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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Zanesljivost v elektroenergetiki | | | | | | | | | | | | | | |
| **Course title:** | | | Reliability in electrical power engineering | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| doktorski študijski program tretje stopnje Elektrotehnika | | | | | ni smeri | | | | | | | | 1 | |  | | |
| 3rd cycle: doctoral study programme Electrical Engineering | | | | |  | | | | | | | | 1 | |  | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | izbirni / elective | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64810 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **30** | **95** | | |  | | |  | | | |  | | |  | |  | **5** |
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| **Nosilec predmeta / Lecturer:** | | | | | prof. dr. Marko Čepin | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | Slovenski (english as needed) | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | Slovenski (english as needed) | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik. | | | | | | | | |  | Enrolment into the program. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Osnovni principi zanesljivosti, varnosti, tveganja in njihove medsebojne povezave. Osnove verjetnostnega računa, teorije množic in Boolove algebre.  Merila zanesljivosti sistemov ter varnosti objektov in naprav. Kriteriji tveganja. Princip odločanja z upoštevanjem tveganja.  Metode za ocenjevanje varnosti in zanesljivosti – teorija in primeri: verjetnost nepokrivanja porabe, indeksi distribucije (indeks povprečnega trajanja prekinitev napajanja v sistemu, indeks povprečne frekvence prekinitev napajanja v sistemu), efektivna zmožnost napajanja bremena, drevo odpovedi, drevo dogodkov. Odpovedi s skupnim vzrokom – metode in primeri.  Izboljševanje zanesljivosti elektroenergetskih sistemov in postrojev: redundanca, neodvisnost in ločenost, raznolikost, varne odpovedi, načelo enojne odpovedi. | | | | | | | |  | | Basic principles of reliability, safety, risk and their mutual relationship.  Basics of probability theory, set theory and Boolean algebra.  Measures of reliability and safety of facilities and devices. Risk criteria. Risk informed decision making.  Methods for assessment reliability and safety – theory and examples: loss of load probability, distribution indices (system average interruption frequency index, system average interruption duration index), effective load carrying capability, fault tree, event tree.  Common cause failures – methods and examples.  Improvement of reliability of power systems and devices: redundancy, independence, separation, fail-safe principle, single failure criterion. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| Čepin M. (2011) Assessment of Power System Reliability, Springer, 2011  Čepin M. (2012) Advantages and difficulties with the application of methods of probabilistic safety assessment to the power systems reliability, Nuclear Engineering and Design, Vol. 246, pp 134-140  Čepin M. (2011)Risk-informed decision-making related to the on-line maintenance, Nuclear engineering and design, Vol. 241, no. 4, pp 1114-1118  Bricman Rejc Ž., Čepin M. (2013) Izboljšana metoda za oceno zanesljivosti proizvodnje v elektroenergetskem sistemu. Elektrotehniški vestnik, letn. 80, št. 1/2, str. 57-63  Bricman Rejc Ž., Čepin M. (2014) An extension of Multiple Greek Letter method for common cause failures modelling. Journal of loss prevention in the process industries, vol. 29, str. 144-154 | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Študent bo spoznal osnovne informacije o varnosti in zanesljivosti v elektroenergetiki. Soočil se bo z uporabo metod in kazalcev zanesljivosti. Pridobil bo znanje o pomenu zanesljivosti komponent in sistemov, ter o njihovem vplivu na varnost in ekonomičnost postrojev. Razvijal bo čut odgovornosti za zanesljivo in varno uporabo energije ter za spodbujanje varnostne kulture. | |  | | Students will obtain basic information about safety and reliability in electrical power engineering. They will learn the basic methods and indices about assessment of reliability. They will get knowledge about importance of reliability of particular components and overall systems and their impact to safety and economics of specific facilities or systems. The safety culture will be emphasised and responsibility for safe and reliable use of energy will be stimulated. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Sposobnost ocene razmerja med izboljševanjem zanesljivosti in posledičnim povečevanjem stroškov. Kritična presoja smiselnosti vplivov investicij v realnih elektroenergetskih sistemih glede na izboljšanje kazalcev zanesljivosti. | | |  | Ability of assessment of improvement of reliability with consequent increase of related costs. Judgement of efficiency of future investments to real power systems considering improvement of reliability indices and consequently increased costs. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja ali individualne konzultacije, mentorstvo seminarske naloge | | |  | Lectures or individual consultations, supervisor of seminar work | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Seminar  Ustni zagovor | 50 %  50 % | | | | Seminar  Oral defence |
| **Reference nosilca / Lecturer's references:** | | | | | |
| Čepin M. (2011) Assessment of Power System Reliability, Springer  Čepin M. (2012) Advantages and difficulties with the application of methods of probabilistic safety assessment to the power systems reliability, Nuclear Engineering and Design, Vol. 246, pp 134-140  Čepin M. (2011) Risk-informed decision-making related to the on-line maintenance, Nuclear engineering and design, Vol. 241, no. 4, pp 1114-1118  Bricman Rejc Ž., Čepin M. (2013) Izboljšana metoda za oceno zanesljivosti proizvodnje v elektroenergetskem sistemu. Elektrotehniški vestnik, letn. 80, št. 1/2, str. 57-63  Bricman Rejc Ž., Čepin M. (2014) An extension of Multiple Greek Letter method for common cause failures modelling. Journal of loss prevention in the process industries, vol. 29, str. 144-154 | | | | | |