowspan="15">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L hours</td><td>AE hours</td></tr>
<tr><td colspan="5">History of computers. Computer architecture. Central processing unit.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Representing information as bit patterns. Arithmetic/Logic Instructions. Machine language. Simple program execution.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">The History of Operating Systems. File management. Components of an Operating System.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Network fundamentals. Network classifications. Protocols. The World Wide Web. Malicious software removal tools.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Office tools: Word processing. MS Word environment. Editing. Formatting. Printing.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Office tools: Symbols. Tabulators. Tables. Inserting object. Equations. Figures. Drawings. Headers and footers.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Office tools: Styles. Templates. Spell check. Bookmarks. Circular letters. Table of content.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">First midterm exam</td><td></td><td></td></tr>
<tr><td colspan="5">Office tools: Spreadsheets. MS Excel environment. Editing. Formatting. Printing.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Office tools: Sorting and filtering. Forms. References and functions. Graphs. Pivot table.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Office tools: Presentations. MS Power Point environment. Smart Art. MS Visio environment. Drawing.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Engineers tools: Introduction to LabVIEW environment. Data types. Simple LabVIEW application for acquire analyze and present data. Using Loops and Decision-Making Structures.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Engineers tools: Shift registers. Vectors, Arrays, Matrices. Modular programming in LabVIEW. Implementing File I/O functions. Automatic report generation.</td><td>2</td><td>0</td></tr>
</table>

| | | | |
|---|---|---|---|
| | Hardware: Processor. Random Access Memory Mass storage: Magnetic systems, Optical systems, Flash drives. Buses. IO channels. Monitors. Scanners. Printers. | 2 | 0 |
| | Second midterm exam | | |
| | List of laboratory exercises | | LE hours |
| | Internet: www, E-mail. E- learning. Windows explorer. Accessories. | | 3 |
| | MS Word: Editing. Formatting. Page setup. Printing. | | 3 |
| | MS Word: Symbols. Tabulators. Tables. Inserting object. Equations. Figures. Drawings. Headers and footers. | | 3 |
| | MS Word: Styles. Templates. Spell check. Bookmarks. Circular letters. Table of content. | | 3 |
| | MS Excel: Environment. Editing. Formatting. Printing. | | 3 |
| | MS Excel: Sorting and filtering. Forms. References and functions. Graphs. Pivot table. | | 3 |
| | MS Power Point: Environment. Smart Art. MS Visio environment. | | 3 |
| | Introduction to LabVIEW environment. Data types. Using Loops, Structures. Automatic report generation. | | 3 |
| | Practical skills exam | | 2 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 3 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,5 |
| | Tests | 0,5 | Oral exam | | Preparation for laboratory exercises | 0,5 |
| | Written exam | 0,5 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams that are carried out as written tests. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 30 short theoretical questions and final tests consist of 30 short theoretical questions. In the final exams students that did not pass the midterm exams take part.<br>The requirement for passing grade is the positive assessment of laboratory exercises and 40 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,4 LV + 0,3 (M1 + M2)<br>the activities in percentage:<br>• LV – laboratory assessment,<br>• M1, M2 – test results. |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | G. Petrović: Skripta s predavanja, FESB | | e-learning portal |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | J. Glenn Brookshear: Computer science an overview, Addison-Wesley. 2012.<br>A. Mamishev. M. Sargent, Creating Research and Scientific Documents Using Microsoft Word, Microsoft Press, 2013.<br>LabVIEW Basics I Introduction Course Manual |

| | |
|---|---|
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **INTRODUCTION TO ENTREPRENEURSHIP** | | | | | | | |
| **Code** | FESY03 | Year of study | 2. | | | | | |
| **Course teacher** | Marija Šiško Kuliš, Ph.D., Associate Professor | Credits (ECTS) | 3 | | | | | |
| Associate teachers | | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | | 15 | | | |
| Status of the course | | Percentage of application of e-learning | | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Students introduce into the entrepreneurship world which is the process of creating value where the businessman at the one place collects all the resources needed for the realization of business opportunities by acapting the risk of losing money, time or some form goods or service. All students who can submit the challenges of decision-making can learn how to become an entrepreneur and how to to behave entrepreneurially |
| Course enrolment requirements and entry competences required for the course | No. |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>1. To define corectly the terms entrepreneur and entrepreneurship through the thought, content and conceptual basis.<br>2. To assess and analyze the entrepreneurial activity in the context of economic and engineering dimensions.<br>3. The strengths and weaknesses accession to the entrepreneurship.<br>4. To collect and interpret data in the field of market analysis (competition, distributors, partners) and make conclusions regarding issues of entrepreneurial activity.<br>5. To understand the basic elements of the entrepreneurial accounting and analysis of financial reports.<br>6. To develop a business plan in the field of engineering entrepreneurship with all necessary, technological, economic and financial parameters.<br>7. To present their own business plan clearly and unequivocally that will support the feasibility of entrepreneurial investment. |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | 1. Introduction – The concept of enterprise and entrepreneurship | 2 | 1 |
| | 2. Business idea, brainstorming and focus groups | 2 | 1 |
| | 3. Business Plan Part 1 | 2 | 1 |
| | 4. Business Plan Part 2 | 2 | 1 |
| | 5. Marketing | 2 | 1 |
| | 6. Market Analysis | 2 | 1 |
| | 7. Fixed and current assets | 2 | 1 |
| | 8. Amortization | 2 | 1 |
| | 9. Cost benefit analysis | 2 | 1 |
| | 10. Entrepreneurial infrastructure | 2 | 1 |
| | 11. Entrepreneurial incubators | 2 | 1 |
| | 12. The kinds of entrepreneurship | 2 | 1 |
| | 13. Company establishment | 2 | 1 |
| | 14. Franchise | 2 | 1 |
| | 15. Practice examples and presentation of business plans | 2 | 1 |

<table>
<tr><td rowspan="2"></td><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6"></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☒ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="4">☐ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="7"></td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>0.5</td><td>Research</td><td></td><td>Practical training</td><td colspan="2"></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Tests</td><td>1</td><td>Oral exam</td><td>0.5</td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>1</td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">During the semester there will be two mid-term exams (tests). The first is the pre-exam after 7 weeks of classes, the second after the next 6 weeks. On the final exam students take the parts of the material that did not pass on the mid-term. Each midterm carried out as written exam for a period of 75 minutes and consists of 20 odd questions and is based on the business plan which students independently write. The requirement for a positive evaluation is a positive evaluation of the self-made business plan, and the final grade (in percentages) formed according to the formula:<br>Rating (%) = 0.05 + 0.15 NA 0.4 PP + (M1 + M2)<br>where activities are expressed in percentages:<br>• NP – attendance at lectures,<br>• PP – Feedback from the business plan,<br>• M1, M2 – POINTS midterm. .<br>The final grade is determined after the second final exam, applying the relative ECTS grading system in accordance with the Regulations on Study and Study System, University of Split. A group of students who passed the exam is divided into four sub-groups: 15% of the best students are graded excellent, 35% following very good, the next 35% are graded good and the last 15% of the assessment is sufficient. Students who did not pass the exam after two final exam take a makeup exam in autumn period in which they can get a positive grade. At the Correctional exam graded the overall material. The exam is written with 20 questions and tasks and lasts 90 minutes.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="5">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="5">M. Šiško Kuliš: Autorizirana predavanja, FESB</td><td></td><td>https://elearning.fesb.unist.hr</td></tr>
<tr><td colspan="5">M. Šiško Kuliš: Autorizirana radna bilježnica</td><td></td><td>https://elearning.fesb.unist.hr</td></tr>
<tr><td colspan="5">Kirby, D., A.: Entrepreneurship, McGraw Hill, London, 2003.</td><td>0</td><td>https://www.amazon.co.uk/Entrepreneurship-David-Kirby/dp/0077098587</td></tr>
</table>

| | | | |
|---|---|---|---|
| | Kolaković, M.: Poduzetništvo u ekonomiji znanja, Sinergija, Zagreb, 2006. | 0 | http://www.superknjizara.hr/?page=knjiga&id_knjiga=17388 |
| Optional literature (at the time of submission of study programme proposal) | - Longenecker, J. G.; Moore, C. W.: Small Business Management – An Entrepreneurial Emphasis, Thomson South-Western, 2003 | | |
| Quality assurance methods that ensure the acquisition of exit competences | - registering the class attendance<br>- annual analysis of the performance of the examination<br>- student survey in order to evaluate teachers<br>- self-evaluation of teachers<br>- feedback from students who have already graduated the relevance of content course | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">INTRODUCTION TO PROGRAMMING</td></tr>
<tr><td>Code</td><td>FELO02</td><td>Year of study</td><td colspan="5">1</td></tr>
<tr><td>Course teacher</td><td>Ljiljana Šerić, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Marin Bugarić, Ph.D., Senior Research</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">30</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- Understanding the performance of computer<br>- Understanding the programming code<br>- To write simple computer programs</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>1. List the basic parts of the computer model<br>2. Identify the basic parts of the programming code<br>3. Describe the principles of storing basic data types in computer memory<br>4. Enumerate and explain the working principle of commands for program flow control<br>5. Write a computer program structured in a several user-defined classes stored in multiple files<br>6. Write a computer program – Applet with a graphical user interface</td></tr>
<tr><td rowspan="12">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Introduction. Components and computer operation. As you run programs on your computer.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Approachesof different programming languages. The characteristics of the programming language Java. The first program in the Java programming language. Translation and execution of the programa written in Java. The main differences between Java and older programming languages</td><td>2</td><td></td></tr>
<tr><td colspan="5">The integer and decimal numbers. Variables. Constants. Integer and decimal math. Operators. Using ConsoleReader class</td><td>2</td><td></td></tr>
<tr><td colspan="5">Character data. Using the String class. The methods of the String class, operators</td><td>2</td><td></td></tr>
<tr><td colspan="5">Program flow control. Boolean algebra. Conditional statements, branching and looping</td><td>2</td><td></td></tr>
<tr><td colspan="5">The functions and procedures. The arguments, parameters, parameter passing by value and references. Recursive functions.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Complex data types. Arrays. Storing an Array in the memory. Command line argments. classes</td><td>2</td><td></td></tr>
<tr><td colspan="5">Objects and classes. An example of a simple class. Writing code in multiple files. Compile and run the program written in multiple files.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Programs with a graphical user interface. Applet. Examples of simple applet. Colors and painting geometric figures.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Communication with the program user. Printing and reading the data within the applet.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Working with files. Classes for working with files.</td><td>2</td><td></td></tr>
</table>

| | | | |
|---|---|---|---|
| | The advanced 146ystem san146 the definition of class. Static variables and methods. More about variables and methods. Final variables and constants. | 2 | |
| | Events. Exceptions and flows | 2 | |
| | List of laboratory or design exercises | | LE or DE hours |
| | Installation and setup of Java and Eclipse programming environment. Writing and translating the first program in Java. | | 2 |
| | Formatted printing | | 2 |
| | Integer variables and integer math | | 2 |
| | Decimal variables and decimal math | | 2 |
| | Strings (data retrieval from the keyboard (ConsoleReader)) | | 2 |
| | Single, double and multiple branching commands, software loop | | 2 |
| | Graphic applet | | 2 |
| | Class object | | 2 |
| | Objects and classes, separation of code in multiple files | | 2 |
| | Command-Line Arguments | | 2 |
| | Working with Files | | 2 |
| | Compensation of missed exercises | | 2 |

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| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work (Other) | 2 |
| | Essay | | Seminar essay | | Laboratory exercises (Other) | 0,5 |
| | Tests | | Oral exam | | Preparation for laboratory exercises (Other) | **0,5** |
| | Written exam | | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | During the semester there will be two mid-term exams. The first mid-exam will be held after 7 weeks of classes, the second after the next 6 weeks. Mid-term exams are written on paper and consist of 5 tasks each.<br>At the final exam students can takeonly the 146ystem materials that day did not pass the mid-term.<br>At the final exam in september students take the whole subject matter of the course.<br>The requirement for passing grade is at least 50% of points achieved on the mid-term exams or final exam. The number of points is calculated as the arithmetic average of the two mid-term exams, or the number of points of the entire final exam.<br>The final grade is determined after the second final exam, applying the relative ECTS grading system in accordance with the Rules of study and study system of the University of Split. A group of students who passed the exam is divided into four sub-groups: 15% of the best students are graded excellent, 35% following very good, the next 35% a good grade and the last 15% positive grade. Students who did not pass the exam after two final exams take the final exam in the autumn period where they can get a positive grade. At autumn exam covers the overall material. |

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| Required literature (available in the | **Title** | **Number of copies in the library** | **Availability via other media** |

| | | | |
|---|---|---|---|
| library and via other media) | Lj.Šerić, Uvod u programiranje, predavanja, FESB | | e-learning portal |
| | M.Bugarić, upute za laboratorijske vježbe | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | Eck, D.: Introduction to Programming using Java, Hobart, 2000.<br>Horton I.: Beginning Java 2, SDK 1.4 Edition, Wrox Press 2003.<br>N. Wiliam Smith College, on-line lecture – Java programming, February., 2001 | | |
| Quality assurance methods that ensure the acquisition of exit competences | • Keeping records of the class attendance<br>• Annual review of the performance of exam<br>• Student survey in order to evaluate teachers<br>• Self-evaluation of teachers<br>• Feedback from students who have already graduated from about the relevance of the course content | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">MAINTENANCE AND TESTING OF ELECTRICAL POWER EQUIPMENT</td></tr>
<tr><td>Code</td><td>FENO18</td><td>Year of study</td><td colspan="5">3.</td></tr>
<tr><td>Course teacher</td><td>Božo Terzić, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Goran Majić, Ph.D.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding the methods and procedures of testing and maintenance of electrical equipment,<br>- permanent adoption and deepening of knowledge in the field of electrical equipment testing,<br>- using electrical test equipments.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Entry competences:<br>- Basic knowledge of the courses Fundamentals of Power Engineering<br>- Basic knowledge of the course Electrical Machines<br>- Basic knowledge of the course Power Plant</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- use the instruments and other measuring equipment during testing,<br>- test electrical equipment using methods that are studied in the course,<br>- analyse and comment on the measurement results<br>- assess the condition of tested equipment based on test results,<br>- create and write the detailed report about measurement results.</td></tr>
<tr><td rowspan="12">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Standardisation. International and national organizations for standardization (ISO, IEC, EN). Croatian state office for standardization and metrology (DZNM).</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">The program of preventive maintenance and testing of electrical equpment. Organization of maintenance service of electrical equipement.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Isolation testing with DC voltage. Dielectrics. Low-voltage and high-voltage testing of transformers, cables and electrical machines.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Isolation testing with AC voltage. Power and dissipation factor. Power factor measurements of transformers, cables and electrical machines.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Types and construction of cables. Cable faults. Methods for determining type and location of the cable fault.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Type of transformers. Preventive maintenance of transformer. Failure diagnostics of transformer. Drying of transformer.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Testing of transformer – testing of inter-turn isolation, determination of vector group, measuring turns ratio, testing of liquid isolation.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">First midterm exam</td><td></td><td></td></tr>
<tr><td colspan="5">Testing of electric machines – Isolation system, heating measurement, testing of inter-turn isolation, testing of iron core, on-line testing.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Testing of switching power apparatus – basic types of switching apparatus, type tests, routine tests, field tests.</td><td>2</td><td>0</td></tr>
<tr><td colspan="5">Vibration testing – physical basis, measuring methods, equipment for vibration measurement, diagnostic of irregular vibration states of electric machines.</td><td>2</td><td>0</td></tr>
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| | Noise measurement - Physical basis of noise, measuring methods and equipment for noise measurement, source of noise in electrical machines. | 2 | 0 |
| | Thermal imaging of electrical equipment- Physical basics of thermography. Thermal imaging cameras. Examples of thermal imaging recording of electrical machines, transformers and electrical connections. | 2 | 0 |
| | On-line monitoring of electrical equipment. Examples of hydrogenerator and transformer monitoring system. | 2 | 0 |
| | Second midterm exam | | |
| | List of laboratory exercises | | LE hours |
| | The study of websites of international and national standards organization (ISO, IEC, DZNM) | | 3 |
| | Measurement of isolation resistance of transformers, cables and electrical machines | | 3 |
| | Detecting location of power cable fault | | 3 |
| | Testing of inter-turn isolation of electric machines | | 3 |
| | Thermal imaging of power converter | | 3 |
| | Type testing of switching apparatus | | 3 |
| | Vibration measurement and diagnostic of electric machines | | 3 |
| | Noise measurement of electric machines | | 3 |
| | On-line monitoring of hydroagregate in HPP Peruča – field wor | | 6 |

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|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☒ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

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| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 1,7 |
| | Essay | | Seminar essay | | Laboratory exercises | 1 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 1 |
| | Written exam | 0,1 | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. At the final exams students take part of course that did not pass the midterm exams. Each midterm test is carried out as written tests with duration of 60 minute and it consists of 8 questions. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam. Final grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,2 LV + 0,4 (M1 + M2)<br>where the activities in percentage:<br>• LV – laboratory assessment,<br>• M1, M2 – midterm points.<br>The final grade is determined according to the following criteria:<br>• 50-62% - sufficient (2)<br>• 63-75% - good (3)<br>• 76-88% - very good (4)<br>• 89-100% - 149ystem sa (5) |

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| | Students who did not pass the exam after two final exams take a makeup exam in the autumn period on which takes the whole exam. The exam consists 10 theoretical questions and lasts 90 minutes. The percentage grade is determined by the formula:<br>Grade(%) = 0,2 LV + 0,8 PI<br>where PI is percentage grade of makeup exame. The final grade is determined by the same criteria as for the two final exams. | | |
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | 1. B. Terzić: Authorized lectures, FESB<br>2. Ž. Novinc, A. Halep: Tehnička dijagnostika i monitoring u industriji, Kigen, Zagreb, 2010. | 10 | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | 1. P. Gill: Electrical Power Equipment Maintenance and Testing, Marcel Dekker, Inc, New York, Basel, 1998.<br>2. N. Srb: Ispitivanje i prematanje elektromotora, Graphis, Zagreb.<br>3. K. Meštrović: Sklopni aparati srednjeg i visokog napona, Graphis, Zagreb | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

| NAME OF THE COURSE | MATHEMATICS | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FEMY03 | Year of study | 1 | | | | |
| **Course teacher** | Ivančica Mirošević, M.Sc., Lectuter | Credits (ECTS) | 7 | | | | |
| Associate teachers | Lea Dujić, Marija Čatipović, Marina Mandić | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 45 | | 45 | | |
| Status of the course | obligatory | Percentage of application of e-learning | 10 | | | | |

**COURSE DESCRIPTION**

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| Course objectives | Training students for:<br>application of mathematical concepts and tools from the area of linear algebra, vector calculus, analytic geometry, diferential calculus, analysis of real functions of real variable, sequences and series of numbers and functions, to solving engineering problems. |
| Course enrolment requirements and entry competences required for the course | Good knowledge of High School mathematics and passed State Exam in Mathematics. |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- state definitions and theorems from the enitre course,<br>- illustrate theorems with examples,<br>- solve systems of linear equations,<br>- apply vector calculus in engineering,<br>- interpret derivatives mathematically, geometrically and physically,<br>- analyse functions of one variable,<br>- test convergence of sequences and series of numbers and functions.<br>- identify integrals which are elementary integrable and solve them.<br>- analyze the extrema of real functions of several variables. |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | 1. Introduction. Sets of numbers, complex numbers, trigonometric 151ystem complex number, Moivre formulas. | 3 | 3 |
| | 2. Matrices. Basic operations with matrices. Matrix formulation of system of linear equations. Gaussian elimination. Linear independence and 151ystem a matrix. Kronecker-Capelli theorem. | 3 | 3 |
| | 3. Inverse matrix. Determinants. Laplace expansion of a determinant. Cramer's rule. | 3 | 3 |
| | 4. Vectors. Basic operations with vectors. Coordinate system. Unit vector and cosines of directions. Linear independence of vectors and basis of a space. Scalar (dot) product, vector product and mixed product. | 3 | 3 |
| | 5. Functions of a real variable: defining function, classification of functions. Review of elementary functions. | 3 | 3 |
| | 6. Limits and continuity. Asymptotes. | 3 | 3 |
| | 7. Derivatives and differential. Tangent and normal. L'Hospital's rule and limits of undetermined forms. | 3 | 3 |
| | 8. Monotonicity. Necessary and sufficient conditions for extrema. Curvature. Sufficient condition for convexity and concavity. Necessary and sufficient conditions for inflection points | 3 | 3 |
| | 9. Examining functions and drawing graphs. | 3 | 3 |
| | 10. Sequences of real numbers. Boundedness, monotonicity and convergence. Boundedness, monotonicity and convergence. Series of real numbers. Sufficient condition for | 3 | 3 |

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|---|---|---|---|
| | convergence. Convergence criteria. Absolute convergence. Alternating series. Power series of functions and convergence radius. | | |
| | 11. Indefinite integrals. Definition and basic properties. Table of basic integrals. Basic techniques of integration. | 3 | 3 |
| | 12. Definite integrals. Newton-Leibnitz formulae. Improper integrals. Application of definite integrals. | 3 | 3 |
| | 13. The functions of several variables. Partial derivatives. Extrema of functions of several variables. | 3 | 3 |
| | List of laboratory or design exercises | | LE or DE hours |
| | | | |

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|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | Regular attendence to and active participation in lectures and excercises. | |

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| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 3 | Research | | Practical training | |
| | Experimental work | | Report | | Self study | 3.6 |
| | Essay | | Seminar essay | | (Other) | |
| | Tests | 0.2 | Oral exam | | (Other) | |
| | Written exam | 0.2 | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | During semester initial exam and two mid-term exams are held. Initial exam is scheduled after two weeks of lectures, the first mid-term exam is scheduled after 7 weeks of lectures, and the second in the week following the lectures. At the initial exam students can get 10 points, and at each mid-term exam 35 points, while the remaining 20 points are attained through assignements during lectures and excercises. The condition for passing the course is minimum 18 points on each mid-term exam and a total of at least 50 points.<br>After semester, two final exams and a correction exam are held.<br>Students which did not pass one mid-term exam, can take only this part of the exam during final exams.<br>Students which did not pass any mid-term exam, take the final exam with comprehensive course content. In that case, maximum numbers of available points is 70. The condition for passing the course is minimum 35 points in the final exam and a total of at least 50 points.<br>The grade is formed after the second final exam according to article 75 of the Statute of FESB:<br>15% of the best students get the mark excellent (5),<br>next 35% students get the mark very good (4),<br>next 35% students get the mark good (3)<br>and the last 15% students get thet mark sufficient (2).<br>Students who did not pass the course after final exams, and have obtained total of at leat 10 points, can attend the correction exam. On the correction exam maximal number of points is 100, and the minimum requirement for a passing grade is 50 points. Mid-term exams, final exams and correction exams are held according to the exam schedule. |

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|---|---|---|---|
| Required literature (available in the | **Title** | **Number of copies in the library** | **Availability via other media** |

| | | | |
|---|---|---|---|
| library and via other media) | Bradić T., Pečarić J., Roki R., Strunje M.: Matematika za tehnološke fakultete, Element Zagreb, 1998. | | |
| | Rivier K.: Zbirka riješenih zadataka I, II, III, Veleučilište u Splitu 2003. | | |
| | Lecture materials on FESB e-learning portal. | | https://elearning.fesb.unist.hr |
| Optional literature (at the time of submission of study programme proposal) | - Šego, B., Matematika za ekonomiste, Narodne novine, Zagreb, 2005.<br>- I. Slapničar, Matematika 1, FESB, Split, http://lavica.fesb.hr/mat1<br>- I. Slapničar, Matematika 2, FESB, Split, http://lavica.fesb.hr/mat2<br>- B. P. Demidovič, Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, Zagreb, 1995.<br>- Dž. Lugić, Matematika II (metodički riješeni zadaci)<br>- B. Apsen, Repetitorij više matematike 1., 2., 3. i 4, Tehnička knjiga, Zagreb<br>- S. Pavasović i ostali, Matematika – riješeni zadaci, Građevinski fakultet, Split | | |
| Quality assurance methods that ensure the acquisition of exit competences | - homework<br>- short tests<br>- quizzes<br>- mid-term exams<br>- final exam<br>- student questionnaires | | |
| Other (as the proposer wishes to add) | | | |

| **NAME OF THE COURSE** | **MEASUREMENTS IN POWER SYSTEM** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FENO11 | Year of study | 2. | | | | |
| **Course teacher** | Goran Petrović, Ph.D., Associate Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Juraj Alojzije Bosnić, assistant<br>Tonko Garma, Ph.D., Assistant Professor | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 0 | 30 | 0 |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | |
| **COURSE DESCRIPTION** | | | | | | | |
| Course objectives | Training students for:<br>- measurement voltage and current by various transducers,<br>- recommend appropriate transducers for specific puproses<br>- using measurement instruments specific for power systems. | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- describe and use inductive voltage transformers,<br>- describe and use inductive current transformers,<br>- describe and use electronic voltage and current transducers<br>- recommend appropriate transducers in accordance with IEC standards<br>- make energy meter calibration,<br>- use some modern instruments for power system,<br>- understand Power quality parameters | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L hours | AE hours |
|---|---|---|---|
| | Instrument transformers. Inductive voltage transformers. Equations in time and frequency measurements. | 2 | 0 |
| | Inductive current transformers. Vector diagram. | 2 | 0 |
| | Mòllinger Gewecke diagrams of errors for inductive transformers. | 2 | 0 |
| | Frequency response of instrument transformers. Labelling. | 2 | 0 |
| | Equivalent scheme with lumped and distributed parameters. High voltage transformers. Cascaded transformers. | 2 | 0 |
| | Instrument voltage and current transformers for protection and measurements IEC standards for voltage transformers. Electromagnetic compatibility. | 2 | 0 |
| | Error calculation procedure for stationary and transient states in accordance with IEC standards. | 2 | 0 |
| | First midterm exam | | |
| | Faults in power system and current instruments for protection in transient state. | 2 | 0 |
| | Capacitive voltage transformers. Voltage resistance and capacitive dividers. Optoelectronic transducers. | 2 | 0 |
| | Electronic current transducers. Hall effect open and closed loop current transducers. Rogowski coil. | 2 | 0 |
| | Power quality monitoring, EN 50160. Dynamic signal analysers. Disturbance analysers. Tariff system | 2 | 0 |
| | Reactive power compensation, and suppression of high harmonics. Systems for supervisory control and data acquisition. | 2 | 0 |
| | Measurement on grounded systems. Soil resistivity. Wenner method. Schlumberger method. | 2 | 0 |
| | Second midterm exam | | |

<table>
<tr><td rowspan="10"></td><td colspan="5">List of laboratory exercises</td><td>LE hours</td></tr>
<tr><td colspan="5">Measurements of AC voltage and current by various transducers.</td><td>3</td></tr>
<tr><td colspan="5">Calibration of current transformer.</td><td>3</td></tr>
<tr><td colspan="5">Calibration of 3 phase energy meter.</td><td>3</td></tr>
<tr><td colspan="5">Measurement by using of electronics transducers for active and reactive power, voltage and current.</td><td>3</td></tr>
<tr><td colspan="5">Measurements of power system quantities by digital instrument.</td><td>3</td></tr>
<tr><td colspan="5">Cable faults. Impulses reflectometry.</td><td>3</td></tr>
<tr><td colspan="5">Monitoring of power transformer. (visiting workshop)</td><td>3</td></tr>
<tr><td colspan="5">Power quality: measurements and reporting</td><td>3</td></tr>
<tr><td colspan="5">Practical skills exam</td><td>2</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>3</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>0,5</td></tr>
<tr><td>Tests</td><td>0,5</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,5</td></tr>
<tr><td>Written exam</td><td>0,5</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and final exams that are carried out as written tests. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 5 theoretical questions and numerical problems and final tests consist of 10 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part.<br>The requirement for passing grade is the positive assessment of laboratory exercises and 40 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,4 LV + 0,3 (M1 + M2)<br>the activities in percentage:<br>• LV – laboratory assessment,<br>• M1, M2 – test results.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">G. Petrović: Skripta s predavanja, FESB</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Alan S. Morris: Signal Processing of Power Quality Disturbances, IEEE Press. 2006.<br>William C. Dunn: Fundamentals of Industrial Instrumentation and Process Control, McGraw-Hill, 2005.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **MEASUREMENTS OF PROCESS QUANTITIES** | | | | | | | |
| **Code** | FENO16 | Year of study | 3. | | | | | |
| **Course teacher** | Goran Petrović, Ph.D., Associate Professor | Credits (ECTS) | 5 | | | | | |
| Associate teachers | Juraj Alojzije Bosnić, assistant | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | 0 | 0 | 30 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- signal conditioning and analogue processing of signals<br>- measuring of different kinds of process variables |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- make basic circuits for analogue processing,<br>- use the basic protocols for communication between smart sensors and PC,<br>- make temperature sensors calibration,<br>- use thermal imaging camera,<br>- make force and pressure sensors calibration,<br>- recommend appropriate sensors for displacement, temperature, force, pressure, velocity, level, flow, light, …<br>- make Labview program for monitoring, control and data acquisition. |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L hours | AE hours |
|---|---|---|
| Instrument accuracy and parameters that affect an instrument's performance. Static features of sensors | 2 | 0 |
| Dynamic features of sensors. Transfer functions and frequencies responses of first and second order systems. | 2 | 0 |
| Operation amplifier and signal conditioning. Amplification, summation, integration, derivation and filtering of analog signals. | 2 | 0 |
| Transfer signals on long distances. Analog and digital modulations techniques. | 2 | 0 |
| Interfaces for signal transferring (USART, RS232, RS 485). Communication protocols (HART, M Bus, MODBUS, Ethernet) | 2 | 0 |
| Displacement sensors. Potentiometric, inductive, capacitive, ultrasound, optical, magnetostrictive, magnetoresistive. Hall effect sensors. | 2 | 0 |
| Measuring of thermal quantities. Resistance thermometers. Thermistors. Linearization. | 2 | 0 |
| First midterm exam | | 0 |
| Thermoelectric effects. Thermocouples. Pyroelectric effects. Thermal radiation. Thermography. | 2 | 0 |
| Pressure measurements. Diaphragms, Bourdon tubes. Microphones. | 2 | 0 |
| Force and moment measurements. Strain gauges. Piezo electric transducers. Charge amplifier. | 2 | 0 |
| Velocity measurements. Doppler effect. Angular velocity. Incremental and absolute encoder. | 2 | 0 |
| Level measurements. Direct level sensing. Indirect level sensing. Flow measurement. Bernoulli equation. | 2 | 0 |

| | | | |
|---|---|---|---|
| | Flow measurement instruments: Pitot tube, Orifice plate, Venturi tube, Rotameter, Turbine meter, Electromagnetic. | 2 | 0 |
| | Second midterm exam | | 0 |
| | List of laboratory exercises | | LE hours |
| | Principles of Labview coding (Data type, Input output variables) | | 3 |
| | Loops and structures in Labview. Creating graphical user interface. | | 3 |
| | Static characteristics of transducers. (Displacement and temperature) | | 3 |
| | Thermistor and thermocouple. Linearization. | | 3 |
| | Thermography. Measurement of thermal flux. | | 3 |
| | Pressure, force, velocity and level measurement | | 3 |
| | Educational Laboratory Virtual Instrumentation Suite (signal conditioning) | | 3 |
| | Educational Laboratory Virtual Instrumentation Suite (photometry) | | 3 |
| | Practical skills exam | | 2 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2 |
| | Essay | | Seminar essay | 0,7 | Laboratory exercises | 0,5 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,5 |
| | Written exam | 0,1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams that are carried out as written tests. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and numerical problems and final tests consist of 20 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part.<br><br>The requirement for passing grade is the positive assessment of laboratory exercises and 40 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br><br>Grade(%) = 0,4 LV + 0,3 (M1 + M2)<br><br>the activities in percentage:<br>• LV – laboratory assessment,<br>• M1, M2 – test results. |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | G. Petrović: Skripta s predavanja, FESB | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | Alan S. Morris: Measurement and Instrumentation Principles. Butterworth-Heinemann, Oxford. 2001.<br>William C. Dunn: Fundamentals of Industrial Instrumentation and Process Control, McGraw-Hill, 2005. | | |

| | |
|---|---|
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| NAME OF THE COURSE | MARINE ELECTRICAL ENGINEERING | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FENO26 | Year of study | 3. | | | | |
| **Course teacher** | Slavko Vujević, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 0 | 30 | 0 |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | |
| **COURSE DESCRIPTION** | | | | | | | |
| Course objectives | Training students for understanding and application of specialized knowledge of:<br>- marine electrical devices and systems,<br>- marine electrical equipment,<br>- marine electrical installations. | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- describe the basic principles of ship's electric power generation,<br>- describe the basic principles of ship's electric power transmission and distribution,<br>- describe the basic principles of ship's electric power consumption,<br>- describe high voltage power system on ships,<br>- define safety rules for working with electrical equipment on ships,<br>- compare the features of marine power systems and terrestrial power systems,<br>- use of normative documents in the field of marine electrical engineering,<br>- apply the requirements of classification societies and the requirements of national maritime administrations. | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L hours |
|---|---|---|
| | Specific features of the ship's electric power system. Marine electric power generation. | 2 |
| | Marine electric propulsion. | 4 |
| | Marine electric power transmission and distribution. | 6 |
| | Marine electric power consumption. | 4 |
| | Marine instrumentation. | 2 |
| | Ship's high voltage electric power system. | 4 |
| | The dangers of electricity. Protection and safety measures when working with electrical equipment. Safety and security measures on ships. | 2 |
| | Standardization of marine electrical engineering through IEC and ISO. Requirements of classification societies and requirements of national maritime administrations. | 2 |
| | Two midterm exams | |
| | List of laboratory exercises | LE hours |
| | Marine electric power generation | 3 |
| | Marine electric propulsion | 3 |
| | Marine electric power transmission | 3 |
| | Marine electric power distribution | 3 |
| | Ship's high voltage electric power system | 3 |
| | Marine electric power consumption | 3 |
| | Optimization of ship's electric power system | 3 |
| | Safety and security measures on ships | 3 |
| | Professional visit to ships in shipyard | 6 |

| Format of instruction | ☒ lectures | ☐ independent assignments |
|---|---|---|

| | | |
|---|---|---|
| | ☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | Attendance on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 1.7 |
| | Essay | | Seminar essay | | Laboratory exercises | 0.8 |
| | Tests | 0.2 | Oral exam | | Preparation for laboratory exercises | 0.2 |
| | Written exam | 0.1 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterm exams. After two midterm exams, student can pass the entire exam. In the two final exams students take course parts that they did not pass in the preliminary exams. If in the first final exam student passes one of the two course parts, that course part the student does not have to take in the second final exam. The requirement for a positive evaluation of the course part is that the student has completed at least 50 % points from that course part. The final grade (in percentage) can be calculated using the formula:<br>Grade (%) = 0.1*LV + 0.45*(G1 + G2)<br>where activities in percentage are: LV – laboratory assessment, G1 – points from the first course part, G2 – points from the second course part.<br>Students who did not pass the entire exam after two final exams can pass the exam in the additional exams. In the two additional exams students take the entire course. The requirement for a positive assessment of the additional exams is that the student has completed at least 50 % points from the entire course. The final grade (in percentage) can be calculated using the formula:<br>Grade (%) = 0.1*LV + 0.9*G<br>where activities in percentage are: LV – laboratory assessment, G – points from the entire course.<br>The final grade can be calculated as follows:<br>• 50 % to 61 % - pass (2)<br>• 62 % to 74 % - good (3)<br>• 75 % to 87 % - very good (4)<br>• 88 % to 100 % - excellent (5)<br>Each of the midterm exams consists of ten theoretical questions. Two final exams and two additional exams consist of twenty theoretical questions. |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | Vujević, S., "Predavanja iz predmeta Brodska elektrotehnika (511)", Sveučilište u Splitu, FESB, Split, 2014. (lecture notes – electronic version) | | e-learning portal |
| | Milković, M.,"Brodski električni strojevi i uređaji", Sveučilište u Dubrovniku, Dubrovnik, 2005. | 5 | |

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|---|---|
| Optional literature (at the time of submission of study | • Hall, D.T., "Practical Marine Electrical Knowledge – Second Revised Edition", Witherby ✓ Co Ltd, 1999.<br>• McGeorge, H.D., "Marine Electrical Engineering and Practice – Second Edition", Butterworth-Heinemann, 1993. |

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|---|---|
| programme proposal) | • Skalicki, B. i Grilec, J., “Brodski električni uređaji”, Sveučilište u Zagrebu, FSB, Zagreb, 2000. |
| Quality assurance methods that ensure the acquisition of exit competences | • Evaluation of results in accordance with the above learning outcomes<br>• Feedback from students via surveys<br>• Self-evaluation of teachers<br>• Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| NAME OF THE COURSE | MARITIME RADIOCOMMUNICATIONS | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELO40 | Year of study | 3. | | | | |
| **Course teacher** | Antonio Šarolić, Ph.D., Full Professor | Credits (ECTS) | 4 | | | | |
| Associate teachers | Niko Ištuk, mag. ing. el. | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | | | 15 | |
| Status of the course | elective | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding the specificities of maritime radiocommunications<br>- acquiring knowledge on maritime radiocommunication systems |
| Course enrolment requirements and entry competences required for the course | None. |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- describe the specificities of maritime radiocommunications<br>- apply the knowledge of radiocommunications to maritime applications<br>- identify the maritime radiocommunication devices and systems in use<br>- use the maritime radiocommunication systems |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction to maritime radiocommunications. | 2 | 0 |
| Basics of maritime telecommunications. | 2 | 0 |
| Basics of maritime radiocommunications. | 4 | 0 |
| Terrestrial radio links. | 2 | 0 |
| Satellite radio links. | 2 | 0 |
| Terrestrial radiocommunication systems. | 2 | 0 |
| Satellite radiocommunication systems. | 2 | 0 |
| GMDSS system. | 2 | 0 |
| Shipboard navigational radar. | 2 | 0 |
| GPS. | 2 | 0 |
| Visit to systems in use (field trip). | 4 | 0 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Introduction to maritime radiocommunications. | 1 |
| Basics of maritime telecommunications. | 1 |
| Basics of maritime radiocommunications. | 2 |
| Terrestrial radio links. | 1 |
| Satellite radio links. | 1 |
| Terrestrial radiocommunication systems. | 1 |
| Satellite radiocommunication systems. | 1 |
| GMDSS system. | 1 |
| Shipboard navigational radar. | 1 |
| GPS. | 1 |
| Visit to systems in use (field trip). | 2 |

| Format of instruction | | |
|---|---|---|
| | ☒ lectures<br>☒ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☒ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |

| | |
|---|---|
| Student responsibilities | Student is required to attend the lectures and auditory exercises in the amount of at least 70% of the schedule. Student is required to attend the laboratory exercises in the amount of 100% of the schedule and to complete all tasks associated with laboratory exercises. |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| | Class attendance | 1,5 | Research | | Practical training | |
| | Experimental work | | Report | | Laboratory exercises | 0,5 |
| | Essay | | Seminar essay | 0,5 | Individual work | 0,5 |
| | Mid-exam | 0,5 | Oral exam | | (Other) | |
| | Written exam | 0,5 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | During the semester, two mid-exams will be held. The first mid-exam will be held in the middles of the semester, while the second will be held after the lectures and exercises are completed, schedules to be agreed with the students.<br>The first mid-exam is based on the first half of the course material. The second mid-exam is based on the first second half of the course material.<br>To pass at each mid-exam, min. 50% of points must be earned from the part of the exam containing numerical problems (material from auditory exercises) and min. 50% of points must be earned from the part of the exam containing theory (material from the lectures).<br>To earn the right to approach the second mid-exam, min. 30% of points must be earned from the part of the first mid-exam containing numerical problems (material from auditory exercises) and min. 30% of points must be earned from the part of the first mid-exam containing theory (material from the lectures).<br>If a student earns the positive grades on both mid-exams, he/she is considered to have passed the whole exam with the grade calculated as average from both mid-exams.<br>At the first exam term, students may choose to take the exam containing only that half of the material that they haven't passed at mid-exams.<br>At all other exam terms, students must take the whole exam, containing all the course material.<br>Approaching the exams is subject to fulfilling the requirements on student responsibilities.<br>The overall point percentage defining the overall grade is calculated as the average of points earned in all exam questions, corrected by the result of oral verification:<br>Percentage -> Grade<br>50% - 62,4% -> sufficient (2)<br>62,5% - 74,9% -> good (3)<br>75% - 87,4% -> very good (4)<br>87,5% - 100% -> excellent (5)<br>Final grade can be supplemented by performing practical project work involving individual and experimental work, in agreement with the teacher.<br>Exam terms: according to the academic year calendar |

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | Kim, J.C., Muehldorf, E.I., Naval Shipboard Communication Systems, Prentice Hall, 1995. | | |
| | Lees, G.D., Williamson, W.G., Handbook for Marine Communications, Lloyds of London Press, London, 1999. | | |
| | Law, Preston E. Jr, Shipboard Antennas, Artech House, Boston, 1986. | | |

| | |
|---|---|
| Optional literature (at the time of | - Zentner, E,. Antene i radiosustavi, Graphis, Zagreb, 2001. |

| | |
|---|---|
| submission of study programme proposal) | - Law, Preston E. Jr, Shipboard Electromagnetics, Artech House, Boston, 1987.<br>- Šarolić, A., Elektromagnetska kompatibilnost brodskih RF uređaja, (magistarska disertacija), FER, 2000. |
| Quality assurance methods that ensure the acquisition of exit competences | Surveys providing student feedback |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="3">MECHATRONICS PRACTICALS</td></tr>
<tr><td>Code</td><td>FELO48</td><td>Year of study</td><td>3</td></tr>
<tr><td>Course teacher</td><td>Vladan Papić, Ph.D., Full Professor Mirjana Bonković, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td>5</td></tr>
<tr><td>Associate teachers</td><td>Miroslav Dujmović, BSc (external collaborator)</td><td>Type of instruction (number of hours)</td><td>L: 15, S: 0, AE: 0, LE: 45, DE: 0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td>0</td></tr>
<tr><td colspan="4">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="3">Training students:<br>- to understand and to apply basic knowledge from the field of electronics, mechanical engineering and computer science for intelligent systems functionality<br>- to understand and to be able to analyze mechatronics systems and their components<br>- to understand the principle of mechatronic system control and to learn how to program them<br>- to be able to apply acquired knowledge for intelligent system realization</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="3">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="3">Students will be able to:<br>- describe the basic elements of the mechatronic system<br>- describe the functionality of the elements of mechatronic system<br>- analyze the functionality of the mechatronic system<br>- program the microcontrollers<br>- calculate the parameters of the system components<br>- demonstrate the functionality of the feedback systems</td></tr>
<tr><td rowspan="18">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="2">Course content</td><td>L or S hours</td></tr>
<tr><td colspan="2">Introduction to mechatronics</td><td>2</td></tr>
<tr><td colspan="2">Feedback control</td><td>1</td></tr>
<tr><td colspan="2">Mechanisms for the transfer of movement</td><td>1</td></tr>
<tr><td colspan="2">Microcontrollers and microcontroller programming</td><td>2</td></tr>
<tr><td colspan="2">Electronic circuits and mechatronic system components</td><td>2</td></tr>
<tr><td colspan="2">Sampling and signal conversion</td><td>2</td></tr>
<tr><td colspan="2">Sensors: sensor characteristics, uncertainty representation, sensor types: incremental encoders, position and orientation sensors, inertial sensors, vision sensors.</td><td>1</td></tr>
<tr><td colspan="2">Electrical actuators (AC and DC motors, solenoids)</td><td>2</td></tr>
<tr><td colspan="2">Mechatronic systems</td><td>1</td></tr>
<tr><td colspan="2">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="2">Instrumentation, elements and breadboard</td><td>2</td></tr>
<tr><td colspan="2">DC motor control</td><td>2</td></tr>
<tr><td colspan="2">Microcontroller programming 1</td><td>2</td></tr>
<tr><td colspan="2">Microcontroller programming 2</td><td>2</td></tr>
<tr><td colspan="2">Project task</td><td>4</td></tr>
<tr><td colspan="2">Project task demonstration</td><td>4</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Format of instruction</td><td>☒ lectures</td><td colspan="2">☐ independent assignments</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">☒ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☒ individual tasks<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled.<br>Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*</td><td>Class attendance</td><td>0,5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>0,7</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>2</td><td>Laboratory exercises</td><td>1,5</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,2</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester there are two midterm exams. The first midterm exam is after 7 weeks of lectures and the second one is after 13 weeks of lectures. The first midterm test is carried out in a written format with duration of 90 minutes. The requirement for passing grade is the positive assessment of laboratory exercises (10%), 50 % points for the midterm tests (40%) and positively evaluated presentation and defense of the project assignment (50%). Students are allowed to have at least 10% of total points on midterm exams, as long as the final average is at least 50% of total points.<br>Grade (in percentage) is formed according to the formula:<br><br>Grade(%) = 0,1L + 0,2M1 + 0,2M2 + 0,5*FP<br><br>where:<br>• L – laboratory assessment,<br>• M1, M2 – midterm test results.<br>• FP – final project.<br><br>According to Article 65. of Faculty’s Bylaw, student is required to participate in all teaching activities attending at least 70% of lectures, and 100% of laboratory exercises. If student does not meet these criteria, she or he won’t be able to take part in the final exam, and will be required to enroll in the course the next year.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="4">**Title**</td><td>**Number of copies in the library**</td><td>**Availability via other media**</td></tr>
<tr><td colspan="4">1. Papić, Mehatronika, lecture notes, FESB.</td><td></td><td>e-Learning</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">1. Sabri Cetinkunt: Mechatronics, John Wiley & Sons, 2006.<br>2. Bateson, Introduction to Control System Technology, Prentice-Hall, 2002.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Keeping records of student attendance.<br>- Annual analysis of course statistics in terms of midterm and finals exams.<br>- Feedback from students via surveys.<br>- Teacher self-evaluation.<br>- Feedback from graduated students (or senior students) on course content relevance.<br>- Periodic institutional evaluation of course teachers.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6">/</td></tr>
</table>

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **MICROCONTROLLERS AND EMBEDDED NETWORK SYSTEMS** | | | | | | | |
| **Code** | FELO39 | Year of study | 2. | | | | | |
| **Course teacher** | Mirjana Bonković, Ph.D., Full Professor | Credits (ECTS) | 4 | | | | | |
| Associate teachers | Ivo Stančić, Ph.D., Assistant Professor | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | 0 | 0 | 15 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students:<br>- to develop an understanding for the purpose and the design principles of the embedded systems<br>- to develop an understanding of basic microcontroller architecture<br>- to be familiar with concept of microcontroller interfaces<br>- to be able to create embedded system that communicates via a local Ethernet network and the Internet | | | | | | | |
| Course enrolment requirements and entry competences required for the course | Finished programming course. | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define and understand the basic concepts related to the process of designing the embedded system.<br>- define and understand the interfacing techniques<br>- program the related microcontrollers' peripheral systems to establish the appropriate functionality of the embedded system<br>- design the embedded system in the Arduino environment that reflect the functionality based on the information processing acquired from the sensors.<br>- apply a procedure that provides network data transmission from sensor to the processing unit<br>- apply a procedure which ensures the functionality of the embedded system through web interface. | | | | | | | |
| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | | | | | | |
| | The purpose of a microcontroller. Embedded system design principles. | 2 | | | | | | |
| | Embedded system design in Arduino environment. | 2 | | | | | | |
| | Knowledge and understanding of fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware. | 2 | | | | | | |
| | Microprocessor peripheral devices. General purpose input output. | 2 | | | | | | |
| | Serial communication: SPI, USART, IIC. | 4 | | | | | | |
| | Real time clock. Timers. | 2 | | | | | | |
| | A / D and D / A converters. Realization of A / D converters. | 2 | | | | | | |
| | Interrupts. Programming interrupts. | 2 | | | | | | |
| | Architecture and functional microprocessors' components for network communication. | 2 | | | | | | |
| | Using IP for local and Internet communications. Exchanging messages using UDP and TCP, e-mail. Alarm system. | 2 | | | | | | |
| | Using the Web interface. | 2 | | | | | | |
| | Optimization of the embedded system regarding the energy consumption | 2 | | | | | | |
| | List of laboratory or design exercises | LE or DE hours | | | | | | |

<table>
<tr><td rowspan="10"></td><td colspan="5">Introduction to the Arduino development environment: hardware components and programming mode.</td><td>1</td></tr>
<tr><td colspan="5">Digital input - output. Serial Monitor.</td><td>1</td></tr>
<tr><td colspan="5">Analog input. PWM output.</td><td>1</td></tr>
<tr><td colspan="5">Speed control of DC motors.</td><td>1</td></tr>
<tr><td colspan="5">Using GPS module.</td><td>1</td></tr>
<tr><td colspan="5">Using NRF modules.</td><td>1</td></tr>
<tr><td colspan="5">Sensors: OneWire temperature sensor, analog sensor (gyroscope), IIC sensor.</td><td>1</td></tr>
<tr><td colspan="5">Ethernet shild. Exchanging messages using UDP and TCP.</td><td>1</td></tr>
<tr><td colspan="5">Web server (with and without feedback), e-mail, alarm system.</td><td>1</td></tr>
<tr><td colspan="5">Student projects.</td><td>6</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☒ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1,5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>0,5</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>1</td><td>Laboratory exercises</td><td>0,7</td></tr>
<tr><td>Tests</td><td>01,</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,1</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester there are two midterm exams. The first midterm exam is after 7 weeks of lectures and the second one is after 13 weeks of lectures (in a form of presentation and defense of the project assignment).The first midterm test is carried out in a written format with duration of 90 minutes. The requirement for passing grade is the positive assessment of laboratory exercises, 50 % points for the first midterm test and positively evaluated presentation and defense of the project assignment. Students are allowed to have at least 45% of total points on midterm exams, as long as the final midterm average is at least 50% of total points.<br>Grade (in percentage) is formed according to the formula:<br><br>Grade(%) = 0,1L + 0,4M1 + 0,5M2<br><br>where:<br>• L – laboratory assessment,<br>• M1, M2 – midterm test results.<br><br>According to Article 65. of Faculty's Bylaw, student is required to participate in all teaching activities attending at least 70% of lectures, and 100% of laboratory exercises. If student does not meet these criteria, she or he won't be able to take part in the final exam, and will be required to enroll in the course the next year.</td></tr>
<tr><td>Required literature (available in the</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
</table>

| | | | |
|---|---|---|---|
| library and via other media) | Steven F. Barrett, Arduino Microcontroller Processing for Everyone!, Synthesis Lectures on Digital Circuits and Systems, Morgan & Claypool Publishers, 2010. | | |
| | David Russeell, Introduction to Embedded Systems Using ANSI C and the Arduino Development Environment, Synthesis Lectures on Digital Circuits and Systems, Morgan & Claypool Publishers, 2010. | | |
| | Michael Predko , Handbook of Microcontrollers, Tab Books, 1998. | | |
| | M. Bonković, J. Musić, I. Stančić, Mikroregulatori i ugradbeni mrežni sustavi, FESB, 2014. | | e-learning |
| Optional literature (at the time of submission of study programme proposal) | 1. Claus Kuhnel, Klaus Zahnert, BASIC Stamp : An Introduction to Microcontrollers,Newnes, 2000.<br>2. Han-Way Huang, PIC Microcontroller, Thomson Delmar Learning, 2004.<br>3. Jan Axelson: Embedded Ethernet and Internet complete, Lakeview Research LLC, 2003., ISBN: 1-931448-00-0<br>- Microcontroller links http://people.westminstercollege.edu/faculty/rerickson/control/stamplinks.html | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance.<br>- Annual analysis of course statistics in terms of midterm and finals exams.<br>- Feedback from students via surveys.<br>- Teacher self-evaluation.<br>- Feedback from graduated students (or senior students) on course content relevance.<br>- Periodic institutional evolution of course teachers. | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="4">MICROPROCESSORS</td></tr>
<tr><td>Code</td><td colspan="2">FENO30</td><td>Year of study</td><td>3.</td></tr>
<tr><td>Course teacher</td><td colspan="2">Ozren Bego, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td>5</td></tr>
<tr><td>Associate teachers</td><td colspan="2">doc. dr. sc. Danijel Jolevski</td><td>Type of instruction (number of hours)</td><td>L: 30, S: 0, AE: 0, LE: 30, DE: 0</td></tr>
<tr><td>Status of the course</td><td colspan="2">Elected</td><td>Percentage of application of e-learning</td><td>0</td></tr>
<tr><td colspan="5">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="4">Training students for:<br>- understanding concept of microprocessors and its periphery,<br>- programing microprocessors in assembler,<br>- design of simpler embedded computer devices.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="4">None.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="4">Students will be able to:<br>- define and choose microprocessor in embedded system,<br>- design microprocessor based device,<br>- program microprocessor,<br>- analyze quality and functionality of embedded computer system.</td></tr>
<tr><td rowspan="23">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="2">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="2">Introduction in course. Introduction in microprocessors.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Standard microprocessor architecture. Functions of ALU, instruction decoder, accumulators/registers,</td><td>2</td><td></td></tr>
<tr><td colspan="2">Model of Atmel ATmega16 microcontroller.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Addressing modes. Review of modes in ATmega16,</td><td>2</td><td></td></tr>
<tr><td colspan="2">Microprocessor instructions. Review of ATmega16 instructions.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Microprocessor busses. Memory types</td><td>2</td><td></td></tr>
<tr><td colspan="2">Concept of transfer data between I/O and CPU; programming I/O. Review of ATmega16 periphery.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Interrupted access to periphery. Application on ATmega16.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Periphery: A/D and D/A convertors.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Periphery: parallel data transfer.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Periphery: serial data transfer. Synchronous and asynchronous serial transfer.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Standards and protocols for serial data transfer.</td><td>2</td><td></td></tr>
<tr><td colspan="2">Higher languages for microprocessor programing.</td><td>2</td><td></td></tr>
<tr><td colspan="3">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="3">Introduction in ATmega16 microcontroller and IDE AVR Studio.</td><td>3</td></tr>
<tr><td colspan="3">Introduction in Easy AVR 5A platform for development embedded system with Atmel microcontrollers.</td><td>3</td></tr>
<tr><td colspan="3">Programing ATmega16 – instructions.</td><td>6</td></tr>
<tr><td colspan="3">Peripheral of ATmega16 – interrupts.</td><td>2</td></tr>
<tr><td colspan="3">Peripheral of ATmega16 – timer/counter, PWM.</td><td>2</td></tr>
<tr><td colspan="3">Peripheral of ATmega16 – ADC, comparator, LCD.</td><td>2</td></tr>
<tr><td colspan="3">Seminar: Design of embedded computer system; independent/group assignments.</td><td>12</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="2">☒ lectures</td><td colspan="2">☒ independent assignments</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">☒ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="2">☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Laboratory attendance</td><td>1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>1.5</td><td>Independent work</td><td>1</td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>Preparation for laboratory work</td><td>0.5</td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During semester students get independent assignments which should be presented in last week of semester. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,05 NP + 0,1 LV + 0,85 IA<br>the activities in percentage:<br>• NP - attendance at lectures,<br>• LV – laboratory assessment,<br>• IA – independent assigment.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="4">**Title**</td><td>**Number of copies in the library**</td><td>**Availability via other media**</td></tr>
<tr><td colspan="4">O. Bego: Predavanja iz predmeta Ugradbeni računalni sustavi, FESB</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6"></td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers,<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">MODELLING AND SIMULATION</td></tr>
<tr><td>Code</td><td>FELO23</td><td>Year of study</td><td colspan="5">3</td></tr>
<tr><td>Course teacher</td><td>Jadranka Marasović, Ph.D., Full Professor<br>Mojmil Cecić, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Marko Lete, mag. ing.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding different methods of modeling and simulation,<br>- application of different methods of modeling and simulation,<br>- simulation of complex systems,<br>- permanent adoption and deepening of knowledge in the field of control system.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- derive mathematical model of the simple systems,<br>- describe different electrical and mechanical circuits using differential equations,<br>- optimize systems,<br>- use software packages VISSIM, MATLAB – Simulink,<br>- design simulation model using different procedures,<br>- solve complex task of simulation different systems.</td></tr>
<tr><td rowspan="23">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="3">Course content</td><td colspan="2">L or S hours</td><td colspan="2">AE hours</td></tr>
<tr><td colspan="3">Mathematical modeling</td><td colspan="2">3</td><td colspan="2"></td></tr>
<tr><td colspan="3">Modeling approach</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Passive and active electrical circuits, fundamental laws</td><td colspan="2">3</td><td colspan="2"></td></tr>
<tr><td colspan="3">Analogous systems</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Optimization of the model</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Analog simulation</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Operational amplifier</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Basic elements of the analog simulation</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Methods of the analog simulation</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Transfer function simulation</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">The basic of digital simulation</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="3">Simulation software package – VISSIM, MATLAB</td><td colspan="2">2</td><td colspan="2"></td></tr>
<tr><td colspan="5">List of laboratory or design exercises</td><td colspan="2">LE or DE hours</td></tr>
<tr><td colspan="5">Basic elements of analog simulation (operational amplifier, inverter, summer, integrator, differentiator</td><td colspan="2"></td></tr>
<tr><td colspan="5">VISSIM, fundamentals</td><td colspan="2"></td></tr>
<tr><td colspan="5">MATLAB – Simulink, fundamentals</td><td colspan="2"></td></tr>
<tr><td colspan="5">Kelvin's feedback method</td><td colspan="2"></td></tr>
<tr><td colspan="5">Beck's method</td><td colspan="2"></td></tr>
<tr><td colspan="5">Johnson's method</td><td colspan="2"></td></tr>
<tr><td colspan="5">Transfer function simulation</td><td colspan="2"></td></tr>
<tr><td colspan="5">Simulation using RC networks (passive and active)</td><td colspan="2"></td></tr>
</table>

| | | |
|---|---|---|
| | Simulation of complex systems (DC motor, hydraulic pump, positional servo system, chemical process) | |
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| Class attendance | 2,0 | Research | | Practical training | |
| Experimental work | | Report | | Individual work | 2,5 |
| Essay | | Seminar essay | 0,2 | (Other) | |
| Tests | 0,2 | Oral exam | | (Other) | |
| Written exam | 0,1 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks.

The requirement for passing grade is the positive assessment of laboratory exercises and 50% points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:

Grade [%] =0,25*L+0.375* (M1 + M2)

where L is laboratory assessment and M1 and M2 are the results of the midterm exams in percentage.

Each midterm test consists of 10 theoretical questions and numerical problems and final test also consists of 10 theoretical questions and numerical problems divided into two groups (the first and the second part). The requirement for passing grade is 50% of the total number of questions. The students who did not pass the midterm exams take part in the final exam. The midterm and final exams are carried out as written tests. Finally grade is determined as follows:

from 50% to 62.5% - dovoljan (2)
from 62.5% to 75% - dobar (3)
from 75% to 87.5% - vrlodobar (4)
from 87.5% to 100% - izvrstan (5)

Midterm and final exams are held in the terms provided by the time table.

**Required literature (available in the library and via other media)**

| Title | Number of copies in the library | Availability via other media |
|---|---|---|
| Zanchi, V.: Simulacija, Sveučilište u Splitu, 1996. | 5 | |
| Maričić, A.: Modeliranje i simuliranje kontinuiranih sustava, Sveučilišna naklada Liber, Zagreb, 198. | 1 | |
| Marasović, J.: Kvantitativno i kvalitativno modeliranje i simuliranje, interna skripta, FESB, Split, 20003. | | e – learning portal |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | - MATLAB – Simulink, User Guide<br>- VISSIM, User Guide<br>- Marasović, J.: Uvod u operacijska istraživanja, interna skripta, FESB, Split, 2000. |
| Quality assurance methods that ensure | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys |

| | |
|---|---|
| the acquisition of exit competences | - Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| **NAME OF THE COURSE** | **MOBILE COMMUNICATION NETWORKS** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELO37 | Year of study | 3. | | | | |
| **Course teacher** | Dinko Begušić, Ph.D., Full Professor | Credits (ECTS) | 4 | | | | |
| Associate teachers | Maja Stella, Ph.D., Assistant Professor<br>Marina Rajič, Mag. ing.<br>Josip Žilić, Magl. ing.<br>Ante Dagelić, Mag. Ing, | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 0 | 15 | 0 |
| Status of the course | Obligatory | Percentage of application of e-learning | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding and application of basic concepts and technologies of wireless communication systems,<br>- collaboration in design, development and maintenance of wireless communication networks,<br>- collaborate in design, development and maintenance of optical communication systems and networks,<br>- permanent adoption and deepening of the knowledge in the area of wirelessl communication systems and networks. |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- identify, select and apply wireless communication systems and networks,<br>- collaborate in design, implementation and maintenance of mobile networks (NMT, GSM, GPRS, EDGE, UMTS, HSDPA, LTE),<br>- collaborate in design, implementation and maintenance of wireless access networks (WIMAN),<br>- collaborate in design, implementation and maintenance of wireless local area networks (WLAN, IEEE 802.11x),<br>- collaborate in design, implementation and maintenance of wireless personal area networks (WPAN, Bluetooth),<br>- collaborate in design, implementation and maintenance of ad-hoc networks,<br>- collaborate in design, implementation and maintenance of sattelite commnication networks (LEO, MEO, GEO),<br>- collaborate in development of services based on wireless communication networks,<br>- permanently adopt and deepening of the knowledge in the area of wireless communication systems and networks. |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | Basic characteristics of wireless communication channels (feding, multipath propagation, Doppler effect). | 2 | - |
| | Digital signal processing and diversity combining in wireless commnications. | 2 | - |
| | Multiple access techniques and multiplexing (FDMA, TDMA, CDMA, OFDMA). | 2 | - |
| | Cellular systems. Interference. Coverage. | 2 | - |
| | Mobile networks evolution. First generation networks. | 2 | - |
| | Second generation networks. | 2 | - |
| | GSM system. Network architecture, physical channels. | 2 | - |
| | Implementation and application of discrete time systems. | 2 | - |
| | GSM system: logical channels, layered model. 3 Mobile networks 2G+; GPRS, EDGE. | 2 | - |

<table>
<tr><td rowspan="12"></td><td colspan="2">Mobile networks 3G+ (UMTS, HSPA).</td><td>2</td><td>-</td></tr>
<tr><td colspan="2">Mobile networks 4G. (LTE, LTE-A). Mobile networks 5G.</td><td>2</td><td>-</td></tr>
<tr><td colspan="2">Wireless access networks. (WMAN); IEEE 802.16. Wireless local networks (WLAN); IEEE 802.11x. Wireless personal area networks (WPAN); Bluetooth., IEEE 802.15</td><td>2</td><td>-</td></tr>
<tr><td colspan="2">Satellite commnication networks (LEO, MEO, GEO). 176nalyse176sin wireless communication networks. Mobile computing and mobile internet.</td><td>2</td><td>-</td></tr>
<tr><td colspan="3">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="3">Configuration of IEEE 802.11x based networks.</td><td>2</td></tr>
<tr><td colspan="3">Throughput measurement in IEEE 802.11x based networks,</td><td>2</td></tr>
<tr><td colspan="3">Configura and throughput measurement in Bluetooth systems.</td><td>2</td></tr>
<tr><td colspan="3">Signalling in GSM networks.</td><td>2</td></tr>
<tr><td colspan="3">Signalling in UMST networks.</td><td>2</td></tr>
<tr><td colspan="3">Signalling in LTE networks.</td><td>2</td></tr>
<tr><td colspan="3">Synchronization in mobile networks.</td><td>2</td></tr>
<tr><td>Format of instruction</td><td>☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="4">.<br><br>D..Begušić: Wireless and mobile communication networks, handouts<br>Optional literature (at the time of submission of study programme proposal)<br>□ IEEE Communications Magazine. □ Documents of standardization institutions ITU, ETSI, IEEE and others. □ Scientific papers in the area of wireless and mobile communication networ</td></tr>
</table>

<table>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1,0</td><td>Research</td><td>-</td><td>Practical training</td><td>-</td></tr>
<tr><td>Experimental work</td><td>-</td><td>Report</td><td>-</td><td>Individual work</td><td>1,7</td></tr>
<tr><td>Essay</td><td>-</td><td>Seminar essay</td><td>-</td><td>Laboratory exercises</td><td>0,5</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td>-</td><td>Preparation for laboratory exercises</td><td>0,5</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td>-</td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm and final test consists of 10 theoretical questions and numerical problems. The duration of each test is 2 school hour. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises, the seminar exercise and 50 % points on each midterm exam or the final exam. The continuous knowledge assessment grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,05 NP + 0,15 LV + 0,4 (M1 + M2)<br>the activities in percentage:<br>• NP – attendance at lectures,<br>• LV – laboratory assessment,<br>• M1, M2 – test results.<br><br>The final grade is based on the grade of the continuous knowledge assesment grade and the oral part of the final exam. The students whose grade may be formed without</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">the need for the oral part of the final exam may not be obliged to attend tthe oral part of the exam.<br>There are two terms for the final exam and one additional term for the make up exam. The requirement for attendance of the final exam or the make up exam is the passing grade for all laboratory excercises and submitted seminar excercis work. At the final exam the student writes the test from the area of the miterm exam(s) which has/have not been succesfully passed before. At the make up exam the student writes the test from the complete course.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>D.Begušić: Mobile communication networks, handouts, FESB, 2016.</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">- P.M.Shankar: Introduction to Wireless Systems, John Wiley ✓ sons, USA, 2002 -<br>- Documents of standardization institutions ITU, ETSI, IEEE and others.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="8">MULTIMEDIA</td></tr>
<tr><td>Code</td><td>FELO19</td><td>Year of study</td><td colspan="6">2.</td></tr>
<tr><td>Course teacher</td><td>Mladen Russo, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="6">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">mag. ing. Jelena Čulić<br>mag. ing. Martina Bašić</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td colspan="2">DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td colspan="2">0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="6">0</td></tr>
<tr><td colspan="9">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="8">Training students for:<br>- understanding of multimedia systems and virtual reality<br>- knowledge of the properties and methods for generating speech, audio, image and video signals (including 3D images and video)<br>- understanding of the most important algorithms for compressing speech, audio, image and video signals</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="8">None.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="8">Students will be able to:<br>- describe the basic principles of human speech, hearing and vision<br>- explain the basic principles of psychoacoustics and their application in compression of audio signals<br>- demonstrate the frequency masking effect<br>- define the most important algorithms for compression of speech, audio, image and video signals<br>- demonstrate the basic mechanisms of JPEG compression</td></tr>
<tr><td rowspan="12">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="6">Introduction. History of multimedia systems. Basic terms. Overview of multimedia software tools. Design of multimedia applications.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Audio signal. How humans hear and speak. Speech modelling.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Generic compression techniques for audio signals. Audio specific algorithms (mp3).</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Speech specific algorithms (LPC, CELP, RELP, MPE, RPE) and applications in mobile telephony. Review of standards for encoding speech and audio signals.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Color in images and video signal. The perception of color (how people perceive electromagnetic radiation). Theory of mixing colors.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Color models for image signal (RGB, CMY, CMYK). Color models for video signal (YUV, YIQ, YCbCr). Software-oriented color models (HSB, HLS, HSV). Gamma correction. Image signal (resolution, depth, memory requirements). Image formats (gif, tiff, jfif, ps, bmp).</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Basics of video and television. Analog television and video. Digital television and video. Video formats and memory requirements.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Image compression. JPEG modes.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Video compression: H.261. H.263.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Video compression: MPEG-1. MPEG -2.</td><td>2</td><td>0</td></tr>
<tr><td colspan="6">Video compression: MPEG-4.</td><td>2</td><td>0</td></tr>
</table>

| | | | |
|---|---|---|---|
| | Video compression: H.264. | 2 | 0 |
| | Fundamentals of virtual reality. History. Stereoscopic (3D) vision. Software and hardware for virtual reality. | 2 | 0 |
| | | | LE or DE hours |
| | Sound recording. Searching of voiced and unvoiced speech. Pitch period. | | 2 |
| | Speech specific algorithms (LPC) | | 2 |
| | Frequency masking | | 2 |
| | 3D sound | | 2 |
| | Image compression (JPEG) | | 2 |
| | Image compression (JPEG) | | 2 |
| | Image compression (JPEG) | | 2 |
| | MPEG – influence of I, P, B frames on video quality | | 2 |
| | Multimedia systems on mobile devices (Android programming) | | 2 |
| | Multimedia systems on mobile devices (Android programming) | | 2 |
| | Multimedia systems on mobile devices (Android programming) | | 2 |
| | 3D images | | 2 |
| | CAVE system | | 2 |

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|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 3 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 1,7 |
| | Essay | | Seminar essay | | (Other) | |
| | Tests | 0,2 | Oral exam | | (Other) | |
| | Written exam | 0,1 | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | During a semester there are two midterms and final exam. Final exam and midterms are held according to the calendar of classes. At the final exam students take the test from the complete course if they do not have a positive grade on the midterms or take the midterm that they did not pass. At the make-up and commission exam students take the test from the complete course.<br>The requirement for passing grade is 50% points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,5*M1+0,5*M2; M1, M2 – midterm test results.<br>The final grade is determined as follows:<br>Percentage Grade<br>50% to 61% sufficient (2)<br>62% to 74% good (3)<br>75% to 87% very good (4)<br>88% to 100% excellent (5) |

| | | | |
|---|---|---|---|
| Required literature (available in the | **Title** | **Number of copies in the library** | **Availability via other media** |

| | | | |
|---|---|---|---|
| library and via other media) | H. Dujmić: Multimedijski sustavi, internal script | 1 | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | Steinmetz, Nahrstedt: "Multimedia Fundamentals: Media Coding and Content Processing", Prentice Hall, 2002<br>Rao, Bojkovic, Milovanovic: "Multimedia Communication Systems: Techniques, Standards and Networks", Prentice Hall, 2002 | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

| NAME OF THE COURSE | OPTICAL COMMUNICATIONS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Code** | FELO45 | Year of study | 3. | | | | | |
| **Course teacher** | Dinko Begušić, Ph.D., Full Professor | Credits (ECTS) | 4 | | | | | |
| Associate teachers | Maja Stella, Ph.D., Assistant Professor<br>Ivica Meštrović, dipl. ing.<br>Marko Banović, dipl. ing.<br>Josip Babić, Mag. Ing,. | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | 0 | - | 15 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students for:<br>- understanding and application of basic concepts and technologies of optical communication 181ystem san dnetworks,<br>- application of passive and active components of optical systems and networks,<br>- collaborate in design, development and maintenance of optical communication systems and networks,<br>- permanent adoption and deepening of the knowledge in the area of optical communication systems and networks. | | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define the basic concepts and methods for signal processing and communication using optical communication systems,<br>- identify the characteristics and apply passive and active components of optical systems and networks,<br>- identify the characteristics and apply the technologies of optical communication networks,<br>- collaborate in design, development and maintenance of optical communication systems and networks,<br>- permanently adopti and deepen the knowledge in the area of optical communication systems and networks. | | | | | | | |

| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours |
|---|---|---|---|
| | Signal transmission and processing using photonic systems. Optical fibre characteristics. | 2 | - |
| | Analysis of linear time invariant systems. | 2 | - |
| | Splicing of the optical fibers. Optical connectors. Optical cables. | 2 | - |
| | Linear and nonlinear effects . Soliton systems. | 2 | - |
| | Passive element sin optical communication systems. Directional couplers, isolators, circulators, optical filters, multiplexers. | 2 | - |
| | Bragg grating, Mach-Zender interferometer, Fabry-Perot filter. | 2 | - |
| | Active components in optical communication networks. Optical amplifiers. EDFA amplifiers. | 2 | - |
| | Light sources. Light emittin diodes (LED). Laser diodes (LD). | 2 | - |
| | Photonic detectors. Pin photodiodes. Avalanche photodiodes (APD). | 2 | - |
| | Photonic switches. Modulators and demodulators. | 2 | - |

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|---|---|---|---|
| | Characteristics of optical receivers. Design of the physical layer of the optical transmission system. | 2 | - |
| | Systems with time domain multiplexing. Wavelength domain multiplexing (WDM, DWDM). | 2 | - |
| | Optical networks SDH/SONET. Optical layer. Access networks based on optical technologies: FTTx systems. Passive optical networks (PON). | 2 | - |
| | List of laboratory or design exercises | | LE or DE hours |
| | Fiber optic and cables. | | 2 |
| | Power measurements in fiber optic systems. | | 2 |
| | Optical splicing. | | 2 |
| | Optical connectors and splitters. | | 2 |
| | Measurements on WDM systems. | | 2 |
| | Measurements by optical reflectometer. | | 2 |
| | Measurements on PON networks. | | 2 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1,0 | Research | - | Practical training | - |
| | Experimental work | - | Report | - | Individual work | 2,0 |
| | Essay | - | Seminar essay | - | Laboratory exercises | 0,5 |
| | Tests | 0,2 | Oral exam | - | Preparation for laboratory exercises | 0,2 |
| | Written exam | 0,1 | Project | - | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm and final test consists of 10 theoretical questions and numerical problems. The duration of each test is 2 school hour. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises, the seminar exercise and 50 % points on each midterm exam or the final exam. The continuous knowledge assessment grade (in percentage) is formed according to the formula:

$$\text{Grade}(\%) = 0,05\ NP + 0,15\ LV + 0,4\ (M1 + M2)$$

the activities in percentage:

- NP – attendance at lectures,
- LV – laboratory assessment,
- M1, M2 – test results.

The final grade is based on the grade of the continuous knowledge assesment grade and the oral part of the final exam. The students whose grade may be formed without the need for the oral part of the final exam may not be obliged to attend tthe oral part of the exam.
There are two terms for the final exam and one additional term for the make up exam. The requirement for attendance of the final exam or the make up exam is the passing grade for all laboratory excercises and submitted seminar excercis work. At the final exam the student writes the test from the area of the miterm exam(s) which has/have not been succesfully passed before. At the make up exam the student writes the test from the complete course.

| Required literature (available in the library and via other media) | Title | Number of copies in the library | Availability via other media |
|---|---|---|---|
| | D.Begušić: Optical communicatios, handouts, FESB, 2016. | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | - Rajiv Ramaswami, Kumar Sivarajan: „Optical Networks: A Practical Perspective“, (Second edition), Academic Press, 2002.<br>- Documents of standardization institutions ITU, ETSI, IEEE and others, | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">OPTOELECTRONICS</td></tr>
<tr><td>Code</td><td>FELO07</td><td>Year of study</td><td colspan="5">2</td></tr>
<tr><td>Course teacher</td><td>Tihomir Betti, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">4</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td></td><td></td><td>15</td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5"></td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- Understanding physical principles of operation of the most important optoelectronic devices.<br>- Application of optoelectronic devices in circuits for light sourcing and/or detection.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- Explain the basic parameters of semiconductor materials important for optoelectronic applications.<br>- Describe the basic physical processes related to interaction of semiconductors with light.<br>- Explain the operation of light-emitting diode and test its operation in the laboratory.<br>- Name the commonly used photodetectors, test them in the laboratory and compare their properties.<br>- Measure the I-V curve of the photovoltaic module and calculate its efficiency and fill factor.</td></tr>
<tr><td rowspan="15">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L hours</td></tr>
<tr><td colspan="6">Introduction to optoelectronics.</td><td>2</td></tr>
<tr><td colspan="6">Semiconductor materials. Electrons and holes in semiconductors. Transport mechanisms in semiconductors (diffusion and drift).</td><td>2</td></tr>
<tr><td colspan="6">Carrier densities in semiconductors. Electrical conductivity of semiconductor.</td><td>2</td></tr>
<tr><td colspan="6">Fermi level in semiconductors. Quasi-Fermi levels. Direct and indirect bandgap semiconductors.</td><td>2</td></tr>
<tr><td colspan="6">Semiconductor heterostructures. Semiconductor alloys. Lattice-matched semiconductor heterostructures and strained-layer epitaxy. Quantum well.</td><td>2</td></tr>
<tr><td colspan="6">Interaction of photons with carriers in semiconductors: emission and absorption. Probabilities of absorption and emission.</td><td>2</td></tr>
<tr><td colspan="6">Optical joint density of states. Rates of absorption and emission. Theoretical spontaneous emission spectrum.</td><td>2</td></tr>
<tr><td colspan="6">Light-emitting diode: operating principle, basic parameters. Device characteristics, materials and applications.</td><td>2</td></tr>
<tr><td colspan="6">Operating principle of a laser. Laser types. Laser diodes.</td><td>2</td></tr>
<tr><td colspan="6">Classification of photodetectors. Main parameters of a photodetector: quantum efficiency, responsivity, impulse response, dark current.</td><td>2</td></tr>
<tr><td colspan="6">Photoconductors: operating principle, main properties and applications. Photodiodes: operating principle.</td><td>2</td></tr>
<tr><td colspan="6">P-N and P-I-N photodiodes. Avalanche photodiodes. Basic photodiode circuits. Phototransistors.</td><td>2</td></tr>
<tr><td colspan="6">Solar cells: operating principles, main parameters, I-V curve. Materials, technology, applications.</td><td>2</td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE hours</td></tr>
</table>

<table>
<tr><td rowspan="5"></td><td colspan="5">Light-emitting diodes.</td><td>3</td></tr>
<tr><td colspan="5">Photoconductor.</td><td>3</td></tr>
<tr><td colspan="5">Photodiode.</td><td>3</td></tr>
<tr><td colspan="5">Phototransistor. Optocoupler.</td><td>3</td></tr>
<tr><td colspan="5">Solar cell.</td><td>3</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">At least 70% of lectures attendance. Completed all laboratory assignments.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>0.5</td></tr>
<tr><td>Tests</td><td>0.15</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0.25</td></tr>
<tr><td>Written exam</td><td>0.1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterm exams and final exams. The first midterm exam is scheduled after 7 weeks of classes and the second one after the following 6 weeks. Each midterm exam is written and consists of theoretical questions and numerical problems. To pass an exam, the student should score at least 50% and also have a positive assesment of the laboratory exercises.<br>The final grade (in percentage) is determined according to the formula:<br>Grade(%)=0.35(M1+M2)+0.3L,<br>where:<br>• M1, M2 – grade from midterm exams given in percentage,<br>• L – grade from laboratory exercises given in percentage.<br>Students not passing the midterm exams take part in the final exams. For passing the final exam, students must score at least 50% as well as have a positive assesment of the laboratory exercises. The grade on final exams is determined by the formula:<br>Grade(%) = 0.7F+0.3L,<br>where:<br>• T – grade from F final exam given in percentage.</td></tr>
</table>

<table>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>T. Betti: Optoelektronika – autorizirana predavanja (prezentacije), FESB</td><td></td><td>E-learning portal</td></tr>
<tr><td>I. Zulim, S. Gotovac: Osnovni poluvodički elektronički elementi, FESB, Split, 1998.</td><td></td><td></td></tr>
<tr><td>S.O. Kasap: Optoelectronics and Photonics, Pearson, 2013.</td><td></td><td></td></tr>
<tr><td>P. Bhattacharya: Semiconductor Optoelectronic Devices, Prentice Hall, 1997.</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">- B.E.A. Saleh, M.C. Teich: Fundamentals of Photonics, 2nd edition, Wiley, 2007.<br>- J. Singh: Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill, 1995.<br>- S. L. Chang, Physics of Optoelectronic Devices, Wiley, 1995.<br>- P. Horowitz, W. Hill: The Art of Electronics, Cambridge University Press, 2015.</td></tr>
<tr><td>Quality assurance methods that ensure</td><td colspan="3">- Record of number of students attending the classes<br>- Evaluation of results in accordance with expected learning outcomes</td></tr>
</table>

| | |
|---|---|
| the acquisition of exit competences | - Feedback from students via student surveys<br>- Teachers self-evaluation<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| **NAME OF THE COURSE** | **PHYSICS** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Code** | FEMO01 | Year of study | 1 | | | | | |
| **Course teacher** | Ivica Sorić, senior lecturer | Credits (ECTS) | 5 | | | | | |
| Associate teachers | | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | | 15 | 15 | | |
| Status of the course | Obligatory | Percentage of application of e-learning | | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding and application of basic principles and classical physics,<br>- setting up and solving simple physical problems,<br>- permanent deepening of knowledge as a necessary basis for adoption of further professional skills |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define the fundamental phenomena, the quantities and the laws of physics,<br>- apply fundamental laws for the calculation of physical quantities,<br>- mathematically formulate and analyse simple physical problems describing observable natural phenomena,<br>- measure basic physical quantities (velocity, acceleration, force, torque…). |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| About physics. Physical quantities. International system of units (SI). Scalar and vectors. Derivations and integrals. | 2 | 1 |
| Particle kinematics. Motion along a straight line. Motion in two or three dimensions. Circular motion. Centripetal and tangential acceleration. | 2 | 1 |
| Particle dynamics. Newton laws of motion. Linear momentum and impulse of force. Friction. | 2 | 1 |
| System of particles kinematics and dynamics. Center of mass. Conservation of linear momentum. | 2 | 1 |
| Work, energy. Conservative and unconservative forces. Potential and kinetic energy. Conservation of mechanical energy. Elastic and unelastic collision. Power. | 2 | 1 |
| Solid body mechanics. Torque. Momentum of inertion. Rotation around a fixed axes. Conservation of angular momentum. | 2 | 1 |
| Inertial and uninertial frames. Forces in the uninertial frames. Gravitation force. Gravitation field. | 2 | 1 |
| Fluid mechanics. Fluid statics. Pascal`s principle, Archimedes principle. Surface tension and capillarity. | 2 | 1 |
| Fluids dynamics. Equation of continuity. Bernoulli`s equation. | 2 | 1 |
| Oscillations. Harmonic oscillations. Damped and forced oscillations. Mathematical and physical pendulum. Resonance. | 2 | 1 |
| Mechanical waves. Equation of traveling wave. Sound waves. Superposition of waves. Interferention. Standing waves. | 2 | 1 |
| Heat and temperature. Empirical gas laws. Ideal gas law. | 2 | 1 |
| The kinetic theory of gases. First law of thermodynamics. Second law of thermodynamics. | 2 | 1 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Measuring of length. Measuring of gravitation constant. | 1 |

| | | |
|---|---|---|
| | Measuring of friction coefficient. Measuring of inertion momentum. | 1 |
| | Measuring of solid density. Measuring of liquid density. | 1 |
| | Ventouri`s tube – testing of Bernoulli`s equation. | 1 |
| | Mathematical and physical pendelum. Airy`s pendelum. | 1 |
| | Measurement of sound velocity in the air. Measurement of sound velocity in the metal. | 1 |
| | Specific heat capacitance measurement. Empiric gas laws testing. | 1 |
| | Geometrical optics. Lens. Spherical mirror. | 1 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Laboratory exercises | 0,5 |
| | Essay | | Seminar essay | | (Other) | |
| | Tests | 0,5 | Oral exam | 2 | (Other) | |
| | Written exam | 1 | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 8 theoretical questions and 4 numerical problems and final tests consist of 16 theoretical questions and 8 numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 45 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,25 LV + 0,5 M1 + 0,25 M2<br>the activities in percentage:<br>• LV – laboratory assessment,<br>• M1 – test results (theoretical problems)<br>• M2 – test results (numerical problems)<br>Final grade would be determined from the relative evaluation rules. |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | P. Kulišić: Mehanika i toplina, Školska knjiga, Zagreb, 2005. | | |
| | V. Henč-Bartolić, P. Kulišić: Valovi i optika, Školska knjiga, Zagreb, 2004. | | |
| | M.Grbac: Predavanja iz fizike | | e-learning |
| | M. Grbac: Zadaci iz fizike, 2008. | | e-learning |
| | M. Grbac i L. Rađa-Ljubić: Zadaci iz fizike (mehanika i hidromehanika), FESB, Split, 1991. | | |
| | S. Botrić, N. Godinović, M. Grbac, I. Puljak, I. Sorić: Laboratorijske vježbe iz Fizike, 2006. | | e-learning |
| | I. Sorić, Predavanja iz Fizike. | | e-learning |
| | I. Sorić, Auditorne vježbe iz Fizike. | | e-learning |

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| Optional literature (at the time of submission of study | N. Cindro: Fizika I, Školska knjiga, Zagreb, 1991.<br>N. Cindro: Fizika II, Školska knjiga, Zagreb, 1985. |

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| programme proposal) | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

| **NAME OF THE COURSE** | **POWER ELECTRONICS** | | |
|---|---|---|---|
| **Code** | FENO07 | Year of study | 2 |
| **Course teacher** | Dinko Vukadinović, Ph.D., Full Professor | Credits (ECTS) | 6 |
| Associate teachers | Mateo Bašić, Ph.D. Assistant Professor<br>Ivan Grgić, Assistant | Type of instruction (number of hours) | L: 45, S: 0, AE: 0, LE: 30, DE: 0 |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 |

| Type of instruction (number of hours) | L | S | AE | LE | DE |
|---|---|---|---|---|---|
| | 45 | 0 | 0 | 30 | 0 |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding of basic principles of power electronics devices switching,<br>- understanding of power converters operating principles<br>- analysis of rectifiers, inverters and non-isolated DC-DC converters |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br><br>1) define ways of power electronics devices switching<br>2) explain the natural commutation in phase-controlled rectifiers<br>3) 190nalyse the operation of rectifiers, inverters and non-isolated DC-DC converters<br>4) adjust the firing angle of full-controlled bridge converter in accordance the desired mean value of the output voltage<br>5) make the simulation model of the phase-controlled three-phase converter<br>6) make the simulation model of the buck non-isolated DC-DC converter<br>7) operate with the buck non-isolated DC-DC converter<br>8) calculate the power factor of the load connected to the electric grid via the power converter<br>9) calculate the thermal resistance of certain power electronics device<br>10) specify ways of power electronics devices protection |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L hours | |
|---|---|---|
| Introduction and basic principles of power electronics devices | 4 | |
| Ways of power electronics devices turning-off and natural commutation | 4 | |
| Diode rectifiers | 4 | |
| Comparison of the diode rectifiers | 2 | |
| Thyristor-based converters | 4 | |
| Power flow in electric grids with power electronics converters and effects of current distortion | 4 | |
| AC converters | 3 | |
| Inverters | 4 | |
| Non-isolated DC-DC converters | 5 | |
| Direct AC-AC converters | 4 | |
| Heat transfer in power electronics devices and power electronics devices protection | 3 | |

| List of laboratory exercises | LE hours |
|---|---|
| Resistor and inductor with a power electronics device (simulation) | 3 |
| Natural commutation (simulation) | 3 |
| Single-phase full-controlled bridge converter for the DC motor supply (simulation) | 6 |
| Three-phase full-controlled bridge converter (simulation and experiments) | 6 |

| | | |
|---|---|---|
| | Single-phase AC voltage controller (experiments) | 6 |
| | Single-phase AC voltage controller (simulation and experiments) | 6 |

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|---|---|---|
| Format of instruction | x lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | x independent assignments<br>☒ multimedia<br>x laboratory<br>☐ work with mentor<br>**☐ (other)** |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled.<br>Performed all required laboratory exercises. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 3 |
| | Essay | | Seminar essay | | Laboratory exercises | 1 |
| | Midterm exams | 0.3 | Oral exam | | Auditory exercises | 0.5 |
| | Written exam | 0.2 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | During the semester, two midterm exams are held – the first after 7 weeks of lectures and the second after 13 weeks of lectures. Each midterm exam consists of 4 problems, either theoretical or numerical. In the final exams, students take those parts of the course which they did not pass in the midterm exams.<br><br>The requirement for passing grade is that the sum of the laboratory exercises' grade (L) and the midterms' grades (M1 and M2), expressed as a percentage, is 50% or more. The sum is calculated as<br><br>Grade (%) = 0.25L + 0.375(M1 + M2)<br><br>where the number of points achieved in each midterm exam has to be at least 50%.<br><br>The students that do not pass the midterm exams take the final written exam which consists of 4 problems. The requirement for a positive evaluation of the final exam is at least 50% points achieved. In the final exam, the students that did not pass one of the midterm exams are presented with 4 problems from the corresponding part of the course. Subsequently, the grade is determined as follows:<br><br>Grade (%) = 0.25L + 0.75(I)<br><br>where I is the number of points achieved in the final written exam (at least 50%).<br><br>The final grade for the course is determined as follows:<br><br>50% to 61% - Sufficient (2)<br>62% to 74% - Good (3)<br>75% to 87% - Very good (4)<br>88% 100% - Excellent (5) |

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|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | D. Vukadinović, Lj. Kulišić: Predavanja iz energetske elektronike za šk. god. 2013/14 | | e-learning portal |
| | D. W. Hart: Power Electronics, McGraw-Hill, 2011. | | e-learning portal |

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|---|---|
| Optional literature (at the time of submission of study programme proposal) | N. Mohan, T. N. Undeland, T. N. Robbins, Power Electronics: Converters, Applications, and Design, 3nd Edition, John Wiley ✓ Sons, 2003. |

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|---|---|
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance<br>- Annual analysis of the performance at midterm exams and final exams<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Feedback from graduated students |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">POWER SYSTEM AND ENVIRONMENT</td></tr>
<tr><td>Code</td><td>FENO22</td><td>Year of study</td><td colspan="5">3.</td></tr>
<tr><td>Course teacher</td><td>Tonći Modrić, Ph.D., Assistant Professor<br>Mate Dabro, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for understanding and application specialized knowledge of:<br>- characteristics of the power system in the Republic of Croatia,<br>- various aspects of the impact of electric power facilities, plants and lines on the environment,<br>- environmental protection from the effects of power facilities, plants and lines.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- describe the characteristics of the power system in the Republic of Croatia,<br>- describe the various aspects of the impact of electric power facilities, plants and lines on the environment,<br>- specify the reference levels of power frequency electric and magnetic fields,<br>- measure the power frequency magnetic flux density and electric field intensity,<br>- explain the principle of measuring ground resistance of the grounding system,<br>- explain the principle of measuring touch voltage, step voltage and transferred potential,<br>- measure resistivity of soil and explain the principle of interpretation of geoelectric sounding data,<br>- describe the protective measures against harmful effects of electric power facilities, plants and lines on the environment,<br>- explain the occurrence of electrical corrosion and the basic principles of protection against electrical corrosion,<br>- explain the basic principles of fire protection and noise levels measurements in the environment of electric power plants and power lines.</td></tr>
<tr><td rowspan="14">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Course content</td><td>L hours</td></tr>
<tr><td colspan="6">Power system in the Republic of Croatia.</td><td>2</td></tr>
<tr><td colspan="6">Electricity generation.</td><td>4</td></tr>
<tr><td colspan="6">Electric power transmission and distribution.</td><td>4</td></tr>
<tr><td colspan="6">Electric power consumption.</td><td>2</td></tr>
<tr><td colspan="6">Calculation of power frequency electromagnetic fields of power lines and plants.</td><td>4</td></tr>
<tr><td colspan="6">Measurement of power frequency electromagnetic fields of power lines and plants. Prescribed reference levels of power frequency electric and magnetic fields.</td><td>2</td></tr>
<tr><td colspan="6">The impact of the power system on the environment.</td><td>4</td></tr>
<tr><td colspan="6">Fire and noise protection.</td><td>2</td></tr>
<tr><td colspan="6">Safety requirements inside and outside the electric power plants.</td><td>2</td></tr>
<tr><td colspan="6">List of laboratory exercises</td><td>LE hours</td></tr>
<tr><td colspan="6">Calculation of power frequency magnetic flux density.</td><td>3</td></tr>
<tr><td colspan="6">Measurement of power frequency magnetic flux density.</td><td>3</td></tr>
<tr><td colspan="6">Calculation of power frequency electric field intensity.</td><td>3</td></tr>
</table>

| | | |
|---|---|---|
| | Measurement of power frequency electric field intensity. | 3 |
| | Geoelectric sounding. | 3 |
| | Interpretation of geoelectric sounding data. | 3 |
| | Ground resistance measurement of a small grounding system. | 3 |
| | Checking the system of the fire protection. | 3 |
| | Noise measurement in the environment of electric power plant. | 3 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☒ field work | ☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70% of the times scheduled.<br>Performed all required laboratory exercises. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2,0 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 1,7 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,8 |
| | Tests | 0,2 | Oral exam | | Preparation for laboratory exercises | 0,2 |
| | Written exam | 0,1 | Project | | (Other) | |

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|---|---|
| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions while final tests consist of 20 theoretical questions. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade (%) = 0,1 LV + 0,45 (G1 + G2)<br>the activities in percentage:<br>• LV – laboratory assessment,<br>• G1, G2 – midterm test results.<br>In a case of final exams, grade (in percentage) is formed according to the formula:<br>Grade (%) = 0,1 LV + 0,9 G<br>the activities in percentage:<br>• LV – laboratory assessment,<br>• G – final test result.<br>The final grade is determined as follows:<br>• 50 – 61 % sufficient (2)<br>• 62 – 74 % good (3)<br>• 75 – 87 % very good (4)<br>• 88 – 100 % excellent (5) |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | T. Modrić, M. Dabro: „Predavanja iz predmeta Elektroenergetski sustav i okoliš (511)“, Sveučilište u Splitu, FESB, Split, 2017. (interna skripta u elektroničkom obliku) | | e-learning portal |
| | D. Feretić i dr.: „Elektrane i okoliš“, Element, Zagreb, 2000. | 5 | |
| | B. Udovičić: „Elektroenergetski sustav“, Kigen, Zagreb, 2005. | 10 | |

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|---|---|
| Optional literature (at the time of submission of study programme proposal) | • CIGRE Technical Brochure 535, „EMC within Power Plants and Substations”, 2013.<br>• CIGRE Technical Brochure 592, “Guide for Assessment of Transferred EPR on Telecommunication Systems due to Faults in A.C. Power Systems”, 2014.<br>• CIGRE Technical Brochure 95, “Guide on the Influence of High Voltage A.C. Power Systems on Metallic Pipelines”, 1995.<br>• CIGRE Technical Brochure 290, „AC Corrosion on Metallic Pipelines due to Interference from AC Power Lines – Phenomenon, Modelling and Countermeasures“, 2006. |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of student presence on lectures<br>- Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | - |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">PRACTICUM IN DIGITAL IMAGE PROCESSING</td></tr>
<tr><td>Code</td><td>FELO33</td><td>Year of study</td><td colspan="5">3</td></tr>
<tr><td>Course teacher</td><td>Mirjana Bonković, Ph.D., Full Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Ana Kuzmanić Skelin, Ph.D., Assistant Professor</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>15</td><td></td><td></td><td>45</td><td></td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="5"></td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students to:<br>- gain basic understanding of digital image processing<br>- develop hands-on experience in using computers to process images<br>- apply and modify state-of-the-art algorithms to specific cases</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Basic programming skills</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- explain how digital images are represented and manipulated in spatial and frequency domain<br>- describe characteristics of algorithms for image enhancement, feature extraction and object segmentation<br>- implement simple digital image algorithms</td></tr>
<tr><td rowspan="18">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Introduction to digital image processing and analysis. Elements of visual perception.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Theory of 2D linear systems. Linear image transformation.</td><td>1</td><td></td></tr>
<tr><td colspan="5">Color image processing. Intensity transformation and spatial filtering. Image enhancement.</td><td>1</td><td></td></tr>
<tr><td colspan="5">Image filtering in the frequency domain. Image and video compression.</td><td>1</td><td></td></tr>
<tr><td colspan="5">Image reconstruction.</td><td>1</td><td></td></tr>
<tr><td colspan="5">Feature extraction.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Image segmentation.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Shape analysis. Motion analysis. Image registration.</td><td>2</td><td></td></tr>
<tr><td colspan="5">Examples of real applications and projects.</td><td>2</td><td></td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">Introduction to Image Processing Toolbox in Matlab. Upload, view and capture an image. Mathematical operations with images. Color representation and transformation.</td><td>3</td></tr>
<tr><td colspan="6">Unary operationsi. Binary operationsi. Gamma corrections. Linear convolution.</td><td>3</td></tr>
<tr><td colspan="6">Quantization and signal sampling. Pixelization. Alias effect. Moire effect.</td><td>3</td></tr>
<tr><td colspan="6">Image processing in the frequency domain. Discrete Fourier Transformation (DFT). DFT and geometric image transformations. Discrete cosine transformation (DCT). DCT and image compression.</td><td>3</td></tr>
<tr><td colspan="6">Image enhancement. First order histogram. Histogram equalization. Histogram modeling. Median and Median Filter. Blur removal.</td><td>3</td></tr>
<tr><td colspan="6">Feature detection. Spatial and amplitude features. Features of the first order histogram. 2nd order histogram. Detection of edges. Sobel's and Prewitt's operators. Compact edge detectors. Laplace operator. Texture features.</td><td>6</td></tr>
</table>

| | | |
|---|---|---|
| | Image segmentation. Amplitude segmentation. Manual selection of threshold. Automatic threshold selection. Edge detection. Text segmentation. | 6 |
| | Image registration. | 6 |
| | Image recovery. Modeling image degradation as a FIR filter. Invese filter. Pseudo-inverse filter. Wiener filter. | 6 |

| | | |
|---|---|---|
| Format of instruction | ☐ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☒ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☒ work with mentor<br>☐ (other) |
| Student responsibilities | At least 70% attendance of the scheduled lecture hours is required. 100% attendance of the scheduled laboratory hours is required. All laboratory assignments and individual assignments must be completed. | |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | | (Other) | 2 |
| | Essay | | Seminar essay | 1.5 | (Other) | |
| | Tests | 0.25 | Oral exam | | (Other) | |
| | Written exam | **0.25** | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterm exams and final exam. The first midterm exam is after 7 weeks of lecturing and the second one is after next 6 weeks.
Project assignments and laboratory assignments will be graded.
Grade is formed according to the following formula: 50 % points on midterm exams or the final exam is required for passing grade.
Grade(%)=0.3*M1+0.3*M2 +0.3*PROJEKTNI_ZADATAK+0.1*kolokvij_lab
M1, M2- midterm/final exam points(%)
PROJEKTNI_ZADATAK – project assignment points
kolokvij_lab – laboratory assignment points
Final grade is given according to the following table :

| Percentage | Grade |
|---|---|
| 50% - 61% | sufficient (2) |
| 62% - 74% | good (3) |
| 75% - 87% | very good(4) |
| 88% - 100% | excellent (5) |

Students that did not pass the midterm exams take part in final exam. Final exam consist of 20 problem questions. Grade is formed according to the number of correctly solved problem questions: 50 % points on the final exam is required for passing grade.

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | V.Papić, Obrada slika i računalni vid, interna skripta | | elearning |
| | D.A. Forsyth, J. Ponce, Computer Vision – A Modern Approach, Prentice Hall, 2003 | 1 | |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | - Stockman, Shapiro, Computer Vision, Prentice Hall, 2001.<br>- Gonzalez, Woods, Digital Image Processing, Addison-Wesley, 1992. |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance.<br>- Annual analysis of course statistics in terms of midterm and finals exams.<br>- Feedback from students via surveys.<br>- Teacher self-evaluation. |

| | |
|---|---|
| | - Feedback from graduated students (or senior students) on course content relevance.<br>- Periodic institutional evolution of course teachers. |
| Other (as the proposer wishes to add) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **PRACTICUM IN ELECTROMAGNETIC SIMULATIONS** | | | | | | | |
| **Code** | FELO46 | Year of study | 3. | | | | | |
| **Course teacher** | Antonio Šarolić, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | | |
| Associate teachers | Niko Ištuk, mag. ing. el. | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 15 | | | 45 | | |
| Status of the course | elective | Percentage of application of e-learning | 0 | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- learning the principles of modelling and computer simulations for solving the problems in electromagnetics<br>- using the most important program packages for electromagnetic simulations |
| Course enrolment requirements and entry competences required for the course | None. |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- model the geometrical structures defining the electromagnetic problem<br>- calculate the fields around the radiation source using computer simulations<br>- analyze the radiation pattern and input impedance of wire and planar antennas surrounded by conductive and dielectric objects using computer simulations<br>- analyze the problems in electromagnetic compatibility using computer simulations |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L or S hours | AE hours |
|---|---|---|
| Introduction to electromagnetic field theory. | 1 | 0 |
| Basic principles of numerical modelling and overview of numerical methods. | 2 | 0 |
| Solving the electromagnetic problems including wire structures using method of moments (software packages NEC2, NEC4, FEKO) | 2 | 0 |
| Solving the electromagnetic problems including planar structures using method of moments (software package ADS Momentum) | 2 | 0 |
| Solving the electromagnetic problems using finite difference method (software package SEMCAD X) | 2 | 0 |
| Solving the electromagnetic problems in time domain (software package HFSS) | 2 | 0 |
| Solving the electrically large electromagnetic problems using methods of geometrical and physical optics (software package FEKO) | 2 | 0 |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| Introduction to electromagnetic field theory. | 3 |
| Basic principles of numerical modelling and overview of numerical methods. | 6 |
| Solving the electromagnetic problems including wire structures using method of moments (software packages NEC2, NEC4, FEKO) | 6 |
| Solving the electromagnetic problems including planar structures using method of moments (software package ADS Momentum) | 6 |
| Solving the electromagnetic problems using finite difference method (software package SEMCAD X) | 6 |
| Solving the electromagnetic problems in time domain (software package HFSS) | 6 |

<table>
<tr><td></td><td colspan="6">Solving the electrically large electromagnetic problems using methods of geometrical and physical optics (software package FEKO)</td><td>6</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="4">☒ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="7">Student is required to attend the lectures and auditory exercises in the amount of at least 70% of the schedule. Student is required to attend the laboratory exercises in the amount of 100% of the schedule and to complete all tasks associated with laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td colspan="2">0,5</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Laboratory exercises</td><td colspan="2">1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>0,5</td><td>Individual work</td><td colspan="2">1</td></tr>
<tr><td>Mid-exam</td><td></td><td>Oral exam</td><td></td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>1</td><td>(Other)</td><td colspan="2"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">Students work on the assigned project task, upon completion they present it as a seminar. The final grade is based on the presented project work results, corrected by the result of oral verification.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="5">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="5">Sheng, X.; Song, W.: "Essentials of Computational Electromagnetics", Wiley-IEEE Press, 2012.</td><td></td><td></td></tr>
<tr><td colspan="5">Poljak, D: "Advanced modeling in computational electromagnetic compatibility", Wiley Interscience, 2007.</td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="7">- Poljak, D., Dorić, V., Antonijević S.: Computer Aided Design of Wire Structures, WIT Press, Southampton-Boston, 2007.<br>- Poljak, D., Kovač, N., Dorić, V.: Numeričke metode u elektrotehnici, FESB, Split, 2005.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="7">Surveys providing student feedback. Teachers teaching related courses collaborate and jointly take care of the teaching quality. Occasional observation and evaluation by the head of department, head of the chair etc.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="7"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="8">PROCESS CONTROL</td></tr>
<tr><td>Code</td><td>FELO12</td><td>Year of study</td><td colspan="6">2</td></tr>
<tr><td>Course teacher</td><td>Darko Stipaničev, Ph.D.<br>Full Professor</td><td>Credits (ECTS)</td><td colspan="6">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td colspan="2">DE</td></tr>
<tr><td>30</td><td>0</td><td>15</td><td>15</td><td colspan="2">0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="6">80</td></tr>
<tr><td colspan="9">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="8">The aim of the course is basic knowledge to processes modelling and control.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="8">Completed basic courses of automatic control (Linear control systems, Nonlinear control systems, Identification and Digital control)</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="8">Students will be able to successfully mastering the subject:<br>1. Describe the process through systematic presentation, idea management, mathematical model, automatic control.<br>2. Enumerate and describe the fundamental processes and their models: transfer processes, processes of transition, transformation process.<br>3. Build process models based on the equation of balance of matter and energy.<br>4. manage to models fluidic processes, thermal processes, the mixing process, complex processes (chemical reactor, distillation).<br>5. Describe the process measurement sensors, converters and actuatorsfor measurement and control of temperature, flow, pressure, level and density.<br>6. Describe and implement different ways of process control, from the basic scheme of control (ON-OFF, P, PI, PD, PID control, program guidance) to the advanced control schemes (time - optimal, ratio, cascade, feedforward, optimal, adaptive and intelligent control).<br>7. Describe the principles of distributed process control. SCADA (Scan Control, Alarm, Data Acquisitions).<br>8. Describe and perform basic procedures for maintaining flow, pressure, level and temperature.<br>9. Describe examples of managing complex processes.<br>10. Describe the process industry: production optimization, control and maintenance.</td></tr>
<tr><td rowspan="5">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="4">Course content</td><td colspan="2">L or S hours</td><td colspan="2">AE + LV hours</td></tr>
<tr><td colspan="4">Introduction. The processes and objects. A systematic approach to process control. Feedbeck control, feedforward control, open-loop control. The input - output variables.</td><td colspan="2">2</td><td colspan="2">0</td></tr>
<tr><td colspan="4">The processes and process equipment. Operations and technology operations. The division of technological operations: Operations of transfer, transition and transformation.</td><td colspan="2">2</td><td colspan="2">0</td></tr>
<tr><td colspan="4">Fluidic systems - basic laws of fluid mechanics, basic fluidic components, modeling fluidic system.<br>Thermal systems - the basic laws of thermodynamics, basic thermal components, modeling of thermal systems.<br>Complex processes and process equipment - mixing, distillation, kemijki reactor</td><td colspan="2">6</td><td colspan="2">12</td></tr>
<tr><td colspan="4">Sensors (sensors) and the actuator (actuators) - input, output and transfer characteristics. Measuring temperature, flow, level, pressure and other process variables.<br>Actuator (actuators) - valves, pumps, heaters and fans</td><td colspan="2">6</td><td colspan="2">2</td></tr>
</table>

| | | | |
|---|---|---|---|
| | Basic control schemas: four-stage static diagrams, on-off and P control. | 2 | 4 |
| | Basic control schemas: PD, PI and PID control | 2 | 4 |
| | Advanced control schemas: selector control, ratio control, cascade control, feedforward control. | 2 | 2 |
| | The most advanced control schemas: optimal control, adaptive control, and intelligent control. | 2 | 2 |
| | Process industry and automatic control. | 2 | 0 |

| | | |
|---|---|---|
| Format of instruction | ☒ ☒ lectures<br>☐ ☒ seminars and workshops<br>☒ ☒ exercises ☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | |
| | Essay | | Seminar essay | 1,5 | Laboratory exercises | |
| | Tests | | Oral exam | | Preparation for laboratory exercises | |
| | Written exam | 2 | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | The exam consists of a written part and if necessary additional oral exam. During the semester will be two tests. The first colloquium in 8 weeks of classes, the second at 18 weeks. A student can pass the course by these tests. In the two final exams in June and July, students who have not collected inadequate number of points through colloquia take the whole subject covered by the two tests. The condition for taking the final exam is successfully finished practical lab exercises.<br><br>The exam is comprehensive and includes the theoretical part of the material and tasks with auditory exercises. The condition for positive assessment is that the student has a total of at least 50% on the exam or when it must have a minimum 25% passing the theoretical part of the material and 25% of the deposited duties. If a student has less than 25% of the points on the tasks and / or less than 25% points from the theoretical part of the material again taken the entire exam. Students who did not pass the exam after two final exams can pass the exam in autumn periods. All test questions students will be known before the exam.<br><br>These rules apply equally to students who are enrolled this course for the first time and to those students who enter college for the second time.<br><br>The final grade is determined as follows:<br>percentage Rating<br>50% to 61% is sufficient (2)<br>62% to 74% good (3)<br>75% to 87% of very good (4)<br>88% 100% Excellent (5)<br><br>The first colloquium will take the material to the teaching units to the seventh week inclusive, and on the other the rest of the teaching weeks. Examinations are held in terms of the anticipated calendar of classes.<br><br>Under Article 65 of the Statute of the Faculty, the student is required to participate in all forms of teaching and attend: lectures at least 70% of classes. If she or he do not meet these requirements, the student will not be able to take the exam and get a signature. |

| Required literature (available in the library and via other media) | Title | Number of copies in the library | Availability via other media |
|---|---|---|---|
| | D.Stipaničev, Process control, lecturing notes and internal textbook | | e-learning portal |
| | D.Stipaničev, J.Marasović, Digitalno vođenje on-line, on-line (Web) udžbenik, MZT – Informatički projekt, 2004. http://laris.fesb.hr/digitalno_vodjenje. | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | - Marlin, T.E.: Process Control, McGraw Hill, New York, 1995.<br>- Patranabis, D.: Principles of Process Control, McGraw Hill, New Delchi, 1981. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

| **NAME OF THE COURSE** | **PROTECTION AND CONTROL SYSTEMS IN SUBSTATION** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FENO14 | Year of study | 2 | | | | |
| **Course teacher** | Elis Sutlović, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Tonći Modrić, Ph.D., Assistant Professor | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 15 | 15 | 0 |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- acquire knowledge on classical and modern local as well as remote control systems in substation,<br>- acquiring knowledge of protective devices in electrical facilities and understanding of protection systems design,<br>- design and maintenance of protection and control circuits in substations. |
| Course enrolment requirements and entry competences required for the course | None |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>1. Analyze and synthesize logical circuits<br>2. Realize control circuits in electrical facilities<br>3. Analyze and design protection circuits in substation<br>4. Calculate and adjust protection relay parameters<br>5. Identify and describe requirements on the substation SCADA system<br>6. Describe the control model of the Croatian power system |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L hours | AE hours |
|---|---|---|
| Coding. Characteristics and application of various codes. Security in encoding and data transmission. | 2 | 2 |
| Switching algebra: basic Properties, switching function, postulates and theorems, duality principle. | 2 | 1 |
| Analysis and synthesis of logical circuit. Minterms and maxterms. | 2 | 2 |
| Method for minimizing logical expression. Examples of logic circuits for disconnector blocking, | 2 | 2 |
| Time dependent switches. Flip-flops. Counters and registers. Programmable logic controllers. | 2 | |
| Remote control, remote measurement, analog and digital information transmission. Introduction to SCADA systems. | 2 | |
| SCADA for substations. | 2 | |
| First midterm exam | | |
| Introduction to electrical protective relays. Measuring transformers. | 2 | |
| Overcurrent Protection. Definite time overcurrent relays. Inverse-time-overcurrent relays. Instantaneous overcurrent relays. | 2 | 2 |
| Directional over-current protection. Distance protection. Voltage protection | 2 | 2 |
| Differential protection. Differential protection of transformer. Transformer gas protection. Tank protection. | 2 | 2 |
| Protection of power transformer. | 2 | |
| Line protection in distribution and transmission networks | 2 | |
| Second midterm exam | | |

| List of laboratory or design exercises | LE hours |
|---|---|
| Minimizing Logic Circuits | 2 |

| | | |
|---|---|---|
| | Synthesis of Logic Circuits | 2 |
| | Memory elements, registers and counter | 2 |
| | Programmable logic controller | 2 |
| | Elektromechanic differential protection of transformer | 2 |
| | Static differential and overcurrent protection of transformer | 2 |
| | Numerical transformer protection system | 3 |

| | | |
|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 1,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,5 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,5 |
| | Tests | 0,3 | Oral exam | | Preparation for laboratory exercises | 0,1 |
| | Written exam | 0,1 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students that did not pass the midterm exams take part. The first midterm is carried out as written exam and it consists of 3 theoretical questions and 3 short numerical problems. The second mid-term is also carried out as written exam and it consists of 3 theoretical questions and 2 numerical problems.

The requirement for passing grade is 50 % points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:

$$\text{Grade}(\%) = 0{,}05\ (AL + LA) + 0{,}45\ (M1 + M2)$$

the activities in percentage:

- AL - attendance at lectures,
- LA – laboratory assessment,
- M1, M2 – test results.

The final grade is determined as follows:

| Percentage | Description |
|---|---|
| 50% do 61% | Sufficient (2) |
| 62% do 74% | Good (3) |
| 75% do 87% | Very Good (4) |
| 88% do 100% | Excellent (5) |

| Required literature (available in the library and via other media) | Title | Number of copies in the library | Availability via other media |
|---|---|---|---|
| | E. Sutlović: Predavanja iz Upravljanja i zaštite u elektroenergetskom sustavu | | e-learning portal |
| | M. Šodan: Automatizacija logičkim sklopovima, Tehnička knjiga, Zagreb | 5 | |

| | |
|---|---|
| Optional literature (at the time of submission of study | - Marušić A. :Osnove numeričke zaštite sustava za distribuciju električne energije, skripta FER, Zagreb<br>- Požar, H. :Visokonaponska rasklopna postrojenja, Tehnička knjiga, Zagreb |

| | |
|---|---|
| programme proposal) | - Božuta, F. :Automatski zaštitni uređaji elektroenergetskih postrojenja, Svjetlost, Sarajevo |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">PROTECTION AT SUBSTATIONS</td></tr>
<tr><td>Code</td><td>FENO20</td><td>Year of study</td><td colspan="5">2</td></tr>
<tr><td>Course teacher</td><td>Petar Sarajčev, Ph.D., Associate Professor</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Robert Kosor, dipl. ing.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td></td><td>15</td><td>15</td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">0</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:<br>- understanding basic principles of power system protection<br>- permanent adoption of principles of distribution network relay protection design<br>- permanent adoption of transformer protection design<br>- setting up and solving transformer differential protection problems<br>- understanding principles of distance protection</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:<br>- calculate and select current transformers for relay protection applications<br>- design protection of distribution network considering its neutral point treatment<br>- calculate distribution network relay protection function settings<br>- design protection of power transformers (two and three windings)<br>- select appropriate numerical relays for transformer protection<br>- calculate protection settings of distance relays</td></tr>
<tr><td rowspan="13">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">Treatment of neutral point earthing in distribution networks. Short-circuit calculations overview. Earth fault. Petersen coil.</td><td>4</td><td>1</td></tr>
<tr><td colspan="5">Current and voltage transformers, Toroid transformers</td><td>3</td><td>1</td></tr>
<tr><td colspan="5">Distribution nework relay protection fundamentals. Overcurrent protection, Earth-fault protection, Overvoltage protection, Directional protection</td><td>6</td><td>3</td></tr>
<tr><td colspan="5">Relay protection in insulated distribution networks, Protection of neutral earthing resistor, Busbar protection</td><td>4</td><td>3</td></tr>
<tr><td colspan="5">Power transformer relay protection, Differential protection, REF protection, Thermal protection, Overcurrent protection, Reverse interlocking</td><td>4</td><td>3</td></tr>
<tr><td colspan="5">Transmission network relay protection fundamentals, Distance protection, In-feed compensation, Impedance measurement, Quadrilateral protection characteristic, Power swing blocking</td><td>6</td><td>3</td></tr>
<tr><td colspan="5">Teleprotection schemes, Breaker failure</td><td>3</td><td>1</td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">Electromechanical, static and numerical protection relays, Testing protection relay functions</td><td>3</td></tr>
<tr><td colspan="6">DIGSI software package by Siemens for protection relay settings</td><td>6</td></tr>
<tr><td colspan="6">SIGRA software package by Siemens for post-mortem analysis</td><td>3</td></tr>
<tr><td colspan="6">Visit to the GIS substation and live interaction with protection relays</td><td>3</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety</td><td colspan="4">☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor</td></tr>
</table>

| | | | | | | |
|---|---|---|---|---|---|---|
| | ☐ partial e-learning<br>☐ field work | | ☐ (other) | | | |
| Student responsibilities | | | | | | |
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 0,5 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 2,5 |
| | Essay | | Seminar essay | | Laboratory excercises | 1,0 |
| | Tests | 0,5 | Oral exam | | (Other) | |
| | Written exam | 0,5 | Project | | (Other) | |
| Grading and evaluating student work in class and at the final exam | There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. Each midterm test consists of 10 theoretical questions and numerical problems and final tests consist of 10 theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises and 50% points on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,5 (M1 + M2)<br>the activities in percentage: M1, M2 – test results. | | | | | |

| | | | |
|---|---|---|---|
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | P. Sarajčev, Autorizirana predavanja, FESB | | e-learning portal |
| Optional literature (at the time of submission of study programme proposal) | - P. M. Anderson, Power system protection, IEEE Press, New York, 1999. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations | | |
| Other (as the proposer wishes to add) | | | |

| **NAME OF THE COURSE** | **RADIO COMMUNICATIONS** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | FELO30 | Year of study | 3. | | | | |
| **Course teacher** | Zoran Blažević, Ph.D., Full Professor | Credits (ECTS) | 5 | | | | |
| Associate teachers | Maja Škiljo, Ph.D., Assistant | Type of instruction (number of hours) | L | S | AE | LE | DE |
| | | | 30 | 0 | 15 | 15 | 0 |
| Status of the course | Elective | Percentage of application of e-learning | 0 | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- understanding and application of basic principles and mechanisms of Earth radio-propagation,<br>- basic radio-channel physical phenomena modelling,<br>- permanent adoption and deepening of knowledge in the field of radio engineering. |
| Course enrolment requirements and entry competences required for the course | None. |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- define the fundamental phenomena, the quantities and the laws of Earth radio-propagation,<br>- apply fundamental laws of radio-propagation and model basic radio-channels,<br>- calculate and estimate basic radio-channel parameters,<br>- apply basic methods of radio-channel measurements |

Course content broken down in detail by weekly class schedule (syllabus)

| Course content | L hours | AE hours |
|---|---|---|
| Introduction to Radio Communications. History perspective of radio engineering. SI units. | 2 | - |
| Antennas. Radiowave propagation. | 4 | 3 |
| Atmospheric influence on radio-propagation-propagation by troposphere. | 6 | 1 |
| Atmospheric influence on radio-propagation-propagation by ionosphere. | 4 | 1 |
| Propagation by diffraction | 4 | 3 |
| Propagation by reflection. | 6 | 3 |
| Digital radio-communication channel. Shannon theorem. | 2 | 4 |
| Cellular radio systems | 2 | 1 |
| Midterm exam | | |

| List of laboratory exercises | LE hours |
|---|---|
| Introduction to laboratory instruments, devices and other equipment | 1 |
| Antenna parameters measurements | 5 |
| Radio-channel parameters measurements by spectrum analyser | 4 |
| Measurements of radio-channels by vector network analyser | 3 |
| Software estimations of radio-channels | 2 |

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|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☒ field work | ☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other) |
| Student responsibilities | The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all laboratory exercises required. | |

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|---|---|---|---|---|---|---|
| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | 2,0 | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 1.5 |
| | Essay | | Seminar essay | | Laboratory exercises | 0,8 |
| | Tests | 0,5 | Oral exam | | Preparation for laboratory exercises | 0,2 |
| | Written exam | | Project | | (Other) | |

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| Grading and evaluating student work in class and at the final exam | There are one midterm and one final exam. Both midterm test and final test consist of theoretical questions and numerical problems. The students that did not pass the midterm exams take part In the final exams. The midterm and final exams are carried out as written tests. The requirement for passing grade is the positive assessment of laboratory exercises, 40 % points on the midterm exam or the final exam, and the rest of the grade depends on the seminary work presented by the student. Grade (in percentage) is formed according to the formula:<br>Grade(%) = 0,1 NP + 0,1 LV + 0,4 (M + S)<br>the activities in percentage:<br>• NP - attendance at lectures,<br>• LV – laboratory assessment,<br>• M – test results.,<br>• S – seminary work results and presentation |

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | I. Zanchi, Z. Blažević: Radiokomunikacije, predavanja, FESB | | e-learning portal |
| | Boithias, L.: Radio Wave Propagation, North Oxford Academic 1987. | 1 | |
| | Zentner, E.: Radiokomunikacije, Školska knjiga - Zagreb, 1980. | 2 | |

| | |
|---|---|
| Optional literature (at the time of submission of study programme proposal) | Zentner, E.: Antene i radiosustavi, Graphis Zagreb, 2001.<br>Parsons, J. D.: "The Mobile Radio Propagation Channel", Pentech Press Publishers - London, GB, 1992.<br>Doble, J.: "Introduction to Radio Propagation for Fixed and Mobile Communications", Artech House Boston - London, GB, 1996. |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Institutional and non-institutional evaluations |
| Other (as the proposer wishes to add) | |

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|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **RENEWABLE ENERGY SOURCES** | | | | | | | |
| **Code** | FENO29 | Year of study | 3 | | | | | |
| **Course teacher** | Damir Jakus, Ph.D.<br>Assistant Professor | Credits (ECTS) | 5 | | | | | |
| Associate teachers | Josip Vasilj, Ph.D. | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 30 | 0 | 0 | 30 | | |
| Status of the course | Elective | Percentage of application of e-learning | 30 | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students for:<br>- Understanding the specifics related to the working principles and operating characteristics of renewable energy sources as well as project financing options<br>- Implementation of a legislative framework that promotes production from RES<br>- Assessment of the annual energy potential for various types of RES<br>- Selection of the optimal parameters and project solutions for different RES<br>- Analysis of network conditions after connection of RES<br>- Project economic feasibility assessment for different RES | | | | | | | |
| Course enrolment requirements and entry competences required for the course | None | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- Define different RES technologies, explain their methods of operation and list main system components for different RES plants<br>- Explain and critically analyze different financial promotion mechanisms for RES<br>- Estimate the annual electricity production for certain types of RES power plants<br>- Perform project profitability assessments for certain types of RES<br>- Define the basic technical requirements which need to be met by RES when connecting to the power system<br>- Conduct the RES grid connection analysis and elaborate gird impacts<br>- Explain the impact of RES large scale integration on power system development, planning, operation and management<br>- Select the parameters for standalone and grid connected system … | | | | | | | |
| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L or S hours | AE hours | | | | | |
| | 1. RENEWABLE ENERGY SOURCES INTRODUCTION<br>The need for renewable energy sources<br>The main sources and forms of energy<br>Properties of renewable energy sources<br>The current status of renewable energy | 2 | | | | | | |
| | 2 RES REGULATION FRAMEWORK<br>The EU directive on RES<br>Renewable energy sources in the Croatian law | 3 | | | | | | |
| | 3 WIND POWER PLANTS<br>The wind power and energy<br>WPP types and mains components | 4 | | | | | | |

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|---|---|---|---|
| | The working principle of WPP<br>WPP grid connection requirements<br>The WPP market and the situation in Croatia | | |
| 4 | SOLAR POWER PLANTS<br>Calculation of solar radiation<br>Solar power plants working principles and main parts<br>PV power plant electricity production<br>Grid connected and standalone systems | 4 | |
| 5 | SOLAR THERMAL POWER PLANTS | 1 | |
| 6 | IMPACT OF WIND AND PV POWER PLANTS ON POWER SYSTEM OPERATION AND MANAGEMENT | 3 | |
| 7 | HYDRO POWER PLANTS<br>Hydropower resources<br>Hydro power and energy<br>The basic components, their roles, performance and operating principles<br>Turbines and generators for small HPP | 4 | |
| 8 | BIOMASS ENERGY<br>Types and basic characteristics of biomass<br>The different technologies for utilization of biomass<br>The potentials and biomass production<br>Different principles of biomass conversion into solid and liquid fuels | 3 | |
| 9 | GEOTHERMAL ENERGY<br>The origin and nature of geothermal energy<br>Geothermal resources<br>Direct use of geothermal energy for heating<br>The use of geothermal energy for electricity gen. | 3 | |
| 10 | OTHER TYPES OF RES<br>Wave energy converters<br>Tidal power<br>Ocean thermal energy converters | 3 | |

| List of laboratory or design exercises | LE or DE hours |
|---|---|
| 1. Technical visit to roof mounted PV power plant | 4 |
| 2. Technical visit to wind power plant | 6 |
| 3. Introduction to software package Homer | 4 |
| 4. Project assignment regarding standalone and grid connected system design and profitability calculation | 4 |
| 5. Project assignment regarding solar collector system design and profitability analysis | 4 |
| 6. Techno-economic analysis of investment in PV power plant | 4 |
| 7. Analysis of RES connection impacts on power losses and voltage profile change in the MV distribution network | 4 |

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|---|---|---|
| Format of instruction | ☒ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☒ field work | ☒ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor |

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|---|---|
| Student responsibilities | - The presence on lectures in the amount of at least 70 % of the scheduled time.<br>- Completed all required laboratory exercises.<br>- Completed and positively graded seminar assignment. |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| | Class attendance | 1 | Research | | Practical training | |
| | Experimental work | | Report | 1 | Self work | 1.5 |
| | Essay | | Seminar essay | | Laboratory work | 0.5 |
| | Tests | 0.5 | Oral exam | | (Other) | |
| | Written exam | 0.5 | Project | | (Other) | |

**Grading and evaluating student work in class and at the final exam**

During the semester there will be two midterm exams covering lectures. The first midterm exam will be in the eighth week of summer semester, and the second one in the last week of summer semester. As a part of laboratory exercises students will be given their work assignments which will be graded after completion. Student can pass the class by passing two midterm exams and by completing their laboratory work assignments. In the two final exams in February and March, students can pass reaming part(s) which they didn't pass through midterm exams. Also, if the student passes one part of class materials through first final exam, then he is not obliged to re-take that part of the exam in the second final exam. The class subject is divided into two parts according to separation defined for midterm exams.

Students who have failed to pass the class after two final exams can try to pass the subject by taking the disciplinary exam which is organized in first part of autumn term. The last chance to pass the subject is through commission exam which will be held in the second part of the autumn exam period. During the disciplinary and commission exam students have to re-take whole exam covering both subject parts regarding their previous results in mid-term and final exams. In autumn term the requirement for positive mark is that the student has at least 50% success on the exam as well as positive mark from seminar assignment.
The requirement for positive mark is that the student has at least 50% points from each part of the course subject during midterm and final exams (or 50% points for the entire course subject on disciplinary and commission exam), as well as positively evaluated seminar assignment. The final score (in percentage) is formed on the basis of all activities according to the formula:

Grade (%) = 0,35Xg1 + 0,35Xg2 + 0,3Xs
Grade (%) = 0,7Xg + 0,3Xs (for disciplinary and commission exam)

wherein:
• G1, G2 – points obtained for each subject part during midterms and(or) final exams
• G – points obtained during disciplinary and commission exam
• S – point given for seminar assignment

The final grade is determined as follows:

| Grade (%) | Mark |
|---|---|
| 50 % do 61% | sufficient (2) |
| 62 % do 74 % | good(3) |
| 75 % do 87 % | very good(4) |
| 88 % do 100 % | excellent(5) |

Exam terms:
The first and second final exam: February / March

| | | | |
|---|---|---|---|
| | The disciplinary and commission exam: August / September<br><br>Under the Article 65 of the Faculty Statute, the student is required to participate in all forms of teaching and attend: lectures at least 70% of scheduled time and laboratory exercises 100% of scheduled time. If you do not meet these requirements, the student will not be able to take the examination. | | |
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | Jakus, D.: Obnovljivi izvori energije, skripta + slajdovi s predavanja + dodatni materijali | | e-learning |
| | Jakus, D., Krstulović Opara, J. : Obnovljivi izvori energije – upute za laboratorijske vježbe -, Split 2013. | | e-learning |
| | Šljivac, D., Šimić, Z.: Obnovljivi izvori energije s osvrtom na uštede, udžbenik, ETF Osijek, 2008. | | |
| | Rajkovič, D.: Proizvodnja i pretvorba energije, Rudarsko-geološko-naftni fakultet, Zagreb, 2011 | | |
| Optional literature (at the time of submission of study programme proposal) | - L. Freris, D.Infield: Renewable Energy in Power Systems, Wiley, 2008<br>- T. Ackerman: Wind Power in Power Systems, Wiley, 2012.<br>- J. Twidell, T. Weir: Renewable Energy Resources, Taylor ✓ Francis, 2005. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student class attendance<br>- Annual review of the exam success<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Feedback on the subject relevance from the former students who have already graduated | | |
| Other (as the proposer wishes to add) | | | |

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="3">SENSORS AND TRANSDUCERS</td></tr>
<tr><td>Code</td><td>FELO36</td><td>Year of study</td><td>3.</td></tr>
<tr><td>Course teacher</td><td>Josip Musić, Ph.D., Assistant Professor</td><td>Credits (ECTS)</td><td>4</td></tr>
<tr><td>Associate teachers</td><td>Ivo Stančić, Ph.D., Assistant Professor</td><td>Type of instruction (number of hours)</td><td>L: 30, S: 0, AE: 0, LE: 15, DE: 0</td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td>0</td></tr>
<tr><td colspan="4">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="3">Training students for:<br>- understanding role and significance of measurement equipment and measurement transducers in autonomous systems via control loops.<br>- acquiring basic practical knowledge about physical limitations and possible issues while using different measurement equipment and transducers.<br>- understanding working principles of different sensors as well as their advantages and disadvantages.<br>- analyzing influence of A/D and D/A converters on sensor characteristics.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="3">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="3">Students will be able to:<br>- recognize sensors and transducers in automatic control loops.<br>- explain importance of sensors and transducers in automation.<br>- explain basic characteristic of measurement transducers (and sensors).<br>- give examples of some of widely used sensors (pressure sensors, flow sensors, temperature sensors, optical sensors, inertial sensors).<br>- examine sensor datasheets,<br>- apply basic measurement transducers.<br>- evaluate A/D and D/A work principle and its influence on measurements/control.</td></tr>
<tr><td rowspan="12">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="2">Course content</td><td>L or S hours</td></tr>
<tr><td colspan="2">Introductory considerations and systematic approach to automatic control. Measurement sensor and actuators in the control loop.</td><td>2</td></tr>
<tr><td colspan="2">Sensor and transducer types. General consideration of most important sensor characteristics (accuracy, sensitivity, repeatability, etc.)</td><td>2</td></tr>
<tr><td colspan="2">A/D and D/A converters and their influence and sensor characteristics.</td><td>2</td></tr>
<tr><td colspan="2">Application examples of measurement sensors in control loops.</td><td>2</td></tr>
<tr><td colspan="2">Pressure sensors: capacitive, inductive, resistive and piezoelectric (working principles, characteristics and applications).</td><td>2</td></tr>
<tr><td colspan="2">Inertial sensors: accelerometer (working principles, characteristics and applications).</td><td>2</td></tr>
<tr><td colspan="2">Inertial sensors: gyroscope (working principles, characteristics and applications).</td><td>2</td></tr>
<tr><td colspan="2">Inertial sensor units (inertial sensors + magnetometers): working principles, characteristics and applications.</td><td>2</td></tr>
<tr><td colspan="2">Optical sensors: photoresistors, photodiodes, position sensors (encoders) and shift sensors (working principles, characteristics and applications).</td><td>2</td></tr>
<tr><td colspan="2">Pressure and force sensors: types, working principles, characteristics and applications.</td><td>2</td></tr>
<tr><td colspan="2">Flow sensors: mechanical, ultrasonic and magnetic (working principles, characteristics and applications).</td><td>2</td></tr>
</table>

<table>
<tr><td rowspan="8"></td><td colspan="6">Intelligent sensors. Dislocated measurement devices: measuring at distant location.</td><td>2</td></tr>
<tr><td colspan="6">Actuators and sensors: functional unit.</td><td>2</td></tr>
<tr><td colspan="6">List of laboratory or design exercises</td><td>LE or DE hours</td></tr>
<tr><td colspan="6">Temperature sensors: application ad measurement characteristics.</td><td>3</td></tr>
<tr><td colspan="6">Pressure and touch sensors: QTC (quantum tunneling compound) and tasters.</td><td>3</td></tr>
<tr><td colspan="6">Distance sensors: capacitive ultrasound and laser.</td><td>3</td></tr>
<tr><td colspan="6">Inertial sensors and magnetometers.</td><td>3</td></tr>
<tr><td colspan="6">Servo motors: control and measurement transducers.</td><td>3</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐ on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☒ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>1,2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>1,5</td></tr>
<tr><td>Tests</td><td>0,1</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,1</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester there are two midterm exams. The first midterm exam is after 7 weeks of lectures and the second one is after 13 weeks of lectures. Each midterm test (as well as the final test) is carried out in a written format with duration of 90 minutes. It consists of both theoretical questions and numerical problems. In the final exams students that did not pass the midterm exams take part. The final exam test consists of 6 theoretical questions and numerical problems. The requirement for passing grade is the positive assessment of laboratory exercises and 50 % points on average midterm exam ((M1 + M2)/2) or the final exam. Students are allowed to have at least 40% of total points on each midterm exams, as long as the final midterm average is at least 50% of total points.<br>Grade (in percentage) is formed according to the formula:<br><br>Grade(%) = 0,5L + 0,5(M1 + M2)<br><br>where:<br>• L – laboratory assessment,<br>• M1, M2 – midterm test results.<br><br>Final grade (based on percentages) is formed as follows:<br>Percentage Grade<br>50% do 62% sufficient (2)<br>63% do 74% good (3)<br>75% do 86% very good (4)<br>87% do 100% excellent (5)<br><br>According to Article 65. of Faculty's Bylaw, student is required to participate in all teaching activities attending at least 70% of lectures, and 100% of laboratory exercises. In accordance with that student is required to solve and turn over for grading 100% of all laboratory exercises. If student does not meet these criteria, she</td></tr>
</table>

| | | | |
|---|---|---|---|
| | or he won't be able to take part in the final exam, and will be required to enroll in the course the next year. | | |
| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
| | Božičević, J.: Temelji automatike 1, Školska knjiga , Zagreb, 2008. | 2 | |
| | Šurina, T.: Automatska regulacija, Školska knjiga, Zagreb, 1981. | 1 | |
| | M.B. Histand, D.G. Alciatore: Introduction to Mechatronics and Measurement Systems, McGraw Hill, 1999. | | teacher/Internet |
| | I. Stančić, Guidelines for laboratory exercises, FESB | | e-learning portal |
| | J. Music: Authorized lecture notes, FESB | | é-learning portal |
| Optional literature (at the time of submission of study programme proposal) | 2. Friedland, B.: Control System Design, McGraw-Hill, New York, 1986.<br>2. Sinclair, I.: Sensors and Transducers, 3rd edition, Newnes, Oxford, 2001. | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Keeping records of student attendance.<br>- Annual analysis of course statistics in terms of midterm and finals exams<br>- Feedback from students via surveys.<br>- Feedback from graduated students (or senior students) on course content relevance.<br>- Self-evaluation of teachers.<br>- Periodic institutional evolution of course teachers. | | |
| Other (as the proposer wishes to add) | / | | |

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|---|---|---|---|---|---|---|---|---|
| **NAME OF THE COURSE** | **SIGNALS AND SYSTEMS** | | | | | | | |
| **Code** | FELO05 | Year of study | 2. | | | | | |
| **Course teacher** | Petar Šolić, Ph.D., Assistant Professor | Credits (ECTS) | 6 | | | | | |
| Associate teachers | Matea Božić-Kudrić, mag. ing. | Type of instruction (number of hours) | L | S | AE | LE | DE | |
| | | | 45 | 0 | 15 | 15 | 0 | |
| Status of the course | Obligatory | Percentage of application of e-learning | 0 | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | |
| Course objectives | Training students for:<br>- Understanding and applying Fourier Transform in signal processing<br>- Understanding the problem of signal transmission through real channels<br>- Understanding the methods of optimal coding and through noisy channels | | | | | | | |
| Course enrolment requirements and entry competences required for the course | Mathematics and Applied Mathematics | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>1. Define and calculate Fourier transform of periodic and non-periodic signals<br>2. Define and calculate correlation, autocorrelation and convolution<br>3. Define linear systems<br>4. Explain problems of transmission in real channels<br>5. Define basic properties of random signals<br>6. Apply optimal coding methods<br>7. Explain transmission in noisy channels. | | | | | | | |
| Course content broken down in detail by weekly class schedule (syllabus) | Course content | L hours | AE hours | | | | | |
| | Introduction. About signals and systems- | 3 | 1 | | | | | |
| | Signals and their properties: speech, audio, video, data, noise | 3 | 1 | | | | | |
| | Definition of Fourier transform. Basic properties of Fourier transform | 3 | 1 | | | | | |
| | Symetric property of Fourier transform. Fourier transform of real functions. Correlation. Autocorrelation. Convolution. | 3 | 1 | | | | | |
| | Linear systems. Impulse response. Transform function. Transmission in real channels. Criteria of transmission quality. | 3 | 1 | | | | | |
| | Periodic signals. Correlation and autocorrelation of periodic signals. Convolution of periodic signals. | 3 | 1 | | | | | |
| | Random signals. Probability transform functions. Random variables. Spectral density of random signals. | 3 | 1 | | | | | |
| | Linear systems with random signals. Signal detection in noise. | 3 | 1 | | | | | |
| | Analog/digital conversion. Sampling. Sampling theorem. Quantization. Coding | 3 | 1 | | | | | |
| | Information source. Alphabet capacity. Channel capacity. Self-information. Entropy | 3 | 1 | | | | | |
| | Coding. Optimal code. Block coding. Shannon-Fano coding method. Huffman coding method. | 3 | 1 | | | | | |
| | Joint events (memory-based information sources). Mutual information. Speech as memory-based information source. Capacity of noisy channels. Information transmission through noisy channels | 3 | 1 | | | | | |
| | List of laboratory exercises | | LE hours | | | | | |
| | Fourier transform | | 2 | | | | | |
| | Linear systems | | 2 | | | | | |
| | Correlation and autocorrelation | | 2 | | | | | |
| | Discrete Fourier transform | | 2 | | | | | |

<table>
<tr><td rowspan="2"></td><td colspan="5">PCM systems</td><td>2</td></tr>
<tr><td colspan="5">Optimal coding</td><td>2</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures<br>☐ seminars and workshops<br>☒ exercises<br>☐on line in entirety<br>☐ partial e-learning<br>☐ field work</td><td colspan="3">☐ independent assignments<br>☐ multimedia<br>☒ laboratory<br>☐ work with mentor<br>☐ (other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70% of the times scheduled.<br>Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2,7</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>0,5</td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0,5</td></tr>
<tr><td>Written exam</td><td>0,1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester there are two mid-term exams and the final exam. First one is after 7 weeks of classes and second one after 13 weeks of classes. In the final exams students that did not pass the midterm exams take part. Mid-term consist of 8 questions and tasks (5-6 questions and 2-3 tasks). In order to take a mid-term exam, student is required to have 70% of its class attendance.<br>The midterm and final exams are carried out as written tests. The requirement for passing grade is 45% points on each midterm exam, with at least 20% of tasks part (if midterm have 2 tasks and maximum of 20 points, then it means to have at least 4 points in task).<br><br>The requirement for passing grade is the positive assessment of laboratory exercises.<br><br>Grade (in percentage) is formed according to the formula:<br>Grade (%) = 0,167 * L + 0,833 * (0.5 * M1 + 0,5 * M2);<br>M1, M2 – points at the mid-term expressed as a percentage, and L – points from the laboratory (with completed all lab. Exercises) expressed as a percentage.<br><br>The final evaluation is determined as follows:<br>percentage Rating<br>50% to 61% is sufficient (2)<br>62% to 74% good (3)<br>75% to 87% of very good (4)<br>88% 100% Excellent (5)<br><br>Final exams consist of 12 questions and tasks (generally 9 questions and 3 tasks). The requirement for passing grade is 45% from total number of given points (if final exam consists of 3 tasks and totally 30 points, it means to achieve at least 13.5 points in tasks).<br><br>Final exams are being held according to the exam schedule.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">H. Dujmić: Signali  i sustavi, FESB, interna skripta</td><td></td><td>e-learning</td></tr>
<tr><td>Optional literature (at the time of submission of study</td><td colspan="6">Haykin and Van Veen: Signals and Systems, John Wiley, 1999, ISBN 0-471-13820-7</td></tr>
</table>

| | |
|---|---|
| programme proposal) | |
| Quality assurance methods that ensure the acquisition of exit competences | - Evaluation of results in accordance with the above learning outcomes<br>- Feedback from students via surveys<br>- Self-evaluation of teachers<br>- Feedback from students that already graduated, by taking their course usability notice |
| Other (as the proposer wishes to add) | |

| **NAME OF THE COURSE** | **PROFESSIONAL TRAINING** | | |
|---|---|---|---|
| **Code** | FEYY03 | Year of study | 3 |
| **Course teacher** | Head of the professional training from the Faculty | Credits (ECTS) | 10 |
| Status of the course | Mandatory | Percentage of application of e-learning | |

| Associate teachers | Head of the professional training from the private institution | Type of instruction (number of hours) | L | S | AE | LE | DE |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- consolidating theoretical knowledge and practical skills in solving highly complex engineering problems<br>- acquaintance with the organization, work and business of the receiving institution,<br>- solving practical problems,<br>- inclusion in the labour market,<br>- writing technical reports |
| Course enrolment requirements and entry competences required for the course | Acquired 120 ECTS credits |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- consolidate theoretical knowledge and practical skills in solving problems<br>- use literature, databases and other sources of information<br>- select appropriate methods and procedures for solving practical problems<br>- apply technical knowledge and skills to effectively solve engineering problems<br>- prepare a written report on the work results |
| Course content broken down in detail by weekly class schedule (syllabus) | Professional training is the independent work of the student performed in the receiving institution in accordance with the plan and programme agreed between the head of the professional training from the receiving institution and the head of professional training from the Faculty. |
| Format of instruction | ☐ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☒ field work<br>☒ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☒ work with mentor<br>☐ (other) |
| Student responsibilities | Independent work |

| Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| Class attendance | | Research | | Practical training | 7 |
| Experimental work | | Report | | Independent work | 2 |
| Essay | | Seminar essay | | Report writing | 1 |
| Tests | | Oral exam | | (Other) | |
| Written exam | | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | Professional training is not evaluated. Students are obliged to complete professional training in accordance with the Regulation on professional training and to write a Professional training report. Professional training report is validated by the head of professional training from the receiving institution and the head of professional training from the Faculty. |

| Required literature (available in the library and via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|
| | | | |
| Optional literature (at the time of submission of study programme proposal) | | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Questionnaire on professional training<br>- Self-evaluation of the head of professional training<br>- Student survey of the whole study programme | | |
| Other (as the proposer wishes to add) | | | |

| NAME OF THE COURSE | FINAL THESIS | | |
|---|---|---|---|
| **Code** | FEYY01 | Year of study | 3 |
| **Course teacher** | | Credits (ECTS) | 10 |
| Associate teachers | | Type of instruction (number of hours) | L: , S: , AE: , LE: , DE: |
| Status of the course | Mandatory | Percentage of application of e-learning | |

| L | S | AE | LE | DE |
|---|---|---|---|---|
| | | | | |

**COURSE DESCRIPTION**

| | |
|---|---|
| Course objectives | Training students for:<br>- consolidating theoretical knowledge and practical skills in solving highly complex engineering problems<br>- being independent in solving problems under the given conditions<br>- writing and presenting the project results |
| Course enrolment requirements and entry competences required for the course | Acquired 120 ECTS credits |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | Students will be able to:<br>- consolidate theoretical knowledge and practical skills in solving problems<br>- use literature, databases and other sources of information<br>- select appropriate methods and procedures for solving practical problems<br>- apply technical knowledge and skills to effectively solve engineering problems<br>- give public presentation, to prepare written report and present project results |
| Course content broken down in detail by weekly class schedule (syllabus) | Final thesis is the independent work of the student produced according to the task and instructions given by the supervisor |
| Format of instruction | ☐ lectures<br>☐ seminars and workshops<br>☐ exercises<br>☐ *on line* in entirety<br>☐ partial e-learning<br>☐ field work<br><br>☐ independent assignments<br>☐ multimedia<br>☐ laboratory<br>☒ work with mentor<br>☐ (other) |
| Student responsibilities | Independent work |

| Screening student work (*name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | | | | | | |
|---|---|---|---|---|---|---|
| | Class attendance | | Research | | Practical training | |
| | Experimental work | | Report | | Individual work | 10 |
| | Essay | | Seminar essay | | (Other) | |
| | Tests | | Oral exam | | (Other) | |
| | Written exam | | Project | | (Other) | |

| | |
|---|---|
| Grading and evaluating student work in class and at the final exam | Final thesis is evaluated by the supervisor based on the student's achievements during the process of the final thesis production and on written and oral presentation. |

| Required literature (available in the | **Title** | **Number of copies in the library** | **Availability via other media** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| library and via other media) | Literature depends on the given problem. The literature list may be given by the supervisor or the student should find the appropriate literature to help solve the problem. | | |
| Optional literature (at the time of submission of study programme proposal) | | | |
| Quality assurance methods that ensure the acquisition of exit competences | - Self-evaluation of teachers<br>- Student survey of the whole study programme | | |
| Other (as the proposer wishes to add) | | | |

# 3. STUDY PERFORMANCE CONDITIONS

## 3.1. Places of the study performance

| Buildings of the constituent part (name existing, under construction and planned buildings) | |
|---|---|
| Identification of building | FESB |
| Location of building | R. Boškovića 32 |
| Year of completion | 2008. |
| Total square area in $m^2$ | 29.477 |

## 3.2. List of teachers and associate teachers

| CODE | Course | Teachers and associate teachers |
|---|---|---|
| FELO16 | Antennas | Antonio Šarolić, Ph.D., Full Professor<br>Associate teachers: Niko Ištuk, mag. ing. el. |
| FENO13 | Application of Industrial Computers | Ozren Bego, Ph.D., Associate Professor<br>Associate teachers: Danijel Jolevski, Ph.D., Assistant Professor |
| FEMY02 | Applied Mathematics | Ivančica Mirošević, M.Sc., Lectuter<br>Associate teachers: Lea Dujić |
| FELO06 | Automation | Josip Music, Ph.D., Assistant Professor<br>Associate teachers: Ana Kuzmanić Skelin, Ph.D., Assistant Professor |
| FELO44 | Biomechanics Practicum | Josip Music, Ph.D., Assistant Professor<br>Associate teachers: Tea Marasović, PhD |
| FEEE14 | Commercial Law | Zlatko Ćesić, Ph.D., Assistant Professor |
| FELO10 | Communication Systems | Matko Šarić, Ph.D., Assstant Professor<br>Associate teachers: Petar Šolić, Ph.D., Assstant Professor |
| FELO31 | Computer Aided Analysis of Radiating Structures | Vicko Dorić, Ph.D., Associate Professor<br>Associate teachers: Maja Škiljo, Ph.D. |
| FELP16 | Computer and Data Security | Julije Ožegović, Ph.D., Full Professor<br>Associate teachers: Lada Sartori, Senior Lectuter, Vesna Pekić, Ph.D., Ante Kristic, Ph.D. |
| FELO22 | Computer Architectures | Sven Gotovac, Ph.D., Full Professor<br>Associate teachers: Dunja Gotovac |
| FELP08 | Computer Networks | Julije Ožegović, Ph.D., Full Professor<br>Associate teachers: Stipe Braica, Lecturer, Mario Mornar, Lecturer, Vesna Pekić, Ph.D., Ante Kristic, Ph.D. |
| FENO08 | Control Engineering | Mateo Bašić, Ph.D., Assistant Professor |
| FENO17 | Control of Electrical Drives | Mateo Bašić, Ph.D., Assistant Professor |
| FELO18 | Control System Design | Mojmil Cecić, Ph.D., Full Professor<br>Associate teachers: Marko Lete, mag. ing. |
| FENO25 | Design of Low Voltage Facilities | Marin Despalatović, Ph.D., Associate Professor |
| FELP17 | Designing and Using Computer Networks | Julije Ožegović, Ph.D., Full Professor |

| | | |
|---|---|---|
| | | Associate teachers: Lada Sartori, Senior Lecturer, Vesna Pekić, Ph.D., Ante Kristic, Ph.D. |
| FELO11 | Digital Techniques | Julije Ožegović, Ph.D., Full Professor<br>Associate teachers: Stipe Braica,Lecturer, Vesna Pekić, Ph.D., Ante Kristic, Ph.D. |
| FENO12 | Electrical Distribution Networks | Damir Jakus, Ph.D. Assistant Professor<br>Josip Vasilj, Ph.D. |
| FENO09 | Electrical Drives | Marin Despalatović, Ph.D., Associate Professor<br>Associate teachers: Goran Majić, Ph.D |
| FENO10 | Electrical Installations | Rino Lucić, Ph.D., Full Professor<br>Associate teachers: Ante Veža, assistant |
| FENO04 | Electrical Machines and Transformers | Ivica Jurić-Grgić, Ph.D., Associate Professor<br>Dino Lovrić, Ph.D., Senior Research Assistant |
| FENO24 | Electrical Measurements | Tomislav Kilić, Ph.D., Full Professor<br>Associate teachers:Tonko Garma, Ph.D. Assistant Professor |
| FENO05 | Electrical Networks | Petar Sarajčev, Ph.D., Associate Professor |
| FENO06 | Electrical Power Switchgears | Tonći Modrić, Ph.D., Assistant Professor |
| FENO15 | Electrical Safety | Ivica Jurić-Grgić, Ph.D., Associate Professor |
| FELO21 | Electromagnetic Compatibility | Vicko Dorić, Ph.D., Associate Professor<br>Associate teachers: Maja Škiljo, Ph.D. |
| FELO27 | Electronic Cad | Mojmil Cecić, Ph.D., Full Professor |
| FELO04 | Electronic Circuits | Spomenka Bovan, M.Sc., Senior Lectuter<br>Associate teachers: Ivan Marasović, Ph.D., Assistant Professor |
| FELO47 | Electronic Circuits Design | Ivan Marinović, Ph.D. Full Professor<br>Associate teachers: Duje Čoko, Ph.D. |
| FENO21 | Electronic Converters for Power Supplies | Dinko Vukadinović, Ph.D., Full Professor<br>Associate teachers: Mateo Bašić, Ph.D. Assistant Professor<br>Ivan Grgić, Assistant |
| FELO42 | Electronic Devices | Spomenka Bovan, M.Sc., Senior Lectuter |
| FELO20 | Electronic Instrumentation | Ivan Marasović, Ph.D. Assistant Professor |
| FELO01 | Electrotechnical Materials and Technologies | Josip Lörincz, Ph. D., Assistant professor<br>Associate teachers: Marko Zubčić, mag. ing. |
| FELO29 | Elements of Robotics | Mirjana Bonković, Ph.D., Full Professor<br>Associate teachers: Miroslav Dujmović, BSc (external collaborator) |
| FENO23 | Energy Sources | Elis Sutlović, Ph.D., Full Professor<br>Associate teachers: Marin Mandić, Assistant |
| FEOO02 | English Language 1 | Mira Braović Plavša, senior lecturer |
| FEOO03 | English Language 2 | Mira Braović Plavša senior lecturer |
| FENO01 | Fundamentals of Electrical Engineering 1 | Tomislav Kilić, Ph.D., Full Professor<br>Associate teachers:<br>Nedjeljka Grulović-Plavljanić, M.Sc., Senior Lectuter |
| FENO28 | Fundamentals of Electrical Engineering 2 | Silvestar Šesnić, Ph.D., Assistant Professor |
| FENO19 | High Voltage Engineering | Petar Sarajčev, Ph.D., Associate Professor |
| FELO41 | High-Frequency Electronics | Ivan Marinović, Ph.D. Full Professor |
| FELO32 | Human Exposure to Electromagnetic Radiation | Vicko Dorić, Ph.D., Associate Professor<br>Associate teachers: Anna Šušnjara, Assistant |

| | | |
|---|---|---|
| FETO01 | Hydraulic and pneumatic systems | Jani Barle, Ph.D., Full Professor<br>Alen Kovač |
| FENO31 | Instrumentation for Smart Grid | Goran Petrović, Ph.D., Associate Processor<br>Associate teachers: Juraj Alojzije Bosnić, assistant |
| FELO35 | Internet Programming | Ljiljana Šerić, Ph.D., Assistant Professor<br>Associate teachers: Marin Bugarić, Ph.D., Senior Research Assistant<br>Andrija Sommer, mag.ing. |
| FESY01 | Introduction to Computer Applications | Goran Petrović, Ph.D., Associate Professor<br>Associate teachers: Josip Vasilj, Ph.D. |
| FESY03 | Introduction to Entrepreneurship | Marija Šiško Kuliš, Ph.D., Associate Professor |
| FELO02 | Introduction to Programming | Ljiljana Šerić, Ph.D., Assistant Professor<br>Associate teachers: Marin Bugarić, Ph.D., Senior Research |
| FENO18 | Maintenance and Testing of Electrical Power Equipment | Božo Terzić, Ph.D., Full Professor<br>Associate teachers: Goran Majić, Ph.D. |
| FENO26 | Marine Electrical Engineering | Slavko Vujević, Ph.D., Full Professor |
| FELO40 | Maritime Radiocommunications | Antonio Šarolić, Ph.D., Full Professor<br>Associate teachers: Niko Ištuk, mag. ing. el |
| FEMY03 | Mathematics | Ivančica Mirošević, M.Sc., Lectuter<br>Associate teachers: Lea Dujić, Marija Čatipović, Marina Mandić |
| FENO11 | Measurements in Power System | Goran Petrović, Ph.D., Associate Professor<br>Associate teachers: Juraj Alojzije Bosnić, assistant; Tonko Garma, Ph.D., Assistant Professor |
| FENO16 | Measurements of Process Quantities | Goran Petrović, Ph.D., Associate Professor<br>Associate teachers: Juraj Alojzije Bosnić, assistant |
| FELO48 | Mechatronics Practicals | Vladan Papić, Ph.D., Full Professor Mirjana Bonković, Ph.D., Full Professor<br>Associate teachers: Miroslav Dujmović, BSc (external collaborator) |
| FELO39 | Microcontrollers and embedded network systems | Mirjana Bonković, Ph.D., Full Professor<br>Associate teachers: Ivo Stančić, Ph.D., Assistant Professor |
| FENO30 | Microprocessors | Ozren Bego, Ph.D., Associate Professor<br>Associate teachers: Danijel Jolevski, Ph.D., Assistant Professor |
| FELO37 | Mobile Communication Networks | Dinko Begušić, Ph.D., Full Professor<br>Associate teachers: Maja Stella, Ph.D., Assistant Professor<br>Marina Rajič, Mag. ing.<br>Josip Žilić, Magl. ing.<br>Ante Dagelić, Mag. Ing, |
| FELO23 | Modelling and Simulation | Jadranka Marasović, Ph.D., Full Professor<br>Mojmil Cecić, Ph.D., Full Professor<br>Associate teachers: Marko Lete, mag. ing. |
| FELO19 | Multimedia | Mladen Russo, Ph.D., Assistant Professor<br>Associate teachers: mag. ing. Jelena Čulić mag. ing. Martina Bašić |
| FELO45 | Optical Communications | Dinko Begušić, Ph.D., Full Professor<br>Associate teachers: Maja Stella, Ph.D., Assistant Professor<br>Maja Stella, Ph.D., Assistant Professor<br>Ivica Meštrović, dipl. ing. |

| | | |
|---|---|---|
| | | Marko Banović, dipl. ing.<br>Josip Babić, Mag. Ing,. |
| FELO07 | Optoelectronics | Tihomir Betti, Ph.D., Assistant Professor |
| FEMO01 | Physics | Ivica Sorić, senior lecturer |
| FENO07 | Power Electronics | Dinko Vukadinović, Ph.D., Full Professor<br>Associate teachers: Mateo Bašić, Ph.D. Assistant Professor<br>Ivan Grgić, Assistant |
| FENO22 | Power System and Environment | Tonći Modrić, Ph.D., Assistant Professor<br>Mate Dabro, Ph.D., Assistant Professor |
| FELO33 | Practicum in Digital Image Processing | Mirjana Bonković, Ph.D., Full Professor<br>Associate teachers: Ana Kuzmanić Skelin, Ph.D., Assistant Professor |
| FELO46 | Practicum in Electromagnetic Simulations | Antonio Šarolić, Ph.D., Full Professor<br>Associate teachers: Niko Ištuk, mag. ing. el |
| xxx | Praktikum iz elektromagnetskih simulacija | Associate teachers: |
| FELO12 | Process Control | Darko Stipaničev, Ph.D., Full Professor |
| FENO14 | Protection and Control Systems in Substation | Elis Sutlović, Ph.D., Full Professor<br>Associate teachers: Tonći Modrić, Ph.D., Assistant Professor |
| FENO20 | Protection at Substations | Petar Sarajčev, Ph.D., Associate Professor<br>Associate teachers: |
| FELO30 | Radio Communications | Zoran Blažević, Ph.D., Full Professor<br>Associate teachers: Maja Škiljo, Ph.D. |
| FENO29 | Renewable Energy Sources | Damir Jakus, Ph.D. Assistant Professor<br>Associate teachers: Josip Vasilj, Ph.D. |
| FELO36 | Sensors and Transducers | Josip Music, Ph.D., Assistant Professor<br>Associate teachers: Ivo Stančić, Ph.D., Assistant Professor |
| FELO05 | Signals and Systems | Petar Šolić, Ph.D., Assistant Professor<br>Associate teachers: Matea Božić-Kudrić, mag. ing. |
| FEYY03 | Professional Training | |
| FEYY01 | Final Thesis | |
| | | |

## 3.3. Curriculum vitae of the course teacher

| | |
|---|---|
| First and last name and title of teacher | **Jani Barle, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Hydraulic and pneumatic systems |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Žnjanska 4, 21000 Split, HR a |
| Telephone number | +385 (21) 305930 |
| E-mail address | Jani.Barle@fesb.hr |
| Personal web page | https://nastava.fesb.hr/nastava/nastavnici/detalji/barle |
| Year of birth | 1964 |
| Scientist ID | 186172 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, May 2011. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, September 2016. |
| Area and field of election into research or art rank | Mechanical engineering, mechanical construction engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | July 1991. |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Process Automation, System Maintenance Management |
| Function | Education and research |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Ph.D. |
| Institution | University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture |
| Place | HR - Zagreb |
| Date | January 1998. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1996. |
| Place | IT - Padua |
| Institution | Dipartimento di Ingegneria Meccanica |
| Field of training | Research on experimental methods |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English - 5 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German - 3 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian - 3 |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | On Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture<br>Undergraduate study:<br>- Industrial process control (FETC06)<br>Master's degree study:<br>- Hydraulics and pneumatics(FETL17)<br>- Maintenance management (FETL04)<br>- Product life management (FETM06)<br>Doctorate degree study:<br>- Experimental methods (FETU24) |

| | |
|---|---|
| | - Reliability engineering (FETU14) |
| Authorship of university/faculty textbooks in the field of the course | Barle, J.: Hydraulics and pneumatics, (student handbook and workbook in Croatian: *Hidraulika i pneumatika*), FESB, Split, 2010. |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Barle, Jani; Đukić, Predrag; Ban, Dario.<br>Verification of Number of Cycles for Fatique Life Estimation of Wind-Sensitive Structures // 7th ICCSM / Croatian Society of Mechanics, 2012. 233-234.<br>2. Barle, Jani; Wolf, Hinko; Đukić, Predrag.<br>Experimental verification of the dynamic model for a wind turbine tower // 30th Danubia-Adria: Symposium on Advances in Experimental Mechanics / Croatian Society of Mechanics, 2013. 219-220<br>3. Grubišić, Vatroslav; Barle, Jani.<br>Procedure for the Service Strength Approval of the Drillship Derricks. // Rad Hrvatske akademije znanosti i umjetnosti. Tehničke znanosti. 521 (2015), 17; 51-62.<br>4. Đukić, Predrag; Wolf, Hinko; Jani, Barle.<br>Simple dynamic model of wind turbine tower with experimental verification. // International journal for engineering modelling. 28 (2015) , 1-4; 49-59 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | 1. Barle, Jani; Franulović, Marina; Jurčević Lulić, Tanja; Kladarić, Ivica; Markučič, Damir; Radica, Gojmir. *Izrada kataloga znanja, vještina i kompetencija za studije strojarstva u Republici Hrvatsko*j // Zbornik radova međunarodne stručne konferencije ME4CataLOgue / Kozak, D., Barle, J., Markučič, D., Pavletić, D., Matičević, G, Vranešević M. N., Rosandić, Ž, Damjanović, D. (ur.)., Sl.Brod 2015.<br>2. "*Hrvatski katalog znanja, vještina i kompetencija za studije strojarstva zasnovan na ishodima učenja (za preddiplomski, diplomski i doktorski studij)*", Strojarski fakultet u Slavonskom Brodu Sveučilišta J. J. Strossmayera u Osijeku, 2015., Kozak, D., Barle, J., Boras, I., Franulović,, M., Jurčević-Lulić, T., Kladarić, I., Lelas, D., Markučić, D., Matičević, G., Pavletić, D., Vranešević-Marinić, N.(ur.), ISBN 978-953-6048-78-6 |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | IPA IV project ME4CataLOgue “Further development and implementation of the Croatian Qualifications Framework (CQF)”, 2013-2015. |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

| | |
|---|---|
| First and last name and title of teacher | **Mateo Bašić, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Control Engineering<br>Control of Electrical Drives |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | 141. brigade 24, 21000 Split, HR |
| Telephone number | +385 21 305 615 |
| E-mail address | mabasic@fesb.hr |
| Personal web page | |
| Year of birth | 1982 |
| Scientist ID | 306926 |
| Research or art rank, and date of last rank appointment | Senior Scientific Associate, 4/11/2016 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant Professor, 19/3/2014 |
| Area and field of election into research or art rank | Technical Sciences, Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 1/6/2008 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Power Engineering (Power Electronics, Control of Electrical Machines) |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 13/2/2023 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 4 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | |

| | |
|---|---|
| | |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Bašić, M., Vukadinović, D. „Online Efficiency Optimization of a Vector Controlled Self-Excited Induction Generator“, IEEE Transactions on Energy Conversion. 31 (2016) , 1; 373-380<br>2. Vukadinović, D., Bašić, M., Nguyen, C.H., Vu, N.L., Nguyen, T.D., „Hedge-Algebra-Based Voltage Controller for a Self- Excited Induction Generator“, *Control engineering practice*, 30 (2014) ; 78-90<br>3. Bašić, M., Vukadinović, D., „Vector control system of a self-excited induction generator including iron losses and magnetic saturation“, *Control engineering practice*, 21 (2013) , 4; 395-406<br>4. Bašić, M., Vukadinović, D., Petrović, G., „Dynamic and Pole-Zero Analysis of Self-Excited Induction Generator Using a Novel Model with Iron Losses“, *International journal of electrical power & energy systems*, 42 (2012) , 1; 105-118<br>5. Bašić, M., Vukadinović, D., Polić, M., „Analysis of Power Converter Losses in Vector Control System of a Self–Excited Induction Generator“, *Journal of Electrical Engineering - Elektrotechnický časopis*, 65 (2014) , 2; 65-74 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

| | |
|---|---|
| First and last name and title of teacher | **Ozren Bego, Ph.D., Associate Professor** |
| The course he/she teaches in the proposed study programme | Application of Industrial Computers<br>Microprocessors |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Trondheimska 4C, 21000 Split, Croatia |
| Telephone number | +385 21 305605 |
| E-mail address | obego@fesb.hr |
| Personal web page | |
| Year of birth | 1966. |
| Scientist ID | 186161 |
| Research or art rank, and date of last rank appointment | Research Scientist, November 2017. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Associate Professor, December 2017. |
| Area and field of election into research or art rank | Technical Sciences, Field Automation and Robotics |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 1991. |
| Name of position (professor, researcher, associate teacher, etc.) | Associate Professor |
| Field of research | Automation, Digital Control Systems |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering and Computing |
| Place | Zagreb |
| Date | 24. 2. 2005. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Elements of industrial automation, Undergraduate study: Electrical Engineering and Information Technology. |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five | Jolevski, Danijel; Bego, Ozren; Sarajcev, Petar: **Control structure design and dynamics modelling of the organic** |

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| years in the field of the course (5 works at most) | **Rankine cycle system** // *Energy (Oxford)*. **121** (2017) ; 193**-**204.<br><br>Jolevski, Danijel; Bego, Ozren. **Model predictive control of gantry/bridge crane with anti-sway algorithm**. // *Journal of mechanical science and technology*. **29** (2015) , 2; 827**-**834<br><br>Jolevski, Danijel; Bego, Ozren; Grgat, Frano. **GA Optimized AVR Controller with Higher Degree of Freedom of Tuning of Wanted Response**. // *International Review of Automatic Control (IREACO)*. **8** (2015) , 1; 72**-**79 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Nacional research project: Safer and more efficient cogeneration / trigeneration plants, 2015. -2016., project financed from the EU fond.<br><br>Development project: Control system for small hydro power plants, project leader, 2010.-2017., project realized for Sintaksa d.o.o. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Dinko Begušić, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Mobile communication networks, Optical communications |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Trondheimska 4d, Split |
| Telephone number | 021305637 |
| E-mail address | begusic@fesb.hr |
| Personal web page | www.fesb.hr/~begusic |
| Year of birth | 1960. |
| Scientist ID | 129685 |
| Research or art rank, and date of last rank appointment | Scientific advisor, scientific field of electrical engineering<br>Scientific advisor, scientific field of computing |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Full professor, permanent position (date of election Spetember 11, 2008) |
| Area and field of election into research or art rank | Scientific area of technical sciences, scientific field of electrical engineering<br>Scientific area of technical sciences, scientific field of computing |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | University of Split, Faculty of electrical engineering, mechanical engineering and naval architecture |
| Date of employment | 1985. |
| Name of position (professor, researcher, associate teacher, etc.) | Full professor, permanent position |
| Field of research | Information and communication technology, Telecommunications and informatics, Information processing, Networking technologies, Digital signal processing |
| Function | Chair of communication technologies and signal processing |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | University of Zagreb, Faculty of electrical engineering and computing |
| Place | Zagreb |
| Date | 1992. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1990. |
| Place | Bruxelles, Belgija |
| Institution | Universite Libre de Bruxelles |
| Field of training | Telecommunications and informatics, Digital signal processing |
| Year | 1992. |
| Place | London |
| Institution | King's College London |
| Field of training | Telecommunications and informatics, Digital signal processing |
| Year | 1998. |
| Place | Dallas, SAD |
| Institution | University of Texas at Dallas |
| Field of training | Telecommunications and informatics, Digital signal processing |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |

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| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 5 |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Wireless communication networks, Optical communication systems, Transmission systems, Software engineering in telecommunications, (master study of electrical engineering) |
| Authorship of university/faculty textbooks in the field of the course | D.Begušić: " Mobile communication networks ", handouts, 2016.<br>D.Begušić: "Optical communications ", handouts, 2014.<br>D.Begušić: " Programsko inženjerstvo u telekomunikacijama", nastavni tekst, 2004.<br>N.Rožić, D.Begušić, M.Vrdoljak, W.Afrić:"New communication technologies ", ISBN 953-6114-20-8, FESB Split - HT-TKC Split, pp. 416, Split, 1999. |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | T.Perković, M.Čagalj, T.Mastelić,N.Saxena, D.Begušić: “Secure Initialization of Multiple Constrained Wireless Devices for an Unaided User“, IEEE Transactions on Mobile Computing (1536-1233) 11 (2012), 2; pp.337-351<br><br>M. Stella, M. Russo, D. Begušić: “RF Localization in Indoor Environment“, Radioengineering, Special issue on advanced RF measurements (ISSN 1210-2512), Vol 21, No. 2, 2012, pp. 557-567<br><br>Josip Lorincz, Antonio Capone, Dinko Begušić, “Optimized Network Management for Energy Savings of Wireless Access Networks”, Computer Networks Journal (ISSN: 1389-1286), svezak 55, broj 3, February 2011, str.: 626-648<br><br>Josip Lorincz, Antonio Capone, Dinko Begušić, “*Heuristic Algorithms for Optimization of Energy Consumption in Wireless Access Networks*”, KSII Transactions on Internet and Information Systems (ISSN: 1976-7277), svezak 5, broj 5, April 2011., str.: 514-540<br><br>D.Begušić, N.Rožić, H.Dujmić: "Development of the communication/information infrastructure at the academic institution", Computer Communications, Elsevier, ISSN 0140-3664, No.26, pp. 472-476, 2003. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | T.Kilić, I.Puljak, D.Begušić: "*Studying electrical engineering and information technology at the University of Split, Croatia*", International Journal of Electrical Engineering Education, Manchester University Press, ISSN 0020-7209, Vol. 44, No. 2; pp.175-183, Manchester, UK, 2007.<br><br>D.Begušić, B.Bilić, T.Kilić, I.Puljak:"*Bolonjski proces na Fakultetu elektrotehnike, strojarstva i brodogradnje u Splitu*", Zbornik sažetaka Obrazovanje inženjera Bolonjski proces 3 godine kasnije, Hrvatska akademija tehničkih znanosti, pp.38-39, Zagreb, 2007. |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Advanced networking technologies and systems, project FESB<br>Advanced heterogeneous networking technologies, project MZOS<br>Collaborative internationalization of software engineering in Croatia j, project TEMPUS |

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| | Research in the area fo telecommunications, joint project FESB - Ericsson Nikola Tesla<br>International conference on Software, Telecommunications and Computer Networks SoftCOM<br>Journal of Communications Software and Systems |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | Member of Croatian academy of engineering, Department of Information systems |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Tihomir Betti, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Optoelectronics |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Kaštelanska 2, HR-21000, Split |
| Telephone number | 091 4305 889 |
| E-mail address | betti@fesb.hr |
| Personal web page | |
| Year of birth | 1977 |
| Scientist ID | 248722 |
| Research or art rank, and date of last rank appointment | Assistant research fellow, 22.11.2012. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor, 18.09.2013. |
| Area and field of election into research or art rank | Technical sciences, electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 08.06.2001. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | Electronics, Nanoelectronics, Photovoltaics |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 04.12.2009. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 2013. (7 weeks) |
| Place | Freiburg, Germany |
| Institution | Fraunhofer ISE |
| Field of training | Photovoltaics |
| Year | 2011. (3 weeks) |
| Place | Ljubljana, Slovenia |
| Institution | Institute „Jožef Stefan“ |
| Field of training | Hybrid polymer solar cells |
| Year | 2007-2009. (several visits, 4 weeks in total) |
| Place | Munich, Germany |
| Institution | Walter Schottky Institute |
| Field of training | Application of semiconductor nanostructures in third generation photovoltaics |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 5 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian, 2 |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name | Optoelectronics, Professional study of Electronics |

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| title of course, study programme where it is/was offered, and level of study programme) | |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. I. Marasović, Ž. Milanović, T. Betti, "Resistance Fluctuations in GaAs Nanowire Grids", Journal of Nanomaterials, (2014), 428390<br>2. I. Marasović, T. Garma, T. Betti, "Modelling a nanowire grid for light-sensing applications", Journal of Physics D: Applied Physics 45 (2012) |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Zoran Blažević, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Radio Communications |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Tolstojeva 47, 21000 Split, HR |
| Telephone number | +385 21 305676 |
| E-mail address | zblaz@fesb.hr |
| Personal web page | |
| Year of birth | 1968 |
| Scientist ID | 238956 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 20/06/2016 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, 16/07/2016 |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical Engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 14/02/2006 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Radio-channel modelling, antennas, microwaves |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 30/05/2005 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | |
| Authorship of university/faculty textbooks in the field of the course | |

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| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Šolić, Petar; Blažević, Zoran; Škiljo, Maja; Patrono, Luigi. Impact of Tag Responsiveness on Gen2 RFID Throughput. // IEEE communications letters. 20 (2016) , 11; 2181-2184<br>2. Šolić, Petar; Maras, Josip; Radić, Joško; Blažević, Zoran. Comparing Theoretical and Experimental Results in Gen2 RFID Throughput. // Ieee transactions on automation science and engineering. 14 (2016) , 1; 349-357<br>3. Škiljo, Maja; Blažević, Zoran. Spherical helices for resonant wireless power transfer. // International Journal of Antennas and Propagation. 2013 (2013) ; 426574-1-426574-12<br>4. Škiljo, Maja; Blažević, Zoran; Poljak, Dragan. Interaction Between Human and Near Field of Wireless Power Transfer System. // Progress In Electromagnetics Research C. 67 (2016) ; 1-10<br>5. Blažević, Zoran; Škiljo, Maja; Poljak, Dragan. Comparison of Generalized Telegrapher Equations Approach and Circuit Model for Wireless Power Transfer // Proceedings of Softcom 2016 Split, 2016. 1-5 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Propagation factors in radio-networks planning, project MZOS 023-0361566-1613, 2007-2013 |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,8/5 |

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| First and last name and title of teacher | **Mirjana Bonković, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Elements of robotics<br>Microcontrollers and embedded network systems<br>Mechatronics Practicals<br>Practicum in Digital Image Processing |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | R. Boškovića 32, 21 000 Split, HR |
| Telephone number | +385 91 4 305 641 |
| E-mail address | mirjana.bonkovic@fesb.hr |
| Personal web page | |
| Year of birth | |
| Scientist ID | 190481 |
| Research or art rank, and date of last rank appointment | |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Full professor, 2016. |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 01/7/1991 |
| Name of position (professor, researcher, associate teacher, etc.) | Full professor, 2016. |
| Field of research | 3D modelling, robotics, computer vision, optimization |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 10/3/2000. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1995 |
| Place | Oxford, UK |
| Institution | Robotics Research Group |
| Field of training | Robot production lines optimization |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German (2) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Computers and Programming, Undergraduate study program<br>Programming, Undergraduate professional study program |

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| Authorship of university/faculty textbooks in the field of the course | Zbirka riješenih zadataka iz programiranja u Cu, upute za laboratorijske vježbe, Interna skripta, FESB Split<br>Mikroregulatori i ugradbeni mrežni sustavi, Interna skripta, FESB Split, 2014 |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Kuzmanić Skelin, Ana; Grujić, Tamara; Bonković, Mirjana, Visual Peoplemeter: A Vision-based Television Audience Measurement System. // Advances in Electrical and Computer Engineering. 14 (2014) , 4; 73-80<br>2. Mazić Igor, Bonković Mirjana, Džaja Barbara. Two-Level Coarse-to-Fine Classification Algorithm for Asthma Wheezing Recognition in Children's Respiratory Sounds. //Biomedical Signal Processing and Control. 5 (2015) ; 105-118 (članak, znanstveni).<br>3. Džaja, Barbara; Bonković, Mirjana; Malešević, Ljubomir. Solving a two-colour problem by applying probabilistic approach to a full-colour multi- frame image super-resolution. // Signal processing. Image communication. 28 (2013) , 5; 509-521 (članak, znanstveni).<br>4. Čić, Maja; Šoda, Joško; Bonković, Mirjana. Automatic classification of infant sleep based on instantaneous frequencies in a single-channel EEG signal. // Computers in biology and medicine. 43 (2013) , 12; 2110-2117 (članak, znanstveni).<br>5. Music, Josip; Bonković, Mirjana; Cecić, Mojmil. Comparison of uncalibrated model-free visual servoing methods for small amplitude movement: a simulation study. //International journal of advanced robotic systems. 11 (2014) , 108; 1-16 (članak, znanstveni). |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Provjera inovativnog koncepta, Alarm astmatičnog napada, projekt HAMAG-BICRO, agencija za malo gospodarstvo, inovacije i investicije., 2014. /2015.<br><br>"Virtual CulTourist - Razvoj korisničkog sučelja za virtualno predstavljanje kulturne baštine kroz integraciju inovativnih 3D tehnologija", 2016-2017. Programa tehnološkog razvoja, istraživanja i primjene inovacija (2014.-2017.), SDŽ<br>"Napredne metode 3D virtualizacije – na putu prema virtualnom turizmu i digitalizaciji splitske kulturne baštine", 2015-2016. Programa tehnološkog razvoja, istraživanja i primjene inovacija (2014.-2017.), SDŽ |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |

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| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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| First and last name and title of teacher | **Spomenka Bovan, M.Sc., Senior Lectuter** |
| The course he/she teaches in the proposed study programme | Electronic Circuits<br>Electronic Devices |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Split, Trondheimska 4d |
| Telephone number | +385 21 305 697 |
| E-mail address | spomenka.bovan@fesb.hr |
| Personal web page | |
| Year of birth | 1960 |
| Scientist ID | 154920 |
| Research or art rank, and date of last rank appointment | |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior lecturer<br>17.04.2013. |
| Area and field of election into research or art rank | Technical sciences, electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 22.04.1987. |
| Name of position (professor, researcher, associate teacher, etc.) | Senior lecturer |
| Field of research | Electronics |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | M. Sc. |
| Institution | Faculty of Electrical Engineering |
| Place | Zagreb |
| Date | 27.02.1992. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (3) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German (2) |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Electronic devices, Professional study programme, 2nd semester<br>Electronic circuits, Professional study programme, 3rd semester<br>Basic electronics, Professional study Programme, 2nd semester |

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| Authorship of university/faculty textbooks in the field of the course | 1. S. Bovan: *Elektronički elementi – Repetitorij s laboratorijskim vježbama*, Veleučilište u Splitu, 2000.<br>2. S. Bovan, I. Marasović: *Poluvodički elektronički elementi – upute za laboratorijske vježbe*, autorizirana skripta, FESB, Split<br>4. S. Bovan: *Elektronički sklopovi – Upute za laboratorijske vježbe,*autorizirana skripta, FESB, Split<br>3. S. Bovan: *Osnove elektronike – autorizirana predavanja*, e-learning portal FESB |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,6 |

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|---|---|
| First and last name and title of teacher | **Mira Braović Plavša senior lecturer** |
| The course he/she teaches in the proposed study programme | English Language1, English Language 2 |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Nazorov prilaz 22, 21000 Split |
| Telephone number | 00385915052155 |
| E-mail address | plavsabm@fesb.hr |
| Personal web page | |
| Year of birth | 1975 |
| Scientist ID | |
| Research or art rank, and date of last rank appointment | |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior lecturer 19.2.2014. |
| Area and field of election into research or art rank | Humanities, Philology |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | V. Grammmar School Vladimir Nazor |
| Date of employment | |
| Name of position (professor, researcher, associate teacher, etc.) | teacher |
| Field of research | English as foreign language and Italian as foreign language |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | English and Italian Teacher |
| Institution | Faculty of Philosophy Zadar |
| Place | Zadar |
| Date | 19.11.1998. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English language 5 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian language 5 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | English language for special purposes (Facultyof Philosophy Split )<br>English for special purposes (Art Academy Split) |
| Authorship of university/faculty textbooks in the field of the course | |

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| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | (2012.) Mira Braović Plavša and Ivana BojčićLanguage Borrowings The periodical of Međimursko Veleučilište, Čakovec<br>(2016) Mira BraovićPlavša and Ivana Bojčić What kind of Culture do we teach? The periodical Folia Linguistica et Litteraria (2016) Nikšić, Montenegro, 12 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | (2014) Mira Braović Plavša/ Ivana Bojčić: The need analysis in general English language courses, Školski vjesnik, 63, Split |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | University degree at the Faculty of Philology – pedagogical group |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4.9/5 |

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| First and last name and title of teacher | **Mojmil Cecić, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Electronic CAD, Control System Design, Modelling and Simulation |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Slavonska 6, Split |
| Telephone number | 091 4 305 828 |
| E-mail address | mcecic@fesb.hr |
| Personal web page | - |
| Year of birth | 1960. |
| Scientist ID | 122922 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 20th November, 2007. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Full professor; 20th March, 2014. |
| Area and field of election into research or art rank | Technical Science, Electrotehnics |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 15th January, 1985. |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Control Systems, Robotics |
| Function | Head of the Department of Electronics and Computer Science |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD. |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 25th June, 1999. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1988. |
| Place | Budapest, Hungary |
| Institution | Budepest University of Technology and Economics |
| Field of training | Industrial robotics |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | 1. Automatics I (Vocational Study Programme)<br>2. Automatics II (Vocational Study Programme)<br>3. Automatic Control I (Undergraduate Study Programme)<br>4. Automatic Control II (Undergraduate Study Programme)<br>5. System Theory (Undergraduate Study Programme)<br>6. Nonlinear Control Systems (Graduate Study Programme) |
| Authorship of university/faculty textbooks in the field of the course | 1. V. Zanchi, M. Bonković, M. Cecić, Programska podrška linearnoj teoriji automatskog upravljanja, FESB, Split. |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Stančić, Ivo; Cecić, Mojmil; Ljubičić, Ante; Identification of UAV Engine Parameters. // WSEAS TRANSACTIONS ON SYSTEMS AND CONTROL. 10 (2015) ; 179-185 (članak, znanstveni). |

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| | 2. Musić, Josip; Bonković, Mirjana; Cecić, Mojmil; Comparison of uncalibrated model-free visual servoing methods for small amplitude movement: a simulation study. // International journal of advanced robotic systems. 11 (2014) , 108; 1-16 (članak, znanstveni)<br>3. Cecić, Mojmil; Papić, Vladan; Bonković, Mirjana; Grujić, Tamara; Musić, Josip; Kuzmanić Skelin, Ana; Stančić, Ivo; Marasović, Tea; Čić, Maja; Pleština, Vladimir; Science and Technology in Biomedical Engineering: LaBACS Case Example. // Physical Medicine and Rehabilitation - International. 1 (2014) , 2; 1-11 (članak, znanstveni).<br>4. Stančić, Ivo; Musić, Josip; Cecić, Mojmil; A Novel Low-Cost Adaptive Scanner Concept for Mobile Robots. // Ingeniería e Investigación. 34 (2014) , 3; 37-43 (članak, znanstveni).<br>5. Cecić, Mojmil; Krajči, Vesna; Bonković, Mirjana; Optimization of Model-Reference Variable-Structure Controller Parameters for Direct-Current Motor. // Journal of Computations and Modelling. 2 (2012.) , 3; 67-88 (članak, znanstveni). |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | 1. Stančić, Ivo; Cecić, Mojmil; Ljubičić, Ante; Identification of UAV Engine Parameters. // WSEAS TRANSACTIONS ON SYSTEMS AND CONT ROL. 10 (2015) ; 179-185 (članak, znanstveni).<br>2. Musić, Josip; Bonković, Mirjana; Cecić, Mojmil; Comparison of uncalibrated model-free visual servoing methods for small amplitude movement: a simulation study. // International journal of advanced robotic systems. 11 (2014) , 108; 1-16 (članak, znanstveni)<br>3. Cecić, Mojmil; Papić, Vladan; Bonković, Mirjana; Grujić, Tamara; Musić, Josip; Kuzmanić Skelin, Ana; Stančić, Ivo; Marasović, Tea; Čić, Maja; Pleština, Vladimir; Science and Technology in Biomedical Engineering: LaBACS Case Example. // Physical Medicine and Rehabilitation - International. 1 (2014) , 2; 1-11 (članak, znanstveni).<br>4. Stančić, Ivo; Musić, Josip; Cecić, Mojmil; A Novel Low-Cost Adaptive Scanner Concept for Mobile Robots. // Ingeniería e Investigación. 34 (2014) , 3; 37-43 (članak, znanstveni).<br>5. Cecić, Mojmil; Krajči, Vesna; Bonković, Mirjana; Optimization of Model-Reference Variable-Structure Controller Parameters for Direct-Current Motor. // Journal of Computations and Modelling. 2 (2012.) , 3; 67-88 (članak, znanstveni). |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Projekt 0023022: Biomechanics of Human Walking, Control and Rehabilitation, MZT RH, 2008.-2013.<br>2. Computer Intelligence in Recognition and Support of Human Activities (RIPrePAkt), project FESB. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?- pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Zlatko Ćesić, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Commercial Law |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | A. B. Šimića 12, 21000 Split, HR |
| Telephone number | +385 21 375286 |
| E-mail address | cesiczlatko@gmail.com |
| Personal web page | |
| Year of birth | 1964. |
| Scientist ID | 285670 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 2014. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistent Professor, 2015. |
| Area and field of election into research or art rank | Social Sciences, Field Law |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Libertas International University |
| Date of employment | 2015. |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Commercial and Company Law |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Law |
| Place | Split |
| Date | 1995. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (3-4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (2-3) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Commercial Law, Undergraduate study programme, Graduate study programme<br>Company Law, Undergraduate study programme, Graduate study programme<br>Corporative Law, Graduate study programme |
| Authorship of university/faculty textbooks in the field of the course | Trgovačko ugovorno pravo, Sveučilište u Mostaru, Mostar, 2009.<br>Komentar Zakona o obveznim odnosima, RRiF, Zagreb, 2005.<br>Komentar Zakona o trgovačkim društvima, RRiF, Zagreb, 2008. |
| Professional, scholarly and artistic articles published in the last five | Otkaz i raskid ugovora, RRiF, 2016.<br>Regulative Solvency II kao preduvjet poslovanja osiguratelja u |

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| years in the field of the course (5 works at most) | Europskoj Uniji, Mostariensia, 2015.<br>Isključenje člana iz društva s ograničenom odgovornošću, Zbornik radova Ekonomskog fakulteta u Mostaru, 2012. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | Priručnik upravljanja kvalitetom, Veleučilište u Kninu, 2013. |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,8/5 |

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| First and last name and title of teacher | **Marin Despalatović, Ph.D., Associate Professor** |
| The course he/she teaches in the proposed study programme | Electrical Drives<br>Design of Low Voltage Facilities |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | R. Boškovića 32, HR-21000 Split |
| Telephone number | +385 (0)21 305 813 |
| E-mail address | marin.despalatovic@fesb.hr |
| Personal web page | |
| Year of birth | 1976. |
| Scientist ID | 248733 |
| Research or art rank, and date of last rank appointment | Senior scientific associate, November 22nd, 2012. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Associate professor, September 20th, 2016. |
| Area and field of election into research or art rank | Technical Sciences – Field Electrical Engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | May 10th, 2001. |
| Name of position (professor, researcher, associate teacher, etc.) | Associate professor |
| Field of research | Research and teaching in electrical machines and drives |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD (in Electrical Engineering) |
| Institution | University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | April 24th, 2009. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Electrical Machines – 113 – Undergraduate Study: Electrical Engineering and Information Technology<br>Modeling of Electromechanical Systems – 231 – Graduate Study: Electrical Engineering<br>Transients in Electrical Machines – 231, 232 – Graduate Study: Electrical Engineering |

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| | Electrical Drives – 261, 262, 263 – Graduate Study: Mechanical Engineering |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Majić, G.; Despalatović, M.; Terzić, B.; Slutej, A.: Influence of Dead-time on Design of LCL-filter for Three-phase Voltage Source Converter, EDPE Conference Proceedings, 2013.<br>2. Despalatović, M.; Jadrić, M.; Terzić, B.: Modeling of Saturated Synchronous Generator Based on Steady-State Operating Data, IEEE Transactions on Industry Applications, 48(1), 2012.<br>3. Terzić, B.; Despalatović, M.; Slutej, A.: Magnetization Curve Identification of Vector-Controlled Induction Motor at Low-Load Conditions, Automatika, 53, 2012.<br>4. Jadrić, M.; Terzić, B.; Despalatović, M.; Majić, G.; Slutej, A.; Šimić, T.: Identification of Rotor Resistance and Transient Inductance of Induction Motors Using Frequency Selection Criterion, Proc. of the XXth International Conference on Electrical Machines, 2012.<br>5. Jadrić, M.; Despalatović, M.; Terzić, B.: Development of synchronous generator saturation model from steady-state operating data, Electric Power Systems Research, 80(11), 2010. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Smart Grid Metrology Infrastructure, HRZZ<br>2. A safer and more efficient cogeneration / trigeneration facilities, co-financing EU fund for science and innovation<br>3. Development of electrical drives for large industrial cranes working in heavy duty conditions, collaboration with ABB Crane Systems<br>4. On-line parameter identification of synchronous generator, MZOŠ<br>5. State and parameter estimation of electrical machines, MZT |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences. | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | Evaluation organizer University of Split<br>Scale from 2 (sufficient) to 5 (excellent)<br>Course:<br>Electrical Drives – 511, average grade 4.0<br>Electrical Machines – 113, average grade 4.2<br>Modeling of Electromechanical Systems – 231, average grade 4.5 |

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| First and last name and title of teacher | **Vicko Dorić, Ph.D., Associate Professor** |
| The course he/she teaches in the proposed study programme | Electromagnetic Compatibility,<br>Human Exposure to Electromagnetic Radiation,<br>Computer Aided Analysis of Radiating Structures |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Matoševa 1, Split |
| Telephone number | 021305694 |
| E-mail address | vdoric@fesb.hr |
| Personal web page | https://nastava.fesb.hr/nastava/nastavnici/detalji/vdoric |
| Year of birth | 1974. |
| Scientist ID | 248744 |
| Research or art rank, and date of last rank appointment | higher scientific collaborator, February 2013. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Associate Professor, September 2016. |
| Area and field of election into research or art rank | Technical sciences, Electrical Engineering, Radio communications |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 20.01.2001. |
| Name of position (professor, researcher, associate teacher, etc.) | Associate Professor |
| Field of research | Technical sciences |
| Function | ERASMUS coordinator |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Phd |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 02.02.2009. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English +4 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | |

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| Authorship of university/faculty textbooks in the field of the course | 1. Poljak, D., Dorić, V., Antonijević S.: Modeliranje žičanih antena primjenom računala, Kigen, Zagreb, 2009.<br>D.Poljak N.Kovač, V. Dorić, Numeričke metode u elektrotehnici – interna skripta, FESB-Split 2006. |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. D.Čavka, D. Poljak, V. Dorić, R. Goić, Transient analysis of grounding systems for wind turbines, Renewable energy, 43, 2012<br>2. D. Poljak, R. Lucić, V. Dorić, S. Antonijević, Frequency domain boundary element versus time domain finite element model for the transient analysis of horizontal grounding electrode, Engineering analysis with boundary elements, 35, 3, 2011<br>3. D. Poljak, V. Dorić, D. Čavka, On the use of isoparametric elements for BEM modeling of arbitrarily shaped thin wires in electromagnetic compatibility applications, Boundary Elements and other Mesh Reduction Methods XXXIV, 2012.<br>4. D. Čavka, D. Poljak, V. Dorić, S. Antonijević, Some Computational Aspects of Using Current and Voltage Sources in Electromagnetic Models of Lightning Return Strokes, ICLP 2012, CONFERENCE PROCEEDINGS, 2012.<br>V. Dorić, D. Poljak, K. El Kamichi Drissi, Human Exposure to Outdoor PLC System, PIERS 2011 Marrakesh Progress In Electromagnetics Research Symposium, 2011. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | EUROfusion – Code Development for Integrated Modelling 2014.-<br>Electromagnetic Interference (EMI) Study of Power Line Communications (PLC) Services 2011.-2012. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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| First and last name and title of teacher | **Damir Jakus, Ph.D. Assistant Professor** |
| The course he/she teaches in the proposed study programme | Electrical distribution networks<br>Renewable energy sources |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Ruđera Boškovića 32, Split |
| Telephone number | 021 305 807 |
| E-mail address | damir.jakus@fesb.hr |
| Personal web page | - |
| Year of birth | 1984. |
| Scientist ID | 292324 |
| Research or art rank, and date of last rank appointment | Research associate – 06/06/2013 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor - 17/07/2013 |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 15.01.2007. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | electric power systems, renewable energy, power system economics, power system optimization |
| Function | Assistant professor |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 09.11.2012. |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English(5) |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | ***Electrical networks*** - Undergraduate study program in Electrical Engineering<br>***Electrical distribution networks*** – Undergraduate study program in Electrical Engineering<br>***Electrical distribution networks*** – University Department of Professional Studies |
| Authorship of university/faculty textbooks in the field of the course | Goić R., Jakus D., Penović, I., „Distribucija električne energije“<br>Goić R., Jakus D., Penović, I., „Električne mreže“<br>Goić R., Jakus D., „Osnove elektroenergetike“ |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Jakus, D; Krstulović Opara, J; Vasilj, J. **,“Algorithm for optimal wind power plant capacity allocation in areas with limited transmission capacity**“, International Transactions on Electrical Energy Systems, 24, 2013. |

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| | 2. Jakus, D.; Goić, R.; Krstulović Opara, J., „**The impact of wind power plants on slow voltage variations in distribution networks**“, Electric power systems research, 81, 2011.<br>3. Goić, R.; Krstulović-Opara, J.; Jakus, D., „**Simulation of aggregate wind farm short-term production variations**“, Renewable Energy, 35, 2010.<br>4. Jakus, D.; Vasilj, J.; Goić, R.,“**Impact of PV Power Plants on the Voltage Conditions and Power System Losses in MV Distribution Network**“, Proceedings of the 4th International Workshop on Integration of Solar into Power Systems, Berlin, 2014.<br>5. Jakus, D.; Vasilj, J.; Tutavac, H.,“**Coordinated Control of Renewable Energy Sources in Distribution Networks**“, Proceedings of the 4th International Workshop on Integration of Solar into Power Systems, Berlin, 2014. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | - |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. ***Razvoj i pogon elektroenergetskog sustava s visokim udjelom vjetroelektrana*** – MZOŠ (scientific project)<br>2. ***Studija razvoja distribucijske mreže za razdoblje narednih 20 godina za distribucijsko područje Elektre Zadar*** – HEP ODS d.o.o. (expert project)<br>3. ***Razvoj distribucijske mreže Elektrojug Dubrovnik u razdoblju 2011-2031. godine*** – HEP ODS d.o.o. (expert project)<br>4. ***Tehničko-okolišna dubinska analiza vjetroelektrane Lukovac*** - HEP Obnovljivi izvori energije d.o.o. (expert project)<br>5. ***Tehničko-okolišna dubinska analiza vjetroelektrane Crno Brdo*** - HEP Obnovljivi izvori energije d.o.o. (expert project) |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | - |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | - |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4.4/5 |

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|---|---|
| First and last name and title of teacher | **Ivica Jurić-Grgić, Ph.D., Associate Professor** |
| The course he/she teaches in the proposed study programme | Electrical Machines and Transformers<br>Electrical safety |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Pujanke 59, 21000 Split, Croatia |
| Telephone number | +385 21 305-811 |
| E-mail address | ijuricgr@fesb.hr |
| Personal web page | - |
| Year of birth | 1977. |
| Scientist ID | 248792 |
| Research or art rank, and date of last rank appointment | Senior scientific associate, 12/7/2012 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Associate Professor, 20/9/2016 |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 23/9/2001 |
| Name of position (professor, researcher, associate teacher, etc.) | Associate Professor |
| Field of research | Power engineering |
| Function | - |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 10/3/2008 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | - |
| Place | - |
| Institution | - |
| Field of training | - |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Electrical Machines 1, Graduate study programme.<br>Testing of electrical installation, Graduate study programme.<br>Electrical safety, Undergraduate study programme. |
| Authorship of university/faculty textbooks in the field of the course | - |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | • Jurić-Grgić, I.; Lucić, R.; Dabro, M.: "A coupled nonuniform transmission line analysis using FEM", International Transactions on Electrical Energy Systems, Vol.23 (8), 2013, pp. 1365–1372.<br>• Lucić, R.; Jurić-Grgić, I.; Balaž, Z.: " Grounding grid transient analysis using the improved transmission |

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| | line model based on the finite element method", ETEP: European Transactions on Electrical Power, Vol.23 (2), 2013, pp. 282–289.<br>• Dabro, M.; Jurić-Grgić, I.; Martinović, M.: "Improvement of Synchronous Generator Power Stability Using Hydraulic Digital Governor", International Journal on Engineering Applications (IREA), Vol. 1 (5), 2013, pp. 263-267.<br>• Dabro, M.; Jurić-Grgić, I.; Lucić, R.: "Optimization of Hydraulic Digital Governor parameters using EMTP-RV", International Journal on Engineering Applications (IREA), Vol. 1 (2), 2013, pp. 90-93.<br>• Dabro, M.; Jurić-Grgić, I.; Lucić, R.: "EMTP-RV Model of Hydraulic Digital Governor", International Review on Modelling and Simulations (IREMOS), Vol. 4 (6), 2011, pp. 1-5. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | - |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | • Study: Elaborat iznošenja potencijala i izračun napona dodira i koraka za EVP 110/25 kV Novska, Naručitelj: Projektni biro Split, 2010.<br>• Project: 023 0231581-1610, "Numeričko modeliranje elektroenergetskog sustava tehnikom konačnih elemenata", br. 023 0231581-1610, Ministarstvo znanosti, obrazovanja i športa Republike Hrvatske, 2007.-2011.<br>• Study: Izrada pravila i mjera sigurnosti za osiguranje mjesta rada na elektroenergetskim vodovima, Naručitelj: HEP OPS d.o.o., Prijenosno područje Split, 2013. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | - |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | - |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | - |

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| First and last name and title of teacher | **Tomislav Kilić, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Electrical Measurements<br>Fundamentals of Electrical Engineering 1 |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Put borika 17, 21000 Split, HR |
| Telephone number | +385 21 305733 |
| E-mail address | tkilic@fesb.hr |
| Personal web page | |
| Year of birth | 1961. |
| Scientist ID | 142496 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 9/7/2009 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, 18/9/2014 |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 1/10/1987 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Electrical Measurement, Power Quality |
| Function | Head of Chair of Electrical Measurement |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 9/11/2001 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1996 |
| Place | Toronto, Canada |
| Institution | GEM Systems |
| Field of training | Research and development of instruments for magnetic field measurement |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (2) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Fundamentals of Electrical Engineering, Undergraduate study programme,<br>Electrical Measurements, Undergraduate study programme |

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| Authorship of university/faculty textbooks in the field of the course | Kilić, Tomislav: Električna mjerenja - upute za laboratorijske vježbe, Skripta, FESB Split, ISBN 953-6114-62-3, Split, 2003. |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Petrović, Goran; Kilić, Tomislav; Garma, Tonko. Measurement and Estimation of the Extremely Low Frequency Magnetic Field of the Overhead Power Lines. // Journal Elektronika ir elektrotechnika. 19 (2013), 7; 33-36.<br>2. Kovač, Nikša; George, J. Anders; Tomislav Kilić. Sheath Loss Factors Taking Into Account the Proximity Effect for Cable Lineand Touching Flat Formation. // IEEE Transactions on Power Delivery, 30 (2015), 3, 1363-1371. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | 1. Marian-Silviu Poboroniuc, Gheorghe Livint, F. Maciel Barbosa, Wojciech Mysiński, Anna Friesel, Bahar Karaoglan, Yoana Ruseva, Dorin Popescu, Tomislav Kilic, Tony Ward, Noel Jackson, Ian Grout: *Developing New Electrical and Information Engineering Related Curricula to Respond to the Actual Global Challenges*, EAEEIE 2015, Denmark |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 2. HRZZ Istraživački projekt: Mjeriteljska infrastruktura za pametne mreže, 2015. - 2018.<br>3. LLP - ERASMUS: Strategic Alignment of Electrical and Information Engineering in European Higher Education Institutions, 2012. -2014.<br>4. TEMPUS: Creation of the third cycle studies-doctoral studies in metrology Trajanje projekta: 2010. – 2013. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?- | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,8/5 |

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|---|---|
| First and last name and title of teacher | **Josip Lörincz, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Electrotechnical materials and technologies |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | FESB, R. Boškovića 32, 21000 Split, Croatia |
| Telephone number | 0914305665 |
| E-mail address | josip.lerinc@fesb.hr |
| Personal web page | http://www.josip-lorincz.com |
| Year of birth | 1978. |
| Scientist ID | 272921 |
| Research or art rank, and date of last rank appointment | Scientific advisor, February 2013. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor (docent), December 2011. |
| Area and field of election into research or art rank | Area: electrical engineering, field: telecommunications and informatics |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of electrical engineering, mechanical engineering and naval architecture (FESB), University of Split |
| Date of employment | October 1, 2003. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | • Information and communication technologies,<br>• Computing,<br>• Electrical engineering,<br>• Telecommunications and informatics,<br>• Energy-efficient networking and computing,<br>• Optimization in telecommunications. |
| Function | Faculty teacher and research scientist |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Ph. D. in electrical engineering, University of Split, FESB-Split, 2010 |
| Institution | Faculty of electrical engineering, mechanical engineering and naval architecture (FESB), University of Split |
| Place | Split, Croatia |
| Date | June 2010. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 2009-2010 |
| Place | Milano, Italy |
| Institution | Politecnico di Milano |
| Field of training | Doctoral research visit |
| | |
| Year | 2003, 2009 |
| Place | Split and Zagreb, Croatia |
| Institution | Croatian academic and research network (CARNet): |
| Field of training | Professional specialisation for instructor of international CCNA (Cisco Certified Network Associate) i CCNP (Cisco Certified Network Professional) program |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English - Excellent (5) |

<table>
<tr><td>Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)</td><td>Italian – sufficient (2)</td></tr>
<tr><td colspan="2">COMPETENCES FOR THE COURSE</td></tr>
<tr><td>Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)</td><td>Introduction of new curriculum:<br>• Introduction of new course on graduate study: Network and mobile operating systems, Ships local computer networks<br>• Introduction of completely new laboratory exercises for next courses on graduate study: Network and mobile operating systems, Local and access networks, Ships local computer networks<br>• Extension of existing laboratory exercises with new content for next courses on graduate study: Wireless communication networks, IP communications, Engineering graphics and presentation<br><br>Establishment and organization of new faculty laboratories:<br><br>• Participation in establishment and development of new Laboratory for network technologies of Cathedra of communication technologies and signal processing on FESB, University of Split.</td></tr>
<tr><td>Authorship of university/faculty textbooks in the field of the course</td><td>Authorship of internal teaching materials:<br><br>• Internal script: Network and mobile operating systems<br>• Internal script: Local and access networks<br>• Internal script: Ships local computer networks<br>• Internal script: Ships local computer networks<br>Authorship of internal laboratory exercise manuals:<br><br>• Manual for laboratory exercise: Network and mobile operating systems<br>• Manual for laboratory exercise: Wireless communication networks<br>• Manual for laboratory exercise: Local and access networks<br>• Manual for laboratory exercise: Engineering graphics and presentation</td></tr>
<tr><td>Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)</td><td>Scientific Monography (book):<br>Josip Lorincz, „Optimizing energy consumption of wireless access networks”, Lambert Academic Publishing, Germany, 2012, str. 210<br><br>Scientific papers published in international scientific journals:<br>1. Chiaraviglio, Luca; Cuomo, Francesca; Maisto, Maurizio; Gigli, Andrea; Lorincz, Josip; Zhou, Yifan; Zhao, Zhifeng; Qi, Chen; Zhang, Honggang, Which is the Best Spatial Distribution to Model Base Station Density? A Deep Dive in Two European Mobile Networks, IEEE Access, Vol.: 4 (2016) , p.p. 1434-1443<br><br>2. J. Lorincz, L. Chiaraviglio, F. Cuomo, A Measurement Study of Short-time Cell Outages in Mobile Cellular</td></tr>
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| | Networks, Computer communications, Vol.: **79** (2016), p.p.: 92-102<br><br>**3.** L. Chiaraviglio, P. Wiatr, P. Monti, J. Chen, J. Lorincz, F. Idzikowski, M. Listanti, L. Wosinska, *„Is Green Networking Beneficial in Terms of Device Lifetime?“,* IEEE Communications Magazine, Volume: 53, Issue: 5, 2015, p.p.: 232-240<br><br>**4.** .J. Lorincz, I. Bule, M. Kapov, *„Performance Analyses of Renewable and Fuel Power Supply Systems for Different Base Station Sites”*, Energies journal, Volume: 7 Issue:12, 2014, p.p.: 7816 – 7846<br><br>**5.** J. Lorincz, T. Matijevic, G. Petrovic, "*On interdependence among transmit and consumed power of macro base station technologies",* Computer communications (ISSN: 0140-3664), Volume (issue): 50 (2014), p.p.: 10-28<br><br>**6.** J. Lorincz, T. Matijevic, "*Energy-efficiency analyses of heterogeneous macro and micro base station sites*", Computers and Electrical Engineering (ISSN: 0045-7906), Volume: 40, Issue: 2, 2014, p.p.: 330-349<br><br>**7.** J. Lorincz, I. Cubic, T. Matijevic, *„Adaptive and Resilient Solutions for Energy Savings of Mobile Access Networks“*, International Journal of Adaptive, Resilient and Autonomic Systems (IJARAS), Svezak: 5, Broj: 3, 2014, p.p.: 82-102<br><br>**8.** J. Lorincz, Energy-efficient wireless cellular communications through network resource dynamic adaptation, International Journal of Business Data Communications and Netwrking (IJBDCN), Svezak: 9, broj: 2, 2013, p.p.: 1-14<br><br>**9.** J. Lorincz, I. Bule, „Renewable energy sources for power supply of base station sites“, International Journal of Business Data Communications and Netwrking (IJBDCN), Svezak: 9, broj: 3, 2013, p.p.: 53-74<br><br>**10.** J. Lorincz, A. Capone, D. Begusic, "*Impact of service rates and base station switching granularity on energy consumption of cellular networks*", EURASIP Journal on Wireless Communications and Networking (ISSN: 1687-1499), Volume (issue): 2012 (342), 2012, p.p.: 1-24<br><br>**11.** J. Lorincz, T. Garma, G. Petrovic, "*Measurements and Modelling of Base Station Power Consumption under Real Traffic Loads*", Sensors Journal (ISSN: 1424-8220), Volume 12, Issue: 4, travanj 2012, p.p.: 4281-4310.<br><br>**12.** J. Lorincz, A. Capone, D. Begušić, “*Heuristic Algorithms for Optimization of Energy Consumption in Wireless Access Networks*”, KSII Transactions on Internet |

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| | and Information Systems (ISSN: 1976-7277), Volume: 5, Issue: 5, 2011., p.p.: 514-540<br><br>**13.** J. Lorincz, A. Capone, D. Begušić, "*Optimized Network Management for Energy Savings of Wireless Access Networks",* Computer Networks Journal (ISSN: 1389-1286), Volume: 55, Issue: 2011, p.p.: 626-648<br><br>**Scientific papers published on international scientific conferences with international review:**<br>1. Luca Chiaraviglio, Josip Lorincz, Paolo Monti, „Towards Luca Chiaraviglio, Marco Listanti, Josip Lorincz, Edoardo Manzia, Martina Santucci, „Modelling the Impact of Power State Transitions on the Lifetime of Cellular Networks", Proceedings of the 2015 IEEE 82nd Vehicular Technology Conference – Fall (IEEE VTC2015-Fall), 06.-09.09.2015, Boston, SAD, p.p.: 1-5 (ISSN: 978-1-4799-8090-1)<br>2. Luca Chiaraviglio, Josip Lorincz, Paolo Monti, „Towards Sustainable and Reliable Networks with LIFETEL", Proceedings of the IEEE Conference on Computer Communications - INFOCOM 2015, 26.4.-1.5.2015, Hong Kong, China, p.p.: 39-40, (ISSN: 978-1-4673-7131-5)<br>3. Lorincz Josip, Mujaric Eldis, Begusic Dinko, „Energy consumption analysis of real metro-optical network", Proceedings of the 38th International Conference on Information and Communication Technologies, Electronics and Microelectronics (MIPRO2015), 25.-29.5.2015., Opatija, Croatia, p.p.: 621-626., (ISSN: 978-953-233-083-0)<br>4. L. Chiaraviglio, P. Wiatr, P. Monti, J. Chen, L Wosinska, L. Lorincz, F. Idzikowski, M. Listanti, „Impact of Energy-Efficient Techniques on a Device Lifetime", Proceedings of the IEEE Online Conference on Green Communications (GreenCom 2014), 12. – 14.11.2014., On-line conference, p.p.: 1-6.<br>5. Luca Chiaraviglio, Josip Lorincz, "The Impact of Sleep Modes on the Lifetime of Cellular Networks", The 22nd International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2014), Proceedings of the 22nd International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2014), 17-19. 9. 2014, Split, Croatia, p.p.: 1-5, (ISSN: 978-953-290-051-4)7<br>6. Luca Chiaraviglio, Antonio Cianfrani, Angelo Coiro, Marco Listanti, Josip Lorincz, Marco Polverini, "Increasing Device Lifetime in Backbone Networks with Sleep Modes", The 21st International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2013), 18.-20.09.2013, Primošten, Croatia, Proceedings of the 21st International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2013), p.p.: 1-6, (ISSN: 978-953-290-041-5) |

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| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | **Book:**<br>1. Domagoj Babić, Zvonimir Rakamarić, Josip Lorincz, „A guide for postgraduate study in foreign countries", P.O.I.N.T. Križevci, Croatia, 2012, p.p.: 100 |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Participation in international scientific projects as project coordinator:<br>• Green networking (HZZ- Croatian Science Foundation)<br>• Doctoral research visit on green networking project (UKF – Unity Through Knowledge Fund))<br>Participation in international scientific projects as project researcher:<br>• Establish Pan-European Information Space to Enhance seCurity of Citizens – EPISECC ( EU FP7: Work programme 2013, Cooperation, Theme 10: Security)<br>• Increasing the LIFEtime of TELecommunication networks (LIFETEL) – University of Rome (La Sapienza)<br>Participation in domestic education projects as project participant:<br>• Modernising doctoral education through implementation of Croatian qualification framework (MODOC) – EU IPA program BGUE 04 06, Human resources development |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences? | In the frame of the programme:<br>• Modernising doctoral education through implementation of Croatian qualification framework (MODOC) – EU IPA program BGUE 04 06, Human resources development<br>Participation in workshop dedicated to the development of methodological-psychological-didactic-pedagogical competences. |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | • Yearly award of Okrug County for scientific/research work and promotion of science in 2013.<br>• Award of Faculty of electrical engineering, mechanical engineering and naval architecture (FESB) for the notable scientific and research results in 2013.<br>• Award „Vera Johanides" for 2012. of Croatian Academy of engineering (Academia Scientiarum Tehnicarum Croatica)<br>• Award of Faculty of electrical engineering, mechanical engineering and naval architecture (FESB) to the most successful scientific novices in 2011. |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average | **Evaluation organizer:** University of Split, Faculty of electrical engineering, mechanical engineering and naval architecture (FESB).<br>**Note on grading scale**: global index evaluating overall course on scale 1-5 |

| Course/average grade | Global index 2011/12 | Global index 2012/13 | Global index 2013/14 | Global index 2014/15 | Global index 2015/16 |
|---|---|---|---|---|---|
| Network and mobile | 4,3 | 3,3 | 3,9 | 4,5 | 4,1 |

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|---|---|---|---|---|---|---|
| grade, note on grading scale and course evaluated) | operating systems | | | | | |
| | Local and access networks | 4,8 | 4,4 | 4,00 | 4,2 | / |
| | Electrotechnical materials and technologies | 4,7 | / | 4,6 | / | 4,5 |

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|---|---|
| First and last name and title of teacher | **Rino Lucić, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Electrical installations |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Split, Duplančića dvori 3 |
| Telephone number | 091/ 4 305 611 |
| E-mail address | Rino.Lucic@fesb.hr |
| Personal web page | - |
| Year of birth | 1957 |
| Scientist ID | 154916 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 18/1/2010 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, 18/1/2016 |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 25/9/1987 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Numerical modeling of electromagnetic fields and transients |
| Function | - |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 16/09/1999. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1992 |
| Place | Swansea (GB) |
| Institution | The University College of Swansea, University of Walles |
| Field of training | Numerical modeling of electromagnetic fields |
| Year | 2001./ 2002. |
| Place | Amiens, San Quentin (France) |
| Institution | The University of P Picardie |
| Field of training | Numerical modeling of electrical machines by the finite element method and by permeance network method |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme | Electrical safety (Undergraduate study programme),FESB<br>Electrical safety (undergraduate study programme),FESB |

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| where it is/was offered, and level of study programme) | Electrical installations testing (graduate study programme),FESB<br>Marine electrical systems (vocational study programme MCAST-Malta)<br>Electrical technology (vocational study programme MCAST-Malta) |
| Authorship of university/faculty textbooks in the field of the course | - |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1) R. Lucić, et al. ' Grounding grid transient analysis using the improved transmission line model based on the finite element method', Int. Trans. on El. Energy Systems, 2013.<br>2) S. Vujević, R. Lucić, et. al. 'Creating rules and safety measures to ensure the place of work on power lines', Study report for HEP OPS, Split, 2013. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Project MZOŠ 023-0000000-3271<br>Project MZOŠ 023-0231581-1610<br>IPA project 'Professional development programs for MCAST students and lecturers', Malta, 2011/2012. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Ivan Marasović, Ph.D. Assistant Professor** |
| The course he/she teaches in the proposed study programme | Electronic Instrumentation |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Jurja Šižgorića 14, 21000 Split |
| Telephone number | +385 21 305826 |
| E-mail address | Ivan Marasovic@fesb.hr |
| Personal web page | |
| Year of birth | 1983. |
| Scientist ID | 297561 |
| Research or art rank, and date of last rank appointment | Assistant research fellow, 07.07.2015. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assitant professor, 01.10.2015. |
| Area and field of election into research or art rank | Technical Sciences, Field electrical Engineering, Branch Electronics |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 01/09/2007 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Electronics, Micro and nano electronics, Solar cells and photovoltaics, Embedded systems |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 11/05/2012 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 2011. (1 weeks) |
| Place | Freiburg, Germany |
| Institution | Fraunhofer ISE |
| Field of training | Photovoltaics |
| Year | 2011. (2 weeks) |
| Place | Ljubaljana, Slovenia |
| Institution | Fakultet za elektrotehniko |
| Field of training | Semiconductor nanoelectronics |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme | Electronic devices and circuits, Undergraduate study of Electrical Engineering and Information Technology<br>Basic electronics, Undergraduate study in Computing |

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| where it is/was offered, and level of study programme) | Digital instrumentation 1, Undergraduate study of Control Engineering and Automation, Electronic and Computer Engineering and Communication |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. L. Mainetti, I. Marasović, L. Patrono,P. Šolić, M.L. Stefanizzi, R. Vergallo "A Novel IoT-aware Smart Parking System based on the integration of RFID and WSN technologies., (2016), 833257<br>2. I. Marasović, Ž. Milanović, I. Zulim, "Modelling and detection of failure in medical electrodes", (2015), 789296<br>3. S. Nižetić, I. Marasović, D. Čoko, "Experimental study on a hybrid energy system with small-and medium-scale applications for mild climates., (2014), 694087<br>4. I. Marasović, Ž. Milanović, T. Betti, "Resistance Fluctuations in GaAs Nanowire Grids", Journal of Nanomaterials, (2014), 428390<br>5. I. Marasović, T. Garma, T. Betti, "Modelling a nanowire grid for light-sensing applications", Journal of Physics D: Applied Physics 45 (2012) |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,0 |

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|---|---|
| First and last name and title of teacher | **Ivančica Mirošević, M.Sc., Lectuter** |
| The course he/she teaches in the proposed study programme | Mathematics, Applied mathematics |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | FESB, R. Boškovića 32, B801 |
| Telephone number | 021 305891 |
| E-mail address | Ivancica.Mirosevic@fesb.hr |
| Personal web page | |
| Year of birth | 1973 |
| Scientist ID | 248845 |
| Research or art rank, and date of last rank appointment | |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Lecturer, since 2011 |
| Area and field of election into research or art rank | Area od Natural Sciences, Field of Mathematics |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | FESB, Split |
| Date of employment | 2001 |
| Name of position (professor, researcher, associate teacher, etc.) | Lecturer |
| Field of research | Mathematics |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Mr. sc. |
| Institution | University of Zagreb, Faculty of Natural Sciences and Mathematics, |
| Place | Zagreb, Croatia |
| Date | 2005 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Lecturer of various courses since 2001 |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five | |

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|---|---|
| years in the field of the course (5 works at most) | |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | Mirošević, Ivančica. Algoritam k-sredina. // KoG : znanstveno-stručni časopis Hrvatskog društva za konstruktivnu geometriju i kompjutorsku grafiku. 20 (2017) , 20; 91-98 (članak, stručni).<br><br>Mirošević, Ivančica; Koceić-Bilan, Nikola; Jurko, Josipa. Različiti nastavno-metodički pristupi čunjosječnicama. // Math.e : hrvatski matematički elektronski časopis. 27 (2015) ; 1-10 (članak, stručni). |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Jadranka Marasović, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Modelling and Simulation |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Split, Zagrebačka 21 |
| Telephone number | 385 021 305 830 (institution) |
| E-mail address | jmar@fesb.hr |
| Personal web page | / |
| Year of birth | 1955. |
| Scientist ID | 080633 |
| Research or art rank, and date of last rank appointment | Senior Research Scientist, 09. July 2007. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Full professor, 01. March 2009. |
| Area and field of election into research or art rank | Technical science, field of electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Machine Engineering and Naval Architecture, University of Split |
| Date of employment | 04. May 1978. |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Science and Education |
| Function | / |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Doctor of science |
| Institution | Faculty of Electrical Engineering, Machine Engineering and Naval Architecture, University of Split |
| Place | Split |
| Date | 11. July 1997. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | / |
| Place | / |
| Institution | / |
| Field of training | / |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (excellent -5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (sufficient-2) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | **Undergraduate studies:**<br>Measurements and Process Control,<br>Industrial Process Control<br>**Graduate studies:**<br>Automatic Control,<br>System Identification, |

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| | Process Control Laboratory Exercises<br>Optimization Methods,<br>Operations Research<br>Automation<br>**Postgraduate study:**<br><br>Optimization Techniques for Environmental Studies (Wessex Institute of Tecnology, UK i FESB)<br><br>Game theory and optimization methods (FESB)<br><br>Complex systems modelling and simulation (FESB) |
| Authorship of university/faculty textbooks in the field of the course | - (autor) Kvantitativno i kvalitativno modeliranje i simuliranje (Quantitative and Qualitative Modelling and Simulation) ( ISBN 953-6114-67-4),<br>- (koautor) On-line (web) udžbenik, Informatički projekt MZT-a, http://laris.fesb.hr/digitalno_vodjenje (Digital Control)<br>- (autor) Predavanja iz kolegija Metode optimizacije (Lessons for Optimizaion Methods) (FESB, e-learning).<br>- (autor) Predavanja iz kolegija Modeliranje i simuliranje sustava (Lessons for Modelling and Simulations) (FESB, e-learning). |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | - Marasović, Tea; Papić, Vladan; **Marasović, Jadranka**. *Motion-based Gesture Recognition Algorithms for Robot Manipulation*. // International Journal of Advanced Robotic Systems. 12 (2015), 51; 1-13, doi: 10.5772/60077.<br>- **Marasović, Jadranka**; Marasović, Tea; Đapić, Marija. *Fair Division Methods Approach as the Option of Learning Process Modeling*. // Proceedings of 18th IEEE International Symposium on Computers and Communications (ISCC). 2013; 735-739.<br>- Mance, Davor; **Marasović, Jadranka**. *EMC in Electronic System Developed to Support Measurements in Space Environment*. // Proceedings of 20th International Conference on Software, Telecommunications and Computer Networks (SoftCOM). 2012; 1-5. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | / |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Associated member in scientific projects:<br>- Računalna inteligencija za prepoznavanje i potporu ljudskih aktivnosti (RIPrePAkt),<br>- GRS Front End Electronics Characterization for LISA,<br>- Agentski orijentirani inteligentni sustavi za nadzor i zaštitu okoliša (Agents Oriented Intelligent Systems for Environment Control and Protection), |

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|---|---|
| | - Inteligentni agenti u modeliranju i vođenju kompleksnih sustava (Intelligent Agents used for Complex Systems Modelling and Control),<br>- Vođenje složenih sustava inteligentnim metodama (Intelligent Methods for Complex Systems Control). |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | / |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | / |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Ivan Marinović, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Electronic Circuits Design<br>High-Frequency Electronics |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Butor dolac 13, 21405 Milna, o. Brač |
| Telephone number | 098 1835911 |
| E-mail address | imarin@fesb.hr |
| Personal web page | www.fesb.hr/~imarin |
| Year of birth | 1966. |
| Scientist ID | 200263 |
| Research or art rank, and date of last rank appointment | Scientific Advisor, 20.06.2016. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Full Professor, 15.07.2016. |
| Area and field of election into research or art rank | Technical Sciences, Electrical Engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture – Split |
| Date of employment | 21.02.1991. |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Electronics, Radiocommunications |
| Function | Head of Cathedra for Radiocommunication Circuits and Systems |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture – Split |
| Place | Split |
| Date | 12.05.2005. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Electronic Circuits, Graduate study programme<br>Electronic Circuits and Measurements, Graduate study programme<br>Microwave Electronics, Graduate study programme<br>Radiocommunications, Graduate study programme |
| Authorship of university/faculty textbooks in the field of the course | Marinović, Ivan; Čoko, Duje, Electronički sklopovi-Upute za laboratorijske vježbe, FESB-Split |

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| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4.8 |

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|---|---|
| First and last name and title of teacher | **Tonći Modrić, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Electrical Power Switchgears<br>Power System and Environment |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Tijardovićeva 14, 21000 Split, Croatia |
| Telephone number | +385 21 305-630 |
| E-mail address | tmodric@fesb.hr |
| Personal web page | - |
| Year of birth | 1982. |
| Scientist ID | 325646 |
| Research or art rank, and date of last rank appointment | Research associate, 20.11.2014. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant Professor, 17.12.2014. |
| Area and field of election into research or art rank | Technical Sciences, Electrical Engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | University of Split<br>Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB) |
| Date of employment | 1.12.2010. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant Professor |
| Field of research | Electric Power Engineering |
| Function | - |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Ph. D. |
| Institution | FESB |
| Place | Split |
| Date | 5.5.2014. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | - |
| Place | - |
| Institution | - |
| Field of training | - |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 4 |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | - |
| Authorship of university/faculty textbooks in the field of the course | - |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Lovrić, D.; Vujević, S.; Modrić, T.: "Comparison of different metal oxide surge arrester models", Proceedings of the International Conference on Applied Electromagnetics (PES 2011), Perić, Z. (ur.), Niš, Serbia: 2011, pp. (O1–2) 1–4. |

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|---|---|
| | 2. Vujević, S.; Balaž, Z.; Modrić, T.; Sarajčev, P.: "Hybrid Model for Analysis of Ground Fault Current Distribution", International Review of Electrical Engineering, Vol. 7 (2), 2012, pp. 4035–4045.<br>3. Modrić, T.; Vujević, S.; Lovrić, D.: "Napredni algoritmi za analizu elektromagnetskih polja elektroenergetskih vodova i postrojenja", 11. savjetovanje HRO CIGRE / Filipović-Grčić, B. (ur.) - Zagreb: Hrvatski ogranak CIGRE, 2013. pp. (C4–18) 1–10.<br>4. Modrić, T.; Vujević, S.; Majić, T.: "Geometrical Approximation of the Overhead Power Line Conductors", International Review on Modelling and Simulations, Vol. 7(1), 2014, pp. 76–82.<br>5. Vujević, S.; Modrić, T.; Vukić, B.: "Internal Impedance of Two-Layer Cylindrical Conductors", International Review of Electrical Engineering, Vol. 9(1), 2014, pp. 235–243. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | - |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Vujević, S.; Lucić, R.; Jurić-Grgić, I.; Lovrić, D.; Modrić, T.; Balaž, Z.: "Izrada pravila i mjera sigurnosti za osiguranje mjesta rada na elektroenergetskim vodovima", 2013.<br>2. Vujević, S.; Lovrić, D.; Modrić, T.: "Mjerenje i analiza razine neionizirajućeg elektromagnetskog polja u okolišu TS 10/0,4 kV Brda 3", 2013. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences? | - |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | - |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,75/5 |

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|---|---|
| First and last name and title of teacher | **Josip Musić, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Automation, Biomechanics practicum, Sensors and transducers |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Ruđera Boškovića 32, Split |
| Telephone number | + 385 (0)21 305 829 |
| E-mail address | jmusic@fesb.hr |
| Personal web page | http://marjan.fesb.hr/~jmusic |
| Year of birth | 1980 |
| Scientist ID | 272932 |
| Research or art rank, and date of last rank appointment | Senior research associate (February 2013) |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor (July 2014) |
| Area and field of election into research or art rank | Technical sciences, Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of electrical engineering, mechanical engineering and naval architecture, University of Split |
| Date of employment | September 2014 |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | Robotics and automatization |
| Function | / |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of electrical engineering, mechanical engineering and naval architecture, University of Split |
| Place | Split |
| Date | 28.04.2010. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 2012 |
| Place | Glasgow, Scotland, UK |
| Institution | School of Computing, University of Glasgow |
| Field of training | human-computer interaction (HCI), signal processing |
| | |
| Year | 2008 |
| Place | Glasgow, Scotland, UK |
| Institution | Department of Computing, University of Glasgow |
| Field of training | human-computer interaction (HCI), signal processing |
| | |
| Year | 2005. |
| Place | Ljubljana, Slovenia |
| Institution | Faculty of electrical engineering, University of Ljubljana |
| Field of training | robotics, biomechanics |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (2) |

| COMPETENCES FOR THE COURSE | |
|---|---|
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Automation (412/512), Automatic control 2 (910,11), Digital electronics (110), Digital control (210), Sensors and transducers (512), Biomechanics Practicum (412/512), Programing mobile robots and drones (221/222/242/250), Computer methods in biomechanics (111), Computers and computer methods in biomechanics (310/330), Telemedicine and biocybernetics (210/220/242)m Introduction to system theory (330) |
| Authorship of university/faculty textbooks in the field of the course | M. Bonković, J. Musić, I. Stančić, Microcontrollers and embedded network systems based on Arduino development environment, faculty script, 2014 |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Musić, Josip; Bonković, Mirjana; Cecić, Mojmil: “Comparison of uncalibrated model-free visual servoing methods for small amplitude movement: a simulation study“, International Journal of Advanced Robotic Systems, 2014 (DOI: dx.doi.org/10.5772/58822 )<br><br>2. Stančić, Ivo; Musić, Josip; Cecić, Mojmil: “A Novel Low-Cost Adaptive Scanner Concept for Mobile Robots”, Ingenieria e Investigacion, 34 (2014), 3; 37-43<br><br>3. Stančić, Ivo; Musić, Josip; Zanchi, Vlasta: “Improved structured light 3D scanner with application to anthropometric parameter estimation“, Measurement, 46 (2013), 1; 716-726<br><br>4. Musić, Josip; Cecić, Mojmil; Zanchi, Vlasta: “Real-time body orientation estimation based on two-layer stochastic filter architecture”, Automatika : časopis za automatiku, mjerenje, elektroniku, računarstvo i komunikacije, 51 (2010), 3; 264-274<br><br>5. Musić, Josip; Murray-Smith, Roderick: “Virtual Hooping: teaching a phone about hula-hooping for Fitness, Fun and Rehabilitation”, Proceedings of Mobile Human Computer Interaction (MobileHCI) 2010. 309-312 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | / |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Compressive sensing and super-resolution in surveillance systems based on optical sensors and UAVs, 2015-2017, Bilateral Croatia-Montenegro cooperation, project lead<br><br>2. Supervised and unsupervised learning from imbalanced datasets for assistance in movement of persons with low vision, 2014-2015, Bilateral Croatia-Slovenia cooperation, project lead<br><br>3. Prototyping a module for automatization of industrial floor scrubbers, 2014-2016, Split-Dalmatia county and Odabir d.o.o., project lead<br><br>4. Computer intelligence for classification and support of human activities, 2014 - , Faculty/University project, researcher |

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|---|---|
| | 5. Biomechanics of human motion, control and rehabilitation, 2007-2014, Ministry of science, education and sports, researcher |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | / |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | / |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | / |

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|---|---|
| First and last name and title of teacher | **Julije Ožegović, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Digital Techniques, Computer Networks, Designing and Using Computer Networks, Computer and Data Security |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Istarska 2, 21000 Split, HR |
| Telephone number | +385 21 305825 |
| E-mail address | julije.ozegovic@fesb.hr |
| Personal web page | www.fesb.hr/~julije |
| Year of birth | 1954. |
| Scientist ID | 91795 |
| Research or art rank, and date of last rank appointment | Scientific Advisor, 2008-03-12 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, 2013-09-15 |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 1979-10-01 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Digital electronics, Computer networks, Automata theory |
| Function | Head of Chair of Digital Systems and Computer Network |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 1998-02-27 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Digital Electronics, Undergraduate study of Electrotechnics, 2006/2007 - today<br>Discrete systems and structures, Undergraduate study of Computing, 2006/2007 - today<br>Computer Networks, Undergraduate study of Electrotechnics, 2006/2007 - today<br>Computer Networks, Undergraduate study of Computing, 2006/2007 - today |

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|---|---|
| | Digital Electronics, Graduate study of Electrotechnics (pre-Bologna), 1998/1999 -2006/2007<br>Discrete systems and structures, Graduate study of Computing (pre-Bologna), 19982000/2001 - 2006/2007<br>Computer Networks, Graduate study of Electrotechnics (pre-Bologna), 1998/1999 -2007/2008<br>Computer Networks, Graduate study of Computing (pre-Bologna), 1998/1999 -2007/2008 |
| Authorship of university/faculty textbooks in the field of the course | Julije Ožegović, Digitalna i mikroprocesorska tehnika, ISBN 953-6806-26-6, Split University, 2000, several editions<br>Julije Ožegović, Digital electronics, Discrete systems and structures, elearning.fesb.hr, updated from 1998<br>Julije Ožegović, Computer Networks, elearning.fesb.hr, updated from 1998 |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | Kedžo, Ivan; Ožegović, Julije; Kristić, Ante: Contention Overhead — Adaptive Binary Priority Countdown protocol, SoftCOM 2013, ISBN 978-953-290-043-9<br>Kristić, Ante; Ožegović, Julije; Kedžo, Ivan: Mathematical model of simplified Constrained Priority Countdown Freezing protocol, The 18th IEEE Symposium on Computers and Communications (ISCC'13), 2013, ISBN 978-1-4673-2711<br>Kristić, Ante; Ožegović, Julije; Kedžo, Ivan: Improved mathematical model of simplified Constrained Priority Countdown Freezing protocol, SoftCOM 2013, ISBN 978-953-290-043-9<br>Kristić, Ante; Ožegović, Julije; Kedžo, Ivan: Mathematical model of Constrained Priority Countdown Freezing Protocol, SoftCOM 2014, ISBN 978-9-5329-0052-1<br>Ines Ramadza, Julije Ozegovic, Vesna Pekic: Class based tunnel exclusion router architecture, SoftCOM 2014, ISBN 978-9-5329-0052-1 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Media access mechanism modelling for wireless local networks (MAMM), FESB Split, od 2014.<br>2. HGCAL - CERN CMS, from 2015. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences. | Me4CataLOgue – Teaching and administrative personnel training |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | Coauthor of awarded paper - ISCC conference 2013. |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4 |

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|---|---|
| First and last name and title of teacher | **Goran Petrović, Ph.D., Associate Professor** |
| The course he/she teaches in the proposed study programme | Introduction to computer applications<br>Measurements in Power System<br>Measurements of Process Quantities<br>Instrumentation for Smart Grid |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Split, Ruđera Boškovića 32 |
| Telephone number | +385 21 305 731 |
| E-mail address | petrovic@fesb.hr |
| Personal web page | |
| Year of birth | 1971 |
| Scientist ID | 248882 |
| Research or art rank, and date of last rank appointment | Research scientist 19.12. 2012. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Associate professor 19.12. 2012. |
| Area and field of election into research or art rank | Technical sciences, electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | FESB |
| Date of employment | 30. 03. 1998. |
| Name of position (professor, researcher, associate teacher, etc.) | professor |
| Field of research | Electrical and process measurement, Signal processing |
| Function | Head of Department for power engineering |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | FESB |
| Place | Split |
| Date | 24. 03. 2006. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English; very good (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | 1. Measurement and signal processing, Electrical engineering, graduate<br>2. Process measurement, Electrical engineering, graduate<br>3. Instrumentation in electrical engineering, Electrical engineering, undergraduate |

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| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Bosnić, Juraj Alojzije; Petrović, Goran; Malarić, Roman. Estimation of the wall thermal properties through comparison of experimental and simulated heat flux // 21ST IMEKO TC-4 measurement. Budapest, 2016.<br><br>2. Mostarac, Petar; Malarić, Roman; Petrović, Goran. Measurement of frequency spectrum with interpolated adaptive chirp-z transformation // XXI IMEKO world congres. Prag,: Czech Technical University in Prague, 2015. 2008-2011.<br><br>3. Petrović, Goran; Malarić, Roman; Ivana, Kardum. Matlab based flickermeter // 20th IMEKO TC4 International Symposium and 18th International Workshop on ADC Modelling and Testing. Benevento: University of Sannio, 2014. 31-34.<br><br>4. Lorincz, Josip; Matijević, Tončica; Petrović, Goran. On interdependence among transmit and consumed power of macro base station technologies. // Computer communications. 50 (2014) ; 10-28<br><br>5. Petrović, Goran; Kilić, Tomislav; Garma, Tonko. Measurement and Estimation of the Extremely Low Frequency Magnetic Field of the Overhead Power Lines. // Elektronika ir elektrotechnika. 19 (2013) , 7; 33-36. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Smart grid metrology infrastructure, HRZZ Research Projects 2015-<br>2. Extracting electric energy from human body for supplying autonomous biomedical devices and new PVDF transducer optimization, Bilateral Croatian Italian scientific project 2010-2013. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Mladen Russo, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Multimedia |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Žnjanska 4, Split |
| Telephone number | 091/2305-844 |
| E-mail address | mrusso@fesb.hr |
| Personal web page | |
| Year of birth | 1977. |
| Scientist ID | 248902 |
| Research or art rank, and date of last rank appointment | Senior scientific associate, 24.10.2013. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor, 01.01.2013. |
| Area and field of election into research or art rank | Technical sciences, electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | FESB - Split |
| Date of employment | 08.06.2001. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | Signal processing, speech recognition, localization |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Ph.D. |
| Institution | FESB – Split |
| Place | Split |
| Date | 29.06.2010. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 4 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian, 2 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | |
| Authorship of university/faculty textbooks in the field of the course | |

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| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | Sikora, Marjan; Grčić, Đana; Russo, Mladen. A tool for soundscape auralization of ancient archaeological sites // Proceedings of 7th congress of Alps Adria Acoustic Association,Ljubljana, Slovenija, 2016.<br>Russo, Mladen; Stella, Maja; Kurajica, Maroje. Cochlear Model based Enhancement of Noisy Speech Signals. // International Journal of Circuits, Systems and Signal Processing. 9 (2015), 446-454.<br>Stella, Maja; Russo, Mladen; Begušić, Dinko. Fingerprinting based localization in heterogeneous wireless networks // Expert systems with applications, 41 (2014), 15; 6738-6747.<br>Šarić, Matko; Dujmić, Hrvoje; Russo, Mladen. Scene Text Extraction in HSI Color Space using K-means Algorithm and Modified Cylindrical Distance // Przegląd elektrotechniczny, 5 (2013) 117-121.<br>Russo, Mladen; Šolić, Petar; Stella, Maja. Probabilistic Modeling of Harvested GSM Energy and its Application in Extending UHF RFID Tags Reading Range // Journal of electromagnetic waves and applications, 27 (2013), 4; 473-484.<br>Primorac, Sanja; Russo, Mladen. Android Application for Sending SMS Messages with Speech Recognition Interface // Proceedings of the 35th International Convention MIPRO, 2012.<br>Russo, Mladen; Stella, Maja; Rožić, Nikola. Noise reduction in speech signals using a cochlear model. // Advances in Smart Systems Research. 2 (2012), 1; 7-12. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | ELISE: Easy Living in Smart Environments, HRZZ, project leader Mladen Russo, Ph.D., 2015. – 2018.<br>Advanced Interface for Simpler Human-Computer Interaction, SDŽ, project leader Mladen Russo, Ph.D., 2015. – 2017.<br>ICT Systems and Services Based on Integration of Information, MZOS, project leader Nikola Rožić, Ph.D., 2007. – 2013. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Petar Sarajčev, Ph.D., Associate Professor** |
| The course he/she teaches in the proposed study programme | Electrical Networks<br>High Voltage Engineering<br>Protection at Substations |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | R. Boškovića 32, HR-21000, Split |
| Telephone number | +385 21 305806 |
| E-mail address | petar.sarajcev@fesb.hr |
| Personal web page | |
| Year of birth | 1976. |
| Scientist ID | 272943 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 10/03/2016 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Associate Professor, 16/05/2012 |
| Area and field of election into research or art rank | Technical sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 01/03/2009 |
| Name of position (professor, researcher, associate teacher, etc.) | Associate Professor |
| Field of research | Power system analysis |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 15/04/2008 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (2) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | High voltage engineering, Graduate study |

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| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. P. Sarajčev, J. Vasilj, R. Goić, Monte Carlo analysis of wind farm surge arresters risk of failure due to lightning surges, Renewable Energy, Vol. 57, pp. 626-634, 2013.<br>2. J. Vasilj, P. Sarajčev, R. Goić, Modeling of current-limiting air-core series reactor for transient recovery voltage studies, Electric power systems research, Vol. 117, pp. 185-191, 2014.<br>3. P. Sarajcev, J. Vasilj, D. Jakus, Monte–Carlo analysis of wind farm lightning- surge transients aided by LINET lightning-detection network data, Renewable Energy, Vol. 99, pp. 501-513, 2016. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Ivica Sorić, senior lecturer** |
| The course he/she teaches in the proposed study programme | Physics |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | 21252 Tugare, Kneza Trpimira 61 |
| Telephone number | +385 21 305 872 |
| E-mail address | suri@fesb.hr |
| Personal web page | http://marjan.fesb.hr/~suri/ |
| Year of birth | 1964. |
| Scientist ID | 170745 |
| Research or art rank, and date of last rank appointment | |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior lecturer, 19/04/2012. |
| Area and field of election into research or art rank | Natural science \| Physics \| General physics |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | FESB - Split |
| Date of employment | 1989. |
| Name of position (professor, researcher, associate teacher, etc.) | Senior lecturer |
| Field of research | Natural science \| Physics \| General physics |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | VSS |
| Institution | Fakulty of electrical engineering, mechanical engineering and naval architecture |
| Place | Split |
| Date | 15. 04. 1989. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1994-2001 (occasionally residence, 10 months altogether) |
| Place | Geneva |
| Institution | CERN |
| Field of training | Fizika |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (3) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Physics, Undergraduated study of Chemical Technology and Food technology,<br>Faculty of Chemistry and Technology, Split |
| Authorship of university/faculty textbooks in the field of the course | S. Botrić, N. Godinović, M. Grbac, I. Puljak, I. Sorić: Laboratorijske vježbe iz Fizike, 2006. |

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| | M. Grbac, I. Sorić: Fizika za inženjere, course book of Physics for programme of undergraduated studies (in progress) |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | Županović, Paško; Sorić, Ivica; Sorić, Tomislav. Stirling engine as simple as possible // Proceedings / Piloteelli, Mariagrazia ; Beretta, Gian Paolo (ur.). Brescia : Cartolibreria Snoopy, 2013. 510-513 (pozvano predavanje,međunarodna recenzija,sažetak,znanstveni). |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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|---|---|
| First and last name and title of teacher | **Darko Stipaničev, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Process Control |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Matoševa 26, 21000 Split |
| Telephone number | +385 91 4305 643 |
| E-mail address | darko.stipanicev@fesb.hr |
| Personal web page | http://laris.fesb.hr/dstip-e.html |
| Year of birth | 1955 |
| Scientist ID | 44861 |
| Research or art rank, and date of last rank appointment | Scientific Adviser in Computer Science, 2006<br>Scientific Adviser in Electrical Engineering, 1997 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, 2002 |
| Area and field of election into research or art rank | Technical Systems, Field Electrical engineering<br>Technical Systems, Fireld Computer sciences |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 1981 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Computer Science – Artificial Intelligence, Electrical Engineering - Automatic Control |
| Function | Head of Chair of Modelling and Intelligent Systems |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Electrotechnical Faculty University of Zagreb |
| Place | Zagreb |
| Date | 1987 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1988-89 |
| Place | London |
| Institution | Queen Mary College |
| Field of training | post-doctoral specialisation |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Discrete regulation systems (1988-2005)<br>Automatic control 2 (2005-danas)<br>Digital control (2005-today)<br>Intelligent control of complex systems (1991-1995) |

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| Authorship of university/faculty textbooks in the field of the course | D.Stipaničev, J.Marasović, Digitalno vođenje on-line (Digital control on-line), on-line (Web) book, MZT – Informatički projekt, 2004. http://laris.fesb.hr/digitalno_vodjenje |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. D.Stipaničev, J.Božičević, Fuzzy Feedforward and Composite Control, **Transaction Inst. Measurement and Control (UK)**, 8(2), 1986, pp. 67-75<br>2. D.Stipaničev, Vođenje i zaštita vjetroelektrana u autonomnom elektro-energetskom sistemu, **Sunčana energija**, 8(2), 1987, pp.91-96<br>3. D.Stipaničev, Diskretno vođenje složenih sustava adaptivnim, nelinearnim PID regulatorima, **Elektrotehnika**, 34(3-4), 1991, pp.153-161<br>4. D.Stipaničev, Fuzzy Relational Models for Intelligent Control, u knizi R. Hanus, P.Kool, S.Tzafestas(ed) **"Mathematical and Intelligent Models in System Simulation"**, J.C.Baltzer AG Scientific Pub.Co., 1991, pp.275-279<br>5. M.De Neyer, D.Stipaničev, R.Gorez, Intelligent Self-organising Controllers and their Application to the Control of Dynamic Systems, u knjizi R.Hanus, P.Kool, S.Tzafestas(ed) **"Mathematical and Intelligent Models in System Simulation"**, J.C.Baltzer AG Scientific Pub.Co., 1991, pp.287-292 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Project Vision based intelligent observers (ViO) (2012 – 2016)<br>2. Project 023-0232005-2003 – AgISEco – Agent based intelligent systems for environmental monitoring, Contract with Ministary of Science RH (2006 - 2012) |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,4/5 |

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|---|---|
| First and last name and title of teacher | **Elis Sutlović, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Protection and control systems in substation, Energy sources |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Kranjčevićeva 28, Split |
| Telephone number | 091 630 5730 |
| E-mail address | Elis.Sutlovic@fesb.hr |
| Personal web page | |
| Year of birth | 1961. |
| Scientist ID | 122652 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 16.12.2010. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, 25.02.2016. |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 24.10.1984. |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Power system planning and analysis, Power system operation and control |
| Function | Head of Chair of Electrical facilities and power systems |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 2001. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Power engineering, Graduate study programme,<br>Power system control, Graduate study programme |

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| Authorship of university/faculty textbooks in the field of the course | Ivan Medić, Elis Sutlović: Električna postrojenja, upute za laboratorijske vježbe, Skripta, FESB Split, ISBN 978-953-290-045-3, Split, 2014. |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Ivan Ramljak, Matislav Majstrović, Elis Sutlović: Statistical Analysis of Particles of Conductor Clashing, *Proceeding of IEEE EnergyCon 2014*, pp. 671-676, May 13-16, 2014, Dobrovnik, Croatia<br>2. Elis Sutlović, Snježana Čujić Čoko, Ivan Medić: Characteristics of basin inflows a statistical analysis for long-term/mid-term hydrothermal scheduling, Thermal Science Journal, Vol 18/3, pp. 9-809, 2014.<br>3. Ivan Ramljak, Elis Sutlović, Matislav Majstrović: Statistical analysis of conductor clashing particles in low-voltage distribution network, INFOTEH-JAHORINA Vol. 14, March 2015.<br>4. M. Majstrović, E. Sutlović, I. Ramljak, "Critical diameter of particles produced in overhead line conductor clashing", *Applied thermal engineering*, Vol 114, pp. 713-718, 2017. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. MZOŠ Istraživački projekt: Power system expansion and operation with large scale integration of wind power, 2006-2012.<br>2. VIF FESB: Analiza energetskih tokova u kompleksnom energetskom sustavu, 2015-2017. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | 4,8/5 |

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|---|---|
| First and last name and title of teacher | **Matko Šarić, Ph.D., Assstant Professor** |
| The course he/she teaches in the proposed study programme | Communication Systems |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Pojišanska 25, 21000 Split |
| Telephone number | 0914305633 |
| E-mail address | msaric@fesb.hr |
| Personal web page | |
| Year of birth | 1980 |
| Scientist ID | 272954 |
| Research or art rank, and date of last rank appointment | Assistant research scientist, 16.6.2011. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor, September 2014. |
| Area and field of election into research or art rank | Computer science, information processing |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split (FESB Split) |
| Date of employment | 1.6.2004. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | Computer vision |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Ph.D. in Electrical Engineering and Information Technology, FESB (Split) |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split (FESB Split) |
| Place | Split |
| Date | 13.10.2010. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English - 4 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German - 2 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | • Multimedia systems, graduate study of electrical engineering<br>• Signals and systems, undergraduate study of electrical engineering and information technology<br>• Algorithms, , undergraduate study of compter science |
| Authorship of university/faculty textbooks in the field of the course | |

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| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Šarić, Matko; Dujmić, Hrvoje; Russo, Mladen. Scene Text Extraction in IHLS Color Space Using Support Vector Machine. // Information Technology And Control. 44 (2015) , 1; 20-29<br>2. Šarić, Matko; Dujmić, Hrvoje; Russo, Mladen. Scene Text Extraction in HSI Color Space using K-means Algorithm and Modified Cylindrical Distance. // Przegląd elektrotechniczny. 5 (2013) ; 117-121<br>3. Šarić, Matko; Stella, Maja; Šolić, Petar. Scene Text Extraction using K-means Clustering in HSI Color Space: Influence of Color Distance Measure. // INTERNATIONAL JOURNAL OF CIRCUITS, SYSTEMS AND SIGNAL PROCESSING. 7 (2013) , 5; 294-301<br>4. Šarić, Matko; Stella, Maja; Šolić, Petar. Extraction of Scene Text in HSI Color Space using K-means Clustering with Chromatic and Intensity Distance // Recent advances in information sciences - Proceeedings of the 5th European conference of compute science (ECCS'13). 2013. 136-141<br>5. Dujmić, Hrvoje; Šarić, Matko; Radić, Joško. Scene text extraction using modified cylindrical distance // Recent Researches in Neural Networks, Fuzzy Systems, Evolutionary Computing and Automation (Proceedings of 12th WSEAS conference on Automation & Information). Brasov, 2011. 213-218 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | • MZOŠ project „ICT systems and services based on information integration“ (2007.-2012.)<br>• HRZZ project „ELISE: Easy Living in Smart Environments“ (2015.-) |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| **PRIZES AND AWARDS, STUDENT EVALUATION** | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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| First and last name and title of teacher | **Antonio Šarolić, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Antennas<br>Maritime Radiocommunications<br>Practicum in Electromagnetic Simulations |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | FESB, Ruđera Boškovića 32, 21000 Split |
| Telephone number | 021 305 700 |
| E-mail address | antonio.sarolic@fesb.hr |
| Personal web page | https://nastava.fesb.hr/nastava/nastavnici/detalji/asarolic |
| Year of birth | 1971. |
| Scientist ID | 223430 |
| Research or art rank, and date of last rank appointment | Scientific Advisor, 2016. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Full Profesor, 2016. |
| Area and field of election into research or art rank | Area: Technical Sciences, Field: Electrical Engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 1.1.2006. |
| Name of position (professor, researcher, associate teacher, etc.) | Full Profesor |
| Field of research | Applied electromagnetics, wireless communications |
| Function | Head of Chair for Applied Electromagnetic Fields |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | FER, University of Zagreb |
| Place | Zagreb |
| Date | 2004. |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 5 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Italian, 2 |
| COMPETENCES FOR THE COURSE | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | Šarolić, Antonio; Modlic, Borivoj.<br>Measurement of Electric Field Probe Response to Modulated Signals Using Waveguide Setup. // IEEE antennas and wireless propagation letters. 9 (2010) ; 1041-1044<br><br>Šarolić, Antonio; Senić, Damir; Živković, Zlatko.<br>Radiation Pattern of a Vertical Dipole over Sea and Setup for Measuring thereof. // Automatika. 53 (2012) , 1; 56-68<br><br>Šarolić, Antonio; Matić, Petar.<br>Wireless LAN Electromagnetic Field Prediction for Indoor Environment Using Artificial Neural Network. // Automatika. 51 (2010) , 3; 233-240<br><br>Živković, Zlatko; Šarolić, Antonio. |

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| | Measurements of Antenna Parameters in GTEM Cell. // Journal of communications software and systems. 6 (2010) ; 125-132<br><br>Živković, Zlatko; Senić, Damir; Šarolić, Antonio; Vučić, Ante. Design and Testing of a Diode-Based Electric Field Probe Prototype // 19th International Conference on Software, Telecommunications & Computer Networks - SoftCOM 2011. Split, 2011. 1-5 |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | **Ongoing projects:**<br>- Chair of EU COST project Action BM1309: "European network for innovative uses of EMFs in biomedical applications", 2014-<br>- EU COST Action IC1102: "Versatile, Integrated, and Signal-aware Technologies for Antennas (VISTA)", Management Committee Member, 2011-<br><br>**Completed projects:**<br>- Principal investigator of research project MZOŠ RH "Measurements in EMC and EM health effects research", 2008-2013.<br>- Leader of technological project BICRO PoC4_06_23 "Integral system of radiocommunications and vessel surveillance in marinas", 2013-2014.<br>- EU COST Action IC1004: "Cooperative Radio Communications for Green Smart Environments", Management Committee Member, 2011-2015. |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | Student evaluations in academic year 2016/17:<br>- "Wireless communications": average grade 4,7 out of 5<br>- "Antenna systems": average grade 5 out of 5<br>- "Electromagnetic compatibility": average grade 4,9 out of 5<br>- "Simulation and measurement of electromagnetic quantities": average grade 4,8 out of 5 |

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| First and last name and title of teacher | **Ljiljana Šerić, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Introduction to Programming<br>Internet Programming |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | FESB, Ruđera Boškovića 32, 21000 Split |
| Telephone number | +385 (0)21 305 651 |
| E-mail address | ljiljana.seric@fesb.hr |
| Personal web page | http://www.fesb.hr/~ljiljana |
| Year of birth | 1979. |
| Scientist ID | 272906 |
| Research or art rank, and date of last rank appointment | Senior Research Associate, 14.02.2013. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor, 02.12.2013. |
| Area and field of election into research or art rank | Technical sciencies, Computer Science |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 02.12.2013. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | Science and education |
| Function | Assistant professor |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 06.10.2010. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (5) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German (3) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | 1. Course name: Artificial Intelligence<br>Name of the study programme in which the course is offered: Automation and Systems, Electrical Engineering, Computer Engineering, Telecommunications and Computer Science, Computer Science<br>The level of the study programme: Graduate study<br>2. Course name: Intelligent Systems |

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| | Name of the study programme in which the subject is taught: Electrical Engineering and Information Technology<br>The level of the study programme: Postgraduate study<br>3. Course name: Web intelligence and large data sets<br>Name of the study programme in which the subject is taught: Electrical Engineering and Information Technology<br>The level of the study programme: Postgraduate study |
| Authorship of university/faculty textbooks in the field of the course | 1) Stipaničev Darko, Šerić Ljiljana. Artificial intelligence. Split, FESB - Internal script, 2012.<br>2) Bodrožić Ljiljana. Programming languages of artificial intelligence. Split, FESB - Internal script, 2007. |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1) Doko Alen, Štula Maja, Šerić Ljiljana. Improved sentence retrieval using local context and sentence length. Information processing & management, 49 (2013), 6, 1301-1312.<br>2) Šerić Ljiljana, Stipaničev Darko, Štula Maja. Engineering of holonic multi agent intelligent forest fire monitoring system. AI communications, 26 (2013), 3; 303-316.<br>3) Šerić Ljiljana, Krstinić Damir, Braović Maja, Milatić Ivan; Mirčevski Aljoša, Stipaničev Darko. Holonic Multi Agent System for Data Fusion in Vehicle Classification. Proceedings of 10th International KES Conference on Agents and Multi-Agent Systems: Technologies and Applications (KES-AMSTA-16). 2016.<br>4) Stipaničev Darko, Šerić Ljiljana, Krstinić Damir, Bugarić Marin. Wildfire video observers network with physical and virtual sensors. Proceeding of 10th EARSeL Forest Fire Special Interest Group Workshop - Sensors, Multi-Sensor Integration, large Volumes: New opportunities and Challanges in Forest Fire Research, Themistocleous, Kyriacos ; Hadjimitsis, Diofantos; Gitas, Ioannios ; Boschetti, Luigi (ur.). Limassol, Cyprus, 2015.<br>5) Ukić Nenad, Maras Josip, Šerić Ljiljana.<br>The influence of cyclomatic complexity distribution on the understandability of xtUML models, Software quality journal, PP (2016) |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | AgiSeco – Agent Oriented Intelligent Systems for Environement Monitoring and Control, MZOS, 2007-2012<br>HOLISTIC – Adriatic Holistic Forest Fire Protection , IPA, 2014- in progres<br>Wind Risk Prevention Projekt – ECHO, Civil Protection<br>Automatic vehicle classification based on computer vision and data fusion |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences. | |
| **PRIZES AND AWARDS, STUDENT EVALUATION** | |
| Prizes and awards for teaching and scholarly/artistic work | 20 best junior reasearchers, 2013 |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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| First and last name and title of teacher | **Silvestar Šesnić, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Fundamentals of Electrical Engineering 2 |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Stepinčeva 65, 21000 Split |
| Telephone number | +385914305814 |
| E-mail address | ssesnic@fesb.hr |
| Personal web page | - |
| Year of birth | 1979. |
| Scientist ID | 272965 |
| Research or art rank, and date of last rank appointment | Research associate, 14.02.2013. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant Professor, 06.2014. |
| Area and field of election into research or art rank | Technical sciences, Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split |
| Date of employment | 01.01.2005. |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant Professor |
| Field of research | Electromagnetic theory |
| Function | - |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split |
| Place | Split, Croatia |
| Date | 04.11.2010. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 2013. |
| Place | Clermont Ferrand, France |
| Institution | Polytech' Clermont Ferrand, Blaise Pascal University |
| Field of training | Electromagnetic compatibility |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 5 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German, 2 |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | - |
| Authorship of university/faculty textbooks in the field of the course | - |
| Professional, scholarly and artistic articles published in the last five | • Poljak, Dragan; Šesnić, Silvestar; Drissi, Khalil El-Khamlichi; Kerroum, Kamal; Tkachenko, Sergey. Transient Electromagnetic Field Coupling to Buried Thin |

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| years in the field of the course (5 works at most) | Wire Configurations: Antenna Model versus Transmission Line Approach in the Time Domain. // *International Journal of Antennas and Propagation*. 2016 (2016); 1-11<br>• Šesnić, Silvestar; Garma, Tonko; Poljak, Dragan; Tkachenko, Sergey V. Comparison of the antenna model and experimental analysis of an impulse impedance of the horizontal grounding electrode. // Electric power systems research. 125 (2015); 159-163<br>• Garma, Tonko; Šesnić, Silvestar. Measurement and modeling of the propagation of the Ripple Control Signal through the distribution network. // International journal of electrical power & energy systems. 63 (2014); 674-680<br>• Šesnić, Silvestar; Poljak, Dragan. Antenna model of the horizontal grounding electrode for transient impedance calculation: Analytical versus Boundary Element Method. // Engineering analysis with boundary elements. 37 (2013), 6; 909-913<br>• Šesnić, Silvestar; Poljak, Dragan; Tkachenko, Sergey V. Analytical Modeling of a Transient Current Flowing Along the Horizontal Grounding Electrode. // IEEE transactions on electromagnetic compatibility. 55 (2013), 6; 1132-1139 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | - |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | • ITER Physics Work Package – Code Development for Integrated Modelling, EURATOM, Horizon 2020<br>• Civil Engineering Applications of Ground Penetrating Radar, COST<br>• EMI study of PLC services, Bilateral agreement Cogito, Croatia, France<br>• Modelling and environmental aspects of ELF electromagnetic fields, MZOŠ |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences? | - |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | - |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | University of Split, 4.3, Fundamentals of Electrical Engineering 2 |

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| First and last name and title of teacher | **Marija Šiško Kuliš, Ph.D., Associate Professor** |
| The course he/she teaches in the proposed study programme | Introduction to Entrepreneurship |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Ilijin potok 16, 21210 Solin |
| Telephone number | 098 414 732 |
| E-mail address | marija.sisko-kulis@hep.hr |
| Personal web page | |
| Year of birth | 1966. |
| Scientist ID | 217703 |
| Research or art rank, and date of last rank appointment | |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Associate Professor, May2011. |
| Area and field of election into research or art rank | Technical sciences, mechanical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | HEP Proizvodnja d.o.o., vanjski suradnik na Fakultetu strojarstva i brodogradnje u Splitu. |
| Date of employment | 1.rujna 1994. |
| Name of position (professor, researcher, associate teacher, etc.) | Head of mechanical department at Hydro South |
| Field of research | Mechanical engineering, investment projects |
| Function | The manager and supervising engineer |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PHD |
| Institution | Faculty of Mechanical Engineering and Naval Architecture, Zagreb |
| Place | Zagreb. |
| Date | 21.09.2000. |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 1998/1999; 1995-1997 |
| Place | LJubljana |
| Institution | Turboinštitut |
| Field of training | Water turbine_management of project reconstruction of hydroelectric power plants |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Hrvatski |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Engleski – 4 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Njemački - 3 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | • Entrepreneurship, Professional Study of Mechanical Engineering, Electrical Engineering, University of Split, Department of Professional Studies,<br>• Entrepreneurship in the media, professional study, TV Academy, Split. |

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| | • Assessment of technological project- Graduate Studies, Industrial Engineering, FESB, Split. |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | •Šiško Kuliš, M. (2013.): Ispitivanje osposobljenosti menadžmeta za primjenu alata i tehnika upravljanja kvalitetom u tvrtkama elektro i metaloprerađivačke industrije Hrvatske, Zbornik radova, Međunarodna konferencije, Neum 2013.<br>• Pleština, M, Šiško Kuliš, M. Vučina, D. (2013.): Analysis of investments in mall hydropower plants International Conference MTSM 2010 / Prof.dr. Dražen Živković (ur.). Split : Hrvatsko društvo za strojarske tehnologije, Hrvatska ; c/o FESB, 2013. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Refurbishment of Zakucac HPP |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | Average value 4.8 |

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| First and last name and title of teacher | **Petar Šolić, Ph.D., Assistant Professor** |
| The course he/she teaches in the proposed study programme | Signals and Systems |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Kupreška 14, 21000 Split, HR |
| Telephone number | +385981752651 |
| E-mail address | psolic@fesb.hr |
| Personal web page | marjan.fesb.hr/~psolic |
| Year of birth | 1985 |
| Scientist ID | 313610 |
| Research or art rank, and date of last rank appointment | Research associate, 20.07.2015. |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Assistant professor, 01/10/2015 |
| Area and field of election into research or art rank | Technical Sciences, |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 01/04/2009 |
| Name of position (professor, researcher, associate teacher, etc.) | Assistant professor |
| Field of research | Telecommunications |
| Function | |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 04/06/2014 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German (2) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | |
| Authorship of university/faculty textbooks in the field of the course | |

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| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | National award for science in 2015 (scientific novice category)<br>Scientific novice award in 2014 (doctorand/postdoc category) |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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| First and last name and title of teacher | **Božo Terzić, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Maintenance and Testing of Electrical Power Equipment |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Elemova 5, 21312 Podstrana HR |
| Telephone number | +385 91 4305609 |
| E-mail address | bterzic@fesb.hr |
| Personal web page | |
| Year of birth | 1962. |
| Scientist ID | 138865 |
| Research or art rank, and date of last rank appointment | Scientific Adviser, 9/7/2009 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, 18/9/2014 |
| Area and field of election into research or art rank | Technical Sciences, Field Electrical Engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 1986. |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Electrical Drives, Power Converters |
| Function | Head of Chair of Electrical Drives and Automation |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 25/11/1998 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German (2) |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Electrical drives - Professional study programme of Electrical engineering,<br>Testing of Electrical Equipement - Graduate study programme of Power engineering |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Terzić, Božo; Despalatović, Marin; Slutej, Alojz. *Magnetization Curve Identification of Vector-Controlled Induction Motor at Low-Load Conditions*. // Automatika - |

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| | Journal for Control, Measurement, Electronics, Computing and Communications, 53 (2012) , 3; 1-8.<br>2. Jadrić, Martin; Terzić, Božo; Despalatović, Marin; Majić, Goran; Slutej, Alojz; Šimić, Toni. *Identification of Rotor Resistance and Transient Inductance of Induction Motors Using Frequency Selection Criterion* // Proceedings of the 2012 XXth International Conference on Electrical Machines / Nogueiras Meléndez, Andrés A. (ur.). Marseille, Francuska : IEEE IES, 2012. 978-984.<br>3. Terzić, Božo; Despalatović, Marin: *Ispitivanje i procjena stanja izolacijskog sustava visokonaponskih motora u tvornicama cementa CEMEX – Kaštel Sućurac*, tijekom posljednjih 5 godina svake godine se testira približno 30 visokonaponskih motora, Naručitelj: Cemex, 2012.-2016.<br>4. Terzić, Božo; Despalatović, Marin; Majić, Goran; Gladina, Željko: *Mjerenja i analiza karakteristika upuštača asinkronih motora u postrojenju mlina cementa 2 u tvornici Cemex – Pogon Sv. Juraj*, Naručitelj: Siemens, 2014.<br>5. Terzić, Božo; Despalatović, Marin; Majić, Goran; Stergulc, Marjan; Kriletić, Ante; Šormaz, Krste: *Frequency Converter Design for High Speed Permanent Magnet Generator in Cogeneration Plants*,, Technical Journal, Scientific-professional Journal of University North, Vol. 10, No. 3-4, Croatia, 2016. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | 1. Domestic sceintific project: *On-line parameter identification of synchronous generator,* project leader, 2011. – 2013., funding the project: MZOŠ<br>2. International development project: Development of electric drives for crane systems operating in hard environment, project leader, 2008. – 2013., in cooperation with swedish company *ABB Crane Systems* that fully funded the project.<br>3. Researche and development project: A safer and more efficient cogeneration / trigeneration plants, project leader, 2014.-2016., project was funded from EU structural funds. |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | From 4 to 4,8. |

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| First and last name and title of teacher | **Slavko Vujević, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Marine Electrical Engineering |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Vijugasta 18, Hr-21000 Split, Croatia |
| Telephone number | +385 21 305-613 |
| E-mail address | vujevic@fesb.hr |
| Personal web page | |
| Year of birth | 1958 |
| Scientist ID | 122731 |
| Research or art rank, and date of last rank appointment | Scientific Adviser; January 20, 2005 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Senior Full Professor, September 24, 2009 |
| Area and field of election into research or art rank | Technical Sciences, Electrical Engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | February 26, 1982 |
| Name of position (professor, researcher, associate teacher, etc.) | Professor |
| Field of research | Electrical Measurement, Power Quality |
| Function | Head of the Subdepartment of Electromagnetics and Engineering Modeling |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | Ph.D. |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | July 14, 1994 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | 2003 |
| Place | Neumarkt, Germany |
| Institution | DEHN + Söhne |
| Field of training | Certificate in Red/Line-Seminar and Yellow/Line-Seminar on "Lightning and Surge Protection in Power Networks" |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English (4) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | German (2) |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | • Electric Machinery Fundamentals, university undergraduate study of Electrical Engineering, University of Split, FESB<br>• Fundamentals of Electric Power Engineering, the university undergraduate study of Electrical Engineering, specialisation Electronics, University of Split, FESB |

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| | • Marine Electrical Engineering, the university undergraduate study of Naval Architecture, University of Split, FESB<br>• Marine Electrical Engineering, the university undergraduate study of Electrical Engineering and Information Technology, University of Split, FESB |
| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Vujević, Slavko; Lovrić, Dino, On Continuous Numerical Fourier Transform for Transient Analysis of Lightning Current Related Phenomena, Electric Power Systems Research, Vol. 119, pp. 364-369, 2015.<br>2. Vujević, Slavko; Lovrić, Dino; Balaž, Zdenko, Self and Mutual Ground Impedances of Cylindrical Metal Plates Buried In Homogeneous Earth, International Journal of Numerical Modelling - Electronic Networks Devices and Fields; Vol. 28. No. 1, pp. 33-49, 2015.<br>3. Vujević, Slavko; Lovrić, Dino; Boras, Vedran, High-Accurate Numerical Computation of Internal Impedance of Cylindrical Conductors for Complex Arguments of Arbitrary Magnitude, IEEE Transactions on Electromagnetic Compatibility, Vol. 56, No. 6, pp. 1431-1438, 2014.<br>4. Lovrić, Dino; Vujević, Slavko; Modrić, Tonći, On the Estimation of Heidler Function Parameters for Reproduction of Various Standardized and Recorded Lightning Current Waveshapes, International Transactions on Electrical Energy Systems; Vol. 23, No. 2, pp. 290-300, 2013.<br>5. Vujević, Slavko; Sarajčev, Petar; Lovrić, Dino, Time-Harmonic Analysis of Grounding System in Horizontally Stratified Multilayer Medium, Electric Power Systems Research, Vol. 83, No. 1, pp. 28-34, 2012. |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | Project of MZOS of Republic of Croatia no. 023-0000000-3271 - Development of Advanced Algorithms for Modelling of Electromagnetic Phenomena, 2008 - 2013 (project leader Professor Slavko Vujević) |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

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| First and last name and title of teacher | **Dinko Vukadinović, Ph.D., Full Professor** |
| The course he/she teaches in the proposed study programme | Power Electronics<br>Electronic Converters for Power Supplies |
| GENERAL INFORMATION ON COURSE TEACHER | |
| Address | Pujanke 61, Split |
| Telephone number | 021/376-715 |
| E-mail address | dvukad@fesb.hr |
| Personal web page | |
| Year of birth | 1973 |
| Scientist ID | 248950 |
| Research or art rank, and date of last rank appointment | Senior research scientist, 15/7/2010 |
| Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment | Full Professor, 26/1/2013 |
| Area and field of election into research or art rank | Technical Sciences, Electrical engineering |
| INFORMATION ON CURRENT EMPLOYMENT | |
| Institution where employed | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Date of employment | 9/2/1998 |
| Name of position (professor, researcher, associate teacher, etc.) | Full Professor |
| Field of research | Power Engineering (Power Electronics, Control of Electrical Machines) |
| Function | Head of Group for Power Electronics and Control |
| INFORMATION ON EDUCATION – Highest degree earned | |
| Degree | PhD |
| Institution | Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture |
| Place | Split |
| Date | 27/10/2005 |
| INFORMATION ON ADDITIONAL TRAINING | |
| Year | |
| Place | |
| Institution | |
| Field of training | |
| MOTHER TONGUE AND FOREIGN LANGUAGES | |
| Mother tongue | Croatian |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | English, 3 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | Germany, 2 |
| Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent) | |
| COMPETENCES FOR THE COURSE | |
| Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme) | Power Electronics, Undergraduate study programme<br>Electronic Converters for Power Supplies, Undergraduate study programme |

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| Authorship of university/faculty textbooks in the field of the course | |
| Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most) | 1. Bašić, M., Vukadinović, D. „Online Efficiency Optimization of a Vector Controlled Self-Excited Induction Generator“, IEEE Transactions on Energy Conversion. 31 (2016) , 1; 373-380<br>2. Vukadinović, D., Bašić, M., Nguyen, C.H., Vu, N.L., Nguyen, T.D., „Hedge-Algebra-Based Voltage Controller for a Self- Excited Induction Generator“, *Control engineering practice*, 30 (2014) ; 78-90<br>3. Bašić, M., Vukadinović, D., „Vector control system of a self-excited induction generator including iron losses and magnetic saturation“, *Control engineering practice*, 21 (2013) , 4; 395-406<br>4. Bašić, M., Vukadinović, D., Petrović, G., „Dynamic and Pole-Zero Analysis of Self-Excited Induction Generator Using a Novel Model with Iron Losses“, *International journal of electrical power & energy systems*, 42 (2012) , 1; 105-118<br>5. Bašić, M., Vukadinović, D., Polić, M., „Analysis of Power Converter Losses in Vector Control System of a Self–Excited Induction Generator“, *Journal of Electrical Engineering - Elektrotechnický časopis*, 65 (2014) , 2; 65-74 |
| Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most) | |
| Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most) | |
| The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije? | |
| PRIZES AND AWARDS, STUDENT EVALUATION | |
| Prizes and awards for teaching and scholarly/artistic work | |
| Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated) | |

## 3.4. Optimal number of students

The admission quote for the first year of studies is 30.

## 3.5. Estimate of costs per student

Annual costs of studies per student amount to HRK 25,000.00.

## 3.6. Plan of procedures of study programme quality assurance

<table>
<tr><td colspan="2">In keeping with the European standards and guidelines for internal quality assurance in higher education institutions (according to “Standards and Guidelines of Quality Assurance in the European Higher Education Area”) on the basis of which the University of Split defines procedures for quality assurance, the proposer of the study programme is obliged to draw up a plan of procedures of study programme quality assurance.</td></tr>
<tr><td colspan="2">Documentation on which the quality assurance system of the constituent part of the University is based:</td></tr>
<tr><td colspan="2">• Regulations on the quality enhancement system of FESB</td></tr>
<tr><td colspan="2">• Quality Assurance Handbook of the constituent part</td></tr>
<tr><td colspan="2">Description of procedures for evaluation of the quality of study programme implementation:<br>• For each procedure the method needs to be described (most often questionnaires for students or teachers, and self-evaluation questionnaire), name the body conducting evaluation (constituent part, university office), method of processing results and making information available, and timeframe for carrying out evaluation<br>• If procedure is described in an attached document, name the document and the article.</td></tr>
<tr><td>Evaluation of the work of teachers and part-time teachers</td><td>• Student evaluation of quality of instruction and teaching activities conducted through student survey (printed questionnaires)<br>• Survey is organised and conducted by the Quality Enhancement Committee of the Faculty (Committee)<br>• Survey results are processed automatically at the University<br>• Survey is conducted each semester<br>• The Committee presents cumulative results of the survey at the sessions of the Faculty Council. The report is published at the Faculty web site.<br>All procedures are conducted in accordance with the Regulations on organisation and role of the quality assurance system of the University of Split, Regulations on procedure of student evaluation of the quality of teachers and teaching of the University of Split and Regulations on the quality enhancement system of FESB.</td></tr>
<tr><td>Monitoring of grading and harmonization of grading with anticipated learning outcomes</td><td>Committee for study programmes in Electrical Engineering and Computing is monitoring the harmonisation of grading and learning outcomes.<br>All the procedures are conducted in accordance with the Rules of procedure of the Faculty Council and the Rules of procedure of the Department, since the Committees for</td></tr>
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| | study programmes are bodies of the Faculty Council and are accountable to the Faculty Council. |
| Evaluation of availability of resources (spatial, human, IT) in the process of learning and instruction | • Student evaluation of work performance of administrative and supporting services, learning infrastructure and student life is conducted through e-survey<br>• Evaluation is conducted using an on-line questionnaire which the students complete in each year of study, except the final year<br>• Survey is organised by the Quality Enhancement Centre of the University of Split, and is implemented by the Quality Enhancement Committee of the Faculty (Committee)<br>• Survey results are processed automatically at the University<br>• Survey is conducted every year<br>• Survey results are presented at the Faculty Council sessions and published at the Faculty web site. |
| Availability and evaluation of student support (mentorship, tutorship, advising) | • Administrative and supporting services are available to students to provide support in their study activities<br>• Supervisors/ mentors are appointed for students' final papers and diploma thesis |
| Monitoring of student pass/fail rate by course and study programme as a whole | • Analysis of student pass rate by courses and study programmes is carried out once a year<br>• Analysis of pass rate by study programmes is carried out by the University in cooperation with the Committee<br>• Analysis by courses and study programmes is carried out by the Faculty Management Board<br>• Results of both analyses are presented at the Faculty Council sessions and published at the Faculty web site. |
| Student satisfaction with the programme as a whole | • Student evaluation of work performance of administrative and supporting services, learning infrastructure and student life is conducted through e-survey<br>• Evaluation is conducted using an on-line questionnaire which the students complete following the completion of studies<br>• Survey is organised by the Quality Enhancement Centre of the University of Split, and is implemented by the Quality Enhancement Committee of the Faculty (Committee)<br>• Survey results are processed automatically at the University<br>• Survey results are presented at the Faculty Council sessions and published at the Faculty web site. |
| Procedures for obtaining feedback from external parties (alums, employers, labour market and other relevant organizations) | • Once every month, the Faculty Management Board meets with the alumni representatives<br>• Once a year, during the annual FESB anniversary event, round tables and workshops are organised with representatives of employers and other stakeholders |
| Evaluation of student practical education (where this applies) | Professional training is a mandatory course of the study programme. Head of the professional training from the receiving institution and the head of professional training from the Faculty are appointed for each student. During the training student writes Professional training report which describes working tasks covered by the professional training. Students are obliged to complete |

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| | professional training in accordance with the Regulation on professional training. Professional training report is validated by the head of professional training from the receiving institution and the head of professional training from the Faculty. Professional training is not evaluated. In addition to the Professional training report student completes a Questionnaire on professional training that evaluates student's satisfaction with organization and performance of the professional training. |
| Other evaluation procedures carried out by the proposer | • Internal audit of the quality assurance system is conducted once every year<br>• Self-evaluation is carried out every 5 years<br>All the procedures are conducted in line with the Quality Assurance Handbook of FESB. |
| **Description of procedures for informing external parties on the study programme (students, employers, alums)** | • All information are available through the Faculty web site: https://www.fesb.hr<br>• Visits to the faculty are organised for high-school students from Split and the wider region<br>• Participation at University fairs<br>• Public media presentations |