Univerza v Novi Gorici
Fakulteta za aplikativno naravoslovje

University of Nova Gorica
School of Applied Sciences

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Astronomski objekti v različnih valovnih dolžinah
Course name:	Multi-wavelength view on astrophysical objects

Študijski program in stopnja **Study program and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Fizika in Astrofizika II. stopnja	Astrofizika	2	/
Physics and Astrophysics II. level	Astrophysics	2	/

Vrsta predmeta / Course type	obvezni / mandatory
Univerzitetna koda predmeta / University course code:	2FAF09

Predavanja **Lectures**	**Seminar** **Seminar**	**Sem. vaje** **Tutorial**	**Lab. vaje** **Lab. work**	**Teren. vaje** **Field work**	**Samost. delo** **Indiv. work**	**ECTS**
45	/	45	/	/	180	9

Nosilec predmeta / Lecturer:	doc. dr. Tanja Petrushevska	
Jeziki / **Languages:**	**Predavanja / Lectures:**	slovenščina / English
	Vaje / Tutorial:	slovenščina / English

Pogoji za opravljanje študijskih obveznosti:	**Prerequisits:**
/	/

Vsebina:	**Syllabus outline:**
1. Glavne značilnosti teleskopov. 2. Opazovanja v ultravijolični, vidni in infrardeči svetlobi: objekti opazovanj, detektorji, posnetki, obdelava, kalibracija, astrometrija, fotometrija in standardni filtri, spektroskopija, polarimetrija, prilagodljiva optika, najpomembnejši sodobni teleskopi na Zemlji in v vesolju. 3. Podmilimetrska in radijska opazovanja: objekti opazovanj, bolometri, radijske antene, najpomembnejši sodobni instrumenti. 4. Interferometrija: radijska, optična in infrardeča.	1. Main characteristics of telescopes. 2. Observations in ultraviolet, optical and infrared wavelenghts: objects of observations, detectors, images, data reduction, calibration, astrometry, photometry and standard filters, spectroscopy, polarimetry, adaptive optics, the most important contemporary ground-based and space telescopes. 3. Submillimeter and radio observations: objects of observations, bolometers, radio antennas, the most important contemporary instruments. 4. Interferometry: radio, optical and infrared.

5. Opazovanja v gama in rentgenski svetlobi: objekti opazovanj, detektorji, najpomembnejši sodobni instrumenti. 6. Vsenebni pregledi neba: veliki vzorci objektov, detekcija in klasifikacija spremenljivih in tranzientnih izvorov.	5.Observations in gamma and X-rays: objects of observations, detectors, the most important contemporary instruments. 6. All-sky surveys: big samples of objects, detection and classification of variable and transient sources.

Temeljni literatura in viri / Basic readings:
George H. Rieke: Measuring the Universe, A Multiwavelength Perspective, Cambridge University Press, 2012. Frederick R. Chromey: To Measure the Sky. Cambridge University Press, 2010. Edmund C. Sutton: Observational Astronomy, Techniques and Instrumentation, Cambridge University Press, 2012

Cilji in kompetence:	**Objectives and competences:**
Obravnava in razumevanje metod astrofizikalnih opazovanj in obdelave podatkov v različnih valovnih dolžinah elektromagnetnega spektra.	Discussion and understanding of methods of astrophysical observations and data reduction in different wavelengths of electromagnetic spectrum.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študenti bodo osvojili pojme in koncepte: - UV, optični, IR teleskopi - radijske antene - teleskopi in detektorji za sevanje gama in rentgensko svetlobo - vse-nebni pregledi neba	Students will become familiar with: - UV, optical, IR telescopes and detectors - radio antennas - gamma and X-ray telescopes and detectors - all-sky surveys

Metode poučevanja in učenja:	**Learning and teaching methods:**
- predavanja - seminar - vaje	- lectures - seminar - tutorial

Načini ocenjevanja:	**Utež / Weight (%)**	**Assessment:**
- seminar - ustni izpit	50 50	- seminar - oral exam

Reference nosilca / references of the course principal:

Dr. Tanja Petrushevska je docentka za področje fizika na Univerzi v Novi Gorici.

Dr. Tanja Petrushevska is assistant professor of physics at the University of Nova Gorica. Her research interests lie in the field of observational astrophysics and cosmology, especially time domain astronomy. Her research has showed the feasibility of searches for strongly lensed supernovae with ground-based facilities and resulted in the discovery of five of the most distant core-collapse supernovae with implications on the volumetric core-collapse rates to very high redshifts. It has furthermore showed the utility of supernovae for cosmological studies, by investigating the properties of the strongly lensed and very distant supernova. As part of the intermediate Palomar Transient Factory, she has contributed to the discovery of supernovae and their study, including the first resolved, multiply-imaged supernova Ia and the first supernova forming a compact neutron star binary. Her current research also includes studying tidal disruption flares and searching for short gamma-ray bursts from supernovae induced by axion-like particles which are candidates for dark matter.

Selected publications:

1. *High-redshift supernova rates measured with the gravitational telescope A1689.* T. Petrushevska, R. Amanullah, A. Goobar, S. Fabbro, J. Johansson, T. Kjellsson, C. Lidman, K. Paech, J. Richard, H. Dahle, R. Ferretti, J. P. Kneib, M. Limousin, J. Nordin and V. Stanishev, A&A, Volume 594, A54, 21 pp, (2016).

2. *Testing for redshift evolution of Type Ia supernovae using the strongly lensed PS1- 10afx at z = 1.4*. T. Petrushevska, R. Amanullah, M. Bulla, M. Kromer, R. Ferretti, A. Goobar and S. Papadogiannakis. A&A, vol. 603, A136, (2017).

3. *iPTF16geu: A multiply-imaged gravitationally lensed Type Ia supernova.* A. Goobar, 30 additional authors including T. Petrushevska, Science, vol. 356, 6335, 291-295 (2017).

4. *Searching for supernovae in the multiply-imaged galaxies behind the gravitational telescope A370*. T. Petrushevska, D. J. Lagattuta, R. Amanullah, A. Goobar, L. Hangard, S. Fabbro, C. Lidman, K. Paech, J. Richard, and J. P. Kneib, A&A vol. 614, A103, (2018)

5. *A hot and fast ultra-stripped supernova that likely formed a compact neutron star binary* K. De, 25 additional authors including T. Petrushevska, Science, vol. 362, 6411, (2018).

6. *Prospects for observing strongly lensed supernovae behind Hubble Frontier Fields galaxy clusters with the James Webb Space Telescope*. T. Petrushevska, T. Okamura, R. Kawamata, L. Hangard, G. Mahler and A. Goobar, Astronomy Reports, vol. 62, 12, (2018).