BACHELOR 'S PROGRAMME
3rd YEAR OF STUDY, 1st SEMESTER

COURSE TITLE	ASTROPHYSICS AND COSMOLOGY
COURSE CODE	
COURSE TYPE	full attendance
COURSE LEVEL	1st cycle (bachelor's degree)
YEAR OF STUDY, SEMESTER	3rd year of study, 2nd semester
NUMBER OF ECTS CREDITS	5
NUMBER OF HOURS PER WEEK	4 (2 lecture hours + 2 seminar hours)
NAME OF LECTURE HOLDER	PROF. PH. D. CIPRIAN DARIESCU
NAME OF SEMINAR HOLDER	PROF. PH. D. CIPRIAN DARIESCU
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.
- → Comparison of the results given by numerical models or simulations of physical phenomena with data provided by literature and/ or experimental measurements.
- → Critical assesment of the results obtained by employing a physical model, including the degree of uncertainty of the obtained experimental results.
- → Presentation of scientific and popularization seminars on topics such as Elementary Particles Physics, Quantum Mechanics, Field Theory.
- → 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.
- → Responsible performing independent work tasks and interdisciplinary approach of topics.

B LEARNING OUTCOMES

- Ability to use theoretical physics methods in various fields;
- application of knowledge to practical situations;
- Ability in extracting information from a large variety of sources.
- Use of specific software for analyzing and processing experimental data.

C LECTURE CONTENT

- Basics of Stellar Astrophysics
- Fundamental Stellar models
- The Hertzsprung–Russell diagram
- Far of the Main-Sequence Stars: white dwarfs and supergiant stars
- Basics of General Relativity: metrics, linear connections and curvatures
- Exotic astrophysical objects
- Classification of galaxies. Galaxy properties and distances.
- The spatial distribution of galaxies
- Einstein Equations for Robertson-Walker Universes
- Various types of fundamental metric tensors
- The Big-Bang Theory of the Hot Universe
- Inflation, Large Scale Structures, Wormholes and Parallel Universes
- Modern Trends in Extra-dimensional Cosmology

D RECOMMENDED READING FOR LECTURES

B. W. Carroll, D. A. Ostlie, An Introduction to Modern Astrophysics, Cambridge Univ Press, 2017
M. A. Dariescu, C. Dariescu, L. M. Cosovanu, C. I. Stelea,Topici de astronomie, astrofizică și cosmologie pentru începători, Ed. Ars Longa, Iasi, 2015.

	V. Ureche, Universul. Astronomie, Ed. Dacia, Cluj, 1982. E. Toma, Introducere in astrofizica, Ed. Tehnica, Bucuresti, 1980. Frank Hsu, Physical Universe: An Introduction to Astronomy, University Science Books, 1982. A.Unsold, B. Baschek, W.D. Brewer, The New Cosmos: An Introduction to Astronomy and Astrophysics, Springer, 2001. N. Straumann, General Relativity and Relativistic Astrophysics, Springer-Verlag, 1984. I. Astefanoaei, C. Dariescu, M. A. Dariescu, Modele speciale de univers şi patologii spaţio-temporale, Ed. Univ. Al. I. Cuza, Iaşi, 2007. S. Gottlober, Early Evolution of the Universe and Formation of Structure, Akademie Verlag, Berlin, 1990. The CLEA Project
E	SEMINAR / LABORATORY CONTENT
	• Applications to each topic presented at the course. • Using the telescope and software devoted to astronomy and astrophysics. • Introduction to radio astronomy, infrared astronomy, optical astronomy, X-ray astronomy.
F	RECOMMENDED READING FOR SEMINARS
	B. W. Carroll, D. A. Ostlie, An Introduction to Modern Astrophysics, Cambridge Univ Press, 2017 M. A. Dariescu, C. Dariescu, L. M. Cosovanu, C. I. Stelea,Topici de astronomie, astrofizică și cosmologie pentru începători, Ed. Ars Longa, Iasi, 2015. V. Ureche, Universul. Astronomie, Ed. Dacia, Cluj, 1982. E. Toma, Introducere in astrofizica, Ed. Tehnica, Bucuresti, 1980. Frank Hsu, Physical Universe: An Introduction to Astronomy, University Science Books, 1982. A.Unsold, B. Baschek, W.D. Brewer, The New Cosmos: An Introduction to Astronomy and Astrophysics, Springer, 2001. N. Straumann, General Relativity and Relativistic Astrophysics, Springer-Verlag, 1984. I. Astefanoaei, C. Dariescu, M. A. Dariescu, Modele speciale de univers şi patologii spaţio-temporale, Ed. Univ. Al. I. Cuza, Iaşi, 2007. S. Gottlober, Early Evolution of the Universe and Formation of Structure, Akademie Verlag, Berlin, 1990. The CLEA Project
G	EDUCATION STYLE
LEARNING AND TEACHING METHODS	Co-operative problem solving. Debate. Problematization. Directed discovery. Exposition. Debate. Problematization. Directed discovery.
ASSESSMENT METHODS	Written exam Participation in seminar activities.
LANGUAGE OF INSTRUCTION	English