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

COURSE TITLE	CLASSICAL MECHANICS
COURSE CODE	
COURSE TYPE	full attendance
COURSE LEVEL	1st cycle (bachelor's degree)
YEAR OF STUDY, SEMESTER	1st year of study, 1st semester
NUMBER OF ECTS CREDITS	6
NUMBER OF HOURS PER WEEK	7 (3 lecture hours + 4 seminar/laboratory hours)
NAME OF LECTURE HOLDER	Assoc. prof. dr. Sebastian POPESCU
NAME OF LABORATORY HOLDER	Asist. dr. Alexandru LUKACS
PREREQUISITES	Advanced level of English

A PROFESSIONAL AND TRANSVERSAL COMPETENCES

Professional competences:

- Identifying the basic concepts of mechanics.
- Explaining the structure and operation of the components of different types of equipment using specific theories and tools (diagrams, mathematical and physical models, etc.).
- Description of the modeling methods of physical phenomena using notions and theories specific to physical and mathematical modeling.
- Explaining and interpreting physical phenomena and operationalizing key concepts based on the appropriate use of laboratory equipment.
- Critical evaluation of the results of the experiment, including the degree of uncertainty of the obtained experimental results.

Transversal competences:

- Identifying roles and responsibilities in a team and applying effective communication and work techniques within the team.
- Effective utilization of learning and communication resources and techniques for your own development.

B LEARNING OUTCOMES

Upon successful completion of this discipline, students will be able to:

- Explain the structure and operation of the components of different types of equipment using specific theories and tools (diagrams, mathematical and physical models, etc.).
- Describes the methods of modeling physical phenomena using notions and theories specific to physical and mathematical modeling.
- Use specific measuring instruments, as well as the mathematical apparatus necessary for the description of mechanical phenomena.
- Analyze mechanical phenomena and extract relevant information for the development of associated mathematical models.
- Calculate the functional expressions and the values of the physical quantities of interest, which can be evaluated based on the developed physical models.

C LECTURE CONTENT

The material point model (point body, reference system, trajectory, position vector, displacement vector, velocity, acceleration. Velocity and angular acceleration. Kinematics in Cartesian coordinates. Natural coordinates – radius of curvature, tangential and normal acceleration. Principles of dynamics; Movement of mass bodies variable, connection forces. Theorems of conservation and mechanical work. Galilean transformations. Consequences: Elements of relativistic dynamics; Movement in a central force field.)
Material points system model (Internal and external forces, center of mass, impulse, energy, kinetic moment, the two-body problem; Gravitational interaction between bodies; Collision of bodies)
The rigid solid model (Mass and density; degrees of freedom, axes of rotation, moments of inertia, rotation of a rigid body with a fixed axis, plane-parallel motion, gyroscope)
The fluid model (Pressure, pressure forces, hydrostatic pressure, continuity equation; Euler's equation, Bernoulli's law; Coanda effect, Magnus effect; Viscous fluids – Newton's law, Poiseuille – Hagen equation, turbulent flow, Reynolds number, wing of plane)

D RECOMMENDED READING FOR LECTURES

1. H. D. Young, R. A. Freedman, "Sears & Zemansky's University Physics", 15th edition, Pearson Education Ltd, 2019
2. http://newton.phys.uaic.ro

E LABORATORY/SEMINARS CONTENT

Kinematics of the material point
The dynamics of the material point
Material point systems
The rigid solid
Fluid dynamics
Measuring physical quantities (length, mass, time) and using measuring instruments
Calculation of errors

	Determination of the density of bodies The movement of the material point under the action of a constant force. The Atwood machine Determination of gravitational acceleration The study of the rotational movement of the rigid solid Determination of the moment of inertia of a body Gyroscope
F	**RECOMMENDED READING FOR LABORATORY/SEMINARS**
	1. H. D. Young, R. A. Freedman, "Sears & Zemansky's University Physics", 15th edition, Pearson Education Ltd, 2019 2. http://newton.phys.uaic.ro
G	**EDUCATION STYLE**
LEARNING AND TEACHING METHODS	Lecture, guided discovery, debate, problem solving
ASSESSMENT METHODS	• Weekly homework • Exam: Oral and Written test
LANGUAGE OF INSTRUCTION	English