



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	6
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	45	4
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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:**

Pogoji za vključitev v delo:
Pogojev ni.

Pogoji za opravljanje študijskih obveznosti:
Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.
Pozitivno ocenjeno poročilo laboratorijskih in

Conditions for Inclusion in the Course:
There are no conditions.

Conditions for Fulfilling Study Obligations:
Each of the listed obligations in the assessment methods must be completed with a positive grade.
Positive grade of laboratory and field report and

terenskih vaj ter pozitivna ocena pisnega izpita sta pogoj za pristop k ustnemu izpitu.

positive grade of written exam are a prerequisites for access to oral examination.

Vsebina:

- 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, opazovanje Lune, Sonca in planetov, kriteriji za kvalitetna astronomska opazovanja
- 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 cikel, 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

Content (Syllabus outline):

- an overview of development of astronomical observations, some important astronomers and their discoveries, observing methods and instruments in the past
- 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, fotometry, digital detectors, contemporary telescopes, actual activities on the field of astronomical observations)

(astronomske vsebine in astronomska opazovanja v kurikulumih v vseh nivojih izobraževanja, napotki za organizacijo astronomskih opazovanj) in izdelava astronomskih opazovalnih pripomočkov •	• 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:

1. Zwitter, T. (2002). Pot skozi vesolje. Ljubljana: Modrijan. ISBN 961-6357-87-5. [COBISS.SI-ID 118412800] https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/118412800 2. Moore, P. (2006). The Amateur Astronomer [e-knjiga]. London: Springer. ISBN 1-85233-878-4. Celotno besedilo dostopno v zbirki SpringerLink Books. 3. Ranzinger, P. (1986). Presekova zvezdna karta (2. nat.). Ljubljana: DMFA SRS. [COBISS.SI-ID 9460737] https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/9460737	
Dodatna literatura / Additional readings:	
1. KITCHIN, Christopher R. Telescopes and Techniques. 3rd ed. New York [etc.]: Springer, 2013. ISBN 978-1-4614-4890-7. [COBISS.SI-ID 1104340830] 2. MUIRDEN, James. Sky Watcher's Handbook: The Expert Reference Source for the Amateur Astronomer. Oxford; New York; Heidelberg: W. H. Freeman: Spektrum, 1993. ISBN 0-7167-4502-X. [COBISS.SI-ID 34275585] 3. SALARIS, Maurizio, CASSISI, Santi. Evolution of Stars and Stellar Populations. Chichester: J. Wiley, 2005. ISBN 0-470-09219-X. [COBISS.SI-ID 27344133]	

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.	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.
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Objectives and competences:

Predvideni študijski rezultati:

Znanje in razumevanje: Po uspešno zaključeni učni enoti je študent zmožen: • povzeti razvoj astronomskih opazovanj	Knowledge and understanding: On completion of this course student: • summarize the evolution of astronomical observations
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Intended learning outcomes:

• 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.	• 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, • awareness of limits of observation methods, • understanding of difference between qualitative and quantitative approaches, • understanding of applied optics, • knowledge of digital data processing.
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Metode poučevanja in učenja:

Predavanja (razlaga, razgovor, demonstracija, uporaba simulacij), eksperimentalna predavanja Laboratorijske, terenske in seminarske vaje (delo s tekstom, metoda pisnih in grafičnih del, metoda praktičnih del, uporaba simulacij in simulacijskih okolij) Individualno delo Elementi obrnjenega poučevanja. Poučevanje in učenje potekata z didaktično uporabo informacijsko-komunikacijske tehnologije.

Learning and teaching methods:

Lectures (explanation, discussion, demonstration, use of simulations), experimental lectures Laboratory, field and seminar exercises (work with text, work with graphic elements, practical work, use of simulations and simulation environments) Individual work Elements of flipped learning. Teaching and learning are done through the didactic use of ICT.
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Načini ocenjevanja:

Delež (v %) /

Assessment:

Weight (in %)

Ustni izpit	40 %	Oral exam
Pisni izpit	30 %	Written exam
Poročilo	30 %	Report

Reference nosilca / Lecturer's references:

• JOZIČ, Primož, ZIDANŠEK, Aleksander, REPNIK, Robert. Fuel conservation for launch vehicles: Falcon Heavy case study. <i>Energies</i>. 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>.