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

COURSE TITLE	ELECTRODYNAMICS AND THEORY OF RELATIVITY
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	6
NUMBER OF HOURS PER WEEK	7 (3 lecture hours + 4 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:

→ Elaboration of a specialty work, respecting the objectives, proposed deadlines and
→ norms of professional ethics.
→ Make of necessary connections to use physical phenomena, using basic knowledge
→ from close domains.

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 (experimental and theoretical models, algorithms, schemes, etc.)
→ Application of the principles and laws of Physics in solving theoretical or practical problems, under qualified assistance conditions.
→ Proper use of numerical methods and mathematical statistics in the analysis and processing of specific physical data.
→ Correlation of statistical analysis methods on a given topic (realization of measurements/calculations, data processing, interpretation).
→ Application of Physics knowledge both in given situations in related fields and in experiments, using standard laboratory equipment.

B LEARNING OUTCOMES

- 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;
- Application of the principles and laws of Physics in solving theoretical or practical problems.

C LECTURE CONTENT

Electrostatic Field.Flux of the Electrostatic Field. Electrostatic Field Potential.
Electrostatic Field Energy. Electrostatic Dipole. Electrostatic Multipoles. Dielectric Polarization.
Gauss` Law of Dielectric Media.
Stationary Electric Current. Magnetic Field of a Stationary Electric Current.
Ampère`s Circuital Law. Vector potential of the Field of a Stationary Current.
Energy of the Magnetic Field of Stationary Current. Magnetostatic Field in Magnetized Media. Polarized Magnetic Media.
Maxwell`s Equations in Vacuum and Polarizable Media. Electromagnetic Field Energy. Poynting`s Theorem.
Electrodynamic Potentials. Electromagnetic Field Equations for Moving Media. Electromagnetic Waves. Propagation of Electromagnetic Waves in Dielectric Media.
Electromagnetic Radiation. Principles of Special Relativity. Lorentz –Einstein transformations.
Some consequences of the Lorentz – Einstein transformations. Minkowski space. Various Representations of Minkowski Space.
Electromagnetic Field Tensor.Covariant Form of Maxwell`s Equations.
Four-Potential and Its Differential Equations. Conservation Laws of Electrodynamics in Covariant Formulation.
General Theory of Relativity. Principles of General Theory of Relativity.
Geodesics. Covariant Derivatives.
Equations of Electrodynamics in the Presence of Gravitation

D RECOMMENDED READING FOR LECTURES

1. Masud Chaichian, Ioan Merches, Daniel Radu, Anca Tureanu – Electrodynamics- An Intensive Course, Springer 2016.

	2. J.D.Jackson, Classical Electrodynamics, 2nd Ed. (Wiley, NY, 1975). 3. Minoru Fujimoto, Physics of classical electromagnetism (Springer, 2006). 4. Cleopatra Mociuţchi, Gabriel Lazăr,Electrodinamică,Ed. MatrixRom, Bucureşti, 2003.
E	SEMINAR CONTENT
	Vector and Tensor Analysis. Orthogonal systems of coordinates. Differential Opertators of I and II order. Green-Gauss-Ostrogradski and Stokes-Ampere theorem Curvilliniar systems of coordinates. A vector calculus in curviliniar coordinates. Dirac distribution. Applicative Exercisses and Problems. Electrostatic Field. Green functions, integral equations and applications. Applicative Exercisses and Problems Magnetostatic Field. Polarized Magnetic Media. Applicative Exercisses and Problems Maxwell`s Equations. Applicative Exercisses and Problems. Electrodynamic Potentials. Exercisses and Problems. Applications. Electromagnetic Radiation. Retarded Potentials. Liénard-Wiechert Potential. Various Representations of Minkowski Space. Exercisses and Problems. Applications. Covariant Form of Maxwell`s Equations. Exercisses and Problems. Applications. Conservation Laws of Electrodynamics in Covariant Formulation. Exercisses and Problems. Applications. General Theory of Relativity. Exercisses and Problems. Applications. Geodesics. Covariant Derivatives. Exercisses and Problems. Applications. Equations of Electrodynamics in the Presence of Gravitation. Exercisses and Problems. Applications.
F	RECOMMENDED READING FOR SEMINARS
	1. V.Novacu, Culegere de probleme de Electrodinamică, Ed. Tehnică, Bucureşti, 1964. 2. A. Alexeev, Recueil de problemes d'electrodynamique, Mir, Moscou, 1980. 3. M. Chaichian, I. Merches, D. Radu, A. Tureanu, Electrodynamics An Intensive Course, Springer (2016). 4. D. Vulcanov, I. I. Cotaescu Jr., Teste grila pentru examenul de Electrodinamica și teoria Relativitatii, Mirton, Timisoara, 1998. 5. K. Likharev, Classical Electrodynamics: Problems with Solutions (2018). 6. D. Griffiths: Introduction to Electrodynamics (1999).
G	EDUCATION STYLE
LEARNING AND TEACHING METHODS	Lecture, applications, guided discovering process, debate.
ASSESSMENT METHODS	• Written and Oral Exam
LANGUAGE OF INSTRUCTION	English