



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Didaktika astronomije
Course title:	Didactics of Astronomy

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Dvopredmetna izobraževalna fizika Double major Educational Physics		1	2

Vrsta predmeta / Course type:

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	120	6

Nosilec predmeta / Lecturer:

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

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

Izkušnje z izvajanjem laboratorijskih in terenskih vaj, osnovna znanja iz mehanike in optike, osnove strokovnega pisanja, znanja iz astronomskih opazovanj

Experiences in laboratory exercises and terrain work, basic knowledge of mechanics and optics, basics of scientific writing, knowledge of astronomical observations

Vsebina: **Content (Syllabus outline):**

PR:

Pregled zgodovinskega razvoja astronomije in didaktike astronomije. (4)

Pregled astronomskih objektov, pojmov in procesov: (6)

- osnovni objekti v astronomiji (obravnavo z večanjem oddaljenosti od Zemlje: Luna, Sonce, Sončev sistem, Galaksija, Lokalna jata...)
- velikostne predstave (razmerja velikosti objektov, razmerja oddaljenosti)
- povezave med objekti (komet - meteorski roj...)
- gibanja objektov v vesolju in posledice (dan-noč, letni časi, mrki...)
- sodobne raziskave v astronomiji in možnosti za prenos informacij v pouk v osnovni in srednji šoli

Opazovanja v astronomiji s poudarkom na izvedbi v šoli: (10)

- orientacija na nebu, koordinatni sistemi, orientacija in razlaga v preteklosti
- astronomski pripomočki: zvezdna karta, astronomski atlas, efemeride; računalniški programi, IKT v astronomiji, internet; optični pripomočki: projekcije, binokularji, teleskopi; ostali pripomočki: sekstant, laser...
- astronomska opazovanja s prostimi očmi:
Luna: mene, vzhajanje in zahajanje, mrki; Sonce: vzhajanje in zahajanje, mrki; meteorji; planeti; svetlobna onesnaženost; priprava, organizacija in opremljenost za astronomska opazovanja
- astronomska opazovanja z optičnimi pripomočki: postavitve, kolimiranje, umerjanje, napajanje teleskopov, Go-To funkcija; opazovanja objektov v Osončju, Messierjev katalog, NGC in drugi katalogi; fotografija in video v astronomiji, obdelava z računalnikom, filtri, kamere; spektroskopija, fotometrija, druge metode; večji teleskopi, nadatmosferski teleskopi, radijski teleskopi, južno nebo, informacijsko-komunikacijska tehnologija v astronomiji

Lectures:

Overview of the historical development of astronomy and didactics of astronomy. (4)

Overview of astronomical objects, phenomena and processes: (6)

- basic objects in astronomy (teaching in sequence of increasing distance from the Earth: The Moon, Sun, Solar system, Galaxy, local cluster ...)
- dimensions conceptions (ratio of the size of objects, ratio of distances)
- links between objects (comet - meteor showers ...)
- movement of objects in space and consequences (day-night, seasons, eclipses ...)
- modern research in astronomy and the potential for transmission of information in teaching in elementary and secondary school

Observations in astronomy with focus on execution of them in school: (10)

- orientation in the sky, coordinate systems, orientation and explanations in the past
- astronomical Accessories star charts (Planisphere), astronomical atlas, ephemerides; computer programs, ICT in astronomy, internet; Optical devices: projections, binoculars, telescopes; other tools: sextant, laser...
- astronomical observations with naked-eyes: Moon: phases, rising and setting, eclipses; Sun: rising and setting, eclipses, meteors, planets, light pollution, preparation, organization and equipment for astronomical observation
- astronomical observation by optical devices: layout, collimation, calibration, power supply of telescopes, Go-To function, observation of objects in the solar system, Messier catalogue, NGC and other catalogues, photography and video in astronomy, processing with a computer, filters, cameras, spectroscopy, photometry, other methods ; larger telescopes, above-atmospheric telescopes, radio telescopes, Southern Sky, ICT and astronomy

Astronomija v izobraževalni vertikali: (10)

- pregled astronomskih vsebin v kurikulumu rednih predmetov po izobraževalnih stopnjah od predšolske vzgoje do mature; druge možnosti: izbirni predmeti, raziskovalno in projektno delo, dnevi dejavnosti, tabori, društva in amaterska ter profesionalna astronomija
- preverjanje in ocenjevanje pri poučevanju astronomskih vsebin
- razvoj naravoslovnih kompetenc in spretnosti pri poučevanju astronomskih vsebin
- nivojsko zasnovano poučevanje astronomskih vsebin (predšolska vzgoja, 1. triletje, 4. in 5. razred, predmet naravoslovje, fizika 8. in 9. razred, srednja šola
- mladi raziskovalci v astronomiji

LV:

- IKT, astronomski multimedijски pripomočki, astronomija in internet
- določevanje dimenzij in oddaljenosti objektov v preteklosti in danes,
- uporaba fizikalnih zakonov v astronomiji in poučevanju astronomije: mehanika nebesnih teles, gravitacijski zakon, Newtonovi in Keplerjevi zakoni, ohranitvene količine, jedrske reakcije, sevanje, Stefanov in Vienov zakon, Hubbleov zakon...
- orientacija in koordinatni sistemi
- uporaba astronomskih pripomočkov
- izvedba dveh astronomskih učnih ur za različni izobraževalni stopnji

TV:

Izvesti osnovna astronomska opazovanja s praktično uporabo astronomskih pripomočkov:

- organizacija astronomskih opazovanj v šoli
- opazovanje Lune in Sonca
- opazovanje planetov Osončja
- izvedba osnovnih opazovanj s prostimi očmi

Astronomy in education vertical: (10)

- review of astronomical content in the curriculum of regular subjects in education levels from pre-school till end of secondary school level; other possibilities: elective subjects, research and project work, activity days, camps, clubs and amateur and professional astronomy
- testing and evaluation in teaching astronomy content
- development of science competences and skills in teaching astronomy content
- different level based teaching astronomical content (Kindergarten, 1st three-year, 4th and 5th grade, the subject of science, physics in 8th and 9th grade, secondary school level
- young researchers in astronomy

LW:

- ICT, astronomical multimedia devices, astronomy and internet
- determination of size and distance of objects in the past and today,
- application of physical laws in astronomy and in teaching astronomy: mechanics of astronomical objects, the gravitational law, Newton's and Kepler's laws, conservation of physics quantities, nuclear reactions, radiation, Stefan's and Wien's law, Hubble's law ...
- orientation and coordinate systems
- the use of astronomical accessories
- implementation of two astronomical lessons for the different educational level

FW

Perform basic astronomical observation with practical use of astronomical accessories:

- organization of astronomical observations in school
- observation of the Moon and the Sun
- observation of the solar system planets

- izvedba aktivnosti z uporabo astronomskih pripomočkov,

- opazovanje svetlobne onesnaženosti na izbranem področju

- izvedba opazovanj z optičnimi pripomočki izbranih astronomskih objektov globokega vesolja

- pri opazovanju izbranega astronomskega objekta posneti astronomsko fotografijo in/ali video, računalniška obdelava

- opazovanje meteorskega roja

- izvedeno eno sistematično astronomsko opazovanje skozi daljši čas (Lunine mene, aktivnost Sonca, višina objekta v kulminaciji, analema, lune planetov, Venerine mene, Jupitrova rdeča pega in lune...)

Projektna naloga:

Samostojno delo: organizacija in sistematična izvedba kvantitativnih opazovanj izbranega astronomskega objekta na dogovorjen način v simulaciji izobraževalnega procesa, priprava poročila.

- implementation of basic naked-eye observations

- the execution of activities with the use of astronomical accessories and tools

- observation of light pollution in the selected area

- implementation of an optical observations of selected astronomical deep-space objects

- record astronomical photography and/or video of selected astronomical object, computer processing

- observation of meteor shower

- implementation of a long-time-period systematic astronomical observation (moon, sun activity, the culmination of astronomical objects, analema, moons of planets, Venus phases, Jupiter Red Spot and moons ...)

Project Work:

Independent work: organization and systematic execution of quantitative astronomical observations of selected astronomical object in the prescribed manner in simulation of educational process, the preparation of report.

Temeljni literatura in viri / Readings:

- Zwitter Tomaž, Pot skozi vesolje, Modrijan, Ljubljana, 2002
- Avsec France, Prosen Marijan, Astronomija, DMFA, Ljubljana, 2006
- Južnič Stanislav, Prosen Marijan, Astronomija na Slovenskem in slovenski astronomi na tujem, Didakta, Radovljica, 2008
- Strnad Janez, Mala zgodovina vesolja, DMFA, Ljubljana
- Chisolm Joanna in dr., Vesolje - velika ilustrirana enciklopedija, Mladinska knjiga, Ljubljana, 2008
- Sir Patrick Moore, The Amateur Astronomer (Patrick Moore's Practical Astronomy Series), Springer-Verlag London Ltd; 12Rev Ed edition (Oct 2005)
- Salaris, Maurizio, Evolution of stars and stellar populations, Chichester : J. Wiley, cop. 2005
- Vrtljiva zvezdna karta nt-BROG, 2011
- Druga astronomska periodika: Spika, Sky&Telescope, Weltraum und Sterne, Kmica ter astronomske in astrofizikalne znanstvene revije
- I. Gerlič. Didaktika pouka fizike v OŠ. PEF MB, 1992.
- I. Gerlič, V. Udir. Problemski pouk fizike v OŠ. Zavod RS za šolstvo, Ljubljana, 2006.

- Zaupanja vredni spletni viri, npr.: www.nasa.gov

Cilji in kompetence:

Študenti osvojijo znanja s področja didaktike astronomije za prenos znanj na nivo, ki je primeren za poučevanje v osnovni in srednji šoli.

Objectives and competences:

Students acquire knowledge in the field of didactics of astronomy for the transfer of knowledge and skills to a level suitable for teaching in primary and secondary school.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Poglobljeno znanje tem s področja didaktike astronomije. Poznajo osnovne astronomske objekte, zgodovinski razvoj astronomije in sodobne raziskave. Znajo samostojno organizirati in varno izvesti različna astronomska opazovanja ter o njih poročati. Usposobijo se za pripravo pouka astronomskih vsebin na različnih izobraževalnih stopnjah. Znajo uporabiti računalnik kot podporo pri poučevanju. Poleg astronomskih znanj znajo razvijati naravoslovne kompetence in spretnosti.

Prenesljive/ključne spretnosti in drugi atributi:

Strokovna in informacijska pismenost. Podajanje znanja za različne razvojne stopnje.

Intended learning outcomes:**Knowledge and understanding:**

Deeper knowledge in topics of didactics of astronomy. They know the basic astronomical objects, historical development of astronomy and modern research. They know how to organize independently and safely carry out various astronomical observations and report about observations. They are trained to prepare teaching of astronomical content in different educational levels. They know how to use computer as a support for teaching. In addition to astronomical knowledge and skills they can develop science competences and skills.

Transferable/Key Skills and other attributes:

Scientific and informational literacy. Knowledge communication at different development stages.

Metode poučevanja in učenja:

Multimedijska predavanja
Vodeno eksperimentalno delo
Problemsko učenje
Terensko delo

Learning and teaching methods:

Multimedia lectures
Guided experimental work
Problem-based learning
Field work

Individualno delo	Individual work
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

a) ustni izpit	a) 40 %	a) Oral exam
b) projektna naloga	b) 30 %	b) Project work
c) izdelano poročilo laboratorijskih in terenskih vaj ter zagovor	c) 30 %	c) Preparing report of labor work and field work and defend it.

Reference nosilca / Lecturer's references:

KRALJ, Samo, REPNIK, Robert. Patterns in symmetry breaking transitions. V: LAMANAUSKAS, Vincentas (ur.). *Philosophy of mind and cognitive modelling in education - 2012*, (Problems of education in the 21st century, vol. 46). Siauliai: Scientific Methodological Center Scientia Educologica, 2012, str. 74-84, ilustr. [COBISS.SI-ID [19462920](#)]

REPNIK, Robert, BRADAČ, Zlatko, MATHELITSCH, Leopold, KRALJ, Samo. Cosmology in the laboratory. V: 5th Liquid Matter Conference of the European Physical Society, Konstanz, 2002. *Abstracts book*, (Europhysics conference abstracts, Vol. 26F). [S. l.]: European Physical Society, 2002, str. 115-116. [COBISS.SI-ID [12039944](#)]

FERK, Eva, OSRAJNIK, Damjan, REPNIK, Robert. Planisphere in astronomy teaching in primary school - a successful tool for development of natural science competences. V: *International Conference on New Horizons in Education - 2010 : proceedings book*. [Famagusta: Sakarya University], 2010, str. 681-686, ilustr. [COBISS.SI-ID [17835272](#)]

REPNIK, Robert, AMBROŽIČ, Milan, GRUBELNIK, Vladimir. Galileo on our web textbook on behalf of International year of astronomy 2009. V: AURER, Boris (ur.), BAČA, Miroslav (ur.), RABUZIN, Kornelije (ur.). 20th Central European Conference on Information and Intelligent Systems, September 23-25, 2009, Varaždin, Croatia. *Conference proceedings*. Zagreb: University of Zagreb; Varaždin: Faculty of Organisation and Informatics, 2009, str. 29-33. [COBISS.SI-ID [22984999](#)]

BRADAČ, Zlatko, KRALJ, Samo, REPNIK, Robert, ŽUMER, Slobodan. Vesolje in tekoči kristali : Kibble Zurkov scenarij. V: MUŠEVIČ, Igor (ur.), ŠKARABOT, Miha (ur.). 3. konferenca fizikov v osnovnih raziskavah, Zdravilišče Laško, 11. oktober 2002. *Zbornik povzetkov*. Ljubljana: DMFA, založništvo, 2002, str. 29. [COBISS.SI-ID [12106248](#)]