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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Akustika v komunikacijah | | | | | | | | | | | | | | |
| **Course title:** | | | Acoustics in communications | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Elektrotehnika, 2. stopnja | | | | | Vse smeri | | | | | | | | 1 | | 1 | | |
| Electrical Engineering, level 2 | | | | |  | | | | | | | | 1 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | izbirni splošni | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64256 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **45** | **0** | | | **30** | | | **0** | | | | **0** | | | **75** | |  | **6** |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Jaka Sodnik | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | **slovenski / slovenian** | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | **slovenski / slovenian** | | | | | | | | | | | |
| **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):** | | | | | | | |
| Zvočno valovanje (vibracije, valovna enačba, impedanca, odboji, lomi, izvori zvoka). Psihoakustika (človeški slušni sistem, glasnost zvoka, frekvenčno in časovno maskiranje, kritični pasovi). Lokalizacija zvoka (dojemanje azimuta, elevacije, razdalje, prenosne funkcije glave, ITD, ILD). Akustika prostora (absorbcija in reverberacija, položaji zvočnikov in poslušalcev, vpliv različnih prostorov). Elektroakustika in transdukcija (zvočniki, mikrofoni, različni senzorji). Podvodna akustika (zvočno valovanje v vodi, hitrost valovanja, odboji, podvodna komunikacija, sonerji). Akustika v interakciji človek-stroj (akustični meniji, opozorilni sistemi, navigacija). | | | | | | | |  | | Sound waves (vibrations, wave equation, impedance, reflection, refraction, sound sources). Psychoacoustics (human auditory system, sound loudness, frequency and temporal masking, critical bands). Localization of sound (perception of azimuth, elevation, distance; head transfer functions, ITD, ILD). Spatial acoustics (absorption and reverberance, positions of speakers and listeners, the impact of different rooms). Electroacoustics and transduction (speakers, microphones, various sensors). Underwater acoustics (sound waves in water, the speed of sound, reflections, underwater communication, sonar). Acoustics in human-machine interaction (acoustic menus, warning systems, navigation). | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. Kinsler, L.E., Frey, A.R., Coppens, A.B., Sanders, J. V. Fundamentals of Acoustics, John Wiley & Sons, 2000. 2. Everest, F.A. and Pohlmann, K.C. Master Handbook of Acoustics, The McGraw-Hill Companies, 2001. 3. Ballou, G.M. (Editor), Handbook for Sound Engineers, Elsevier, 2005. 4. Blauert, J. Spatial Hearing: The Psychophysics of Human Sound Localization, The MIT Press, 2001. 5. Rumsey, F. Spatial Audio, Elsevier, 2005. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Spoznavanje osnov akustike in zvoka kot pomembnega elementa v komunikaciji med ljudmi in v interakciji človek-stroj. Poudarek je tudi na spoznavanju osnovnih fizikalnih značilnosti zvočnega valovanja v različnih medijih in različnih prostorih ter sposobnosti dojemanja in lokalizacije zvoka pri ljudeh. Spoznavanje osnov delovanja zvočnikov in mikrofonov kot temeljnih gradnikov večine telekomunikacijskih sistemov.  Predstavitev t.i. podvodne akustike, delovanja različnih sonarjev in drugih senzorjev. | |  | | Understanding basics of acoustics and sound as an important element in the communication between human beings and in the human-machine interaction. The emphasis is on learning about the basic physical characteristics of sound waves in different media and rooms and the ability of human comprehension and localization of sound.  Understanding the basic principles of speakers and microphones as the fundamental building blocks of most telecommunication systems.  Presentation of the so-called underwater acoustics, the operation of sonar and other sensors. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Poznavanje osnovnih zakonitosti zvočnega valovanja in delovanja akustičnih naprav ter sposobnosti dojemanja zvoka pri ljudeh v različnih okoljih. | | |  | Basic knowledge of sound waves, the operation of acoustic devices and the ability of perception of sound by humans in different environments. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, na katerih se študent seznani s teoretičnimi osnovami, in laboratorijske vaje, kjer nekaj problemov spozna tudi praktično in jih skuša v duhu timskega dela reševati. | | |  | Lectures in which the student is acquainted with the theoretical basics and lab work where the student meets the practical problems and solves them in the team. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: pisni izpit, ustni izpit.  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Pozitivna ocena pisnega izpita je pogoj za pristop k ustnemu izpitu.  Prispevki k oceni:   * pisni izpit * ustni izpit | 50%  50% | | | | Type: laboratory exercises, written exam, oral exam.  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Positive evaluation of written exam is a prerequisite for the oral exam.  Contributions to the final grade:   * written exam * oral examination |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. SODNIK, Jaka, JAKUS, Grega, TOMAŽIČ, Sašo. The use of spatialized speech in auditory interfaces for computer users who are visually impaired. J. vis. impair. blind., Oct.-Nov. 2012, vol. 106, no. 10, str. 634-645. 2. SODNIK, Jaka, JAKUS, Grega, TOMAŽIČ, Sašo. Multiple spatial sounds in hierarchical menu navigation for visually impaired computer users. Int. j. human-comput. stud., Jan.-Feb. 2011, vol. 69, no. 1/2, str. 100-112. 3. SODNIK, Jaka, DICKE, Christina, TOMAŽIČ, Sašo, BILLINGHURST, Mark. A user study of auditory versus visual interfaces for use while driving. Int. j. human-comput. stud., May 2008, vol. 66, no. 5, str. 318-332. 4. SODNIK, Jaka, SUŠNIK, Rudolf, TOMAŽIČ, Sašo. Principal components of non-individualized head related transfer functions significant for azimuth perception. Acta acustica united with Acustica, 2006, vol. 92, no. 1, str. 312-319. 5. SODNIK, Jaka, SUŠNIK, Rudolf, ŠTULAR, Mitja, TOMAŽIČ, Sašo. Spatial sound resolution of an interpolated HRIR library. Appl. Acoust.. [Print ed.], Nov. 2005, vol. 66, no. 11, str. 1219-1234. | | | | | |