Second Cycle Degree in Computer Engineering (Master level)
Study Programme

Osijek, March 2005
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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.

Computer engineering studies programme profiles in the field of technical sciences which educates experts and potential young scientists for a very important field of technological and the overall social development.

Assessment of rationale with respect to labour market requirements - The labour market in Croatia shows that experts who complete their Master programme in computer engineering get employed easily on different workplaces in almost every company, institution and institute. According to some facts obtained from the Croatian Employment Service, there are practically no unemployed experts in the field of computer engineering. This fact can be attributed to a rather rapid development and application of computers and computer networks as well as new services offered by the network. This trend is going to be continued which is the main reason for starting a study of this profile. Computer and communication industry is continuously undergoing a process of rapid expansion which has created the need for a great number of engineers of the above mentioned profile. Master level of computer engineering, bachelor level of computer engineering and the doctorate will make a logically encircled whole of education of engineers in the field of computer engineering. Engineers who successfully complete the Master level programme in computer engineering, MSc in Computer Engineering, will have skills and knowledge needed to confront complex research and development problems as well as application of new technologies. Further social and economic development of modern society as well as Croatia is inconceivable without computer engineering and telecommunications which are present in every segment of human life.

Today, computer engineering is and will be even more an interdisciplinary component connecting different scientific fields and will be the initiator of further development and progress of human race. Highly educated experts in computer engineering educated at the Faculty of Electrical Engineering in Osijek have found and will find their place at the labour market.

Connection with modern scientific ideas and/or skills based on them - The modern study of 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 communications industry, which is supported by most recent ideas of the scientific field of electrical engineering. The initiator of the development and researches 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. Continuous and first-rate scientific work carried out at the Faculty will ensure outgoing experts of high quality in the scientific field of computer engineering.

Comparability with programmes of other eminent foreign higher education institutions – The Master level of computer engineering at the Faculty of Electrical Engineering in Osijek is based on study programmes of other distinguished European universities. Furthermore, it can be compared with the Master level programme in computer engineering at TU Vienna. The common base is the study duration of two years during which students can acquire the minimum of 120 ECTS credits. The professional qualification awarded after the successful completion of second cycle studies is Master of Science in Computer Engineering, indicating the field of specialisation. Some advanced knowledge of fundamental course units of specific fields and elective modules/course units where students can acquire some additional knowledge of a specific field represent the basis for this study.

b) Experience in the implementation of equivalent or similar programmes

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

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

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

d) Faculty overtness towards mobility of students

Within the scope of the Master level of computer engineering, students from other universities/faculties will be given an opportunity to study particular courses/modules or 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. Candidates that have completed the adequate degree at some other related technical and natural science faculties will be enabled to enrol in the Master level study programme of electrical engineering at the Faculty of Electrical Engineering in Osijek. A high level of students’ mobility will be enabled in this way. 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:

Second cycle degree in computer engineering.

2.2. Institution:

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

2.3. Duration of study:

Master level study programme in computer engineering would take 2 years and a student should acquire a minimum of 120 ECTS credits.

2.4. Entry requirements:

Prior to their enrolment in the second cycle degree (Master of Science) study programme in computer engineering applicants should successfully complete the first cycle degree (Bachelor of Science) study programme in electrical or computer engineering. It would also be possible for applicants who graduated from other corresponding engineering and natural science study programmes to enter the second cycle, taking a compulsory course unit or module enhancing fundamental courses in electrical and computer engineering indispensable to a successful continuation of the study programme, whereby first cycle courses would be acknowledged as electives. In this way a high level of student mobility within natural and engineering sciences would be obtained.

2.5. Qualification attributes or competencies computer engineering graduates would achieve and positions they would be qualified for:

Upon graduation from the Faculty of Electrical Engineering in Osijek MSc degree holders in Computer Engineering would acquire knowledge and skills to carry out investigations, design, develop and apply various solutions in the field of computing relative to industry, the private and public sector, banking, transport, environment protection, etc. MSc in CE would learn how to identify, formulate, survey electronic and print literature and solve complex engineering tasks, whereby he/she would draw important conclusions applying first of all basic mathematical principles and engineering sciences. In addition, they would learn how to design solutions to complex engineering tasks, as well as systems, components and processes corresponding to specific demands, paying special attention to public health care, security, cultural and societal values, and environment protection. MSc degree holders in CE would be able to investigate complex problems, including experimental design, data analysis and interpretation, as well as synthesis of all information by creating effective judgement. Furthermore, they would be able to create, select and apply respective techniques, resources and modern engineering tools, including prediction and modelling, to complex engineering activities, understanding at the same time limits such tools might have.
Second cycle degree holders (MSc) in computer engineering, branch: Computer Engineering in Process Control, would acquire the necessary knowledge and abilities to:

- create, develop and maintain modern microprocessor and computer systems;
- develop and update system and application software for standard and specialised computer equipment;
- expand functional hardware and software capabilities of modern computer systems;
- develop, adapt and implement modern computer technologies in different fields of application;
- work efficiently, which involves problem identification, user requirements specification, computer system analysis, design and development, accompanied by appropriate engineering documentation.
- study principles of operation and mathematical description as well as construction and description of measuring, control, and other elements of automation systems;
- research, develop and apply the analysis resp. synthesis method of control systems, as well as methods of mathematical modelling, computer simulation, and optimisation of various systems;
- develop, design and apply hardware and software support for computer controlled engineering processes;
- develop, design, implement, test and maintain automated technological, power and transport plants, processes and facilities;
- apply methods for testing, documentation and evaluation of automation systems.

In addition to first cycle degree holders (BSc) in Computer Engineering who graduated from the Faculty of Electrical Engineering in Osijek, graduates from other first cycle degree granting institutions (universities, departments) in computer engineering would be able to enrol in the second cycle study programme in computer engineering (leading to an MSc degree). Furthermore, first cycle degree holders (BSc) in electrical engineering and other engineering and natural study programmes encompassing fundamental knowledge of mathematics, physics and computer engineering, would also be able to enrol in the MSc study programme. However, a special course module would be organised for such students, aiming at acquiring the knowledge necessary for their studies.

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

After the successful completion of the second cycle study programme (Master level) in computer engineering graduates would be awarded the title **Master of Science in Computer Engineering**, branch: **Computer Engineering in Process Control**.
3. Program Description

3.1. Second Cycle Degree Study Programme in Computer Engineering-
branch: Computer Engineering in Process Control - obligatory and elective courses

Curriculum of the Second cycle degree study programme 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: D <B><x><y><z>

where: D – one-letter symbol for the second-cycle degree study programme
B – one- or multi-letter symbol for the study programme or an elective course
  R – Second-cycle degree study programme in computer engineering
  E – Electrical engineering courses
  K – Communications courses
  I – Elective courses

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

Workload notation

P - lectures
A – problem solving
L – laboratory practice
K - design/construction exercises
### 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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<tr>
<td>DRIK101</td>
<td>Radoslav Galić, PhD, Associate Professor</td>
<td>Discrete Mathematics</td>
<td>2 2 0 0 4</td>
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<td>DR101</td>
<td>Željko Hocenski PhD, Associate Professor</td>
<td>Computer System Design</td>
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<td>DR102</td>
<td>Željko Hocenski PhD, Associate Professor, Robert Cupec PhD</td>
<td>Control of Dynamic Systems</td>
<td>3 1 1 0 5</td>
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<td>DKR101</td>
<td>Drago Žagar PhD, Assistant Professor</td>
<td>Computer Networks</td>
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<td>5</td>
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<td>DRIK102</td>
<td>Franjo Jović PhD, Full Professor</td>
<td>Automation and Formal Languages</td>
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**Electives:**

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<th>ECTS credits</th>
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<td>DIR101</td>
<td>Zdravko Valter PhD, Full Professor, Robert Cupec PhD</td>
<td>Elements of Automation</td>
<td>2 1 1 0 4</td>
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<td>DIR102</td>
<td>Ivica Crnković PhD, Full Professor</td>
<td>Software System Design and Modelling</td>
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<td>DIR103</td>
<td>Prof.dr.sc. T. Švedek</td>
<td>Biomedical electronics</td>
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<td>DKIR101</td>
<td>Snježana Rimac-Drlje PhD, Assistant Professor</td>
<td>Digital Signal Processing</td>
<td>2 1 1 0 4</td>
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<tr>
<td>DIKR101</td>
<td>Tomislav Švedek PhD, Full Professor</td>
<td>Microelectronics</td>
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**Optional courses:**

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<td>DF101</td>
<td>Branka Pavlović, MA, Senior Lecturer, Ivanka Ferčev BA, Lecturer</td>
<td>English</td>
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<td>DF102</td>
<td>Branka Pavlović, MA, Senior Lecturer, Ivanka Ferčev BA, Lecturer</td>
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<td>DR201</td>
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<td>System Programming</td>
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<td>DR202</td>
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<td>DRIK201</td>
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<td>Real-time Computer Systems</td>
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**Elective course II**

**TOTAL:** 12 2 6 0 24 5 30

**Electives:**

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<td>DIR201</td>
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<td>Basics of Robotics</td>
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<td>DIR204</td>
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<td>Software Quality Assurance</td>
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<td>DKR201</td>
<td>Snježana Rimac-Drlje PhD, Assistant Professor</td>
<td>Multimedia Systems</td>
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<td>DIER201</td>
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<td>Process Measurement</td>
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<td>DIKR201</td>
<td>Vlado Majstorović PhD, Full Professor</td>
<td>Information Technology and Management</td>
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**Optional course:**

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<tr>
<td>DF201</td>
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### 2nd Year
#### Semester 3

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<td>DR301</td>
<td>Davor Antonić PhD, Assistant Professor</td>
<td>Industrial Informatics</td>
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<td>DR302</td>
<td>Željko Hocenski PhD, Associate Professor</td>
<td>Computer System Reliability and Diagnostics</td>
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<td>Goran Martinović PhD, Assistant Professor</td>
<td>Distributed Computer Systems</td>
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Elective course III 4 1 5
Elective course IV 4 1 5

**TOTAL:** 9 4 3 0 24 5 30

Elective:

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<td>DIR301</td>
<td>Franjo Jović PhD, Full Professor</td>
<td>Expert Systems</td>
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<td>DIR302</td>
<td>Davor Antonić PhD, Assistant Professor, Robert Cupec PhD</td>
<td>Robot Vision</td>
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<td>Ninoslav Slavek PhD, Assistant Professor</td>
<td>Software Engineering</td>
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<td>DIR304</td>
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<td>Automatic Electric Drives</td>
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<tr>
<td>DIKR301</td>
<td>Drago Žagar PhD, Assistant Professor</td>
<td>Communication Protocols</td>
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<td>DIKR301</td>
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<td>Network Security</td>
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<td>DIKR302</td>
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<tr>
<td>DI301</td>
<td>Ante Lauc PhD, Full Professor</td>
<td>Science, Technology, Society</td>
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### Semester 4

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<td>Management</td>
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<td>D402</td>
<td>Ninoslav Slavek PhD, Assistant Professor, Vedran Boras PhD, Assistant Professor</td>
<td>Project Management</td>
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<td>Introduction to Research Work</td>
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**TOTAL:** 6 3 0 13 25 5 30
3.2. Second Cycle Degree in Computer Engineering (Master level) – Courses description

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<tr>
<td><strong>DR101</strong></td>
<td><strong>Discrete Mathematics</strong></td>
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<tr>
<td><strong>Lecturer:</strong></td>
<td>Radoslav Galić, PhD, Associate Professor</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>Students get acquainted with the fundamental linear algebra calculation and algebra structures which are the basis for many other courses. During the lectures and practice the basic concepts will be discussed and by using the examples their efficiency and application will be illustrated.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
<td>Students are obliged to attend both lectures and exercises.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
<td>During the semester students could take several tests which replace the written examination. This ensures continuous assessment of students’ work and knowledge.</td>
</tr>
</tbody>
</table>
| **Recommended additional literature:** | 1. D. Veljan, Kombinatorna I diskretna matematika, Algoritam, Zagreb, 2001.  
| **ECTS credits:** | 5 ECTS credits  |
| **An ECTS credit value has been added according to calculation of required time 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 practice.  |
| **Course assessment:** | Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students’ final assessments and their overall success.  |

| DR101 | **Computer System Design**  |
| **Lecturer:** | Željko Hocenski PhD, Associate Professor  |
| **Knowledge and skills acquired:** | Using lectures and individual work student gets knowledge about computer, microprocessor and microprocessor systems design. Students learn to recognize specific microprocessor, microcontroller and computer design problems.  |
and solving methods. The skills of applying modern software tools for hardware and software design, simulation and verification are obtained. Tools and instruments for development and diagnostics are presented like digital oscilloscopes, programming tools, logic analyzers, 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 programs like WebCT
- Reading from written papers
- Exercises with solved problems
- Individual problems solving and team work
- Laboratory practice on completed models and construction of simple own circuits and devices

**Student assessment:**
- Simple individual problem solving and team work using more complex problems
- On-line testing using e-learning tools like WebCT with questions data base
- Estimation of work in laboratory and estimation of design, construction, testing and presentation of own simple circuits and devices
- Talk with a student to get final appreciation

**Obligatory literature:**

**Recommended additional literature:**

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

**Examination methods:**
Evaluation of knowledge during lectures and individual problem solving and oral examination

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

<table>
<thead>
<tr>
<th>DR102</th>
<th>Control of Dynamic Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Željko Hocenski PhD, Associate Professor, Robert Cupec PhD</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>Basic knowledge needed for creating mathematical models of several typical processes in industry. Knowledge of discrete control systems. Knowledge of methods which can be used for design of continuous and discrete controllers based on linear mathematical process model. Bases of advanced control methods. Basics of process identification. Bases of nonlinear control systems.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
<td>Lectures, seminars and laboratory practice.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
<td>Laboratory practice tests, written tests during semester and final examination.</td>
</tr>
<tr>
<td><strong>Obligatory literature:</strong></td>
<td>1. N. Perić, Automatsko upravljanje - predavanja, Zavodška skripta, FER, Zagreb, 2004.</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>ECTS credits:</strong></td>
<td>5.5 ECTS credits</td>
</tr>
<tr>
<td><strong>Exam examination methods:</strong></td>
<td>An ECTS credit value has been added according to calculation of required time for studying and successful course completion.</td>
</tr>
<tr>
<td><strong>Course assessment:</strong></td>
<td>Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DKR101</strong></th>
<th><strong>Computer Networks</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Drago Žagar PhD, Assistant Professor</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>The students will get the knowledge necessary to use and design the computer networks. By successful acquisition of this topic the students will be able to project the basic computer network parameters.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
<td>Lectures, exercises, laboratory practice. Besides the classical learning methods, the advanced teaching methods, E-learning and demonstrations will be used.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
<td>Several tests during the semester, laboratory practice examination, written and oral examination.</td>
</tr>
<tr>
<td><strong>ECTS credits:</strong></td>
<td>5 ECTS credits</td>
</tr>
<tr>
<td><strong>Exam examination methods:</strong></td>
<td>An ECTS credit value has been added according to calculation required time for studying and successful course completion.</td>
</tr>
<tr>
<td><strong>Course assessment:</strong></td>
<td>Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success.</td>
</tr>
</tbody>
</table>
# DRIK102  Automation and Formal Languages

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

**Course description:**

**Knowledge and skills acquired:**
Development of simple lexer and parser. Validity analysis of a context free programme.

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

**Student assessment:**
Seminar completion, oral examination.

**Obligatory literature:**

**Recommended additional literature:**

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

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

**Course assessment:**
Conducting an anonymous questionnaire organized and used for lecturer verification and validation. Lecturers who have this course as mandatory will be contacted as well.

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## Electives – Semester 1

One elective course has to be chosen. Due to the set standards of student workload to 30 ECTS credits, every elective course carries 4.5 ECTS credits. A student who enrolls a larger number of elective courses is not awarded additional ECTS credits.

# DIR101  Elements of Automation

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

**Course description:**

**Knowledge and skills acquired:**
Knowledge of principles, properties and methods of application of sensors and actuators used in automatic control. Knowledge needed for integration of sensors and actuators in control systems.

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

**Student assessment:**
Laboratory practice tests and final examination.

**Obligatory literature:**
Recommended additional literature:


ECTS credits: 4 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

Examination methods:
Oral examination

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

DIR102 | Software System Design and Modelling

Lecturer: Ivica Crnković PhD, Full Professor

Course description:
Software System Modelling gives students insights in principles for modelling and designing large software systems. Most of today’s software systems are large and complex systems which require specification on a higher abstraction level than on a programming language level. The course will give an introduction to an overall, conceptual design, i.e. software architecture. It will give the students theoretical bases for software system designing, architectural definition languages and UML, design patterns, model-based and component-based development. In addition to this the students will acquire the practical knowledge through a set of laboratory practice and projects.

Knowledge and skills acquired:
Theoretical and practical knowledge of analysis and design of software systems. Insights into different architectural definition languages, UML. Writing technical reports.

Teaching methods:
Lectures, laboratory practice, projects

Student assessment:
Practice, project reports

Obligatory literature:

Recommended additional literature:

ECTS credits: 4 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

Examination methods:
Laboratory reports, project reports and seminars.

Course assessment:
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success.
**DIR103 | Biomedical electronics**

*Lecturer:* Tomislav Švedek PhD, Full Professor

**Course description:**

**Knowledge and skills acquired:**
Students will be introduced to biomedical electrical equipment testing for safety measures according to IES safety standards. They will acquire basic knowledge pertaining to biomedicine preparing them for work in interdisciplinary environments.

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

**Student assessment:**
Student assessment consists of laboratory practice tests and oral examination.

**Obligatory literature:**

**Recommended additional literature:**
1. -

**ECTS credits:** 4.5 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

**Examination methods:**
Oral examination.

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

---

**DK1R101 | Digital Signal Processing**

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

**Course description:**

**Knowledge and skills acquired:**
Students will be introduced to the basic techniques for digital signal processing, the FFT applications, as well as the z-transform applications. They will acquire practical knowledge of the digital filter design and of the signal processing in time and frequency domain.

**Teaching methods:**
Lecture (2 hours per week), problem solving (1 hour), laboratory practice (1 hour)

**Student assessment:**
Laboratory practice testing, written and oral examinations

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 4.5 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.
Examination methods:
The final examination consisting of written and the oral part.

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

<table>
<thead>
<tr>
<th>DIKR101</th>
<th>Microelectronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer: Tomislav Švedek PhD, Full Professor</td>
<td></td>
</tr>
</tbody>
</table>

Course description:

Knowledge and skills acquired:
- basic knowledge of integrated circuits production technologies
- basic skills of analog and digital circuit design in one of microelectronics technologies
- skills in leading the IC design projects: from technical requirements, through design of integral sub-circuits, to methods of the circuit testing

Teaching methods:
Lectures, project.

Student assessment:
Written theoretical paper and contribution in IC project design team

Obligatory literature:

Recommended additional literature:
1. P.Biljanović, Mikroelektronika, Školska knjiga, Zagreb, 1983

ECTS credits: 4.5 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

Examination methods:
Tests, discussion, oral examination

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

<table>
<thead>
<tr>
<th>DF101</th>
<th>English - Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer: Branka Pavlović, MA, Senior Lecturer / Ivanka Ferčec, BA, Lecturer</td>
<td></td>
</tr>
</tbody>
</table>

Course description:

Knowledge and skills acquired:
Reading and understanding texts from the fields of 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 specific fields of students’ future profession, understanding and acquisition of specific grammatical structures of the English language, as well as ESP characteristics necessary for basic speech acts, introduction to techniques and methods of reading and writing abstracts as well as
### Fundamentals of Business Communication

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

**Obligatory literature:**

**Recommended additional literature:**
2. Scientific and professional journals from the field of communications.

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

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

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### DF102 German - optional

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

**Course description:**

**Knowledge and skills acquired:**
Reading comprehension of electrical engineering texts, acquiring new vocabulary and new syntactic structures, acquiring new communicative patterns.

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

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

**Obligatory literature:**
1. V. Grujoski: Deutsche Fachtexte aus der Elektrotechnik, Sveučilišna tiskara, Zagreb, 1996.

**Recommended additional literature:**

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

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

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### Semester 2

### DR201 System Programming

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

**Course description:**

**Knowledge and skills acquired:**
Knowledge of operating systems possibilities and restrictions, as well as user and environment requirements. Design of reasonably complex, efficient system and application software by using modern programming approaches and tools.

**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 and homework (occasionally).

**Obligatory literature:**

**Recommended additional literature:**

**ECTS credits:** 6.5 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

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

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success. Lecturers who treat this course a prerequisite for their courses are also welcome to give feedback about the knowledge acquired during this course.

**DR202 Intelligent Systems**

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

**Course description:**

**Knowledge and skills acquired:**

**Teaching methods:**
Participating to lectures and exercises is mandatory.

**Student assessment:**
Seminar completion, oral examination.

**Obligatory literature:**

**Recommended additional literature:**

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

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success. Lecturers that have this course as mandatory will be contacted as well.

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**DRIK201**  
**Real-time Computer Systems**

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

**Course description:**

**Knowledge and skills acquired:**
Understanding of timing, as well as other important boundaries by application of today's computer systems. Knowledge and use of relevant methodologies and development tools which enable an increase of system performance.

**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 and homework (occasionally).

**Obligatory literature:**
4. Selected papers and lecturer's www site.

**Recommended additional literature:**

**ECTS credits:** 6.5 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

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

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success. Lecturers who treat this course a prerequisite for their courses are also welcome to give feedback about the knowledge acquired during this course.
DKR201  Internet Programming

Lecturer:  Davor Antonić PhD, Assistant Professor

Course description:

Knowledge and skills acquired:
Fundamentals of the Internet and advanced web programming. Design and implementation of web contents on client and server side by using new technologies.

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.

Obligatory literature:

Recommended additional literature:

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

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

Course assessment:
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students’ final assessments and their overall success.
### Electives – Semester 2

One elective course has to be chosen. Due to the set standards of student workload to 30 ECTS credits, every elective course carries 5 ECTS credits. A student who enrols a larger number of elective courses is not awarded additional ECTS credits.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIR201</td>
<td>Basics of Robotics</td>
<td>Davor Antonić PhD, Assistant Professor, Robert Cupec PhD,</td>
</tr>
</tbody>
</table>

**Course description:**

**Knowledge and skills acquired:**
Knowledge needed for creating kinematic and dynamic model of the robot manipulator based on its mechanical specifications and application of these models for manipulator control. Bases of mobile robotics. Bases of robot motion planning. Knowledge of sensors used in robotics and basic principles of robot vision.

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

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

**Obligatory literature:**
1. Z. Kovačić, S. Bogdan, V. Krajčić, Osnove robotike, Graphis Zagreb, 2002.

**Recommended additional literature:**

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

**Examination methods:**
Final examination consists of the written and the oral examination, or of oral examination only for those students who have successfully solved the written tests during semester.

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIR202</td>
<td>Process Identification</td>
<td>Zdravko Valter PhD, Full Professor, Robert Cupec PhD,</td>
</tr>
</tbody>
</table>

**Course description:**

**Knowledge and skills acquired:**
Knowledge which can be used for building of a dynamic process model based on data measurement. Knowledge needed for application of the process identification methods in adaptive control. Practical experience with software
tools for process identification.

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

**Student assessment:**
Laboratory practice tests and final examination.

**Obligatory literature:**

**Recommended additional literature:**

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

**Examination methods:**
Oral examination

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

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**DIR203 Plant Data Based Modelling**

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

**Course description:**

**Knowledge and skills acquired:**
This course of study gives the bases of methods for extraction of process knowledge contained in historical plant data, as well as methods for prediction model building based on this knowledge. In the laboratory practice they gain skills in using available software tools for data analysis and processing, as well as tools for data based modelling.

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

**Student assessment:**
Laboratory practice tests and final examination.

**Obligatory literature:**

**Recommended additional literature:**

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

**Examination methods:**
Final examination consists of the written and the oral examination.

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students'
**DIR204  Software Quality Assurance**

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

**Course description:**

**Knowledge and skills acquired:**
Basic knowledge of the computer hardware. Basic knowledge of the system and application software. Basic knowledge of software quality.

**Teaching methods:**
Lectures are not obligated, laboratory work is obligated.

**Student assessment:**
Well finished laboratory practice. Practice can complete test and oral examination.

**Obligatory literature:**

**Recommended additional literature:**

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

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

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

**DKIR201  Multimedia Systems**

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

**Course description:**

**Knowledge and skills acquired:**
Students will acquire a knowledge of standards for speech, audio and video coding. They will become familiar with multimedia systems and parameters which influence the multimedia transmission quality. Students will make programmes for multimedia processing and will deal with DSP implementation in multimedia applications.

**Teaching methods:**
Lecture (3 hours per week), laboratory practice (1 hour), constructive practice (1 hour)

**Student assessment:**
Laboratory practice testing, written and oral examinations.

**Obligatory literature:**

**Recommended additional literature:**

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

**Examination methods:**
Project, written and oral examination.

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

<table>
<thead>
<tr>
<th>DIER201</th>
<th>Process Measurement</th>
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<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Zdravko Valter PhD, Full Professor</td>
</tr>
</tbody>
</table>

**Course description:**

**Knowledge and skills acquired:**
Knowledge necessary for understanding of dynamic dimensions measurement. Getting acquainted with measurement system applications in the industrial processes automation.

**Teaching methods:**
Lectures, laboratory practice and visit to some industrial plants.

**Student assessment:**
Creating of several simple application programmes in LabVIEW

**Obligatory literature:**

**Recommended additional literature:**

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

**Examination methods:**
Seminar paper and oral examination

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students’ final assessments and their overall success.
DIKR201 Information Technology and Management

Lecturer: Vlado Majstorović PhD, Full Professor

Course description:

Knowledge and skills acquired:
Getting acquainted with the fundamental aspects of information technology in terms of creating, development and business possibilities in the global world with special reference to its possibilities and application in the entrepreneurship field.

Teaching methods:
Lectures, problem solving, practice.

Student assessment:
Control tests.

Obligatory literature:

Recommended additional literature:

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

Examination methods:
Seminar, tests, discussion and the oral examination.

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

DF201 English - Optional

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

Course description:

Knowledge and skills acquired:
Reading and understanding texts from the field of computer science, 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 specific fields of students' future profession, understanding and acquisition of specific grammatical structures of the English language, as well as ESP characteristics necessary for basic speech acts, introduction to techniques and methods of reading and writing abstracts.

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

**Obligatory literature:**

**Recommended additional literature:**
2. Professional journals from the field of computer science.

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

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

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

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**DF202**  
**German - optional**

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

**Course description:**

**Knowledge and skills acquired:**
Reading comprehension of electrical engineering text, acquiring new vocabulary and new syntactic structures, acquiring new communicative patterns.

**Teaching methods:**
Lectures and language practice include terminology referring to specific fields of students' future profession, understanding and acquisition of specific grammatical structures of German language, as well as ESP characteristics necessary for basic speech acts, introduction to techniques and methods of reading and writing abstracts.

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

**Obligatory literature:**
1. V. Grujoski: Deutsche Fachtexte aus der Elektrotechnik, Sveučilišna tiskara, Zagreb, 1996.

**Recommended additional literature:**

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

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

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

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**Semester 3**

**DR301**  
**Industrial Informatics**

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

**Course description:**
Knowledge and skills acquired:
This course of study introduces students to the tasks of the production control, and building of automation system. In the laboratory practice students gain knowledge of PLC programming and a methodology of practical control system implementation.

Teaching methods:
Lectures, seminars and laboratory practice.

Student assessment:
Laboratory practice tests and final examination.

Obligatory literature:

Recommended additional literature:

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

Examination methods:
Final examination consists of the written and the oral examination

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

DR302 Computer System Reliability and Diagnostics

Lecturer: Željko Hocenski PhD, Associate Professor

Course description:

Knowledge and skills acquired:
Using lectures and individual work students get knowledge of components, digital circuits, devices and system reliability. Students learn about methods and tools for diagnostics and testing of components, digital circuits and systems. Software tools are presented for reliability prediction and calculating of components and systems, fault simulation and prediction as RELEX etc. Students get knowledge of fault avoidance and fault tolerant design.

Teaching methods:
- Lectures using multimedia presentations-Individual learning using CD ROM
- E-learning using multimedia programmes
- Reading from written papers
- Problem solving exercises
- Individual problem solving and team work on problems in components and system reliability and design to get reliability increase and fault tolerance
- Laboratory practice to get experience in design and testing of dependable and reliable fault tolerant circuits and systems.

Student assessment:
-Simple individual problem solving and team work on more complex problems
-On-line testing using e-learning tools like WebCT with questions data base
Estimation of work in laboratory and estimation of design, construction, testing and presentation of own simple circuits and devices

Talk with a student to get final appreciation

### Obligatory literature:

### Recommended additional literature:

### ECTS credits: 6.5 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

### Examination methods:
Evaluation of knowledge during learning and individual problem solving and oral examination.

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

### DRIK301 Distributed Computer Systems

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

#### Course description:

#### Knowledge and skills acquired:
Insight into and fundamental knowledge of properties, prerequisites and ways of design, use and evaluation of distributed computer systems. Overview and use of system and software tools, as well as development of rather simple application programmes in a distributed computer system.

#### 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 and homework (occasionally).

#### Obligatory literature:

#### Recommended additional literature:
**ECTS credits:** 6.5 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

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

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students’ final assessments and their overall success. Lecturers who treat this course a prerequisite for their courses are also welcome to give feedback about the knowledge acquired during this course.

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**Electives – Semester 3**

One elective course has to be chosen. Due to the set standards of student workload to 30 ECTS credits, every elective course carries 5 ECTS credits. A student who enrols a larger number of elective courses is not awarded additional ECTS credits.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIR301</td>
<td>Expert Systems</td>
<td>Franjo Jović PhD, Full Professor</td>
</tr>
<tr>
<td></td>
<td><strong>Course description:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Knowledge and skills acquired:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skills in design and application of the small expert system up to 200 rules. System testing.</td>
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<tr>
<td></td>
<td><strong>Teaching methods:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Participating to lectures and practice is mandatory.</td>
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</tr>
<tr>
<td></td>
<td><strong>Student assessment:</strong></td>
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</tr>
<tr>
<td></td>
<td>Expert system completion, oral examination.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Obligatory literature:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Recommended additional literature:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Trans. IEEE on Man Machine and Cybernetics</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ECTS credits:</strong> 5 ECTS credits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>An ECTS credit value has been added according to calculation of required time for studying and successful course completion.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Examination methods:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test and oral examination.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Course assessment:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students’ final assessments and their overall success. Lecturers that have this course as mandatory will be contacted as well.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIR302</td>
<td>Robot Vision</td>
<td>Davor Antonić PhD, Assistant Professor, Robert Cupec PhD,</td>
</tr>
<tr>
<td></td>
<td><strong>Course description:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Knowledge and skills acquired:</strong></td>
<td></td>
</tr>
</tbody>
</table>
Introduction to computer vision and its application in robotics. Knowledge needed for development of a computer vision system which enables manipulation with objects in robotized production systems and navigation of mobile robots in their operating environments.

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

**Student assessment:**
Laboratory practice tests, seminar and final examination.

**Obligatory literature:**

**Recommended additional literature:**

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

**Examination methods:**
Seminar and oral examination

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

<table>
<thead>
<tr>
<th>DIR303</th>
<th>Software Engineering</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 the computer hardware. Basic knowledge of the system and application software. Basic knowledge of software quality</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>Well finished laboratory practice. Practice can complete test and oral examination.</td>
</tr>
<tr>
<td><strong>ECTS credits:</strong></td>
<td>5 ECTS credits</td>
</tr>
</tbody>
</table>
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

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

**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success.
## DIR305 Automatic Electric Drives

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

**Course description:**

**Knowledge and skills acquired:**
Knowledge necessary for understanding working of an automatic electric drive and getting acquainted with electric drive applications in the industrial automation processes.

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

**Student assessment:**
Making laboratory reports

**Obligatory literature:**

**Recommended additional literature:**

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

**Examination methods:**
Seminar work and oral examination

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

## DKIR301 Communication Protocols

**Lecturer:** Drago Žagar PhD, Assistant Professor

**Course description:**

**Knowledge and skills acquired:**
The students will get the knowledge necessary to use, analyse and design the communication protocols.

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

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

**Obligatory literature:**
### DIKR301  Network Security

**Lecturer:** Drago Žagar PhD, Assistant Professor

**Course description:**

**Knowledge and skills acquired:**
The students will get the knowledge necessary to use cryptographic methods and other security mechanisms in communication and computer networks.

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

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

**Obligatory literature:**

**Recommended additional literature:**

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

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

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

### DIKR302  Optical Communications

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

**Course description:**

**Knowledge and skills acquired:**
To get the knowledge about bases of the optoelectrical communication systems.
Teaching methods:
Students are obliged to attend both lectures and practice.

Student assessment:
During the semester students could 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 required time for studying and successful course completion.

Examination methods:
Seminar paper and oral examination.

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

DIER301 Computer Integrated Products Development

Lecturer: Milenko Obad PhD, Associate Professor

Course description:

Knowledge and skills acquired:
Getting acquainted with methodologies and principles in computer integrated product development and with digital product model use in the total development cycle, also with Computer Aided integration methodologies in the development product cycle, as well as with the simulation methods and virtual product development, and intelligence support in the product development.

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

Student assessment:
During the semester students could 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 required time for studying and successful course completion.

Examination methods:
Seminar paper and oral examination.
**Course assessment:**
Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students’ final assessments and their overall success.

### DI301 Science, Technology, Society

**Lecturer:** Ante Lauc PhD, Full Professor

**Course description:**

Introduction: science, technique/technology, society; - Sociology of Science; History, sociology of scientific cognition, social construction of science and technology; - Science: logic and structure of science, fundamental and applied sciences, paradigm in science, history of science and scientific institutions. – Technique and technology: definition, logics and structure of technique, division of technique into disciplines; - Modern science & technology: science and technology as a social matrices of technologies and social values; - Theory of economic and technological determinism, energy/ ecology, social construction of technological systems; - Scientific discoveries, technical inventions and technological innovations; social preconditions and consequences of scientific discoveries, invention as a social process. - Theories about society, social stratification, education and society, technological effects on society, technological accidents, social control of technology. - Profession: definition, social characteristics of professional, professions as social groups, ethical problems of professions; - Elements of profession: role of knowledge, professional monopole, recognition of profession, professional organizations, professional ethics and social responsibility.

Seminar topics from lectures are given in more details:
- Through discussion on examples of scientific discoveries and technical innovations (6 hours), and getting more familiar with
- The scientific information system in Croatia and worldwide (2 hours);
- On-line search of databases (3 hours);
- Cd-roms (1 hour);
- Current contents and similar secondary scientific publications(3 hours)

**Knowledge and skills acquired:**

Course "Science, Technology, Society" is the first course (among the two) of social sciences at the pregraduate study at the Faculty of Electrical Engineering, providing students with the basic knowledge of science, technique and technology as well as society necessary for understanding the interaction between these three civilization systems. Acquired knowledge enables students to understand the topics of the specific professional subjects of the study more profesionaly and enables them to successfully use the distance learning methods and sources of information and knowledge also providing necessary know-how and social framework for creating a selfconcept of own profession and enables them for social relations in postindustrial society and European business practice.

**Teaching methods:**

Lectures and seminars.

**Student assessment:**

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

**Obligatory literature:**

2. Ivanović, M - Znanost, tehnika, društvo (Science, Technology, Society) - Albert E & Grafika, Osijek 2005.

**Recommended additional literature:**


**ECTS credits:** 5 ECTS credits

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

**Examination methods:**

Oral examination.

**Course assessment:**

1. Insight into the written preparation of lectures and seminars.
2. Students’ attendance to lectures.
3. Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of
students' final assessments and their overall success.
4. Passing rate and an average examination mark.

### Semester 4

<table>
<thead>
<tr>
<th>D401</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Zlatko Lacković PhD, Associate Professor</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>During this course students get acquainted with all the elements of company management. In this way they could be completely ready to apply their technical knowledge as well as to be independent entrepreneurs, i.e., company or specific organization unit managers.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
<td>Lectures and practice.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
<td>General knowledge testing.</td>
</tr>
<tr>
<td><strong>Obligatory literature:</strong></td>
<td>1. Lacković, Z., Management malog poduzeća, Elektrotehnički fakultet, Osijek, 2004.</td>
</tr>
<tr>
<td></td>
<td>7. P. Samuelson: Ekonomija, Mate, Zagreb.</td>
</tr>
<tr>
<td><strong>ECTS credits:</strong></td>
<td>4 ECTS credits</td>
</tr>
<tr>
<td>An ECTS credit value has been added according to calculation of required time for studying and successful course completion.</td>
<td></td>
</tr>
<tr>
<td><strong>Examination methods:</strong></td>
<td>Positively evaluated programme work and oral examination.</td>
</tr>
<tr>
<td><strong>Course assessment:</strong></td>
<td>Conducting an anonymous questionnaire filled in by students after the course completion, an analysis of students' final assessments and their overall success.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D402</th>
<th>Project Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lecturer:</strong></td>
<td>Ninoslav Slavek PhD, Assistant Professor, Vedran Boras PhD, Assistant Professor</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
<td>Basic knowledge of the computer hardware. Basic knowledge of the system and application software.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
<td>Lectures and practice.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
<td>Well finished laboratory practice. Practice can complete test and oral examination.</td>
</tr>
<tr>
<td><strong>Obligatory literature:</strong></td>
<td></td>
</tr>
</tbody>
</table>

Recommended additional literature:

ECTS credits: 4 ECTS credits
An ECTS credit value has been added according to calculation of required time for studying and successful course completion.

Examination methods:
Test and oral examination

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

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D403 Introduction to Research Work

Lecturer: Ante Lauc PhD, Full Professor

Course description:
1. Introduction to science – Definition of science, science structure and logic, structure elements – terms, language, hypotheses, laws, theories, paradigm; Ways of science thinking; relations between science and philosophy, ideology, tehnics, art and politics; Scientific fields (exact, technical, bio-medical, social and humanistic science); Definition of scientific disciplines (objects and methods of research); Dualism in science (theory, practice). 2. Researching in exact and technical sciences - Terms of scientific research; definition and features of scientific research; presumptions and logic in scientific research; fundamental and applied research; Methodology in scientific research (induction, deduction, experiment, simulation). 3. Types of scientific works – Terms and types of research (expert, scientific and technical researches); Category of scientific works, Scientific information. 4. Elements of scientific research – Detection scientific problems, researching hypotheses, researching goals, experimental draw (project), addiction and nonaddicion variables, 5. Scientific research phases – Definition of problems and researching goals; bibliography; identification and operacionalisation of researching variables, setting up hypotheses; makig draw of project, methodology and researching technics; interpretation, making deductions and scientific report. 6. Parts of scientific work, scientific project , structure of scientific article. – During the seminars objects are deeper and wider explored – (a) through discussing scientific and technical discoveries and (b) through looking for scientific informations in Croatia and the world, (c) on-line and CD searching databases, (e) through scientific language (rules and syntaxis in scientific speach, scientific abbrevations, biblography etc) and (f) managing projects (structure of project and methodology of team work)

Knowledge and skills acquired:
Providing students with the basic knowledge of science, technics and technology as separate region of human thinking and creativity. Introduction to method of researching and understanding of element researching work. Acquired knowledge enables students to understand the topics of the specific professional subjects of the study more professionally, enables them to successfully use the distance leraning methods and sources of information and knowledge also providing necessary know-how framework for creating a concept of expert project and team work.

Teaching methods:
Lectures and seminars.

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

Obligatory literature:
2. Ivanović, M. - Uvod u znanstveni rad u tehničkim znanostima (Introducing to Researching in Tnehical Sciences)

Recommended additional literature:
1. V. Silobrčić: Kako sastaviti, objaviti i ocijeniti znanstveno djelo, Medicinska naklada Zagreb, 2003

ECTS credits: 4 ECTS credits
<table>
<thead>
<tr>
<th>Lecturer:</th>
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</thead>
<tbody>
<tr>
<td><strong>Thesis</strong></td>
</tr>
<tr>
<td><strong>Course description:</strong></td>
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<tr>
<td>While making the thesis a student will solve problems in the field of his/her Master Level under his/her mentor leadership. By successful thesis defense a student will show that he/she can apply all his/her practical knowledge acquired during the study at the faculty.</td>
</tr>
<tr>
<td><strong>Knowledge and skills acquired:</strong></td>
</tr>
<tr>
<td>Knowledge and abilities for the individual engineering work.</td>
</tr>
<tr>
<td><strong>Teaching methods:</strong></td>
</tr>
<tr>
<td>Tutorial with mentor.</td>
</tr>
<tr>
<td><strong>Student assessment:</strong></td>
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<tr>
<td>Work under the mentor leadership.</td>
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<tr>
<td><strong>ECTS credits:</strong> 13 ECTS credits</td>
</tr>
<tr>
<td>An ECTS credit value has been added according to calculation of required time for studying and successful course completion.</td>
</tr>
<tr>
<td><strong>Examination methods:</strong></td>
</tr>
<tr>
<td>Thesis defense in front of Ph.D. committee.</td>
</tr>
<tr>
<td><strong>Course assessment:</strong></td>
</tr>
<tr>
<td>Conducting an anonymous questionnaire filled in by students at the course completion.</td>
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</tbody>
</table>