



UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Astrofizika
Course name:	Astrophysics

Študijski program in stopnja Study program and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika in Astrofizika II. stopnja	Astrofizika	1	/
Physics and Astrophysics II. level	Astrophysics	1	/

Vrsta predmeta / Course type	obvezni / mandatory
Univerzitetna koda predmeta / University course code:	2FAF04

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:	prof. dr. Andreja Gomboc	
Jeziki / Languages:	Predavanja / Lectures:	slovenščina / English
	Vaje / Tutorial:	slovenščina / English

Pogoji za opravljanje študijskih obveznosti: Prerequisites:

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Vsebina:	Syllabus outline:
<ul style="list-style-type: none"> - Lastnosti medzvezdnega plina in prahu . - Nastanek zvezd in planetov: protozvezde in protoplanetarni disk, nastanek Zemlji podobnih planetov, nastanek plinastih orjakov, razvoj planetarnih sistemov, metode odkrivanja in opazovanj eksoplanetov. - Osnove astroseizmologije, zvezdna nihanja in stabilnost. - Končna stanja zvezd: lastnosti in opis belih pritlikavk, nevtronskih zvezd (pulzarji, magnetarji) in črnih lukenj. - Visoko-energijski tranzientni pojavi: lastnosti 	<ul style="list-style-type: none"> - The properties of interstellar gas and dust. - The formation of stars and planets: protostar and the protoplanetary disk, the formation of Earth-like planets, the formation of cloud regions, the development of planetary systems, methods of detection and observation of exoplanets. - Basics of astro-seismology, stellar oscillations and stability. - Final stages of stars: characteristics and description of the white dwarfs, neutron stars (millisecond pulsars, magnetars) and black holes.



<p>in vrste supernov, izbruhi sevanja gama, dogodki plimskih raztrganj v bližini črnih lukenj, radijski blišči.</p> <p>- Akrecija na kompaktne objekte: modeli akrecijskih diskov, nastanek curkov, rentgenske dvojne zvezde, aktivna galaktična jedra, črne luknje: aktivne in neaktivne.</p> <p>- Dinamika zvezd: večkratni sistemi zvezd, dinamika zvezd v zvezdnih kopicah, v galaksijah, v bližini središč galaksij in supermasivne črne luknje.</p> <p>- Dinamika naše Galaksije: črna luknja v središču, zvezdni tokovi, misija Gaia.</p>	<p>- High-energy transient events: properties and types of supernovae, gamma ray bursts, tidal disruption events by black holes, radio flares.</p> <p>- Accretion to compact objects: accretion disc models, jet formation, X-ray binaries, active galactic nuclei, black holes: active and inactive.</p> <p>- Stellar dynamics: multiple stellar systems, dynamics of stars in globular clusters, in the vicinity of galactic centres and supermassive black holes.</p> <p>- The dynamics of our Milky Way Galaxy: a black hole in the center, stellar streams, Gaia mission.</p>
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<p>Temeljni literatura in viri / Basic readings:</p>
<p>R. Kippenhahn, A. Weigert: Stellar Structure and Evolution, Springer-Verlag, 1994.</p> <p>N. Duric: Advanced Astrophysics, Cambridge University Press, 2003.</p> <p>P.J. Armitage: Astrophysics of Planet Formation, Cambridge University Press, 2013.</p> <p>M.H.P.M. Van Putten, A. Levinson: Relativistic Astrophysics of the Transient Universe, Cambridge University Press, 2012.</p> <p>U. Kolb, Extreme Environment Astrophysics, Cambridge University Press, 2010.</p>

<p>Cilji in kompetence:</p>	<p>Objectives and competences:</p>
<p>Cilji: Cilj predmeta je obravnava astrofizikalnih konceptov nastanka, razvoja, stabilnosti in dinamike zvezd ter končnih stanj zvezd.</p> <p>Kompetence: Poznavanje in razumevanje pogojev za nastanek zvezd in planetarnih sistemov, razvoja in končnih stanj zvezd ter njihove dinamike.</p>	<p>Objectives: The objective of the course is discussion of astrophysical concepts of stellar formation, evolution, stability, and dynamics and end stages of stars.</p> <p>Competences: Knowledge and understanding of conditions for formation of stars and planetary systems, evolution and end states of stars and stellar dynamics.</p>

<p>Predvideni študijski rezultati:</p>	<p>Intended learning outcomes:</p>
<p>Študenti bodo osvojili pojme in koncepte: - nastanek zvezd in planetarnih sistemov</p>	<p>Students will become familiar with: - formation of stars and planets</p>



- razvoj zvezd - končna stanja zvezd - dinamika zvezd - dinamika naše Galaksije.	- evolution of stars - end states of stars - stellar dynamics - dynamics in the Milky Way galaxy
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Metode poučevanja in učenja:	Learning and teaching methods:
- predavanja - numerične vaje - računske vaje	- lectures - numerical work - tutorial

Načini ocenjevanja:	Utež / Weight (%)	Assessment:
- kolokviji, pisni izpit - ustni izpit	50 50	- written tests, written exam - oral exam

Reference nosilca / references of the course principal:

Izr. prof. dr. Andreja Gomboc se raziskovalno ukvarja z izbruhi sevanja gama, plimskim raztrganjem zvezd v bližini masivnih črnih lukenj in modeliranjem relativističnega navigacijskega sistema satelitov. Doslej je objavila 60 znanstvenih člankov v mednarodnih referiranih revijah.

Assoc. Prof. Dr. Andreja Gomboc is active in research of gamma-ray bursts, tidal disruption of stars by massive black holes, and modelling of a relativistic navigation satellite system. She has published 60 scientific papers in international refereed journals.

Izbrane objave /selected publications:

1. K. Wiersema et al. (incl. A. Gomboc). Circular polarization in the optical afterglow of GRB 121024A. *Nature*, 509: 201-204, 2014.
2. A. Maselli et al. (incl. A. Gomboc). GRB 130427A: A Nearby Ordinary Monster. *Science*, 343: 48-51, 2014.
3. J. Japelj, et al. and A. Gomboc. Phenomenology of Reverse-Shock Emission in the Optical Afterglows of Gamma Ray Bursts. *The Astrophysical Journal*, 785: Issue 2, article id. 84, 22 pp., 2014.
4. C. Mundell et al. (incl. A. Gomboc). Highly Ordered Magnetic Field from GRB 120308A. *Nature*, 504, 119-121, 2013.
5. A. Gomboc. Unveiling the secrets of gamma ray bursts. *Contemporary Physics* 53: 339-355, 2012.
6. J. Japelj and A. Gomboc. Detectability of GRB Optical Afterglows with Gaia Satellite. *Publications of the Astronomical Society of the Pacific*, 123: 1034-1043, 2011.