

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	FIZIKALNI POJAVI V OKOLJU
<b>COURSE TITLE:</b>	PHYSICAL PHENOMENA IN THE ENVIRONMENT

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Varstvo okolja in ekotehnologije, 1. stopnja	/	2.	1.
Environmental Protection and Eco-technologies, 1 <sup>st</sup> level	/	2 <sup>st</sup>	1 <sup>st</sup>

**Vrsta predmeta / Course type** Obvezni predmet / Obligatory subject

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

Predavanja Lectures	Seminar Seminar	Sem. Vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
40	/	10	20	/	100	6

**Nosilec predmeta / Lecturer:** izr. prof. dr. Nikola Holeček

**Jeziki / Languages:** **Predavanja / Lectures:** Slovenski / Slovenian  
**Vaje / Tutorial:** Slovenski / Slovenian

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

Opravljen izpit iz Matematike

**Prerequisites:**

Mathematics exam

**Vsebina:**

- Mehanika (fizikalne količine in enote, kinematika, Newtonovi zakoni, gravitacija, delo in moč, potencialna energija in zakon o ohranitvi energije, periodično gibanje, mehanika tekočin)
- Valovanje / Akustika (mehansko valovanje, zvok, difuzija in uklon, Dopplerjev pojav, psihoakustika)
- Termodinamika (temperatura in toplota, enačba stanja, termične lastnosti snovi, I. in II. Zakon termodinamike)
- Elektromagnetizem in optika (električni naboj in električno polje, Gaussov zakon, električni potencial, magnetno polje, elektromagnetno valovanje, narava in širjenje svetlobe, interferenca, uklon)
- Moderna fizika (foton, elektron in atom, valovna narava delcev in širjenje, atomska struktura, molekule, nuklearna fizika, fizika delcev)
- Fizikalna dogajanja v okolju (atmosfera, vetrovi, hidrosfera, tla, sevanje in hrup)

**Content (Syllabus outline):**

- Mechanics (physical quantities and units, kinematics, Newton's laws, gravitation, work and power, potential energy and energy conservation law, periodic motion, fluid mechanics)
- Wave / Acoustics (mechanical waves, sound, diffusion and diffraction, Doppler phenomenon, psychoacoustics)
- Thermodynamics (temperature and heat, equation of state, thermal properties of substances, The I. and II. law of thermodynamics)
- Electromagnetism and optics (electric charge and electric field, Gauss's law, electric potential, magnetic field, electromagnetic waves, the nature and propagation of light, interference, diffraction)
- Modern physics (photons, electrons and atoms, the wave nature of particles, atomic structure, molecules, nuclear physics, particle physics)
- Physical phenomena in the environment (atmosphere, wind, hydrosphere, soil, radiation and noise)

## Temeljni literatura in viri / Textbooks:

Kučer, I., Moljk, A., Kranjc, T., Peternelj, J., 1999. Fizika za srednje šole, Ljubljana: DZS.  
Strnad J., 1995, Fizika, 1. del – mehanika, toplota, 2. del – elektrika in optika, Ljubljana: Društvo matematikov, fizikov in astronomov Slovenije.  
Grabec, I., 2004. Predavanja iz fizike, Ljubljana: Fakulteta za strojništvo.  
Young, H., Freedman, R., 2008. University physics with modern physics, San Francisco: Pearson International Edition.

### Cilji in kompetence:

Predmetno specifični cilji in kompetence:  
Študent nadgradi srednješolsko znanje fizike v segmentih, ki so pomembni za pojave v okolju, na raven, ki se približuje ravni univerzitetnega študija na naravoslovnih in tehničnih fakultetah.

Vaje v okviru fizikalnega praktikuma omogočijo študentu, da si zgradi prave predstave o naravnih dogajanjih, pri računskih vajah pa naj bi si pridobil sposobnost kvantitativne obravnave fizikalnih pojavov.

Splošne kompetence:

sposobnost analize, sinteze in predvidevanja rešitev ter posledic pojavov in obvladovanje raziskovalnih in razvojnih metod

### Objectives and competences:

Specific competences:

The student upgrades the secondary knowledge of physics in segments that are important for environmental phenomena, to a level that is approaching the level of university studies in natural and technical faculties. Exercises within the framework of a physical practitioner allow a student to build real ideas about natural events, and in calculating exercises he should have acquired the ability to quantitatively deal with physical phenomena.

General competences:

ability to analyze, synthesize and predict the solutions and consequences of phenomena and master the research and development methods

### Predvideni študijski rezultati:

#### Znanje in razumevanje:

Študent bo ob zaključku tega predmeta sposoben:

- razumevanje fizikalnih pojavov,
- sposobnost načrtovanja enostavnih meritev,
- sposobnost računske obravnave rezultatov meritev.

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

- Uporaba domače in tuje literature
- Obdelava in interpretacija rezultatov eksperimentalnih raziskav
- Pisno in ustno poročanje o rezultatih meritev

### Intended learning outcomes:

#### Knowledge and Understanding:

The student will be at the completion of this course able to:

- understanding physical phenomena,
- the ability to design simple measurements,
- ability to calculate the results of measurements.

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

- Use of domestic and foreign literature
- Processing and interpretation of the results of experimental research
- Written and oral reporting of the results of the measurements

### Metode poučevanja in učenja:

#### Oblike dela:

- Predavanja
- Laboratorijske vaje
- Samostojno delo študentov/tk

#### Metode dela:

- Razlaga
- Dialog, diskusija

### Learning and teaching methods:

#### Forms of teaching:

- In-class lectures
- Laboratory courses
- Individual work of students

#### Teaching methods:

- Explanation
- Discussion, debate

- Preučevanje praktičnih primerov
- Priprava, predstavitev in zagovor seminarske naloge

- Practical demonstration
- preparation, presentation of a seminar paper

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<ul style="list-style-type: none"> <li>• pisni izpit</li> <li>• priprava, predstavitev in zagovor seminarske naloge</li> <li>• izvedba laboratorijskih meritev in priprava merilnih poročil</li> </ul> <p>Na vajah je obvezna 100 % prisotnost. Študent mora izdelati poročila o vajah, potem lahko pristopi h končnemu pisnemu izpitu</p> <p>Ocenjevalna lestvica:</p> <ul style="list-style-type: none"> <li>• zadostno 6: 60-67%</li> <li>• dobro 7: 68-75%</li> <li>• prav dobro 8: 76-83%</li> <li>• prav dobro 9: 84-90%</li> <li>• odlično 10: 91-100%</li> </ul>	<p><b>50</b></p> <p><b>20</b></p> <p><b>30</b></p>	<ul style="list-style-type: none"> <li>• written exam</li> <li>• preparation, presentation and defence of seminar paper</li> <li>• laboratory measurements and preparation of measurement reports</li> </ul> <p>At 100 % attendance at lab work is required. Students must first draw up report on their lab work, which is a prerequisite for final written examination.</p> <p>Grading system:</p> <ul style="list-style-type: none"> <li>• Sufficient D (6): 60-67%</li> <li>• Good C (7): 68-75%</li> <li>• Very good B (8): 76-83%</li> <li>• Very good B+ (9): 84-90%</li> <li>• Excellent A (10): 91-100%</li> </ul>

#### Materialni pogoji za izvedbo predmeta :

- predavalnica z multimedijско opremo
- laboratorij za fizikalni praktikum

#### Material conditions for subject realization:

- classroom with the multimedia equipment
- laboratory for physical practicum

#### Obveznosti študentov:

- Obvezna udeležba na vajah
- Izdelana seminarska naloga

#### Student's commitments:

- Mandatory attendance at exercises
- Seminar work done

#### Reference nosilca predmeta:

##### (1) Pedagoško delo:

- nosilec in izvajalec predmetov na dodiplomskem študiju: Delovno okolje – hrup (FKKT Univerza v Ljubljani, Fizikalni pojavi v okolju (VSVO- Velenje), Varstvo pred hrupom in sevanji (B&B Visoka šola za trajnostni razvoj Ljubljana) in podiplomskem študiju: Hrup in protihrupna tehnologije (VŠVO)

- mentor in somentor diplomantom na študiju I., II. in III. Stopnje

##### (2) Raziskovalno delo:

Zvok in hrup, meritve zvoka, razpoznavanje in zmanjševanje hrupa na strojih in gospodinjstkih aparatih, zmanjševanje komunalnega hrupa, razpoznavanje in zmanjševanje industrijskega hrupa

##### Pomembnejša raziskovalna dela:

**HOLEČEK, Nikola**, ŠIROK, Brane, HOČEVAR, Marko, PODGORNIK, Rudolf. Reducing the noise emitted from a domestic clothes-drying machine. *Noise control engineering journal*, ISSN 0736-2501, May-Jun 2006, letn. 54, št. 3, str.5-13. [COBISS.SI-ID 389928], **Nagrada:**

#### Lecturer's references:

##### (1) Pedagogical work:

- carrier and subject of undergraduate studies: Working environment - noise (FKKT University of Ljubljana, Physical phenomena in the environment (VSVO - Velenje), Protection against noise and radiation (B & B High School for Sustainable Development Ljubljana) and postgraduate studies: Noise and noise technology (VŠVO)

- mentor and co-mentor graduates in study I., II. In III. Level

##### 2) Research work:

Sound and noise, sound measurements, recognition and reduction of noise on machines and household appliances, reduction of communal noise, identification and reduction of industrial noise

##### Significant research work:

**HOLEČEK, Nikola**, ŠIROK, Brane, HOČEVAR, Marko, PODGORNIK, Rudolf. Reducing the noise emitted from a domestic clothes-drying machine. *Noise control engineering journal*, ISSN 0736-2501, May-Jun 2006, letn. 54, št. 3, str.5-13. [COBISS.SI-ID 389928], **Martin**

**Martin Hirschorn IAC prize 2008 - best paper award**

**HOLEČEK, Nikola**, ŠIROK, Brane, HOČEVAR, Marko, PODGORNIK, Rudolf. Experimental research of aerodynamic noise induced by condenser of drying machine. *International journal of acoustics and vibration*, ISSN 1027-5851, mar. 2005, let. 10, št. 1, str. [COBISS.SI-ID 342056],

PENŠEK-ČERU, Marijan, **HOLEČEK, Nikola**, GJERKEŠ, Henrik, GOLOBIČ, Iztok. Energy consumption analysis of domestic oven. *Strojniški vestnik*, ISSN 0039-2480, jul-avg. 2005, let. 51, št. 7-8, str. 405-410. [COBISS.SI-ID 362792], [

**HOLEČEK, Nikola**. Zmanjšanje hrupa pralnih strojev z uporabo dušilnih materialov = The reduction of washing machine noise by the use of muffling materials. *Strojniški vestnik*, ISSN 0039-2480, 1999, letn. 45, št. 7/8, str. 287-293. [COBISS.SI-ID 195624]

DVORŠEK, Matjaž, HOČEVAR, Marko, ŠIROK, Brane, **HOLEČEK, Nikola**, DONEVSKI, Božin. The influence of airflow inlet region modifications on the local efficiency of natural draft cooling tower operation. *Strojniški vestnik*, ISSN 0039-2480, 2011, vol. 57, no. 10, str. 750-759, ilustr., doi: 10.5545/sv-jme.2010.208. [COBISS.SI-ID 12068891],

(3) Strokovno delo:

-Ustanovitelj Laboratorija za akustiko v Gorenju, ki je vodilen na svojem področju v Sloveniji. 33 letne delovne izkušnje v podjetjih in izkušnje pri aplikaciji stroke na strokovnem področju, npr. Idejno-tehnološki projekt akustičnega laboratorija Gorenje, SIQ Slovenskega inštituta za kakovost, Tehnološki projekt polgluhe sobe v Domelu...

(4) Priznanja in sodelovanje v mednarodnih organizacijah:

Članek *Reducing the noise emitted from a domestic clothes - drying machine*, objavljen v reviji Noise control engineering Journal je bil nagrajen z prestižno svetovno nagrado **MartinHirschorn IAC Prize**, ki se dodeljuje za najboljši svetovni članek na področju zmanjševanja hrupa, v obdobju 2006 -2008.

Član IIAV (International Institute of Acoustics),

Član INCE, Institute of Noise Control Engineering of United States of America, Inc

Član AAAA (Alps Adria Acoustics Assoation)

Recenzent v reviji Noise Control Engineering Journal (INCE USA)

-

**Hirschorn IAC prize 2008 - best paper award**

**HOLEČEK, Nikola**, ŠIROK, Brane, HOČEVAR, Marko, PODGORNIK, Rudolf. Experimental research of aerodynamic noise induced by condenser of drying machine. *International journal of acoustics and vibration*, ISSN 1027-5851, mar. 2005, let. 10, št. 1, str. [COBISS.SI-ID 342056],

PENŠEK-ČERU, Marijan, **HOLEČEK, Nikola**, GJERKEŠ, Henrik, GOLOBIČ, Iztok. Energy consumption analysis of domestic oven. *Strojniški vestnik*, ISSN 0039-2480, jul-avg. 2005, let. 51, št. 7-8, str. 405-410. [COBISS.SI-ID 362792], [

**HOLEČEK, Nikola**. Zmanjšanje hrupa pralnih strojev z uporabo dušilnih materialov = The reduction of washing machine noise by the use of muffling materials. *Strojniški vestnik*, ISSN 0039-2480, 1999, letn. 45, št. 7/8, str. 287-293. [COBISS.SI-ID 195624]

DVORŠEK, Matjaž, HOČEVAR, Marko, ŠIROK, Brane, **HOLEČEK, Nikola**, DONEVSKI, Božin. The influence of airflow inlet region modifications on the local efficiency of natural draft cooling tower operation. *Strojniški vestnik*, ISSN 0039-2480, 2011, vol. 57, no. 10, str. 750-759, ilustr., doi: 10.5545/sv-jme.2010.208. [COBISS.SI-ID 12068891],

(3) Expert work:

-Founder of the Laboratory for Acoustics in Gorenje, which is leading in its field in Slovenia. 33 years of work experience in companies and experience in applying professional in the field, for example, Design and technology project of the acoustic laboratory Gorenje, SIQ of the Slovenian Institute of Quality, the Technological project of polluks rooms in Domel ...

(4) Recognition and participation in international organizations:

Article *Reducing the noise emitted from a domestic clothes drying machine*, published in the Noise control engineering Journal magazine, was awarded the prestigious **MartinHirschorn IAC Prize Award**, which is awarded for the world's best noise reduction article in 2006 -2008.

Article IIAV (International Institute of Acoustics),

Member INCE, Institute of Noise Control Engineering of the United States of America, Inc.

Member of the AAAA (Alps Adria Acoustics Assoation)

Reviewer in the Noise Control Engineering Journal (INCE USA)