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

Osijek, May 2008
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1. INTRODUCTION

a) Rationale for founding the Faculty

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

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

Connection with modern scientific ideas and/or skills based on them - The modern study of computer engineering is based on the overall research and development in the field of natural and technical sciences but on new technologies as well. It is especially manifested in the development of computer and IT technology, which is supported by most recent ideas in the scientific field of computer engineering. The initiator of the development and research in this field is the labour market, which supports further investment into science and research in the field of computer engineering. Consequently, most recent scientific ideas have to be followed by research and development at the Faculty, in the first place within the framework of different projects supported by the Ministry of Science, Education and Sports, through projects supported by the European Union and certainly through cooperation and projects with economy. The proposed study programme for the Bachelor level of computer engineering will be founded on the latest scientifically based
facts in the scientific field of computer engineering and the study programme will be adjusted to the latest ideas of this exceptionally dynamic field.

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

b) Experience in the implementation of equivalent or similar programmes

Faculty of Electrical Engineering in Osijek has educated experts in the scientific field of electrical engineering with the emphasis on the orientation in the scientific field of computer science through two branches: Computer Engineering and Communication and Automation and Computer Engineering in Process Control. Computer Engineering in Process Control is a branch of the postgraduate studies in computer engineering which is carried out at the Faculty of Electrical Engineering in Osijek. On account of the mentioned studies, Faculty of Electrical Engineering has gained valuable experience in the education of experts in the field of computer engineering. Former studies of electrical engineering with the branches in computer engineering represent the foundation for the new First cycle studies of computer engineering that will, together with the Second cycle studies of computer engineering with the branch Computer Engineering in Process Control and the Third cycle studies keeping the same branch, create a continuing educational cycle from the Bachelor to the Master and finally to the doctoral degree in computer engineering. In this way, the Faculty of Electrical Engineering will encircle the education of experts in the scientific field of computer engineering.

d) Faculty overtness towards mobility of students

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

2.1. Study programme:
First cycle degree in computer engineering

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

2.3. Duration of study:
Bachelor level study programme in computer engineering would take 3 years and a student should acquire a minimum of 180 ECTS credits.

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

2.5. Qualification attributes or competencies computer engineering students would achieve and positions they would be qualified for:
Bachelor level study programme in computer engineering aims at preparing its students for an extremely dynamic area of technological development. Computer engineers of this profile are architects and implementers of most up-to-date information and communication technologies, and are in great demand throughout both industry and commerce, but the public sector as well. Computer engineering students would learn how to identify, formulate, and solve engineering problems by using appropriate software tools. In addition, they would acquire abilities to recognise the interaction between engineering activities and design, fabrication, marketing, user requirements and requirements of the manufacturing process. They should adapt to a changing technology and new techniques as part of a life long learning process. Moreover, computer engineering students would display an understanding of engineering activities and their influence on life in general and the environment, demonstrating high moral and ethical principles while solving engineering tasks. Students would be able to apply the acquired knowledge to undertake appropriate further training aimed at improving their professional and academic abilities. By solving problems, computer engineering students would creatively and critically evaluate arguments, assumptions, concepts and data in order to make effective judgement and offer their adequate contribution.
First cycle degree holders in Computer Engineering would acquire the necessary knowledge and skills, and be able to:

- specify, design and implement computer systems;
- install, use and maintain common operating systems, software and hardware;
- carry out object oriented programming;
- apply the principles of advanced communication technologies to the design and implementation of a wide range of computer engineering;
- deploy effectively the tools used for the construction and documentation of hardware and system software;
- develop graphical and dialogue-based user interface;
- configure and apply standard properties and functions in database systems;
- use high-level programming languages;
- create and maintain Internet Web presentations using standard editing tools and web functions;
- implement input/output programming with standard protocols and bus systems applied to control systems;
- design basic digital circuits and systems;
- participate in the development of large computer programmes;
- explain the principles of digital signal processing.
- be familiar with processes and mechanisms in computer networking, as well as the role of network supervisor.

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

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

After the successful completion of the first cycle study programme (Bachelor level) in computer engineering students would be awarded the title **Bachelor of Science in Computer Engineering.**
3. PROGRAM DESCRIPTION

3.1. First Cycle Degree Study Programme in Computer Engineering- obligatory and elective courses

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

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

**Course notation**

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

Course code: P Bx y z

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

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

**Workload notation**

P - lectures
A – problem solving
L – laboratory practice
K - design/construction exercises
### 1st Year

#### Semester 1

<table>
<thead>
<tr>
<th>Code</th>
<th>Lecturer</th>
<th>Course</th>
<th>Weekly workload</th>
<th>Examination</th>
<th>ECTS credits</th>
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<tbody>
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<td>Fundamentals of Electrical Engineering I</td>
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**TOTAL:** 13 7 4 1 25 6 30

Optional course:

PF101 Branka Pavlović, MA, Senior Lecturer, Ivanka Ferčec, BA, Lecturer | English | 1 1 0 0 2 | 0 |

**TOTAL:** 13 7 5 0 25 5 30

#### Semester 2

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<td>Muharem Mehmedović, PhD, Assistant Professor</td>
<td>Fundamentals of Electrical Engineering II</td>
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**TOTAL:** 13 7 5 0 25 5 30

Optional course:

PF201 Branka Pavlović, MA, Senior Lecturer, Ivanka Ferčec, BA, Senior Lecturer | English | 1 1 0 0 2 | 0 |
# 2nd Year

## Semester 3

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<td>Damir Sljivac PhD, Assistant Professor</td>
<td>Fundamentals of Power Engineering and Ecology</td>
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**TOTAL:** 13 6 4 1 24 5 30

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<td>P402</td>
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<td>Probability and Statistics</td>
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3rd Year

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<td>Modelling and Simulation</td>
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<td>Basics of Automatic Control</td>
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Semester VI

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<td>Technical System Designing</td>
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<td>P604</td>
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### 3.2. First Cycle Degree in Computer Engineering (Bachelor level) – Courses description

#### Semester 1

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<th>Course Code</th>
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<tr>
<td>P101</td>
<td>Linear Algebra</td>
<td>Radoslav Galić, PhD, Full Professor</td>
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</table>

**Course description:**


**Knowledge and skills acquired:**

Students are introduced to linear algebra calculus and algebraic structures fundamental to many other courses. Lectures and exercises will include basic terminology whose usage will be illustrated by various examples and tasks.

**Teaching methods:**

Students are obliged to attend both lectures and exercises.

**Student assessment:**

During the semester students can take several tests which replace the written examination. This ensures continuous assessment of students’ work and knowledge.

**Obligatory literature:**


**Recommended additional literature:**


**ECTS credits:** 5 ECTS credits

An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**

The final examination consists of the written and the oral part. Students could take the final examination after the completion of lectures and exercises.

**Course assessment:**

Conducting an anonymous questionnaire filled in by students after course completion, an analysis of students' final assessments and their overall success.
<table>
<thead>
<tr>
<th>P102</th>
<th>Calculus I  (Differential Calculus)</th>
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<tr>
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</table>

**Course description:**

1. Preliminaries. Real numbers, infimum and supremum, absolute value, intervals. Complex numbers.
3. Sequences of real numbers. Concept of a sequence, properties and convergence. Number e.

**Knowledge and skills acquired:**

At the introductory level students should be introduced to fundamental ideas and methods of mathematical analysis, which represent the basis for many other courses. During lectures basic terminology would be explained in an informal way, their utility and applications would be illustrated. During exercises students should master an adequate technique and become trained for solving concrete problems.

**Teaching methods:**

Students are obliged to attend both lectures and exercises.

**Student assessment:**

During the semester students can take several tests which replace the written examination. This ensures continuous assessment of students’ work and knowledge.

**Obligatory literature:**


**Recommended additional literature:**

1. S. Kurepa, Matematička analiza I (diferenciranje i integriranje), Tehnička knjiga, Zagreb, 1989.
3. S. Lang, A First Course in Calculus, Springer-Verlag, New York, 1986

**ECTS credits:** 5 ECTS credits

An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**

The final examination consists of the written and the oral part. Students could take the final examination after the completion of lectures and exercises.

**Course assessment:**

Conducting an anonymous questionnaire filled in by students after course completion, an analysis of students' final assessments and their overall success.
### P103 | Fundamentals of Electrical Engineering I

**Lecturer:** Snježana Rimac-Drlje, PhD, Associate Professor

**Course description:**

**Knowledge and skills acquired:**
Students will acquire knowledge of the fundamental laws in electromagnetism, units and measures of the electric and magnetic fields. Furthermore, they will be able to make calculations of the electric field, magnetic field, capacitance, inductance and resistance of simple conductive forms. They will be able to measure with ampermetre, voltmetre, watmetre, ohmmetre, teslametre and oscilloscope.

**Teaching methods:**
Students are obliged to attend both lectures and exercises.

**Student assessment:**
Testing laboratory practice, written and oral examinations

**Obligatory literature:**
3. S. Rimac-Drlje, Ž. Hederić, A. Keller: Osnove elektrotehnike 1 - Upute za laboratorijske vježbe

**Recommended additional literature:**
1. V. Pinter, Osnove elektrotehnike I i II, Tehnička knjiga, Zagreb, 1994.

**ECTS credits:** 6 ECTS credits

An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination, possibility of passing the examination by passing periodic tests.

**Course assessment:**
Students' evaluation, analysis of their work in laboratory and grades scored in the written and the oral examination.

### P104 | Physics I

**Lecturer:** Josip Brana, PhD, Assistant Professor

**Course description:**
The course consists of two parts:
- Mechanics: vectors; kinematics; dynamics; work; power; energy; system of particles;
  - rigid body dynamics; (non)inertial systems; Newton's law of gravitation;
  - harmonic oscillator; waves; fluid mechanics.
- Thermodynamics: ideal gas law; kinetic theory of gases; laws of thermodynamics;
  - Carnot's heat engines; entropy.

**Knowledge and skills acquired:**
Students must acquire knowledge of the concepts and mathematically formulated laws of mechanics and thermodynamics, which enables them to understand mechanical and heat phenomena in nature and technology as well as to solve simple problems.

**Teaching methods:**
Lectures, problem solving, laboratory practice.
### Student assessment:
Laboratory test, written and oral examination.

### Obligatory literature:
1. Mehanika i toplina, P. Kulišić;
2. Riješeni zadaci iz mehanike i topline, P. Kulišić i dr.

### Recommended additional literature:
1. The Feynman Lectures on Physics, R. P. Feynman, R. B. Leighton, M. Sands; The Berkeley Physics Course.

### ECTS credits: 5.5 ECTS credits
An ECTS credit value has been added according to calculation of time required time studying and successful course completion.

### Examination methods:
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises.

### Course assessment:
Conducting an anonymous questionnaire filled in by students after course completion. Permanent contact with students.

---

### P105 Engineering Graphics and Documentation

**Lecturer:** Tomislav Mrčela, PhD, Associate Professor

**Course description:**

**Knowledge and skills acquired:**
During the course students acquire general knowledge and skills that enable them to access projects and tasks in the field of electrical engineering. They also gain basic knowledge of AutoCAD graphical design tools as well as specialised graphical tools used in electrical engineering. Moreover, students become trained for successful project realisation in accordance with IEC regulations.

**Teaching methods:**
Lectures, design exercises.

**Student assessment:**
Partial exam.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 3 ECTS credits
An ECTS credit value has been added according to calculation of time required time studying and successful course completion.

**Examination methods:**
Project task and oral examination.

**Course assessment:**
During the semester and at the semester end students evaluate teaching successfulness by anonymous questionnaires.
### P106 | Programming I

**Lecturer:** Goran Martinović, PhD, Assistant Professor

**Course description:**

**Knowledge and skills acquired:**
Necessary knowledge of computer architecture and working principles. Successful usage of up-to-date system and application tools. Fundamentals of programming and simple programs developed in C.

**Teaching methods:**
Lectures and laboratory practice are obligatory.

**Student assessment:**
Two successfully graded exercises during one semester can replace the final written examination. Tests in laboratory practice add additional points to the final examination, which consists of the written and the oral part.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 5.5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
During and at the end of semester, students evaluate teaching successfulness by anonymous questionnaires. Lecturers who treat this course a prerequisite for their courses are also welcome to give feedback about the knowledge acquired during this course.

---

### P107, P206, P304, P405 | Physical Education I, II, III and IV

**Lecturer:** Željko Širić, Senior Lecturer

**Course description:**
Physical education is carried out according to four programmes:

**Course contents:**
1. Basic programme
   1. Apparatus gymnastics. Warming-up exercises, without and with gymnastics apparatus. Apparatus exercises (parallel bars, stationary rings, etc.). Exercises on the floor (rolls, forward horizontal stand, positions, postures, etc.)
   2. Ball games. Basic elements of ball games (basketball, volleyball, football, handball, etc.)
   3. Athletics.

2. Programme for students of damaged health
   In case there are students of damaged health condition, the lecturer develops a special program for each
   student of such group.

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**PF101  English I – optional**

**Lecturer:** Branka Pavlović, MA, Senior Lecturer / Ivanka Ferčec, BA, Senior Lecturer

**Course description:**
Introduction, asking and giving information, describing people, expressing regret, distinguishing levels of formality, spelling and counting.

**Knowledge and skills acquired:**
Basic communicative patterns acquiring basic language structures.

**Teaching methods:**
Lectures and language practice.

**Student assessment:**
Written and oral assessment.

**Obligatory literature:**
1. The New Cambridge English Course, Book 1

**Recommended additional literature:**
1. Student's Book
2. Practice Book

**ECTS credits:** 0 ECTS credits
This course is optional and does not carry any ECTS credits.

**Examination methods:**
Written and oral examination.

**Course assessment:**
Students’ evaluation at the course end.

---

**Semester 2**

**P201  Calculus II  (Integral Calculus – Differential Equations)**

**Lecturer:** Tomislav Marošević, PhD, Assistant Professor

**Course description:**
2. Indefinite integral. Basic methods and techniques of integration (the method of substitution, integration by parts, integration of rational functions and integration of functions boiling down to integrals of rational functions, Euler substitution, binomial integral)
7. Ordinary differential equations of the second order. Some special types. Linear differential equation of the second order. Lagrange's method of variation of the constant. Linear differential equation of the second order with constant coefficients. Examples and applications (harmonic oscillator).

**Knowledge and skills acquired:**
At the introductory level students should be introduced to fundamental ideas and methods of mathematical analysis, which represent the basis for many other courses. During lectures basic terminology would be explained in an informal way, their utility and applications would be illustrated. During exercises students should master an adequate technique and become trained for solving concrete problems.

**Teaching methods:**
Students are obliged to attend both lectures and exercises.

**Student assessment:**
During the semester students can take several tests which replace the written examination. This ensures continuous assessment of students’ work and knowledge.

**Obligatory literature:**

**Recommended additional literature:**
2. S. Kurepa, Matematička analiza 1 (diferenciranje i integriranje), Tehnička knjiga, Zagreb, 1989.
4. B.P. Demidovič, Zadaci i rješeni primjeri iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, Zagreb, 1986.

**ECTS credits:**
5.5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises.

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after course completion, an analysis of students' final assessments and their overall success.

**P202 Fundamentals of Electrical Engineering II**

**Lecturer:**
Zdravko Valter, PhD, Full Professor

**Course description:**

**Knowledge and skills acquired:**
Student will acquire knowledge of phasors, linear DC and AC circuits solving, complex power calculation; calculation of the compensation and resonance; current, voltage and power calculation in three-phase networks; as well as basic knowledge of transformers.

**Teaching methods:**
Students are obliged to attend both lectures and exercises.

**Student assessment:**
Testing laboratory exercises, written and oral examinations

**Obligatory literature:**

**Recommended additional literature:**
1. V. Pinter, Osnove elektrotehnike I i II, Tehnička knjiga, Zagreb, 1994.

**ECTS credits:** 7 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination, possibility of passing the examination by passing periodic tests.

**Course assessment:**
Students' evaluation, analysis of their work in laboratory and grades scored in the written and the oral examination.

<table>
<thead>
<tr>
<th>P203</th>
<th>Physics II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer:</td>
<td>Josip Brana, PhD, Assistant Professor</td>
</tr>
</tbody>
</table>

**Course description:**
Gauss's law; Faraday's law; Ampere's law; Maxwell equations; electromagnetic field; energy of electromagnetic field; wave equation; Poynting vector; reflection; refraction; dispersion; absorption; geometrical optic; interference; Fraunhofer diffraction; polarisation; photo-metrics; black body radiation; Planck's law of radiation; photoelectric effect; Compton's effect; Rutherford and Bohr model of the atom; correspondence principle; dual nature of matter; electron diffraction; quantum numbers; spin; structure of atomic nucleus; radioactivity; fission; fusion.

**Knowledge and skills acquired:**
Students must acquire knowledge of concepts and mathematically formulated laws of electromagnetics, which enables them to understand electromagnetic phenomena in nature and technology as well as to solve simple problems.

**Teaching methods:**
Lectures, problem solving, laboratory practice.

**Student assessment:**
Laboratory test, written and oral examination.

**Obligatory literature:**
1. Valovi i optika, P. Kulišić i V. Henč-Bartolić;
2. Riješeni zadaci iz valova i optike, V. Henč-Bartolić i dr.

**Recommended additional literature:**
1. The Feynman Lectures on Physics, R. P. Feynman, R. B. Leighton, M. Sands; The Berkeley Physics Course.

**ECTS credits:** 5.5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises.

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after course completion. Permanent contact with students.
### P204 Electronics I

**Lecturer:** Tomislav Švedek, PhD, Full Professor

**Course description:**

**Knowledge and skills acquired:**
- Basic knowledge of semiconductor components, physical and electronics circuits
- Skills for analysis of semiconductor components and their adequate application in circuits

**Teaching methods:**
Lectures, problem solving, laboratory practice.

**Student assessment:**
Control tests, control of preparation for laboratory practice.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 6.5 ECTS credits

An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises.

**Course assessment:**
Examination, tests, discussion.

### P205 Programming II

**Lecturer:** Davor Antonić, PhD, Associate Professor

**Course description:**

**Knowledge and skills acquired:**

**Teaching methods:**
Lectures, laboratory practice.

**Student assessment:**
Laboratory practice evaluation, tests.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 5.5 ECTS credits

An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises.

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after course completion.

<table>
<thead>
<tr>
<th>PF101</th>
<th>English II – optional</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Branka Pavlović, MA, Senior Lecturer / Ivanka Ferčec, BA, Senior Lecturer</td>
</tr>
<tr>
<td><strong>Course description:</strong></td>
<td>Directions, personal data, opinion, places, position, expressing politeness, participation in longer conversations.</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>Basic communicative patterns aimed at acquiring basic language structures.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
<td>Lectures and language practice.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
<td>Written and oral assessment.</td>
</tr>
<tr>
<td><strong>Obligatory literature:</strong></td>
<td>1. The New Cambridge English Course, Book 1</td>
</tr>
<tr>
<td><strong>Recommended additional literature:</strong></td>
<td>1. Student's Book 2. Practice Book</td>
</tr>
<tr>
<td><strong>ECTS credits:</strong></td>
<td>0 ECTS credits</td>
</tr>
</tbody>
</table>

This course is optional and does not carry any ECTS credits.

**Examination methods:**
Written and oral examination.

**Course assessment:**
Students’ evaluation at the course end.

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**Semester 3**

<table>
<thead>
<tr>
<th>P301</th>
<th>Calculus III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Tomislav Marošević, PhD, Assistant Professor</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td></td>
</tr>
</tbody>
</table>
Students are introduced at the introductory level to basic ideas and methods of functions of several variables and functions of a complex variable, as a basis for other courses. Stress will be put on applications, and basic concepts are going to be analysed in an informal way. During exercises students should acquire certain techniques and be trained for solving concrete problems.

**Teaching methods:**
Students are obliged to attend both lectures and exercises.

**Student assessment:**
During the semester students can take several tests which replace the written examination. This ensures continuous assessment of students’ work and knowledge.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 6 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises. During the semester students can take several tests which replace the written examination.

**Course assessment:**
During the semester students can take several tests which enables continuous assessment and stimulation of students’ work. At the semester end an official questionnaire can be conducted pertaining to students’ evaluation of course teaching and lecturers participating in course teaching.

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**P302 Fundamentals of Power Engineering and Ecology**

**Lecturer:** Damir Šljivac PhD, Assistant Professor

**Course description:**
The importance of energy. Forms, sources and classification of energy. Non-renewable sources of energy (coal, oil, nuclear and geothermal energy). Renewable sources of energy (hydropower, biomass, wind power, solar energy etc.). Fundamental energy conversion. Conversion of primary energy forms into the final desired forms (conversion of chemical and nuclear energy into internal energy, internal energy into mechanical energy, potential water energy into mechanical energy, mechanical energy into electrical energy, direct conversions into electrical energy, conversion of electrical energy into other forms). Transmission energy. Transmission and distribution of energy forms. Storage of energy. Environmental impact of engineering products and processes. Industrial ecology. Life cycle assessment. Material flow analysis. Sustainable production and consumption systems.

**Knowledge and skills acquired:**
Getting acquaintance with the basic knowledge of power engineering and ecology.

**Teaching methods:**
Students are obliged to attend both lectures and exercises.

**Student assessment:**
Two control tests during the semester.

**Obligatory literature:**
2. H. Požar: Osnove energetike 1, 2 i 3, Školska knjiga, Zagreb, 1992

Recommended additional literature:

ECTS credits: 5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

Examination methods:
Written and oral examination.

Course assessment:
Poll. Interviews and tutorials with students.

<table>
<thead>
<tr>
<th>PRK301</th>
<th>Digital Electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer:</td>
<td>Željko Hocenski, PhD, Full Professor</td>
</tr>
</tbody>
</table>

Course description:

Knowledge and skills acquired:
Using lectures and individual work, student acquires basic knowledge in the field of digital integrated circuits and systems area, reasons of appearance, historical development, technological characteristics and production specifications. Logic functions, logic circuits, integrated logic circuits and simple applications in digital equipment and digital computers are presented. Student learns to recognize specific digital electronic problems and solving methods by using requirements specification in digital circuits and systems design. The skills in applying modern software tools for drawing logic diagrams, simulation and verification of logic circuits and systems are obtained. Design methods for logic circuits and structures by using integrated logic circuits, programmable logic circuits and microprocessor systems. Tools and instruments for development and diagnostic as logic probes, digital oscilloscopes, PAL and GAL programming tools, logic analysers, software tools for digital design (like MicroSim, OrCAD, Cadence etc).

Teaching methods:
- Lectures using multimedia presentations-Individual learning using CD ROM - E-learning using multimedia programmes like WebCT- Reading written papers-Exercises with solved problems- Individual problems solving and team work- Laboratory practice on ready-made models and construction of own simple circuits and devices.

Student assessment:
- Solving simple individual problems and encouraging team work on more complex problems
- On-line testing using e-learning tools like WebCT with questions data base
- Assessment of work in laboratory and estimation of design, construction, testing and presentation of own simple circuits and devices
- Oral examination with the student to define the final mark

Obligatory literature:
1. Ž. Hocenski, Digitalna elektronika, ETF Osijek, 2005.

Recommended additional literature:

**ECTS credits:** 6 ECTS credits

An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Knowledge assessment during the semester and individual problems solving and oral examination

**Course assessment:**
Lecture attendance, exercises and examinations during the semester.

<table>
<thead>
<tr>
<th>PR301</th>
<th>Object-oriented Programming</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Ninoslav Slavek, PhD, Assistant Professor</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>Basic knowledge of computer hardware. Basic knowledge of system and application software. Basic knowledge of programming in C and C++.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
<td>Lectures are not obligatory. Laboratory practice is obligatory.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
<td>Successfully completed laboratory exercise. The final examination consists of the written and the oral part.</td>
</tr>
</tbody>
</table>

**ECTS credits:** 6 ECTS credits

An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
At the semester end an official questionnaire can be conducted pertaining to students' evaluation of course teaching and lecturers participating in course teaching.

<table>
<thead>
<tr>
<th>PR501</th>
<th>Algorithms and Data Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Davor Antonić, PhD, Assistant Professor</td>
</tr>
<tr>
<td><strong>Course description:</strong></td>
<td></td>
</tr>
</tbody>
</table>

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Knowledge and skills acquired:
Algorithm development and implementation. Implementation of complex programming solutions in C programming language.

Teaching methods:
Lectures, laboratory practice.

Student assessment:
Laboratory practice evaluation, tests.

Obligatory literature:

Recommended additional literature:

ECTS credits: 7 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

Examination methods:
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises.

Course assessment:
An anonymous questionnaire filled in by students after course completion.

Semester 4

P401 Communication Networks

Lecturer: Drago Žagar, PhD, Associate Professor

Course description:

Knowledge and skills acquired:
Students will acquire the basic knowledge of communication networks, how to design network parameters for specific applications, and to determinate the network traffic characteristics.

Teaching methods:
Lectures, exercises, laboratory practice. In addition to classical learning methods, advanced learning methods will be used.

Student assessment:
Several tests during the semester, knowledge examination of laboratory practice, written and oral examination.

Obligatory literature:

**Recommended additional literature:**

**ECTS credits:** 6 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
Students’ examination by the end of the course.

<table>
<thead>
<tr>
<th>P402</th>
<th>Probability and Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Radoslav Galić, PhD, Full Professor</td>
</tr>
</tbody>
</table>

**Course description:**

**Knowledge and skills acquired:**
Introduction to statistical terminology and laws, construction of statistical models and their application in: engineering, process control, quality control and other problems. To prepare students for lifelong learning process and for the use of mathematical tools in application.

**Teaching methods:**
Students are obliged to attend both lectures and exercises.

**Student assessment:**
During the semester students can take several tests which replace the written examination. This ensures continuous assessment of students’ work and knowledge.

**Obligatory literature:**
1. R. Galić, Vjerojatnost, ETF, Osijek, 2004
2. R: Galić, Statistika, ETF, Osijek, 2004

**Recommended additional literature:**
1. Pavlić, Statistička teorija i primjena, Tehnička knjiga Zagreb, 2000
3. Ž. Pauše, Vjerojatnost i stohastički procesi, Školska knjiga, Zagreb, 2004

**ECTS credits:** 5.5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
The final examination consists of the written and the oral part. Students can take the final examination after the completion of lectures and exercises.

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after course completion, an analysis of students' final assessments and their overall success.
### P403  Signals and Systems

**Lecturer:** Hrvoje Babić, PhD, Full Professor

**Course description:**

**Knowledge and skills acquired:**
Students acquire knowledge necessary for analysis and modelling signals and systems.

**Teaching methods:**
Lectures, problem solving and laboratory practice.

**Student assessment:**
Control tests and tests in laboratory practice.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 5.5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
Students' questionnaire.

### PR401  Operating Systems

**Lecturer:** Goran Martinović, PhD, Assistant Professor

**Course description:**

**Knowledge and skills acquired:**
Understanding of operating systems principles. Advanced usage of modern operating systems. Overview and fundamentals of using software tools for development of simple and efficient applications according to operating system properties.

**Teaching methods:**
Lectures and laboratory practice are obligatory. Seminar is recommended, because it replaces part of the final examination.

**Student assessment:**
Continuous assessment of laboratory practice execution and homework (occasionally).

**Obligatory literature:**
Recommended additional literature:

ECTS credits: 5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

Examination methods:
Written and oral examination. Grades earned in laboratory practice, seminar and homework can replace the written examination and/or increase the final grade.

Course assessment:
During and at the end of the semester, students evaluate teaching successfulness by anonymous questionnaires. Lecturers who treat this course as a prerequisite for their courses are also welcome to give feedback regarding the knowledge acquired during this course.

PRK401 Information Theory
Lecturer: Franjo Jović, PhD, Full Professor

Course description:

Knowledge and skills acquired:

Teaching methods:
Lectures and laboratory practice are mandatory.

Student assessment:
Test examples from problem solving, oral examination.

Obligatory literature:

Recommended additional literature:

ECTS credits: 5.5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

Examination methods:
Test and oral examination.

Course assessment:
Students will be asked to participate in the evaluation of the course acceptance during and at the end of the course. Lecturers that consider this course mandatory are also invited to give their assessment.

P404 English I
Lecturer: Branka Pavlović, MA, Senior Lecturer / Ivanka Ferčec, BA, Lecturer

Course description:

**Knowledge and skills acquired:**
Reading and understanding texts from the field of electrical engineering, acquisition of new ESP vocabulary, broadening of knowledge pertaining to new structures typical of the English language (with special attention paid to Technical English), broadening and acquisition of new verbal and non-verbal communication patterns.

**Teaching methods:**
Lectures and exercises include terminology relative to fundamental fields of students' future profession, basic grammatical structures of the English language, as well as ESP characteristics necessary for basic speech acts.

**Student assessment:**
Individual homework or group task projects, regular communication, exercises, written and oral examination.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 2 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after course completion, an analysis of students' final assessments and their overall success.

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**Semester 5**

**PER501 Basics of Automatic Control**

**Lecturer:** Dražen Slišković, PhD, Assistant Professor

**Course description:**

**Knowledge and skills acquired:**
This course of study gives the basics of description of system dynamic behaviour, structural presentation of the basic elements and systems of automatic control, feedback phenomenon in the system, and feedback system stability analysis. Additionally, the students acquire basic knowledge about control algorithm design and how to evaluate the achieved control quality. In laboratory practice they gain skills in using basic software tools for control system analysis and synthesis (Matlab), and learn about the methodology of practical control system implementation.

**Teaching methods:**
Lectures, seminars and laboratory practice.

**Student assessment:**
Laboratory practice tests, written tests during the semester and the final examination.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 7 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
Students’ examination by the end of the course.

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**PRK501 Data Bases**

**Lecturer:** Ninoslav Slavek, PhD, Assistant Professor

**Course description:**
Information system. DB development. Data flow. Entity relationship model. Normalisation. 1,2,3, and other normal forms. DB management system. SQL.

**Knowledge and skills acquired:**
Basic knowledge of the data bases. Basic knowledge of the system and application software.

**Teaching methods:**
Lectures are optional, laboratory practice is obligatory

**Student assessment:**
Successful completion of laboratory practice, tests and oral examination.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 7 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
At the end of the semester an official enquiry can be conducted concerning students’ evaluation of the course lectures and lecturers participating in the course teaching

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**PRK502 Modelling and Simulation**

**Lecturer:** Franjo Jović, PhD, Full Professor

**Course description:**

Knowledge and skills acquired:
System approach to model design. Skills of modern modelling tools application. Modelling in various technology fields. Design of various model types and basic simulation skills.

Teaching methods:
Lectures and laboratory practice are mandatory.

Student assessment:
Design of verbal model, design of laboratory models, oral examination.

Obligatory literature:

Recommended additional literature:

ECTS credits: 6 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

Examination methods:
Test and oral examination.

Course assessment:
During and at the semester end students will be asked to evaluate the acceptability of the teaching methods. Course lecturers are asked to give their opinions as well.

PRK503 Computer Architecture
Lecturer: Željko Hocenski, PhD, Full Professor

Course description:

Knowledge and skills acquired:
Using lectures and individual work a student acquires knowledge of computer architecture, microprocessor and microprocessor systems, technological characteristics and production specifications. Students learn how to recognise specific computer design problems and solving methods. Skills of applying modern software tools for hardware and software design, simulation and verification are obtained. Design methods for logic circuits and structures by using integrated logic circuits, programmable logic circuits and microprocessor systems. Tools and instruments for development and diagnostic as logic probes, digital oscilloscopes, PAL and GAL programming tools, logic analysers, software tools for digital design (such as MicroSim, OrCAD, Cadence etc).

Teaching methods:
- Lectures using multimedia presentations
- Individual learning using CD ROM
- E-learning using multimedia programs like WebCT
- Reading papers
- Exercises with solved problems
- Individual problems solving and team work
- Exercises in laboratories on ready-made models and construction of students' own simple circuits and devices

**Student assessment:**
Solving simple individual problems and team work on more complex problems.
On-line testing using e-learning tools like WebCT with questions data base.
Assessment of laboratory work and estimation of design, construction, testing and presentation of students' own simple circuits and devices.
Discussion with a student to form the final grade.

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 7 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful completion of the course.

**Examination methods:**
Assessment of knowledge during lectures and individual problems solving and the oral examination.

**Course assessment:**
Attendance on lectures, exercises and examinations.

<table>
<thead>
<tr>
<th>P501</th>
<th>English II</th>
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<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Branka Pavlović, MA, Senior Lecturer / Ivanka Ferčec, BA, Senior Lecturer</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>Reading and understanding texts from the field of electrical engineering, acquisition of new ESP vocabulary, broadening of knowledge pertaining to new structures typical of the English language (with special attention paid to Technical English), broadening and acquisition of new verbal and non-verbal communication patterns.</td>
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<tr>
<td><strong>Teaching methods:</strong></td>
<td>Lectures and exercises include terminology relative to fundamental fields of students' future profession, basic grammatical structures of the English language, as well as ESP characteristics necessary for basic speech acts.</td>
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<tr>
<td><strong>Student assessment:</strong></td>
<td>Individual homework or group task projects, regular communication, exercises, written and oral examination.</td>
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<tr>
<td><strong>Recommended additional literature:</strong></td>
<td>1. R.Murphy, English Grammar in Use, CUP, Cambridge, 1995.</td>
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<tr>
<td><strong>ECTS credits:</strong></td>
<td>3 ECTS credits</td>
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<tr>
<td>An ECTS credit value has been added according to calculation of a neccessary time for studding and successful completion of the course.</td>
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<tr>
<td><strong>Examination methods:</strong></td>
<td>Written and oral examination.</td>
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</table>
Course assessment:
Conducting an anonymous questionnaire filled in by students after course completion, an analysis of students' final assessments and their overall success.

Semester 6

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Lecturer</th>
<th>Course Description</th>
<th>Knowledge and skills acquired</th>
<th>Teaching Methods</th>
<th>Student Assessment</th>
<th>Obligatory Literature</th>
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<td>Recommended additional literature:</td>
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<td>An ECTS credit value has been added according to calculation of time required for studying and successful course completion.</td>
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<td>Examination methods: Oral examination after the successful completion of the programme assignment.</td>
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<td>Course assessment: Conducting an anonymous questionnaire filled in by students after course completion</td>
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<td>Course assessment: Conducting an anonymous questionnaire filled in by students after course completion</td>
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</tbody>
</table>
Obligatory literature:

Recommended additional literature:

ECTS credits: 5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

Examination methods:
Oral examination after the successful completion of the programme assignment.

Course assessment:
Conducting an anonymous questionnaire filled in by students after course completion.

P603 Communication Skills

Lecturer: Antun Pintarić, PhD, Associate Professor

Course description:

Knowledge and skills acquired:
Learning various components of effective communication to improve student's presentation skills. Learn and practice effective listening and communication skills, public speaking skills, how to run effective meetings, work in groups, etc. Motivate students to use the tools and techniques immediately for improving their communication. Developing a clear technical writing style. Collect, organise and evaluate information and data effectively. Use appropriate formats for professional documents. How to recognize ethical dimensions of engineering communication, research, and practice.

Teaching methods:
Short lectures, exercises, tutorials, presentations

Student assessment:
Seminar paper, interactive communication tests

Obligatory literature:

Recommended additional literature:

ECTS credits: 5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

Examination methods:
All assessments will be carried out during the semester.

Course assessment:
Conducting an anonymous questionnaire filled in by students after course completion
### P604  English III

**Lecturer:** Branka Pavlović, MA, Senior Lecturer / Ivanka Ferčec, BA, Senior Lecturer

**Course description:**

**Knowledge and skills acquired:**
Reading and understanding texts from the field of computer science and communications, acquisition of new ESP vocabulary, broadening of knowledge pertaining to new structures typical of the English language, broadening and acquisition of new verbal and non-verbal communication patterns.

**Teaching methods:**
Lectures and exercises include terminology relative to fundamental fields of students' future profession, basic grammatical structures of the English language, as well as ESP characteristics necessary for basic speech acts.

**Student assessment:**
Individual homework or group task projects, regular communication, exercises, written and oral examination.

**Obligatory literature:**

**Recommended additional literature:**
2. Scientific and professional papers from the fields of computer science and communications.

**ECTS credits:** 5 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Written and oral examination.

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after course completion, an analysis of students' final assessments and their overall success.

### P605  Final work

**Lecturer:**

**Course description:**
Within the final work (project) framework and under supervision of their tutors students will solve problems pertaining to their respective fields of study at the Bachelor level. By completing their projects successfully students will prove that they can apply knowledge acquired at the Faculty to practical work.

**Knowledge and skills acquired:**
Knowledge and skills necessary for independent work as engineers.

**Teaching methods:**
Permanent contact with tutors.

**Student assessment:**
Working under supervision of the tutor.

**ECTS credits:** 10 ECTS credits
An ECTS credit value has been added according to calculation of time required for studying and successful course completion.

**Examination methods:**
Final presentation of the completed task.

**Course assessment:**
An anonymous questionnaire filled in by students after they complete their studies.