



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Akustika</b>
<b>Course title:</b>	<b>Acoustics</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	4	8
Five-year master's degree program Subject Teacher	/		

**Vrsta predmeta / Course type**

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
50			10		90	5

**Nosilec predmeta / Lecturer:**

<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	<input type="text" value="Slovenski/Slovenian"/>
	<b>Vaje / Tutorial:</b>	<input type="text" value="Slovenski/Slovenian"/>

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

**Prerequisites:**

**Vsebina:**

**Content (Syllabus outline):**

<p>Nihala, sinusna in nesinusna nihanja, šumi, spektri in spektrogrami.</p> <p>Valovanje, zvočno valovanje.</p> <p>Razširjanje valovanja - zvoka v prostoru, Dopplerjev pojav.</p> <p>Odboj, lom, uklon in interferenca zvočnega valovanja.</p> <p>Vsiljeno nihanje in resonanca.</p> <p>Stoječe valovanje, nihanje strun.</p> <p>Odpрте in zaprte piščali, akustična impedanca.</p> <p>Sluh, glasnost, uho, naglušnost.</p> <p>Občutek višine in barve zvoka.</p> <p>Kombinacijski toni, konsonanca, disonanca.</p> <p>Glasbeni intervali in lestvice.</p> <p>Glasbeni instrumenti s strunami, trobila, pihala, tolkala.</p> <p>Akustični pojavi v neživi in živi naravi.</p> <p>Človeški glas; zgradba govoril, resonance govorne cevi, analiza in sinteza govora, značilnosti pevskega glasu.</p> <p>Hrup in okolje, merjenje, zaščita, hrup strojev iz našega okolja.</p> <p>Akustika prostorov.</p> <p>Električne in elektronske akustične naprave. Mikrofon, ojačevalniki, zvočniki.</p> <p>Analogni in digitalni zvočni zapisi.</p> <p>Računalniška obdelava in analiza zvočnih zapisov.</p>	<p>Vibrating bodies, simple and complex vibrations, noises, spectrums and spectrograms.</p> <p>Waves, sound waves.</p> <p>Progression of waves - sound in space, Doppler effect.</p> <p>Reflection, refraction, diffraction and interference of sound waves.</p> <p>Driven vibrations and resonance.</p> <p>Standing waves, vibration of strings.</p> <p>Open and closed pipes, acoustic impedance.</p> <p>Hearing, loudness, ear, hearing loss.</p> <p>Pitch and timbre.</p> <p>Combination tones, consonance, dissonance.</p> <p>Musical intervals and scales.</p> <p>String, brass, woodwind, and percussion musical instruments.</p> <p>Natural acoustic phenomena.</p> <p>The human voice; vocal organs, resonances of the vocal tract, analyses and synthesis of speech, the characteristics of singing voice.</p> <p>Noise and the environment, measurement, protection, noise from different devices.</p> <p>Acoustics of rooms.</p> <p>Electrical and electronic acoustical devices. Microphones, amplifiers, loudspeakers.</p> <p>Analog and digital sound records.</p> <p>Computer processing and analyses of sound records.</p>
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### Temeljni literatura in viri / Readings:

1. Eberhard Hänsler, Gerhard Schmidt, Topics in Acoustic Echo and Noise Control, Springer-Verlag Berlin Heidelberg, 2006
2. Thomas D. Rossing, The science of sound (3rd edition), Addison-wesley Publishing. Company, 2001

3. Bruno Ravnikar, Osnove glasbene akustike in informatike, DZS, Ljubljana 2001

4. Ivo Verovnik, Uporaba računalnika pri obravnavi zvočnih pojavov, Zavod Republike Slovenije za šolstvo, Ljubljana, 2001.

5. Leopold Mathelitsch, Ivo Verovnik, Akustische Phaenomene, Aulis Verlag Deubner GMBH & CO, Koeln, 2004 ali Verlag Oebv & hpt, Wien 2004.

Znanstveni in strokovni prispevki v domači in tuji periodiki (npr. Obzornik DMFA, Presek, Fizika v šoli, Physick in unserer Zeit, AJP, EJP...) ter druga študijska gradiva na spletnih straneh FNM UM.

**Cilji in kompetence:**

Študenti pridobijo znanje z različnih področij akustičnih pojavov. Pri tem se podrobneje seznanijo z možnostmi za obdelavo in analizo zvoka, ki jih omogoča sodobna računalniška tehnologija.

**Objectives and competences:**

Students obtain the knowledge about a wide variety of acoustic phenomena. Especially they get an insight of using contemporary computer technology for processing and analyses of sound records.

**Predvideni študijski rezultati:**

**Znanje in razumevanje:**

Kvalitativno in kvantitativno razumejo zvočne pojave in se seznanijo s sodobnimi metodami za njihovo analizo.

**Prenesljive/ključne spretnosti in drugi atributi:**

Razumejo in se usposobijo za osnovne meritve, obdelave in analize zvoka, ki temeljijo na uporabi sodobnih računalniških tehnologij.

**Intended learning outcomes:**

**Knowledge and understanding:**

Qualitative and quantitative understanding of sound phenomena and methods of contemporary computer analyses.

**Transferable/Key Skills and other attributes:**

The students understand and are able to make the basic measurements, processing and analyses of sound, using contemporary computer technology.

**Metode poučevanja in učenja:**

Predavanja  
Laboratorijske vaje

**Learning and teaching methods:**

Lectures  
Laboratory exercises

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Ustni ali pisni izpit.	<b>80</b>	Written or oral exam.
Opravljene laboratorijske vaje in njihov zagovor.	<b>20</b>	Solving practical exercises and their defense.

**Reference nosilca / Lecturer's references:**

PLOJ VIRTIČ, Mateja, REPNIK, Robert. Improving quality of the educational process by raising teachers' communication skills. V: LAMANAUSKAS, Vincentas (ur.). *Philosophy of mind and cognitive modelling in education - 2012*, (Problems of education in the 21st century, vol. 46). Siauliai: Scientific Methodological Center Scientia Educologica, 2012, str. 109-115. [COBISS.SI-ID [19493128](#)]

REPNIK, Robert, GRUBELNIK, Vladimir. ICT and competences connected with the subject Environmental education in primary school. *Literacy information and computer education journal*, mar. 2011, vol. 2, iss. 1, str. 270-276. <http://infonomics-society.org/LICEJ/ICT%20and%20Competences%20Connected%20with%20the%20Subject%20Environmental%20Education%20in%20Primary%20School.pdf>. [COBISS.SI-ID [19407624](#)]

GERLIČ, Ivan, REPNIK, Robert. Conceptual learning of physics in Slovenian primary schools. V: LAMANAUSKAS, Vincentas (ur.). *Challenges of science, mathematics and technology teacher education in Slovenia*, (Problems of education in the 21st century, vol. 14). Siauliai: Scientific Methodological Center Scientia Educologica, 2009, str. 65-69. [COBISS.SI-ID [17352968](#)]

REPNIK, Robert, GRUBELNIK, Vladimir. Need for strengthening teachers competences for teaching environmental education in primary school. V: SHONIREGUN, Charles A. (ur.), AKMAYEVA, Galyna (ur.). *Canada International Conference on Education, April 4-7, 2011, Toronto, Canada. CICE-2011 Proceedings*. [Toronto]: Infonomics Society, cop. 2011, str. 64-68. [COBISS.SI-ID [19414536](#)]

REPNIK, Robert, MATHELITSCH, Leopold, SVETEC, Milan, KRALJ, Samo. Physics of defects in nematic liquid crystals. *Eur. j. phys.*, 2003, 24, str. 481-491, ilustr. [COBISS.SI-ID [12755208](#)], [JCR, WoS do 21. 9. 2013: št. citatov (TC): 18, čistih citatov (CI): 15, normirano št. čistih citatov (NC): 26, Scopus do 21. 9. 2013: št. citatov (TC): 18, čistih citatov (CI): 12, normirano št. čistih citatov (NC): 20]