



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Izbrana poglavja iz fizike okolja
Course title:	Selected Chapters from Environmental Physics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA, 3. stopnja		1. ali 2.	1., 2. ali 4.
PHYSICS, 3 rd cycle		1. or 2.	1., 2. or 4.

Vrsta predmeta / Course type

Izbirni za vse module / elective for all modules

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

Vaje / Tutorial:

slovenski/Slovenian

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

Ni zahtev. Priporočeno znanje dodiplomske fizike ter osnov energetike in fizikalnih procesov v okolju.

Prerequisites:

None. Recommended knowledge of undergraduate physics as well as fundamentals of energetics and physical processes in environment.

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

Izbrana poglavja iz spektroskopskih metod, ki

Content (Syllabus outline):

1. Review of physics models in environment

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

2. Review of physics measurements in

se uporabljajo za študij okolja, kot so: Maska spektroskopija, NMR spektroskopija, optična spektroskopija, laserska spektroskopija (Lidar), plinska kromatografija

3. Uporaba izbranih fizikalnih modelov v okolju

Modeliranje transporta polucije v vodi, zraku in zemlji

4. Uporaba izbranih fizikalnih meritev v okolju

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

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 selected physics models in environment

Modelling of pollution transport in water, air and soil

4. Application of selected physics measurements in environment

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

Temeljni literatura in viri / Readings:

1. Smith, C. (2001). Environmental Physics. London; New York: Routledge. [COBISS.SI-ID 1507169] <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/1507169>
2. Wallace, J. M., & Hobbs, P. V. (2006). Atmospheric Science: An Introductory Survey (2nd ed.). Amsterdam: Elsevier. [COBISS.SI-ID 271017] <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/271017>
3. Houghton, J. (2002). The Physics of Atmospheres (3rd ed.). Cambridge: Cambridge University Press. [COBISS.SI-ID 3253369] <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/3253369>
4. Holzbecher, E. (2012). Environmental Modeling: Using MATLAB (2nd ed.). Berlin; Heidelberg: Springer. [COBISS.SI-ID 23497480] <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/23497480>
5. Abina, A., Puc, U., Zidanšek, A. (2022). Challenges and opportunities of terahertz technology in construction and demolition waste management. *Journal of Environmental Management*, 315, 115118, 1–8. [COBISS.SI-ID 105906947] <https://doi.org/10.1016/j.jenvman.2022.115118>

Dodatna literatura / Additional readings:

1. Stull, R. B. (2000). Meteorology: for Scientists and Engineers. Brooks Cole. [COBISS.SI-ID 3178361]
2. Seinfeld, J. H., & Pandis, S. N. (2016). Atmospheric Chemistry and Physics: From Air Pollution to Climate Change (3rd ed.). Wiley. [COBISS.SI-ID 38573573]
3. Boeker, E., & van Grondelle, R. (1999). Environmental Physics (2nd ed.). Chichester: Wiley. [COBISS.SI-ID 15915303]
4. Članki v revijah New Scientist, Scientific World in Computational Physics
5. Na spletnih straneh Oddelka za fiziko objavljena elektronska gradiva / Teaching materials

published on websites of Department of Physics

Cilji in kompetence:

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

Objectives and competences:

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

Predvideni študijski rezultati:

Znanje in razumevanje:

Razume in uporablja spektroskopske tehnike, ki se uporabljajo pri meritvah polutantov v okolju.

Sestavi modele transporta polutantov v vodi, zraku in zemlji, jih reši in ovrednoti rezultate.

Prenosljive/ključne spretnosti in drugi atributi:

Predmet pripravlja študenta za samostojno raziskovalno delo na projektih s področja okolja.

Intended learning outcomes:

Knowledge and understanding:

The students understand and apply spectroscopic techniques for measurement of pollutants in the environment.

They compose models of transport of pollutants in water, air and soil, solve them and evaluate results.

Transferable/Key Skills and other attributes:

Subject prepares the student for independent research work on projects in the field of environment.

Metode poučevanja in učenja:

Razlaga, razgovor, demonstracija, študij primerov, problemsko učenje ter terensko delo.

Learning and teaching methods:

Lecture, discussion, demonstration, case studies, problem based learning, field work.

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)

projektna naloga
ustni izpit

Projekt

Ustni izpit

Delež (v %) /

Weight (in %)

Assessment:

Type (examination, oral, coursework, project):

project
oral examination

Project

Oral exam

Reference nosilca / Lecturer's references:

- 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. [COBISS.SI-ID 28983847]
- ZIDANŠEK, Aleksander, PUC, Uroš, ABINA, Andreja. Ground-penetrating radar Investigation of the St. Benedict Church in Kančevci. V: *SDEWES 2019. 14th Conference on Sustainable Development of Energy, Water and Environment Systems*, October 1-6 2019, Dubrovnik, Croatia. [S. l.]: SDEWES.ORG, 2019. Str. 1066-1-1066-7, ilustr. [COBISS.SI-ID 32795943]
- PUC, Uroš, ABINA, Andreja, JEGLIČ, Anton, ZIDANŠEK, Aleksander, KAŠALYNAS, Irmantas, VENCKEVIČIUS, Rimvydas, VALUŠIS, Gintaras. Spectroscopic analysis of melatonin in the terahertz frequency range. *Sensors*, ISSN 1424-8220, 2018, vol. 18, no. 12, str. 4098-1-4098-12, doi: 10.3390/s18124098. [COBISS.SI-ID 31962407]
- JAZBINŠEK, Mojca, PUC, Uroš, ABINA, Andreja, ZIDANŠEK, Aleksander. Organic crystals for THz photonics. *Applied sciences*, ISSN 2076-3417, 2019, vol. 9, no. 5, str. 882-1-882-45, doi: 10.3390/app9050882. [COBISS.SI-ID 32214055]

- ~~VASUDEVAN, Aswathy, SHVALYA, Vasyi, ZIDANŠEK, Aleksander, CVELBAR, Uroš. Tailoring electrical conductivity of two dimensional nanomaterials using plasma for edge electronics : a mini review. *Frontiers of Chemical Science and Engineering*. 13 (3): 427-443, 2019, 17 str. ISSN 2095-0179. DOI: [10.1007/s11705-019-1805-4](https://doi.org/10.1007/s11705-019-1805-4). [COBISS.SI-ID 32306471]~~
- Abina, A., Puc, U., Jazbinšek, M., & Zidanšek, A. (2023). Analytical gas sensing in the terahertz spectral range. *Micromachines*, 14(11), 1987. [COBISS.SI-ID 170582019]
- Zidanšek, A., Cvelbar, U., & Šlaus, I. (2023). Knowledge for a sustainable future. Newcastle Upon Tyne: Cambridge Scholars. [COBISS.SI-ID 160626435]
- Abina, A., Temeljotov Salaj, A., Cestnik, B., Karalič, A., Ogrinc, M., Kovačič Lukman, R., & Zidanšek, A. (2024). Challenging 21st-century competencies for STEM students: companies' vision in Slovenia and Norway in the light of global initiatives for competencies development. *Sustainability*, 16(3), 1295. [COBISS.SI-ID 185634819]
- Abina, A., Korošec, T., Puc, U., & Zidanšek, A. (2023). Review of bioplastics characterisation by terahertz techniques in the view of ensuring a circular economy. *Photonics*, 10(8), 883. [COBISS.SI-ID 160775939]
- Zid, M., Pal, K., Harkai, S., Abina, A., Kralj, S., & Zidanšek, A. (2024). Qualitatively and quantitatively different configurations of nematic–nanoparticle mixtures. *Nanomaterials*, 14(5), 436. [COBISS.SI-ID 187069955]