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

COURSE TITLE	THEORETICAL MECHANICS
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	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 — COURSE-SPECIFIC COMPETENCES

Course-specific competences:

→ Identification and proper use of the main laws and physical principles in a given context.
→ 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.
→ Solving of Physics problems in given conditions, using numerical and statistical methods.
→ Comparative assessment of the theoretical results offered by literature and of an experiment conducted in the framework of a professional project.

B — LEARNING OUTCOMES

- Description of physical systems, using specific theories and tools (experimental and theoretical models, algorithms, schemes, etc.).
- Proper use in professional communication of the terminology specific to Physics but also to related domains (especially Mathematics).
- Explanation and interpretation of physical phenomena by formulating assumptions and operationalizing key concepts and proper use of laboratory equipment.
- Application of Physics knowledge in given situations in related fields, as well as in experiments, using standard laboratory equipment.

C — LECTURE CONTENT

Introduction. The principles of classical/ newtonian mechanics. The principle of Classical/Galilean relativity.
The fundamental elements (notions and fundamental theorems) for one and many-particle systems.
Constraints. Clasifications. Examples. Motion on a curve and a surface.
The static equilibrium of the mechanics systems.
Elementary (real and virtual) displacements.The principle of Virtual Work.
Generalized Coordinates. Configuraton Space. Generalized Forces. The kinetic energy in Generalized Coordinates.
Lagrangean Formalism: D`Alembert`s Principle. Lagrange Equations of the second kind.
Hamilton`s Principle. Generalized H Hamilton`s Principle. Lagrange Equations of the second kind.
Lagrangian Mechanics. First Integrals.
Hamiltonian formalism. Hamilton`s Canonical Equations.
Canonical Transformations. Integral Invariants.
Hamilton – Jacobi method.
Action-Angle Variables.
Kinematics of Continuous Deformable Media
Dynamics of Continuous Deformable Media

D — RECOMMENDED READING FOR LECTURES

Masud Chaichian, Ioan Mercheş, Anca Tureanu – Mechanics – An intensive Course, Springer Publishing House, 2012.
I. Mercheş, L. Burlacu – Applied Analytical Mechanics, "The Voice of Bucovina" Press, Iaşi, 1995.
Z. Gábos, I. Stan – Curs de mecanică teoretică pentru fizicieni, Univ. Cluj, 1974.
V. Novacu – Mecanica teoretică, Univ. Bucureşti, 1969.

E — SEMINAR CONTENT

Vectors in euclidian tridimensional space. Vector and Tensor Algebra. Vector and Tensor Analysis.
Differential Vector Operators.
Vectorial Identities.
Orthogonal Curvilinear Coordinates. Analytical Expressions for Velocity and Acceleration in different Coordinate Systems.
Applicative Exercisses and Problems using Lagrange equatons of the first kind.

	Applicative Exercisses and Problems using Lagrange equatons of the second kind. Applicative Exercisses and Problems using Hamiltonian formalism. Poisson Brackets. Examples and Applications. Applicative Exercisses and Problems using Hamilton-Jacobi method. Concrete applications for study of Continuous Deformable Media.
F	RECOMMENDED READING FOR SEMINARS
	1. L.G. Grechko, V.I. Sugacov, C.F. Tomasevich, A.M. Fedorchenko – Problems in Theoretical Physics, Mir Moscow, 1977. 2. Daniel Radu, Iordana Aștefănoaei, Noțiuni fundamentale și probleme de mecanică analitică - - Iași - 2005. 3. M. Chaichian, I. Merches, A. Tureanu - Mechanics - An intensive Course, Springer - 2012
G	EDUCATION STYLE
LEARNING AND TEACHING METHODS	Lecture, debate, guided discovering process, applications, guided discovering process, debate
ASSESSMENT METHODS	• Written paper • Presentations
LANGUAGE OF INSTRUCTION	English