



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Astronomska opazovanja
Course title:	Astronomical observations

Študijski program in stopnja **Študijska smer** **Letnik** **Semester**
Study programme and level **Study field** **Academic year** **Semester**

Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	3, 4	6, 8
Five-year master's degree program Subject Teacher	/		

Vrsta predmeta / Course type

Obvezni / Compulsory

Univerzitetna koda predmeta / University course code:

Predavanja	Seminar	Vaje	Lab. vaje	Terenske vaje	Samost. delo	ECTS
Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	
30		15	15	15	105	6

Nosilec predmeta / Lecturer:

Robert Repnik

Jeziki / Predavanja / Lectures:
Languages: Vaje / Tutorial:

slovenski/Slovenian

slovenski/Slovenian

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

Pogojev ni.

None.

Vsebina:

Content (Syllabus outline):

- pregled razvoja astronomskih opazovanj, pomembnejši astronomi in njihova odkritja,
- opazovalne metode in pripomočki v preteklosti
- opazovanja s prostimi očmi, orientacija na dnevnem in nočnem nebu, ozvezdja,

- an overview of development of astronomical observations, some important astronomers and their discoveries, observing methods and instruments in the past

<p>opazovanje Lune, Sonca in planetov, kriteriji za kvalitetna astronomska opazovanja</p> <ul style="list-style-type: none"> • koordinatni sistemi, gibanje Zemlje (rotacija, revolucija, precesija, paralaksa, pomen mesta opazovanja na zemeljskem površju) in navidezno gibanje neba • binokularji, lečni in zrcalni teleskopi, drugi astronomski pripomočki (zvezdne karte, astronomski računalniški programi, astronomija na internetu) • gibanje Zemlje, Lune in Sonca, opazovanja teh teles in z njimi povezanih pojavov (rotacija Sonca, sončeve pege, sončev ciklus, površje Lune, lunine mene, nutacija, sončevi in lunini mrki, polarni sij, pristanki na Luni) • opazovanja planetov in drugih objektov osončja s prostimi očmi in teleskopi (gravitacijski zakon, Keplerjevi zakoni, meteorji, meteoriti, kometi, asteroidi, lune drugih planetov, misije v osončju) • opazovanje Mlečne ceste (zvezde in večzvezdja, Hertzsprung-Russelov diagram, življenje zvezd, izvenosončni planeti in planetni sistemi, razsute in kroglaste zvezdne kopice, meglice, planetarne meglice...) • katalogi opazovalnih objektov in opazovanje oddaljenih galaksij (Messierjev katalog, NGC in drugi katalogi, opazovanje Andromedine in drugih galaksij, Hubbleov zakon) • razvoj in zgradba vesolja, gibanje objektov na večji skali v vesolju (lokalna jata, jate in nadjate, mikrovalovno ozadje, veliki pok in alternativne teorije razvoja vesolja) • preprostejši in zahtevnejši astronomski opazovalni pripomočki (spektrografija, fotometrija, digitalni detektorji, sodobni teleskopi, aktualne aktivnosti na področju razvoja astronomskih opazovanj) • astronomija v slovenskem izobraževalnem sistemu in slovenskem prostoru nasploh (astronomske vsebine in astronomska opazovanja v kurikulumih v vseh nivojih izobraževanja, napotki za organizacijo astronomskih opazovanj) in izdelava astronomskih opazovalnih pripomočkov • 	<ul style="list-style-type: none"> • observations with naked eye, orientation on the day and night sky, constellations, observations of the Moon, Sun and planets, criteria for qualitative astronomical observations • coordinate systems, moving of Earth (rotation, revolution, precession, parallax, role of observation point on earth's surface) and apparent movement of the sky • binoculars, refractors and reflectors, other astronomical instruments (sky maps, astronomical computer programs, astronomy on internet) • movement of Earth, Moon and Sun, observation of this bodies and correlating phenomena (rotation of Sun, sunspots, Sun's cycle, Moon's surface, Moon's phases, nutation, Sun's and Moon's eclipses, aurora borealis, landings on the Moon) • observations of planets and other objects of Sun system with naked eye and telescopes (gravitation law, Kepler laws, meteors, meteorites, comets, asteroids, moons of other planets, sun system missions) • observation of Milky way (stars and multiple stars systems, Hertzsprung-Russel diagram, life of stars, extra solar planets and planet systems, open and globular star clusters, nebulae, planetary nebulae...) • catalogues of observing objects and observations of distant galaxies (Messier catalogue, NGC and other catalogues, observing • of Andromeda and other galaxies, Hubble's law) • evolution and structure of space, movement of objects in space on larger scale (local group, galaxy groups and superclusters, microwave background, big bang and alternative theories of space evolution) • simple and advance astronomical instruments (spectrography, photometry, digital detectors, contemporary telescopes, actual activities on the field of astronomical observations) • astronomy in education system in Slovenia and in Slovenia generally (astronomical subjects and astronomical observations in curriculums on all levels of education, instructions for organisation of astronomical observations) and making of astronomical observing instruments
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Temeljni literatura in viri / Readings:

- Sir Patrick Moore, The Amateur Astronomer (Patrick Moore's Practical Astronomy Series), Springer-Verlag London Ltd; 12Rev Ed edition (Oct 2005)
- Christopher R. Kitchin, Telescopes and Techniques: An Introduction to Practical Astronomy, Springer-Verlag London Ltd; 2Rev Ed edition (Aug 2003)
- James Muirden, Sky Watcher's Handbook: The Expert Reference Source for the Amateur Astronomer, Oxford University Press, USA (January 1, 1993)
- Salaris, Maurizio, Evolution of stars and stellar populations, Chichester : J. Wiley, cop. 2005
- T. Zwitter: Pot skozi vesolje, Modrijan, 2002
- Presekova zvezdna karta, DMFA, 2000

Cilji in kompetence:

Študent je usposobljen za varno organizacijo individualnih ali množičnih astronomskih opazovanj različnih astronomskih objektov ali pojavov, s posebnim poudarkom na astronomskih opazovanjih znotraj slovenskega izobraževalnega sistema.

Objectives and competences:

Student gain ability for safe organisation of individual or mass astronomical observations of different astronomical objects or phenomena, in particular focused on astronomical observations in frame of Slovene educational system.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po uspešno zaključeni učni enoti je študent zmožen:

- povzeti razvoj astronomskih opazovanj
- razložiti slike vesolja in glave fizikalne pojave v njem
- povezati in prenesti teoretično znanje iz aplikativne optike za obravnavo pojavov v astronomiji,
- organizacije in izvedbe astronomskih opazovanj analizirati astronomske vsebine v slovenskem izobraževanju in uporabljati ustrezne didaktične pristope.

Prenesljive/ključne spretnosti in drugi atributi:

Študent:

- je sposoben kritičnega vrednotenja informacij,
- se zaveda omejitev opazovalnih metod,
- razume razlike med kvalitativnimi in kvantitativnimi pristopi,
- je sposoben digitalne obdelave podatkov.

Intended learning outcomes:

Knowledge and understanding:

On completion of this course student:

- summarize the evolution of astronomical observations
- understands space conception and main
- connects and transfer theoretical knowledge in applicative optics to study phenomena in astronomy,
- is able to organize and execute astronomical observations analysesastronomical subjects in Slovene education and uses appropriate didactical approaches.

Transferable/Key Skills and other attributes:

Student gains:

- the ability of critical evaluation of information,
- awariness of limits of observation methods,
- understanding of difference between qualitative and quantitative approaches,
- understanding of applied optics,
- knowledge of digital data processing.

Metode poučevanja in učenja:**Learning and teaching methods:**

<p>Predavanja (razlaga, razgovor, demonstracija, uporaba simulacij), eksperimentalna predavanja</p> <p>Laboratorijske, terenske in seminarske vaje (delo s tekstom, metoda pisnih in grafičnih del, metoda praktičnih del, uporaba simulacij in simulacijskih okolij)</p> <p>Individualno delo</p> <p>Elementi obrnjenega poučevanja.</p> <p>Poučevanje in učenje potekata z didaktično uporabo informacijsko-komunikacijske tehnologije.</p>	<p>Lectures (explanation, discussion, demonstration, use of simulations), experimental lectures</p> <p>Laboratory, field and seminar exercises (work with text, work with graphic elements, practical work, use of simulations and simulation environments)</p> <p>Individual work</p> <p>Elements of flipped learning.</p> <p>Teaching and learning are done through the didactic use of ICT.</p>
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Načini ocenjevanja:

Delež (v %) /

Assessment:

Weight (in %)

a) ustni izpit	a) 40 %	a) Oral exam
b) pisni izpit	b) 30 %	b) Written exam
c) izdelano poročilo laboratorijskih in terenskih vaj ter zagovor	c) 30 %	c) done report of laboratory work and field work and the oral avocation of experiments.
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.		
Pozitivno ocenjeno poročilo laboratorijskih in terenskih vaj ter pozitivna ocena pisnega izpita sta pogoj za pristop k ustnemu izpitu.		For a successfully finished course, both oral and written exams have to be positive.
		Positive grade of laboratory and field report and positive grade of written exam are a prerequisites for access to oral examination.

Reference nosilca / Lecturer's references:

JOZIČ, Primož, ZIDANŠEK, Aleksander, REPNIK, Robert. Fuel conservation for launch vehicles: Falcon Heavy case study. *Energies*. 2020, vol. 13, no. 3, str. 1-10. ISSN 1996-1073. DOI: 10.3390/en13030660.

STERKUŠ, Robert, REPNIK, Robert. Assessment of experimental skills and physics knowledge of students at measuring albedo. V: II International Conference on Physical Aspects of Environment ICPAE2023 : Zrenjanin, 24-26th, August 2023 : proceedings. Zrenjanin: Technical Faculty "Mihajlo Pupin", 2023. Str. 40-47. ISBN 978-86-7672-366-9. <http://147.91.177.109/icpae/conference%20program!/Zbornik%20ICPAE2023!.pdf>.

REPNIK, Robert, STERKUŠ, Robert. Measuring solar irradiance with Vernier pyranometer. V: II International Conference on Physical Aspects of Environment ICPAE2023 : Zrenjanin, 24-26th, August 2023 : proceedings. Zrenjanin: Technical Faculty "Mihajlo Pupin", 2023. Str. 31-39. ISBN 978-86-7672-366-9. <http://147.91.177.109/icpae/conference%20program!/Zbornik%20ICPAE2023!.pdf>.

