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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Osnove elektrotehnike I | | | | | | | | | | | | | | |
| **Course title:** | | | Fundamentals of Electrical Engineering I | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Univerzitetni študijski program prve stopnje Elektrotehnika | | | | | **Ni smeri** | | | | | | | | **1.** | | **zimski** | | |
| 1st cycle academic study programme Electrical Engineering | | | | | **/** | | | | | | | | **1.** | | **winter** | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni – strokovni/ compulsory professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64103 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **60** |  | | | **45** | | |  | | | |  | | | **95** | |  | **8** |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Dejan Križaj, Iztok Humar | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik študija | | | | | | | | |  | Enrolment in the year of the course | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Elektrina in tok. Elektrina in porazdelitve elektrine. Električni tok, gostota električnega toka. Zakon o ohranitvi elektrine, kontinuitetna enačba. Prvi Kirchhoffov zakon.  Električno polje. Coulombov zakon električne sile. Električna poljska jakost. Izvornost električnega polja. Delo električne sile, električna potencialna energija, nevrtinčnost električnega polja. Električni potencial. Električna napetost. Drugi Kirchhoffov zakon. Električni dipol. Prevodnik in električno polje. Zrcaljenje. Dielektrik in električno polje. Polarizacija. Gostota električnega pretoka, električni pretok. Dielektričnost. Mejna pogoja električnega polja. Kapacitivnost. Kondenzator. Delne kapacitivnosti. Energija električnega polja. Gibalni procesi v električnem polju. Kondenzatorsko vezje.  Tokovno polje. Ohmov zakon. Joulov zakon. Specifična električna prevodnost. Mejni pogoji tokovnega polja. Električna upornost in električna prevodnost. Ozemljitvena upornost. Upor. Nelinearen upor. Napetostno-tokovna karakteristika. Napetostni in tokovni vir. Enosmerna električna vezja. Analiza preprostih vezij in teoremi. | | | | | | | |  | | Electric charge and current. Charge distributions. Electric current density. Conservation of charge. Continuity equation. Kirchhoff’s current law.  Electric force. Coulomb’s law. Electric field. Electric field strength. Gauss law of electric field. Work of electric force. Electric potential energy. Electric potential. Voltage. Kirchhoff’s voltage law. Electric dipole. Conductor and electric field. Image theory. Dielectric material and electric field. Polarization. Electric flux. Electric flux density. Dielectric permittivity. Boundary conditions of electric field. Dielectric breakdown. Capacitance. Capacitor. Partial capacitances. Energy of electric field. Forces and torques. Capacitor circuits.  Current field. Ohm’s law. Joule’s law. Specific electric conductivity. Boundary conditions of current field. Resistance and conductance. Grounding resistance. Resistor. Non-linear resistor. Voltage-Current characteristic. Voltage and current sources. DC electric circuits. Analyses and theorems. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. Sinigoj A. R.: Osnove elektromagnetike, Založba FE in FRI, Ljubljana, 1994.  2. Sinigoj A. R.: Elektrotehnika 1 in 2, Založba FE in FRI, Ljubljana, 2006.  3. Križaj D.: Osnove elektrotehnike I, Založba FE in FRI, Ljubljana, 2012.  4. Humar I., Bulić E., Sinigoj A. R.: OE I - LAB, Laboratorijske vaje. Založba FE in FRI, Ljubljana, 2013.  5. Duffin W. J.: Electricity and magnetism, McGraw-Hill, London, 1990.  6. Popović D. B.: Osnovi elektrotehnike 1 in 2, Građevanska knjiga, Beograd, 1986.  7. Purcell E. M.: Electricity and magnetism, McGraw-Hill, New York, 1965.  8. Albach M.: Grundlagen der Electrotechnik 1 in 2, Pearson Studium, Muenchen, 2005.  9. Sinigoj A. R.: Elektrotehnika 1 in 2, Založba FE in FRI, Ljubljana, 2006.  Spletna stran http://torina.fe.uni-lj.si/oe/. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Spoznati in uporabljati zakone električnega in tokovnega polja ter enosmernih električnih vezij. Snov predmeta je osnova za spremljanje strokovnih predmetov v višjih letnikih študija elektrotehnike. | |  | | To acquire fundamental knowledge on electrostatic field, current field and DC electric circuits. The acquired knowledge serves as a basis for further electrotechnical studies. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Razumevanje zakonov električnega in tokovnega polja ter enosmernih električnih vezij. | | |  | Understand the laws of electrostatic and current field and basic analysis of DC circuits. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, avditorne in laboratorijske vaje (praktikum), izvajanje priprav in domačih nalog, učenje z uporabo videa in spletnih gradiv. Predavanja celotnega predmeta so v video obliki študentom dostopna preko spleta. | | |  | Lectures, exercises, laboratory work (practicum), homeworks and seminars, IT assisted teaching (video, animations, web materials, simulation examples, …) | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: laboratorijske vaje, domače naloge, seminar, pisni izpit, ustni izpit.  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Opravljene laboratorijske vaje, domače naloge in seminar so pogoj za pristop k izpitu.  Prispevki k oceni:  pisni izpit  ustni izpit  Vsaka izmed ocen mora biti pozitivna. | 50%  50% | | | | Type: laboratory exercises, homework, seminar, written exam, oral exam.  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Passed laboratory exercises, homeworks and seminar are prerequisites for the exam.  Contributions to final grade:  written exam  oral examination  Each individual grade must be positive. |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. HUMAR, Iztok, GE, Xiaohu, XIANG, Lin, JO, Minho, CHEN, Min, ZHANG, Jing. Rethinking energy efficiency models of cellular networks with embodied energy. IEEE network, 2011, vol. 25, no. 2, str. 40-49.  2. HUMAR, Iztok, SINIGOJ, Anton R., BEŠTER, Janez, HAGLER, Marion O. Integrated component web-based interactive learning systems for engineering. IEEE transactions on education, Nov. 2005, vol. 48, no. 4, str. 664-675, ilustr.  3. KRIŽAJ, Dejan, ISKRA, Ivan, REMŠKAR, Maja. (Quasi 3D) numerical simulation of operation of a capacitive type nanoparticle counter. Journal of electrostatics, Dec. 2011, vol. 69, no. 6, str. 533-539.  4. VUKADINOVIĆ, Mišo, MALIČ, Barbara, KOSEC, Marija, KRIŽAJ, Dejan. Modelling and characterization of thin film planar capacitors : inherent errors and limits of applicability of partial capacitance methods. Measurement science & technology, vol. 20, no. 11, str. 115106-1-115106-11.  5. KRIŽAJ, Dejan, JAN, Janja, VALENČIČ, Vojko. Modeling AC current conduction through a human tooth. Bioelectromagnetics, April 2004, vol. 25, no. 3, str. 185-195. | | | | | |