

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Astronomska opazovanja v šoli
Course title:	Astronomical observations in school

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Predmetni učitelj / 1. in 2. stopnja Subject teacher / 1. and 2. level	/	5	Poletni Summer

Vrsta predmeta / Course type Izbirni/Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
30			15	15	30	3

Nosilec predmeta / Lecturer: Robert Repnik

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

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

Pogojev ni.
Priporočljiva osnovna znanja iz fizike.

None.
Recommended basic knowledge in physics.

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 ciklus, površje Lune, lunine mene, nutacija, sončevi in lunini mrki, polarni sij, pristanki na Luni)

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

<ul style="list-style-type: none"> • 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, sevanje in lastnosti svetlobe) • 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) • kratek uvod: 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 • astronomija in astronomska opazovanja pri pouku fizike ter v medpredmetnih povezavah • dosedanja vloga in sodobni izzivi matematike, kemije, biologije, ekologije in računalništva v opazovanju in preučevanju vesolja • projektna naloga iz področja astronomskih opazovanj (teorija, priprava, organizacija in izvedba, dokumentiranje, priprava poročila, pisno in ustno poročanje) 	<p>Moon's eclipses, aurora borealis, landings on the Moon)</p> <ul style="list-style-type: none"> • 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, radiation and properties of light) • 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) • short introduction: astronomy in education system in Slovenia and in Slovenia in general (astronomical subjects and astronomical observations in curriculums on all levels of education, instructions for organisation of astronomical observations) and making of astronomical observing instruments • astronomy and astronomical observations in teaching physics and in cross curricular interactions • impact and contemporary challenges of mathematics, chemistry, biology, ecology and computer science in observing and researching universe • project exercise in the field of astronomical observation (theory, preparation, organisation and execution, documenting, preparation of report, written and oral reporting)
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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

- Vrtljiva zvezdna karta nt-BROG, 2011
- učni načrti fizike in drugih predmetov s področja naravoslovja, tehnike in matematike, kjer se astronomija in astronomska opazovanja lahko pojavijo kot možnost medpredmetne povezave
- Druga astronomska periodika: Spika, Sky&Telescope, Weltraum und Sterne, Kmica ter astronomske in astrofizikalne znanstvene revije
- Zaupanja vredni spletni viri, npr.: www.nasa.gov

Cilji in kompetence:

Študent je usposobljen za varno organizacijo individualnih ali množičnih astronomskih opazovanj različnih astronomskih objektov ali pojavov v sklopu neformalnega in informalnega poučevanja.

Objectives and competences:

to be able for safe organisation of individual or mass astronomical observations of different astronomical objects or phenomena, in the frame of nonformal and informal teaching.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po uspešno zaključeni učni enoti je študent zmožen:

- povzeti razvoj astronomskih opazovanj
- razložiti slike vesolja in glavnih fizikalnih pojavov v njem
- organizirati in izvesti astronomska opazovanja
- uporabiti ustrezne didaktične pristope za obravnavo astronomskih vsebin

Prenesljive/ključne spretnosti in drugi atributi:

- sposobnost kritičnega vrednotenja informacij
- zavedanje omejitev opazovalnih metod
- razumevanje razlike med kvalitativnimi in kvantitativnimi pristopi
- razumevanje aplikativne optike
- digitalna obdelava podatkov
- povezovanja fizikalnih vsebin z drugimi predmeti
- sodelovanje v interdisciplinarni skupini

Intended learning outcomes:

Knowledge and understanding:

On completion of this course student is able to:

- summarize the evolution of astronomical observations
- explain space conception and main physics processes in it
- organize and execute astronomical observations
- use appropriate didactical approaches to specific astronomical content

Transferable/Key Skills and other attributes:

- ability of critical evaluation of information
- to be aware of limits of observation methods
- understanding of difference between qualitative and quantitative approaches
- understanding of applied optics
- digital data processing
- connecting physical contents to other subjects
- collaboration in interdisciplinary group

Metode poučevanja in učenja:

Predavanja (razlaga, razgovor, demonstracija, uporaba simulacij), eksperimentalna predavanja
Laboratorijske in terenske vaje (delo s tekstom, metoda pisnih in grafičnih del, metoda praktičnih del, uporaba simulacij in simulacijskih okolij)

Learning and teaching methods:

Lectures (explanation, discussion, demonstration, use of simulations), experimental lectures

Individualno delo Elementi obrnjenega poučevanja.	Laboratory and field exercises (work with text, work with graphic elements, practical work, use of simulations and simulation environments)
Poučevanje in učenje potekata z didaktično uporabo informacijsko-komunikacijske tehnologije.	Individual work Elements of flipped learning.
	Teaching and learning are done through the didactic use of ICT.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Projektna naloga (izdelek in predstavitev) ustni izpit		Project work (work and presentation) oral examination
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.		For a successfully finished course, both oral and written exams have to be positive.
Pozitivno ocenjena projektna naloga je pogoj za pristop k ustnemu izpitu.	50 50	Positive grade of project work is a prerequisite for access to oral examination.

Reference nosilca / Lecturer's references:

GRUBELNIK, Vladimir, MARHL, Marko, REPNIK, Robert. Determination of the size and depth of craters on the moon. *CEPS journal : Center for Educational Policy Studies Journal*, ISSN 1855-9719, 2018, vol. 8, no. 1, str. 35-53, ilustr., graf. prikazi. <https://ojs.cepsj.si/index.php/cepsj/article/view/322/267>, doi: [10.26529/cepsj.322](https://doi.org/10.26529/cepsj.322). [COBISS.SI-ID 11968585], [SNIP, Scopus do 19. 5. 2018: št. citatov (TC): 0, čistih citatov (CI): 0] 2. MEŠIĆ, Vanes, NEUMANN, Knut, AVIANI, Ivica, HASOVIĆ, Elvedin, BOONE, William J., ERCEG, Nataša, GRUBELNIK, Vladimir, SUŠAC, Ana, SALIBAŠIĆ GLAMOČIĆ, Džana, KARUZA, Marin, VIDAK, Andrej, ALIHODŽIĆ, Adis, REPNIK, Robert. Measuring students' conceptual understanding of wave optics : a rasch modeling approach. *Physical review, Physics education research*, ISSN 2469-9896, 2019, vol. 15, iss. 1, str. 010115-1-010115-20, doi: [10.1103/PhysRevPhysEducRes.15.010115](https://doi.org/10.1103/PhysRevPhysEducRes.15.010115). [COBISS.SI-ID 24513288], [JCR, SNIP, WoS do 9. 5. 2019: št. citatov (TC): 0, čistih citatov (CI): 0] REPNIK, Robert, AMBROŽIČ, Milan. Practical school experiments with the centre of mass of bodies. *CEPS journal : Center for Educational Policy Studies Journal*, ISSN 1855-9719, 2018, vol. 8, no. 1, str. 97-116, ilustr. <https://ojs.cepsj.si/index.php/cepsj/article/view/311/270>, doi: [10.26529/cepsj.311](https://doi.org/10.26529/cepsj.311). [COBISS.SI-ID 11972169], [SNIP, Scopus do 19. 5. 2018: št. citatov (TC): 0, čistih citatov (CI): 0]