COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_AM465	**SEMESTER OF STUDIES**	6th
COURSE TITLE	TOPICS IN CLASSICAL MECHANICS		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	4	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Elective course
PREREQUISITE COURSES:	Recommended prerequisite knowledge: CLASSICAL MECHANICS
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP223/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning*

and Appendix B

- *Guidelines for writing Learning Outcomes*

This course presents selected topics from three major branches of Classical Engineering: (1) Point particles mechanics, (2) Mechanics of rigid bodies and (3) Mechanics of continuous media. The number of degrees of freedom increases in these categories and that is why they are presented in this order.

During the course, the students will gain a unified view of Classical Mechanics where the above three classes will no longer be separate chapters but part of the entirety of the science of Mechanics.

After successfully completing the course, the students will have a clear understanding of both the physical processes and the mathematical concepts that characterize the above topics. The students will acquire the physical intuition that results from the proper mathematical formalism and will have the skills to further specialize as well as to tackle problems related to these areas of Mathematical Physics.

General Abilities

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*Others…*
Production of new research ideas	

- Finding, analyzing and combining facts and information using the most suitable technologies.
- Adapting to new situations.
- Working and studying autonomously.
- Working in a team.
- Generating new research ideas.
- Stimulating free, creative and constructive thinking.

3. COURSE CONTENT

The contents of this elective course may vary slightly from year to year, depending on the teacher. We here give the contents of the course as it was taught recently.

Part 1. Mechanics of point particles: (i) Ballistic flight without air resistance. (ii) The concept of the envelope curve. (iii) The dimensionless Reynolds number an its physical significance. (iv) Ballistic flight with resistance proportional to the speed (linear drag). (v) Ballistic flight with resistance that goes as the square of the speed (quadratic drag).

Part 2. Mechanics of rigid bodies: (i) Definition of the center of mass and its significance in the dynamics of extended rigid bodies. (ii) Angular momentum of a rigid body. (iii) Total angular momentum of an ensemble of rigid bodies. (iv) Rotation about a fixed axis. (v) Rotation about any axis, moments of inertia. (vi) Principal axes of a rigid body.

Part 3. Mechanics of continuous media**:** (i) Mathematical modeling of the vibrations of a stretched string. (ii) The wave equation and its analytical solution. (iii) Dispersion relation, comparison with other linear wave equations. (iv) Standing and traveling waves. (v) Boundary conditions, waves on finite strings. (vi) The continuity equation for continuous media, and in particular for fluids.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc..*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	✓ Use of information and communication technologies in the classroom, the tutorial classes, and for communication with the students ✓ Website of the course ✓ Use of the Department's online platform MyMath Use of mathematical programs in the classroom: During the lectures, apart from the classical teaching on the blackboard, frequent use is made of the mathematical programs *Maple* and *Mathematica* in order to present the students with a vivid and accurate illustration of the systems under consideration and their (often quite non-trivial) dynamics.
TEACHING ORGANIZATION *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	*Semester workload*
Lectures	52
Solving suggested exercises	28
Self-study during the semester	40
Preparation for the final examination	27
Duration of the written final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	**150**

STUDENT ASSESSEMNT *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	**Assessment Language:** Greek **Assessment Language for Erasmus students:** English **Assessment methods:** Written final examination (100%) including: ✓ Theory, ✓ Exercises, ✓ Real-world applications of Mechanics. Minimum passing grade: 5 Maximum passing grade: 10

5. RECOMMENDED LITERATURE

The recommended literature is announced by the teacher at the start of the course. Two relevant textbooks (that both exist also in a Greek translation) are the following:

- Goldstein Herbert, Poole Charles P. Jr. and Safko John L. *Classical Mechanics*. 3rd ed., Addison-Wesley, 2001.
- Kibble Tom W.B. and Berkshire Frank H. *Classical Mechanics*. 5th ed., Imperial College Press, 2004.