



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Akustika
Course title:	Acoustics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika		3	6
Physics			

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		120	6

Nosilec predmeta / Lecturer:

Jeziki / Predavanja / Lectures:
Languages: Vaje / Tutorial:

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

Formalno ali neformalno znanje poglavij iz uvodnega univerzitetnega programa fizike: Nihanje in valovanje, Zvok.

Prerequisites:

Formal or informal knowledge from the introductory university course of physics: Oscillations and waves, Acoustic phenomena.

Vsebina:

Nihala, sinusna in nesinusna nihanja, šumi, spektri in spektrogrami.
Valovanje, zvočno valovanje.
Razširjanje valovanja - zvoka v prostoru, Dopplerjev pojav.
Odboj, lom, uklon in interferenca zvočnega valovanja.
Vsiljeno nihanje in resonanca.
Stoječe valovanje, nihanje strun.
Odprte in zaprte piščali, akustična impedanca.
Sluh, glasnost, uho, naglušnost.
Občutek višine in barve zvoka.
Kombinacijski toni, konsonanca, disonanca.

Content (Syllabus outline):

Vibrating bodies, simple and complex vibrations, noises, spectrums and spectrograms.
Waves, sound waves.
Progression of waves - sound in space, Doppler effect.
Reflection, refraction, diffraction and interference of sound waves.
Driven vibrations and resonance.
Standing waves, vibration of strings.
Open and closed pipes, acoustic impedance.
Hearing, loudness, ear, hearing loss.
Pitch and timbre.
Combination tones, consonance, dissonance.

Glasbeni intervali in lestvice.
Glasbeni instrumenti s strunami, trobila, pihala, tolkala.
Akustični pojavi v neživi in živi naravi.
Človeški glas; zgradba govoril, resonance govorne cevi, analiza in sinteza govora, značilnosti pevskega glasu.
Hrup in okolje, merjenje, zaščita, hrup strojev iz našega okolja.
Akustika prostorov.
Električne in elektronske akustične naprave.
Mikrofoni, ojačevalniki, zvočniki.
Analogni in digitalni zvočni zapisi.
Računalniška obdelava in analiza zvočnih zapisov.

Musical intervals and scales.
String, brass, woodwind, and percussion musical instruments.
Natural acoustic phenomena.
The human voice; vocal organs, resonances of the vocal tract, analyses and synthesis of speech, the characteristics of singing voice.
Noise and the environment, measurement, protection, noise from different devices.
Acoustics of rooms.
Electrical and electronic acoustical devices.
Microphones, amplifiers, loudspeakers.
Analog and digital sound records.
Computer processing and analyses of sound records.

Temeljni literatura in viri / Readings:

1. Thomas D. Rossing, The science of sound, Addison-wesley Publishing. Company, 1990
2. Bruno Ravnikar, Osnove glasbene akustike in informatike, DZS, Ljubljana 2001
3. Ivo Verovnik, Uporaba računalnika pri obravnavi zvočnih pojavov, Zavod Republike Slovenije za šolstvo, Ljubljana, 2001.
4. Leopold Mathelitsch, Ivo Verovnik, Akustische Phaenomene, Aulis Verlag Deubner GMBH & CO, Koeln, 2004 ali Verlag Oebv & hpt, Wien 2004.

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

Načini ocenjevanja:

Delež (v %) /

Weight (in %) **Assessment:**

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

AMBROŽIČ, Milan, REPNIK, Robert, SLAVINEC, Mitja. *Višja matematika v fiziki*. Maribor: Univerzitetna založba Univerze: = University of Maribor Press, 2017. ISBN 978-961-286-026-4. <http://press.um.si/index.php/ump/catalog/book/215>, <https://dk.um.si/lzpisGradiva.php?id=65487>, doi: [10.18690/978-961-286-026-4](https://doi.org/10.18690/978-961-286-026-4). [COBISS.SI-ID [91540225](https://cobiss.si/id/91540225)]

ÜLEN, Simon, GERLIČ, Ivan, SLAVINEC, Mitja, REPNIK, Robert. Evaluating the effectiveness of physlet-based materials in supporting conceptual learning about electricity. *Journal of science education and technology*, ISSN 1059-0145, 2017, vol. 26, iss. 2, str. 151-160, tabele, doi: [10.1007/s10956-016-9661-1](https://doi.org/10.1007/s10956-016-9661-1). [COBISS.SI-ID [22803208](https://cobiss.si/id/22803208)]

REPNIK, Robert, DUBTSOV, Alexander, PASECHNIK, Sergey V., SHMELIOVA, Dina V., KRALJ, Samo. UV-irradiation induced structural transitions in nematic liquid crystal droplets. V: EMRI, Igor (ur.). *20th International Workshop on Advances in Experimental Mechanics, August 14-20, 2016, Grand Hotel Bernardin, Portorož, Slovenia*, (Series on advances in experimental mechanics, vol. 20). Ljubljana: Faculty of Mechanical Engineering, Center for Experimental Mechanics, 2016, str. 1-11, ilustr. [COBISS.SI-ID [23028744](https://cobiss.si/id/23028744)]

Alexander, PASECHNIK, Sergey V., SHMELIOVA, Dina V., KRALJ, Samo. Controlled nanoparticle targeting. V: *Program & abstract : energy materials nanotechnology*, EMN Meeting on Liquid Crystal 2016 and EMN Meeting on Electrocatalysis, Feb. 15-19, 2016, Orlando, Florida. [S. l.: s. n., 2016], str. 14-16. [COBISS.SI-ID [22978056](https://cobiss.si/id/22978056)]