BACHELOR 'S PROGRAMME
2nd YEAR OF STUDY, 1st SEMESTER

COURSE TITLE	INTRODUCTION TO ASTROPHYSICS
COURSE CODE	
COURSE TYPE	full attendance
COURSE LEVEL	1st cycle (bachelor's degree)
YEAR OF STUDY, SEMESTER	2nd year of study, 1st semester
NUMBER OF ECTS CREDITS	5
NUMBER OF HOURS PER WEEK	4 (2 lecture hours + 2 seminar hours)
NAME OF LECTURE HOLDER	LECT. PH. IORDANA ASTEFANOAEI
NAME OF SEMINAR HOLDER	LECT. PH. IORDANA ASTEFANOAEI
PREREQUISITES	Advanced level of English

A GENERAL AND COURSE-SPECIFIC COMPETENCES

General competences:

- → Achievement of professional tasks efficiently and responsibly, in compliance with the field-specific deontology legislation, with qualified assistance.
- → Application of efficient work techniques in a multi-disciplinary team, on various hierarchical levels.
- → Effective use of information sources and communication resources and assisted professional training, both in Romanian and in a foreign language.

Course-specific competences:

- → Derivation of working formulas for calculations with physical quantities using appropriate principles and laws of Physics.
- → Description of physical systems, using specific theories and tools (theoretical models, algorithms, schemes, etc.)
- → Application of the principles and laws of Physics in solving theoretical or practical problems, under qualified assistance conditions.
- → Critical assesment of the results obtained by employing a physical model, including the degree of uncertainty of the obtained experimental results.
- → Elaboration of reports and presentations, the construction of logical and coherent arguments, the support of these arguments in front of an informed audience, on subjects of General Physics.

B LEARNING OUTCOMES

- → To provide a good knowledge on basics and main results of modern astronomy and astrophysics, along with their application to a variety of fields;
- → To provide teaching at undergraduate level that is stimulating, useful and enjoyable to students;
- → To develop the capacity of analyzing information from a large variety of bibliographic sources;
- → Achievement of professional tasks efficiently and responsibly, in compliance with the field-specific deontology legislation, with qualified assistance.
- → Application of efficient work techniques in a multi-disciplinary team, on various hierarchical levels.
- → Effective use of information sources and communication resources and assisted professional training, both in Romanian and in a foreign language.

C LECTURE CONTENT

Introduction. A history of cosmic discovery.
The general methods of Astronomy and astrophysics.
Celestial Sphere – Spherical Trigonometry;
Celestial coordinates and their Applications;
Equinox and Solstice.
Concept of Time: Solar Time, Sidereal Time, Time Zone, Universal Time, Local Mean Time; Different definitions of ~year~.
Planetary Motion Physics: Apparent and Retrograde Motion; Views of the Universe: Ptolemy vs. Copernicus; Eclipses.
Elements of Celestial Mechanics:
Newton`s Law of Gravitation;
Kepler`s Law for circular and non-circular orbits;
2-body problem.
Elements of Stellar Astrophysics: Distance, Brightness and Luminosity; Magnitudes; Color; Size and Mass; Spectra and Spectroscopy.
The Sun. Solar structure, Solar surface activities, Sun-Earth relations, Solar wind, Heliosphere, Magnetosphere.
The Solar System. Overview. Formation and evolution. Structure and Components. Orbital and Rotational Dynamics.

	Terrestrial Planets: Mercury. Venus. Mars The Giant Planets. Jupiter. Saturn. Uranus. Neptune. Satellite and Rings. Small Bodies. Nature and Dynamics. Asteroids. Comets. Interplanetary Dust. Meteorits. Galaxies: types, structure, stellar population; formation and dynamics; Hubble`s Classification of Galaxies Gravitational Lensing. Redshift, Distance and Hubble Law. Clusters of Galaxies. Astrophysics with Gravitational Waves. Description. Sources of the gravitational waves.
D	RECOMMENDED READING FOR LECTURES
	[1]. S. A. Roy și D. Clarke, Astronomy. Principles and Practice, Taylor & Francis 2003. [2]. M.Kacheriess, A concise Introduction to Astrophysics, NTNU, Trondeheim, Norway. [3]. B. W. Carroll, D. A. Ostlie, An Introduction to Modern Astrophysics, Cambridge Univ. Press, 2017. [4]. V. Ureche, Universul. Astronomie, Ed. Dacia, Cluj, 1982.
E	SEMINAR CONTENT
	Presentation of sky maps and catalogues; Star Atlases and observing Guides; Applications – Spherical Triangle. Gauss formulas Applications: Refraction. Parallax, Precession and Nutation The Earth Planet. Earth-Moon system. Precession. Nutation. Libration Laplace problem. Ephemerides. Applications to each topic presented at the course
F	RECOMMENDED READING FOR SEMINARS
	[1]. M. A. Dariescu, C. Dariescu, L. M. Cosovanu, C. I. Stelea,Topici de astronomie, astrofizică și cosmologie pentru începători, Ed. Ars Longa, Iasi, 2015. [2]. V. Ureche, Universul. Astronomie, Ed. Dacia, Cluj, 1982. [3]. M.Kacheriess, A concise Introduction to Astrophysics, NTNU, Trondeheim, Norway. [4]. B. W. Carroll, D. A. Ostlie, An Introduction to Modern Astrophysics, Cambridge Univ. Press, 2017.
G	EDUCATION STYLE
LEARNING AND TEACHING METHODS	Lecture, didactic explanation, heuristic coversation, video projection, problem solving method, case studies
ASSESSMENT METHODS	Written paper, presentations
LANGUAGE OF INSTRUCTION	English