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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Osnove elektrotehnike II | | | | | | | | | | | | | | |
| **Course title:** | | | Fundamentals of Electrical Engineering II | | | | | | | | | | | | | | |
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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.** | | **letni** | | |
| 1st cycle academic study programme Electrical Engineering | | | | | **/** | | | | | | | | **1.** | | **summer** | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni –strokovni/ compulsory professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64107 | | | | | |
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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** |
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| **Nosilec predmeta / Lecturer:** | | | | | Iztok Humar, Dejan Križaj | | | | | | | | | | | | |
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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, opravljen izpit pri predmetu Osnove elektrotehnike I. | | | | | | | | |  | Enrollment into the study year, completed exam of Electrical Engineering I. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Magnetno polje. Tokovni element. Amperov zakon magnetne sile. Gostota magnetnega pretoka in Biot - Savartov zakon. Magnetni pretok. Neizvornost magnetnega polja. Vrtinčnost časovno nespremenljivega magnetnega polja. Lorentzova sila. Gibanje delca v električnem in magnetnem polju. Navor in delo magnetne sile. Magnetni dipol. Magnetik in magnetno polje. Magnetizacija. Magnetna poljska jakost. Permeabilnost. Mejna pogoja magnetnega polja. Magnetna napetost in magnetni potencial. Magnetni viri, magnetni upori in magnetna vezja.  Faradayev zakon indukcije. Inducirana napetost, inducirana električna poljska jakost, vrtinčnost induciranega električnega polja, gibalna in transformatorska inducirana napetost. Magnetni sklep. Lastne in medsebojne induktivnosti. Tuljava in sklop tuljav. Energija magnetnega polja. Gibalni procesi v magnetnem polju. Elektromagneti. Vrtinčnost časovno spremenljivega magnetnega polja.  Električna vezja spremenljivih tokov in napetosti. Prehodni pojavi v električnih vezjih. Harmonična električna vezja. Kompleksni račun: kazalci, impedanca, admitanca in kompleksna moč. Resonanca. Harmonična električna vezja. Analiza vezij in teoremi. Transformator. Trifazni sistem in vezave bremen. Vrtilno magnetno polje. | | | | | | | |  | | Magnetic field. Current element. Ampere’s law of magnetic force. Magnetic flux density. Biot-Savart law. Magnetic flux. Gauss law of magnetic field. Ampere’s circuital law. Lorentz force. Moving charge in electromagnetic field. Torque and work of magnetic force. Magnetic dipole. Magnetic material and magnetic field. Magnetization. Magnetic field strength. Permeability. Boundary conditions of magnetic field. Magnetomotive force. Scalar magnetic potential. Elements of magnetic circuits.  Faraday induction law. Electromotive force voltage and electric field, Stokes’ theorem of electric field. Motional and transformer electromotances. Magnetic flux linkage. Self and mutual inductances. Coils and coupled coils. Magnetic field energy. Lifting force. Electromagnets. Displacement current. Maxwell’s equations.  AC electric circuits. Sinusoidal steady-state electric circuits and analysis in complex domain: phasors, impedance and admittance, complex power. Oscillators. Resonance. Theorems. Transformer. Three-phase circuits. Transients. | | | | | | | |

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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 II, III, Založba FE in FRI, Ljubljana, 2006.  3. Križaj D.: Osnove elektrotehnike II, Magnetika., 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. Halliday D, Resnick R., Walker J., Fundamentals of Physics, John Wiley, 1997.  8. Purcell E. M.: Electricity and magnetism, McGraw-Hill, New York, 1965.  9. Albach M.:Grundlagen der Elektrotechnik 1 und 2, Pearson Studium, Muenchen, 2005.  spletna stran http://torina.fe.uni-lj.si/oe/ | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Spoznati in uporabljati zakone magnetnega in induciranega električnega polja ter električnih vezij spremenljivih tokov in napetosti. Snov predmeta je osnova za spremljanje strokovnih predmetov v višjih letnikih študija elektrotehnike. | |  | | To acquire fundamental knowledge on magnetic field, induced field as well as AC electric circuits, three phase systems and transient circuit analysis. The acquired knowledge serves as a basis for further electrotechnical studies. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Razumevanje zakonov magnetnega in induciranega električnega polja ter električnih vezij spremenljivih tokov in napetosti. | | |  | Understand and use the laws of magnetic field and induced electric field, AC electric circuits, three phase systems and transient circuit analysis. | |
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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. | | | | | |