



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Izbrana poglavja iz fizike okolja</b>
<b>Course title:</b>	<b>Selected Chapters from Environmental Physics</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1. ali 2.	1., 2. ali 4.
PHYSICS		1. or 2.	1., 2. or 4.

**Vrsta predmeta / Course type**

Izbirni za vse module

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

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje	Samost. delo Individ. work	ECTS
4			4	7	165	6

**Nosilec predmeta / Lecturer:**

Aleksander Zidanšek

**Jeziki /  
Languages:**

**Predavanja /  
Lectures:**

slovenski/Slovenian in/and angleški s slovenskim prevodom/English with translation in Slovenian

**Vaje / Tutorial:**

slovenski/Slovenian in/and angleški s slovenskim prevodom/English with translation in Slovenian

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

Predznanje dodiplomske fizike in predmetov na drugi stopnji Fizikalne meritve v okolju in Fizikalni procesi v ekosistemih.

**Prerequisites:**

Knowledge of undergraduate physics, and second degree courses Physical Measurements in Natural Environment and Physical Processes in Ecosystems.

**Vsebina:**

1. Pregled fizikalnih modelov v okolju

Izbrana poglavja iz modeliranja v okolju:  
Širjenje polucije v vodi, zraku in zemlji

2. Pregled fizikalnih meritev v okolju

**Content (Syllabus outline):**

1. Review of physics models in environment

Selected chapters from environmental modelling: Pollution transport in water, air and soil

Izbrana poglavja iz spektroskopskih metod, ki se uporabljajo za študij okolja, kot so: Masna spektroskopija, NMR spektroskopija, optična spektroskopija, laserska spektroskopija (Lidar), plinska kromatografija

### 3. Uporaba preprostih fizikalnih modelov v okolju

Modeliranje transporta polucije v vodi, zraku in zemlji

### 4. Uporaba preprostih fizikalnih meritev v okolju

Izbrane vsebine iz uporabe spektroskopskih metod v okolju. Meritve na terenu.

### 2. Review of physics measurements in environment

Selected chapters from spectroscopic methods, which are applicable for environmental studies, such as: Mass spectroscopy, NMR spectroscopy, optical spectroscopy, laser spectroscopy (Lidar), gas chromatography

### 3. Application of elementary physics models in environment

Modelling of pollution transport in water, air and soil

### 4. Application of elementary physics measurements in environment

Selected chapters from application of spectroscopic methods in environment. Field measurements.

## **Temeljni literatura in viri / Readings:**

- 1) John Houghton, Nigel Mason, Peter Hughes, Randall McMullan, Ross Reynolds, Lester Simmonds, John Twidell, Introduction to Environmental Physics: Planet Earth, Life and Climate, CRC Press, Boca Raton 2001.
- 2) Egbert Boeker, Rienk van Grondelle, Environmental Science: Physical Principles and Applications, John Wiley & Sons, New York 2001.
- 3) E. Boeker, R. Grondelle, Environmental Physics, John Wiley & Sons, New York 1995.
- 4) R. J. H. Clark, R. E. Hester, Spectroscopy in Environmental Science, John Wiley & Sons, Chichester 1995.
- 5) Mark A. Nanny, Roger A. Minear, Jerry A. Leenheer, Nuclear Magnetic Resonance Spectroscopy in Environmental Chemistry, Oxford University Press, 1997.
- 6) Članki v revijah New Scientist, Scientific World in Computational Physics
- 7) Na spletnih straneh Oddelka za fiziko objavljena elektronska gradiva / teaching material published on websites of Department of Physics

## **Cilji in kompetence:**

Študentje usvojijo znanja, potrebna za razumevanje in interpretacijo meritev polutantov v naravnem okolju, za samostojno izvajanje preprostih meritev in za modeliranje transporta polutantov.

## **Objectives and competences:**

Students achieve knowledge that is necessary for complex understanding and interpretation of pollutant measurements in natural environment, for independent performance of elementary measurements and for modelling the pollution transport.

## **Predvideni študijski rezultati:**

## **Intended learning outcomes:**

<p><b>Znanje in razumevanje:</b></p> <p>Razumevanje spektroskopskih tehnik, ki se uporabljajo pri meritvah polutantov, in obvladovanje modelov širjenja polutantov.</p> <p>Prenesljive/ključne spretnosti in drugi atributi:</p> <p>Predmet pripravlja študenta za samostojno delo na fizikalnih projektih s področja ekologije in okoljevarstva.</p>	<p><b>Knowledge and understanding:</b></p> <p>Understanding of spectroscopic techniques for measurement of pollutants and mastering the models of pollutant transport.</p> <p>Transferable/Key Skills and other attributes:</p> <p>Subject prepares the student for independent work on some physics projects in ecology and environmental protection.</p>
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<p><b>Metode poučevanja in učenja:</b></p> <p>Metodika obsega: predavanja, laboratorijske in terenske vaje v različnih naravnih okoljih.</p>	<p><b>Learning and teaching methods:</b></p> <p>They are based on: lectures, laboratory and field work comprising also exercises in different natural environments.</p>
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<b>Načini ocenjevanja:</b>	Delež (v %) / Weight (in %)	<b>Assessment:</b>
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
projektna naloga	<b>50%</b>	project
ustni izpit	<b>50%</b>	oral examination

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

1. ABINA, Andreja, PUC, Uroš, JEGLIČ, Anton, ZIDANŠEK, Aleksander. Structural characterization of thermal building insulation materials using terahertz spectroscopy and terahertz pulsed imaging. *NDT & E International*, ISSN 0963-8695. [Print ed.], 2016, vol. 77, str. 11-18, doi: [10.1016/j.ndteint.2015.09.004](https://doi.org/10.1016/j.ndteint.2015.09.004). [COBISS.SI-ID [28983847](#)]
  
2. PUC, Uroš, ABINA, Andreja, SLUBAN, Melita, ZIDANŠEK, Aleksander, JEGLIČ, Anton, VALUŠIS, Gintaras. Terahertz spectroscopic identification of explosive and drug simulants concealed by various hiding techniques. *Applied optics*, ISSN 1559-128X. Tiskana izd., 2015, vol. 54, no. 14, str. 4495-4502, doi: [10.1364/AO.54.004495](https://doi.org/10.1364/AO.54.004495). [COBISS.SI-ID [28541735](#)]
  
3. ABINA, Andreja, PUC, Uroš, JEGLIČ, Anton, KEMPERL, Jana, VENCKEVIČIUS, Rimvydas, KAŠALYNAS, Irmantas, VALUŠIS, Gintaras, ZIDANŠEK, Aleksander. Qualitative and quantitative analysis of calcium-based microfillers using terahertz spectroscopy and imaging. *Talanta*, ISSN 0039-9140. [Print ed.], 2015, vol. 143, str. 169-177, doi: [10.1016/j.talanta.2015.05.027](https://doi.org/10.1016/j.talanta.2015.05.027). [COBISS.SI-ID [28632359](#)]
  
4. KARALIUNAS, Mindaugas, VENCKEVIČIUS, Rimvydas, KAŠALYNAS, Irmantas, PUC, Uroš, ABINA, Andreja, JEGLIČ, Anton, ZIDANŠEK, Aleksander, VALUŠIS, Gintaras. Investigation of pharmaceutical drugs and caffeine-containing foods using Fourier and terahertz time-domain spectroscopy. V: RAZEGHI, Manijeh (ur.). *Terahertz emitters, receivers, and applications VI : August 9, 2015, San Diego, California, United States*, (Proceedings of SPIE, ISSN 0277-786X, 9585). Bellingham: SPIE,

2015, str. 95850U-1-95850U-8. [COBISS.SI-ID [28829479](#)]

tipologija 1.08 -> 1.01

**5.** ABINA, Andreja, PUC, Uroš, JEGLIČ, Anton, ZIDANŠEK, Aleksander. Structural analysis of insulating polymer foams with terahertz spectroscopy and imaging. *Polymer testing*, ISSN 0142-9418. [Print ed.], 2013, vol. 32, issue 4, str. 739-747, doi: [10.1016/j.polymeresting.2013.03.004](https://doi.org/10.1016/j.polymeresting.2013.03.004). [COBISS.SI-ID [26612263](#)]