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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Modul F: Materiali in tehnologije | | | | | | | | | | | | | | |
| **Course title:** | | | Module F: Materials and Technologies | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Podiplomski magistrski študijski program druge stopnje Elektrotehnika | | | | | Vse smeri | | | | | | | | 1 | | 2 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | All study fields | | | | | | | | 1 | | 2 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Izbirni-strokovni /elective professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64269 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **60** |  | | | **15** | | |  | | | |  | | | **75** | |  | **6** |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Danjel Vončina | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | **Slovenski / slovene** | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | **Slovenski / slovene** | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik. | | | | | | | | |  | Enrolment in the year of the course. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Razdelitev elektrotehniških materialov, postopki za določanje lastnosti materialov, kristalografija in izbrane kristalne strukture, kovinski materiali, topnost kovin, zlitine, hladno preoblikovanje kovin, izbrani kovinski materiali in njihove lastnosti, materiali za električne kontakte, kontaktna napetost, termoelektrični pojavi, elektrokemični členi, vodik in gorivne celice, uporovni materiali, superprevodni materiali, spajke in spajkalna zaščitna sredstva.  Magnetni materiali: razdelitev magnetnih materialov, magnetni moment pri feromagnetnih materialih, magnetna anizotropija, domene in pregrade, tehnologije izdelave mehkomagnetnih in trdomagnetnih materialov, primeri uporabe magnetnih materialov.  Izolacijski materiali oz. dielektriki: vrste polarizacij v snoveh, dielektrične izgube, termoplasti, duroplasti, elastomeri, kompoziti, plini, tekočine, anorganski dielektriki. | | | | | | | |  | | Classification of materials in electrical engineering. Determination of material properties. Fundamentals of crystallography. Selected crystal structures of metals. Synthesis and properties of alloys. Thermoelectric effects of metal junctions, electrical contacts. Fundamentals of electrochemistry, batteries and fuel cells. Materials for resistors. Superconductivity. Soldering alloys and fluxes. Soft and permanent magnet materials. Magnetic anisotropy, technology of soft and permanent magnet materials and their applications. Properties of isolation materials. Thermoplastic and duroplastic materials. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. E. Ivers-Tiffee, W. von Munch, "Werkstoffe der Elektrotehnik", Teubner, 2004 2. P. Campbell, "Permanent Magnet Materials and their Application", Cambridge University Press, 1994. 3. E. Steingroever, G. Ross, "Magnetization, Demagnetisation and Calibration of Permanent Magnet Systems", Magnet-Physik, Köln, 1997. 4. C. P. Poole, "Handbook of Supeconductivity", Academic Press, 2000 5. Gerhard Fasching, "Werkstoffe für die Elektrotechnik", Springer Verlag, Wien, 1984. 6. Carl H. Hamann, Andrew Hamnett, Wolf Vielstich, "Electrochemistry", Wiley-VCH, Weinheim, 1998. 7. Michaeli, Greif, Wolters, Vossebürger, "Technologie der Kunststoffe", Carl Hanser Verlag München, 1998. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Študenti pridobijo znanje o materialih, ki se uporabljajo v elektrotehniki. S poznavanjem električnih, mehanskih in drugih fizikalnih lastnosti materialov lahko aktivno sodelujejo pri načrtovanju električnih strojev in naprav na področju močnostne elektronike in energetike. Poleg tega pridobijo znanje o postopkih za izdelavo, za preoblikovanje in za izboljšanje specifičnih lastnosti materialov. | |  | | Student will get knowledge about materials that are used in the field of electrical engineering. Knowing the electrical, mechanical, chemical and other properties of materials students can be active in design of electrical machines and devices in the field of power electronics and power systems. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Razumevanje zgradbe elektrotehniških materialov, njihovih fizikalnih, kemičnih in mehanskih lastnosti. Pridobil bo znanje o izdelavnih postopkih materialov na področju močnostne elektrotehnike. Študent bo poznal tudi postopke za izboljšanje specifičnih lastnosti materialov. | | |  | Understanding structure of materials in the field of electrical engineering, their physical, chemical and mechanical properties. Student will get knowledge about processing of materials that are mainly used in the field of power electronics and power systems. Student will get insight into technologies for improvement of specific properties of materials. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, laboratorijske vaje, strokovne ekskurzije. | | |  | Lectures, laboratory work in small groups (danger of high voltage), professional excursion | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Laboratorijske vaje, izpit.  Ocenjevalna lestvica: Ocene od 1 do vključno 5 so negativne, ocene od 6 do 10 so pozitivne.  Pozitivna ocena laboratorijskih vaj je pogoj za pristop k izpitu.  Prispevki k oceni:   * laboratorijske vaje * izpit | 30%  70% | | | | Type: laboratory exercises, exam.  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Positive evaluation of laboratory exercises is a prerequisite for the exam.  Contributions to the final grade:   * laboratory exercises * exam |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. PETKOVŠEK, Marko, KOSMATIN, Peter, ZEVNIK, Ciril, VONČINA, Danijel, ZAJEC, Peter. Measurement system for testing of bipolar plates for PEM electrolyzers = Merilni sistem za testiranje bipolarnih plošč PEM elektrolizne celice. *Informacije MIDEM*, ISSN 0352-9045, mar. 2012, letn. 42, št. 1, str. 60-67. 2. LEBAN, Aleš, VONČINA, Danijel. Procesni vir za impulzno bakrenje tiskanih vezij - enota za generiranje tokovnih impulzov. *Elektrotehniški vestnik*, ISSN 0013-5852. [Slovenska tiskana izd.], 08, letn. 75, št. 3, str. 105-110. 3. MODRIJAN, Gorazd, PETKOVŠEK, Marko, ZAJEC, Peter, VONČINA, Danijel. Precise characterization of soft-magnetic materials at high saturation = Merjenje lastnosti mehkomagnetnih materialov pri visoki stopnji magnetnega nasičenja. *Informacije MIDEM*, ISSN 0352-9045, jun. 2006, letn. 36, št. 2, str. 95-101. 4. KOSMATIN, Peter, MILJAVEC, Damijan, VONČINA, Danijel. A novel control strategy for the switched reluctance generator. *Przeglęad Elektrotechniczny*, ISSN 0033-2097, 2012, rok 88, no. 7a, str. 49-53. 5. PETKOVŠEK, Marko, LEBAN, Aleš, NEMEC, Mitja, VONČINA, Danijel, ZAJEC, Peter. Series active power filter for high-voltage synchronous generators = Serijski aktivni močnostni filter za visokonapetostne sinhronske generatorje. *Informacije MIDEM*, ISSN 0352-9045, Dec. 2013, vol. 43, no. 4, str. 228-234. | | | | | |