## Course description

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| Generic information |
| Head of Course | Rene Prenc, Ph.D. |
| Course | Fundamentals of Electrical Engineering 1 |
| Study Programme  | Marine Electronic Engineering and Information Technology |
| Level | undergraduate |
| Type of Course | mandatory |
| Year of Study | 1. |  |
| Estimated Student Workload and Methods of Instruction | ECTS coefficient of Student Workload | 7 |
| Number of Hours (L+E+S) | 45+30+0 |

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| 1. **GENERAL COURSE DESCRIPTION**
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| * 1. *Course Objectives*
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| Introduction to basic electrical quantities. Acquiring knowledge of basic phenomena and laws in the field of electrostatics, electromagnetism and direct currents. Ability to solve numerical problems in the field of electrical engineering. Performing experiments and qualitative analysis of established or measured quantities. |
| * 1. *Prerequisites for Course Registration*
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| None. |
| * 1. *Expected Learning Outcomes*
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| After passing the exam, students will be able to do the following:1. Describe and explain the laws of electrostatic fields. Apply the basic laws of electrostatic fields.2. Make and interpret basic calculations of simpler electrostatic fields.3. Describe and explain the laws of electromagnetic fields. Apply the basic laws of electromagnetic fields.4. Make and interpret basic calculations of simpler magnetic circuits.5. Explain and interpret basic concepts and quantities in DC circuits.6. Explain and apply the basic laws of circuits in the calculations of direct circuits.7. Analyse and interpret current, voltage and power calculations in simpler and more complex DC circuits. |
| * 1. *Course Outline*
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| Electrical partical charge and electrical charge of the body. Coulomb's law. Electrical field. Electrical influence. Electric field force operation. Electrical potential and voltage. Forces and equipotential surfaces. Capacitor and capacitor capacity. Matter in the electrical field. Capacitor connections. Electrostatic field energy. Magnetic field. Electromagnetic force associated with particles in motion and current flowing conductor. Magnetic flux. Faraday's law of electromagnetic induction. Occurrence of self-induction and mutual induction. Matter in the magnetic field. Ferromagnetism. Magnetic circuits and curve of magnetization and hysteresis. Magnetic field energy. The concept of electric current. Working resistance and conductivity. Temperature dependence of resistance. Ideal and real electricity sources. Electrical circuit. Power and energy of direct current. Kirchhoff's laws. Linear direct current networks. |
| * 1. *Modes of Instruction*
 | [x] Lectures[ ]  Seminars and workshops [x]  Exercises [ ]  E-learning[ ]  Field work | [ ]  Practical work [ ]  Multimedia and Network [x]  Laboratory[ ]  Mentorship[ ]  Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| * 1. *Comments*
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| * 1. *Student Obligations*
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| 1st partial exam, 2nd partial exam, 3rd partial exam, final exam |
| * 1. *Assessment[[1]](#footnote-1) of Learning Outcomes*
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| Course attendance | 2,5 | Class participation | 0,5 | Seminar paper |     | Experiment |     |
| Written exam |     | Oral exam | 1 | Essay |     | Research |     |
| Project |     | Continuous Assessment | 3 | Presentation |     | Practical work |  |
| Portfolio |     |  |     |  |     |  |     |
| * 1. *Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam*
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| The procedure for evaluating the acquired learning outcomes takes place according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:• through continuous testing of knowledge during classes, 70% of acquired learning outcomes are evaluated through attendance (10%), then the 1st partial exam - learning outcomes 1-2 (20%), the 2nd partial exam - learning outcomes 3-4 (20%), 3rd partial exam - learning outcomes 5-7 (20%);• in laboratory exercises the student must apply the acquired knowledge and demonstrate it through the measurement and interpretation of the values ​​of electrical quantities in direct current circuits.• at the final part of the exam, 30% of the acquired learning outcomes are evaluated (1-7), whereby the student must realize a minimum of 50% of points in order to pass the final exam.Examples of evaluating learning outcomes in relation to set learning outcomes are:1. Describe and explain the structure of matter, Coulomb's law, and the electric field of individual and grouped charge.
2. Define the concept of work in an electric field and electric potential and voltage. Describe the behaviour of matter in an electric field. Explain the concept of electrical capacity and capacitors.
3. Apply Coulomb's law, electric field intensity and calculation of potentials and voltages on the example of individual and group charge sources. Explain the behaviour of capacitors in stationary DC circuits.
4. Describe and explain the properties of the magnetic field, magnetic flux and induction, and the intensity of the magnetic field.
5. Define the magnetic field of a flat conductor, bent conductor, and coil. Explain the effect of a magnetic field on a charge and a moving conductor, and on a conductor flowing with electric current. Emphasize the importance of the law of electromagnetic induction, and Lentz's law.
6. Define the division of matter according to its magnetic properties. Calculate the magnitudes of the magnetic field on the example of simpler magnetic circuits. Emphasize the importance of the acquired knowledge about magnetic circuits on the example of transformers.
7. Define the term electric current. Explain the difference between direct current (DC) and alternating current (AC). Explain the elements of a simple and complex circuit of direct current.
8. Define Ohm's law, and I. and II. Kirchhoff's law. Explain and interpret the concept of energy and power of direct current circuits.
9. Perform and analyse current, voltage, and power calculations in simpler and more complex DC circuits. In doing so, recognize when it is necessary to apply Thevénin's and Norton's theorem, and the theorem of contour currents.
10. Demonstrate the acquired knowledge about DC circuits by recognizing and applying instruments for measuring electrical quantities on a specific example of a DC circuit. It is necessary to perform measurements and interpret the results and compare them with the calculations of a specific example of a DC electrical network.
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| * 1. *Main Reading*
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| * teaching materials for the course available on the e - learning system - Merlin (https://moodle.srce.hr)
* V. Pinter; Osnove elektrotehnike, Knjiga prva, Tehnička knjiga Zagreb, 1989.
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| * 1. *Recommended Reading*
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| * G. Đurović: Elektrotehnika I, Školska knjiga, Zagreb, 2004.
* B. Jajac: Teorijske osnove elektrotehnike, Svezak I-III, Graphis, Zagreb, 2001.-2007.
* E. Šehović, M. Tkalić, I. Felja: Osnove elektrotehnike – zbirka primjera (prvi dio), Školska knjiga, Zagreb
* B. Kuzmanović: Osnove elektrotehnike 1, Element, Zagreb, 2000.
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| * 1. *Number of Main Reading Examples*
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| *Title*  | *Number of examples* | *Number of students* |
| teaching materials for the course available on the e - learning system - Merlin (https://moodle.srce.hr) | - | 60 |
| V. Pinter; Osnove elektrotehnike, Knjiga prva, Tehnička knjiga Zagreb, 1989. | 5 | 60 |
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| * 1. *Quality Assurance*
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| The quality of studies is monitored in accordance with the ISO 9001 system and in accordance with European standards and guidelines for quality assurance, which is carried out at the Faculty of Maritime Studies in Rijeka. Once a year, the results of passability are analysed and appropriate measures are adopted. |

1. **NOTE**: Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities. [↑](#footnote-ref-1)