COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Astronomy: Exploring Time and Space	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: dr. Šarūnas Mikolaitis **Other(s):** habil. dr. Gražina Tautvaišienė, dr. Arnas Drazdauskas, dr. Renata Minkevičiūtė, dr. Edita Stonkutė	Faculty of Physics, Institute of Theoretical Physics and Astronomy Saulėtekio av. 3, 10257 Vilnius, LITHUANIA

Study cycle	Type of the course unit (module)
First	General university studies

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face to face	Spring semesters	English

Requirements for students	
Prerequisites: English B1 or B2 level.	**Additional requirements (if any):** The module is oriented to students of humanities and social sciences which have finished the basic physics course in high school. Students of technological, biomedical and physical sciences may choose the module, with exception of students of the Faculty of Physics.

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	130	48	82

Purpose of the course unit (module): programme competences to be developed		
Students will gain the knowledge of the Universe around us, the forces and laws of physics in it, methods of its cognition, latest discoveries and challenges. The main goal is to familiarize students with the place of humanity in the Universe while developing the ability critically evaluate the reliability of scientific information and to form a scientifically based civic position.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
Will be able to critically interpret the information on scientific achievements and to make reasoned conclusions, work independently and in groups.	Preparation and presentation of the report and discussion in lectures and seminars. Review and discussion of the latest news in Astronomy, search for original papers and their evaluation.	Interim and final written examinations, presentation of the selected topic and participation in discussions (actively) in the seminars.
Will understand the principles of main physical phenomena, astronomical observations and research methods.	Teaching with visual demonstrations and discussions in seminars.	
Will acquire knowledge about important issues of modern astrophysical research and will understand the methods, tools, context and significance of future research.	Teaching with visual demonstrations and discussions in seminars.	

Content: breakdown of the topics	Contact hours								Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work	E. learning	**Contact hours**	**Self-study hours**	**Assignments**
1. History of night sky observations in the World and Lithuania. The understanding of the Universe in different civilizations. The connections between astronomy and other sciences (philosophy, mythology, history, geology etc.). Getting to know the visible objects and their movements in the night sky. How we observe the sky today, and how it will observed in the future.	6		3					**9**	**14**	Reading the compulsory sections of the literature. (Sections: 2-3 & 6. Pages: 3-34 p. 47-76 p.; 113-125 p.) Reading and studying of materials submitted in Virtual Learning Environment (VLE). Preparing for seminars and exam.
2. What is matter and energy: what constitutes the Universe surrounding us? Atoms, molecules, dark and other exotic matter and their interactions. How is matter produced in stars. The Big Bang and the evolution of the Universe. Place of humanity in the context of the evolution of the universe.	4		2					**6**	**12**	Reading and studying of materials submitted in Virtual Learning Environment (VLE). (Time, Space, Stars And Man: The Story Of The Big Bang (2nd Edition) / Woolfson, M. M. Chapters 6-9. Pages 53-91) Preparing for seminars and exam.
3. Solar System: formation, planets, their satellites, other small bodies and the laws governing their motion.. Solar system research and space missions. The review of human advancement in exploring the neighboring space. How Lithuanian scientists contribute to the research of our solar system.	6		3					**9**	**14**	Reading the compulsory sections of the literature. (Sections: 7 & 12. Pages: 133-197 p.; 263-270 p.) Reading and studying of materials submitted in Virtual Learning Environment (VLE). Preparing for seminars and exam.
4. Stars: what are their types? What are they made of? How do they born, live and die? Introduction to nuclear reactions. Investigation of the light from stars. Stellar systems. Why knowing the stars is important for humanity. How Lithuanian scientists contribute to the research of stars?	6		3					**9**	**14**	Reading the compulsory sections of the literature. (Sections: 8 & 10-11. Pages: 133-197 p.; 229-237 p.; 243-257 p.) Reading and studying of materials submitted in Virtual Learning Environment (VLE). Preparing for seminars and exam.
5. Our Galaxy - The Milky Way. The place of humanity in the Galaxy. Galaxies: what are their types, their similarities and differences, the physical laws behind their movement. The contribution of Lithuanian scientists in exploring The Milky Way and other galaxies.	6		3					**9**	**14**	Reading the compulsory sections of the literature. (Sections: 17-18. Pages: 349-363p.; 367-389 p.) Reading and studying of materials submitted in Virtual Learning Environment (VLE). Preparing for seminars and exam.
6. What is Astrobiology? The requirements for life on planets from the biophysical point of view. The search and characterisation of planets	4		2					**6**	**14**	Reading the compulsory sections of the literature. (Section: 20. Pages: 415-427 p.)

orbiting other stars. Exotic worlds. Search for life on other planets. The impact of possible life on other planets for humanity. Ethical considerations awaiting first contact with extraterrestrial civilisations. General summary of the course: the significance of astronomical achievements to the progress of our civilisation.										Reading and studying of materials submitted in Virtual Learning Environment (VLE). Preparing for seminars and exam.
Total	**32**		**16**					**48**	**82**	

Assessment strategy	**Weight ,%**	**Deadline**	**Assessment criteria**
Midterm exam	40	During the semester	Midterm exam from topics 1–3.
Evaluation of the presentation	20	During the semester	A student (or a group of students up to 5 persons) will be able to prepare a report on the relevant subject and present it during the seminar. Students will be able to choose to do the presentation either by themselves or in groups of up to 5 persons. Different topics will be available depending whether its for a single presenter, or for a group. The topics chosen for group assignments will have clear subtopics. Presentation time for one student should be around 5-7 minutes. The individual contributions to the group presentation should be of equal value. After the presentation, the lecturers and/or other students will have an opportunity to ask questions. The report will be evaluated by looking at how well the topic is explained, the completeness of the analysis, the significance of the content, the novelty and validity of the literature used, the quality of the presentation preparation: smooth talk, illustrations, and the logic of conclusions. Each student will be assessed individually according to his / her personal contribution to the presentation. Evaluated in a 10-point system. Score values: 10: Excellent knowledge and skills, student provides detailed answers to questions. 9: Very good knowledge and skills. 8: Good knowledge and skills, minor mistakes. 7: Medium knowledge and skills, insignificant mistakes. 6: Satisfactory knowledge and skills, some significant mistakes. 5: Weak knowledge and skills that still meet the minimum requirements. Many mistakes. 0–4: Minimum requirements are not met.
Exam	40	Session	Exam from topics 4 – 6.

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsory reading				
Hannu Karttunen Pekka Kröger Heikki Oja Markku Poutanen Karl Johan Donner	2016	Fundamental Astronomy		Springer is part of Springer Science+Business Media (www.springer.com) Electronic document (virtualibiblioteka.vu.lt)
Optional reading				
Fraknoi Andrew, Morrison David Wolff, Sidney C	2016	Astronomy		UMN Center for Open Education Electronic document (virtualibiblioteka.vu.lt)

Christian Carol, Roy Jean-René	2017	A Question and Answer Guide to Astronomy		Cambridge university press Electronic document (virtualibiblioteka.vu.lt)
Stephen Hawking	2011	The grand design		Bantam Books
Stephen Hawking	2001	The universe in a nutshell		Bantam Books
Nicolson Iain	2014	Introducing Astronomy: A Guide to the Universe		Dunedin Academic Press Electronic document (virtualibiblioteka.vu.lt)
Flammarion Camille, Gore John Ellard	2014	Popular Astronomy: A General Description of the Heavens		Cambridge university press Electronic document (virtualibiblioteka.vu.lt)
Woolfson, M. M.	2013	Time, Space, Stars And Man: The Story Of The Big Bang (2nd Edition)		Imperial College Press. Electronic document (virtualibiblioteka.vu.lt)