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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Trajnostna oskrba z električno energijo | | | | | | | | | | | | | | |
| **Course title:** | | | Sustainable power supply | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| **Elektrotehnika / II** | | | | | **Ni smeri** | | | | | | | | **Vsi letniki** | | **zimski** | | |
| **Electrical Engineering / II** | | | | |  | | | | | | | |  | |  | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Izbirni predmet za študente netehniških študijskih programov  Elective course for students of non-engineering study programmes | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64317 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Sem. vaje**  **Tutorial** | | | **Lab. vaje**  **Laboratory work** | | | | **Teren. vaje**  **Field work** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| 45 | - | | | - | | | 15 | | | | - | | | 65 | |  | 5 |
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| **Nosilec predmeta / Lecturer:** | | | | | Marko Čepin, Rafael Mihalič, Valentin Ažbe, Boštjan Blažič | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisites:** | | | | | | | |
| Izbirni predmet je namenjen študentkam in študentom netehniških študijskih programov ne glede na stopnjo njihovega matičnega programa.  Predmeta ne morejo izbrati študentke in študenti podiplomskega študijskega programa II. stopnje Elektrotehnika. | | | | | | | | |  | The elective course is intended for students of non-engineering study programmes irrespective of the level of their programme.  The students of master study programme Electrical Engineering are not entitled to elect this course. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Slušatelji si bodo ustvarili celostno sliko o vlogi, najosnovnejših principih proizvodnje ter družbenoekonomskih in tehničnih vidikih porabe in zadovoljevanja potreb po električni energiji.  V okviru tega bodo pridobili osnovna znanja na področju oskrbe z električno energijo skozi spoznavanje proizvodnje, prenosa in razdeljevanja električne energije. Pri tem bodo poudarjeni najosnovnejši principi obratovanja elektroenergetskih sistemov (EES) in zahteve EES z vidika okoljevarstva, razvoja novih tehnologij, vpliva različnih konceptov proizvodnje električne energije na okolje (konvencionalnih, obnovljivih) in družbenoekonomskega vpliva na razvoj oskrbe z električno energijo.  Pridobili bodo informacije o osnovnih zakonitostih pretvorbe energije, o vlogi in osnovnih značilnostih elektroenergetskih sistemov pri oskrbi z električno energijo.  Predstavljeni jim bodo pojmi, ki narekujejo razvoj elektroenergetskih sistemov: trajnostni viri, nizkoogljične tehnologije, učinkovita raba električne energije, kakovost električne energije in pametna omrežja. | | | | | | | |  | | Students will get a comprehensive overview about the role and the principles of the electrical energy production. They will learn the social, economic and the technical aspect of the energy consumption.  The basic knowledge about the electrical energy supply will be obtained. The generation of electric power, its transmission and its distribution will be explained. The emphasis will be placed to the elementary principles of power system operation, the requirements of power system operation regarding the environment protection, the development of new technologies, the impact of different concepts of electrical energy generation (conventional sources, renewable sources) and the socioeconomic impact of the electrical energy supply.  Students will obtain information about the basic laws related to the energy conversion and about the role and characteristics of power systems for the electrical power supply.  The terms, which rule the development of new electrical power systems, will be described such as sustainable energy sources, low carbon technologies, efficient use of electrical energy, quality of electrical energy and smartgrids. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. Encyclopedia of Energy, 2004 Elsevier Inc. 2. Standard Handbook for Electrical Engineers, The McGraw-Hill, 2006 3. M. Čepin, Assessment of power system reliability. London: Springer, 2011 4. B. Orel: Energetski pretvorniki I, Založba FER, Ljubljana 1992 5. B. Orel: Energetski pretvorniki II, Založba FER, Ljubljana 1993 6. J. Voršič:Pretvarjanje v električno energijo Maribor: Fakulteta za elektrotehniko, računalništvo in informatiko, 1996, 7. Ian Plimer: Heaven and Earth, Taylor Trade Publishing, 2009 | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Slušatelji si bodo ustvarili celostno sliko o pojmu potreb po električni energiji in izkoriščanju virov pri njenem pridobivanju. Pridobili bodo osnovna znanja na področju oskrbe z električno energijo skozi spoznavanje proizvodnje, prenosa in razdeljevanja električne energije. V okviru aktualne problematike predmet izpostavlja okoljevarstvene vidike, vpliv in razvoj novih tehnologij, obnovljive vire energije (veter, voda, sonce, biomasa itn.) in učinkovito rabo energije.  Kot bistveno pa izpostavljamo pridobitev osnovnih informacij o relaciji med pavšalnimi ocenami in nedomišljenimi koncepti ter tehnično in fizikalno uresničljivimi koncepti s področja oskrbe z električno energijo. | |  | | Students will get an overview about the needs related with the electrical energy and about the exploitation of sources in the process of electric energy production. They will get the basic knowledge in the field of production, transmission and distribution of electrical energy. The benefits of the environmental protection, new technologies, renewable energy sources and efficient use of energy will be explained and discussed.  The basic knowledge will be obtained, which will enable that students will be capable to distinguish between general theoretical concepts and technically and environmentally acceptable concepts. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Znanje in razumevanje  Slušatelj bo razumel načine in metode pretvorbe primarnih energetskih virov v električno energijo s konvencionalno tehnologijo oz. alternativnimi tehnologijami.  Spoznal bo osnovne fizikalno-tehnične principe pretvorbe v električno energijo, njenega prenosa in izrabe. Poznal bo osnovne pogoje za izvedbo energetskih pretvorb v električno energijo, izkoristke teh pretvorb, njihove osnovne ekonomske kazalce in okoljske omejitve. Kot nujen pogoj za razumevanje oskrbe z električno energijo bo spoznal osnovne obratovalne značilnosti virov električne energije, pogoje obratovanja EES in porabnikov električne energije.  Uporaba  Pridobljeno znanje predstavlja osnovo za vrednotenje energetskih konceptov in osnovo za reševanje problematike umeščanja energetskih virov v prostor. Poznavanje obratovalnih lastnosti in omejitev klasičnih virov električne energije je tudi temelj za načrtovanje nacionalnega sistema za oskrbo z električno energijo.  Prenosljive spretnosti  Pridobljena znanja predstavljajo osnovo za sprejemanje odločitev v zvezi z načrtovanjem in projektiranjem elektroenergetskih objektov ter njihovim umeščanjem v prostor. Nadalje so potrebna za kompetentno ekonomsko ovrednotenje posameznih rešitev na nivoju oskrbe z električno energijo. | | |  | Knowledge and understanding:  Students will understand the principles and the methods of primary energy conversion into electrical energy with conventional technology and with alternative technologies.  Students will understand the physical and technical principles, which enable the conversion of energy to electrical energy and the transmission principles. They will learn about the efficiency related with environmental end economic parameters. Students will understand the operational characteristics of electrical power systems, end users and the conditions for the operation.  Application  Acquired knowledge will serve as a standpoint for the evaluation of electrical energy concepts and a basis for solving the problems of siting the power plants to the environment. Knowledge of operational characteristics and limitations of conventional sources of energy represents the basis for the national energy program.  Skills  Acquired knowledge forms the basis for decision-making related to the planning of power plants and their placement into the environment. Acquired knowledge supports the competent economic evaluation of individual power supply solutions. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja in laboratorijske vaje | | |  | Lectures and laboratory exercises | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Pisni in ustni izpit. Kandidat, ki na pisnem izpitu zbere vsaj 50 % možnih točk, lahko pristopi k ustnemu izpitu. Končna ocena se oblikuje na podlagi rezultata pisnega izpita in ustnega zagovora, pri katerem se upošteva tudi poročilo z vaj.    Ocenjevalna lestvica: nezadostno (od 1 do 5), zadostno (6), dobro (7), prav dobro (8), prav dobro (9), odlično (10).  Prispevki k oceni:  vaje  pisni izpit  ustni izpit | 20%  30%  50% | | | | Written and oral exam. The candidate who passes the written exam with at least 50% of all possible points can take the oral examination. Final assessment is formed on the basis of the result of written and oral examination, which is subject also to a report from the practical work.     Grading scale: poor (1 to 5), adequate (6), good (7), very good (8), very good (9), excellent (10).  Contributions to final grade:  exercises  written exam  oral examination |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. ČEPIN, Marko. Assessment of power system reliability. London: Springer, 2011. 2. ČEPIN, Marko. Advantages and difficulties with the application of methods of probabilistic safety assessment to the power systems reliability. Nucl. Eng. Des.. [Print ed.], 2012, vol. 246, str. 134-140. 3. MIHALIČ, Rafael. Stabilnost in dinamični pojavi v elektroenergetskih sistemih : osnovni pojmi s primeri. Ljubljana: Slovensko združenje elektroenergetikov CIGRÉ - CIRED, 2013. 4. BLAŽIČ, Boštjan, MATVOZ, Dejan, PAPIČ, Igor. Analiza ukrepov za zmanjšanje flikerja v prenosnem omrežju Slovenije. Elektrotehniški vestnik. [Slovenska tiskana izd.], 2008, let. 75, št. 1-2, str. 18-23. 5. BLAŽIČ, Boštjan, PAPIČ, Igor. Large-scale integration of distributed energy resources in power networks. Elektrotehniški vestnik. [Slovenska tiskana izd.], 2008, letn. 75, št. 3, str. 117-122. | | | | | |