Univerza v Novi Gorici
Fakulteta za naravoslovje

University of Nova Gorica
School of Sciences

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet	Fizikalni laboratorij IV
Course name	Physics laboratory IV

Študijski program in stopnja **Study program and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Fizika in Astrofizika I. stopnja	/	3	1
Physics and Astrophysics I. level	/	3	1

Vrsta predmeta / Course type	obvezni / mandatory
Univerzitetna koda predmeta / University course code	1FAF24

Predavanja **Lectures**	**Seminar** **Seminar**	**Sem. vaje** **Tutorial**	**Lab. vaje** **Lab. work**	**Teren. vaje** **Field work**	**Samost. delo** **Indiv. work**	**ECTS**
10	/	/	50	/	120	6

Nosilec predmeta / Lecturer	prof. dr. Mattia Fanetti	
Jeziki / Languages	**Predavanja / Lectures**	slovenščina / English
	Vaje / Tutorial	slovenščina / English

Pogoji za opravljanje študijskih obveznosti	**Prerequisites**
Matematična fizika II (1FAF16) Fizikalni laboratorij III (1FAF19)	Mathematical physics II (1FAF16) Fizikalni laboratorij III (1FAF19)

Vsebina	**Syllabus outline**
1. UVOD: Ponovitev osnovnih konceptov Fourierovih vrst, Fourierove transformacije, disktretne fourierove transformacije in 2D fourierove transformacije **2. POSKUS:** Analiza spektra zvoka strune in primerjava z modelom **3. POSKUS:** Uklon na kristalni mreži, primerjava z realno sliko, Fourierove transformacije in uklonska slika **4. POSKUS:** Meritev pasivnih filtrov (nizko-pasovnega, visoko-pasovnega in ozko-pasovnega filtra) in primerjava z modelom. **5. POSKUS:** Meritev pasovne širine lock-in	**1. INTRODUCTION:** Reprise of basics concepts about: Fourier series, Fourier transform, discrete Fourier transform and 2D Fourier transform. Examples of application in experimental physics. **2. EXPERIMENT:** Sound spectrum analysis from a plucked string and comparison with model **3. EXPERIMENT:** Diffraction from a crystalline lattice, comparison between direct image, FT image and diffraction pattern **4. EXPERIMENT:** Characterization of signal filtering by passive filters (high pass, low pass, band pass). Comparison with models.

ojačevalca. Meritev ojačitve signala z lock-in ojačevalcem. **6. POSKUS:** Uklon ultrazvoka (FFT)	**5. EXPERIMENT:** Characterization of lock-in bandwidth. Lock-in amplification of a weak signal. **6. EXPERIMENT:** Ultrasound diffraction (FFT)

Temeljni literatura in viri / Basic readings
Vsak poskus ima podana navodila v pisni obliki z seznamom literature. / Each experiment is conducted according to provided written instructions, which contain a list of relevant readings.

Cilji in kompetence	**Objectives and competences**
Študenti izvajajo zahtevnejše praktične vaje s področja spektralne analize meritev. Samostojno izvedejo več poskusov, ki so vnaprej pripravljeni. Nato obdelajo rezultate in jih tudi ustrezno predstavijo v pisnem poročilu.	Students perform previously arranged experiments in the field of spectral analysis of the obtained data. They analyze and present the results in a written report.

Predvideni študijski rezultati	**Intended learning outcomes**
- Do konca tega predmeta bo študent sposoben samostojno izvesti kompleksnejši poskus, ki zajema naslednje korake: - priprava na poskus, pregled literature - meritev in beleženje podatkov s pomočjo računalnika - statistična obdelava podatkov, primerjava z matematičnimi modeli - pisanje poročila meritve in predstavitev rezultatov obdelave podatkov - zagovor rezultatov	- By the end of this course student will be able to perform a complex experiment including these steps: - preparation for the experiment, literature check - measurement and computerized data collection - statistical analysis of data, comparison with mathematical models - writting a report of measurement and results of - analysis defense of results

Metode poučevanja in učenja	**Learning and teaching methods**
- predavanja - samostojne meritve v laboratoriju	- lectures - individual measurements in the laboratory

Načini ocenjevanja	**Utež / Weight (%)**	**Assessment**
- Ocena dnevnika meritev - Oddana poročila - Ustni zagovor poročil	20 50 30	- Examination of lab. notes - Delivered reports - Oral defense of reports

Reference nosilca / references of the course principal

Dr. Mattia Fanetti je izredni profesor za področje fizike na Univerzi v Novi Gorici.
Mattia Fanetti is an associate professor of physics at the University of Nova Gorica.

Izbrane reference / selected bibliography:

1. FANETTI, Mattia, MIKULSKA, Iuliia, FERFOLJA, Katja, MORAS, Paolo, SHEVERDYAEVA, P. M., PANIGHEL, M., LODI-RIZZINI, A., PÍŠ, I., NAPPINI, S., VALANT, Matjaž, GARDONIO, Sandra. Growth, morphology and stability of Au in contact with the Bi2Se3(0001)Bi2Se3(0001)surface. *Applied Surface Science*, ISSN 0169-4332. Mar. 2019, vol. 471, str. 753-758, ilustr., doi: 10.1016/j.apsusc.2018.11.140. [COBISS.SI-ID 5276923]

2. FERFOLJA, Katja, VALANT, Matjaž, MIKULSKA, Iuliia, GARDONIO, Sandra, FANETTI, Mattia. Chemical instability of an interface between silver and Bi2Se3Bi2Se3 topological insulator at room temperature. *The journal of physical chemistry. C, Nanomaterials and interfaces*, ISSN 1932-7447, 2018, vol. 122, no. 18, str. 9980-9984, ilustr., doi: 10.1021/acs.jpcc.8b01543. [COBISS.SI-ID 5205243]

3. BHATI, Vijendra Singh, FANETTI, Mattia, VALANT, Matjaž, et al. Efficient hydrogen sensor based on Ni-doped ZnO nanostructures by RF sputtering. *Sensors and actuators. B, Chemical*, ISSN 0925-4005. [Print ed.], 2018, vol. 255, part. 1, str. 588-597, ilustr., doi: 10.1016/j.snb.2017.08.106. [COBISS.SI-ID 4951803]

4. VALANT, Matjaž, LUIN, Uroš, FANETTI, Mattia, MAVRIČ, Andraž, VYSHNIAKOVA, Kateryna, SIKETIĆ, Zdravko, KALIN, Mitjan. Fully transparent nanocomposite coating with an amorphous alumina matrix and exceptional wear and scratch resistance. *Advanced functional materials*, ISSN 1616-301X, 2016, vol. 26, no. 24, str. 4362-4369, ilustr., doi: 10.1002/adfm.201600213. [COBISS.SI-ID 4427003]

5. EMIN, Saim, ABDI, Fatwa F. Abdi, FANETTI, Mattia, PENG, Wei, SMITH, W., SIVULA, K., DAM, Bernard, VALANT, Matjaž. A novel approach for the preparation of textured CuO thin films from electrodeposited CuCl and CuBr. *Journal of electroanalytical chemistry*, ISSN 1572-6657, 2014, vol. 717-718, str. 243-249, doi: 10.1016/j.jelechem.2014.01.038. [COBISS.SI-ID 3243515]

6. FANETTI, Mattia, AMBROSINI, Stefano, AMATI, Matteo, GREGORATTI, Luca, ABYANEH, M. K., FRANCIOSI, A., CHIA, A. C. E., LAPIERRE, R. R., RUBINI, Silvia. Monitoring the Fermi-level position within the bandgap on a single nanowire : a tool for local investigations of doping. *Journal of applied physics*, ISSN 0021-8979, 2013, vol. 114, no. 15, str. 154308-1-154308-9, doi: 10.1063/1.4826198. [COBISS.SI-ID 3196411]

7. BALOG, Richard, FANETTI, Mattia, et al. Bandgap opening in graphene induced by patterned hydrogen adsorption. *Nature materials*, ISSN 1476-1122, 2010, vol. 9, no. 4, str. 315-319. [COBISS.SI-ID 2261243]