COURSE OUTLINE

(1) GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**33**	**SEMESTER**	**3**
COURSE TITLE	CLASSICAL MECHANICS I		

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*	**WEEKLY TEACHING HOURS**	**CREDITS**
	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*	General background/Specialised general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=397

(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*

The objective of this course is to present to the students and make them familiar with the basic principles of Classical Mechanics – a science that finds applications over a wide range of physical phenomena, from the motion of bodies on the surface of the Earth to the motion of star clusters around a black hole in the centre of the Galaxy.

After attending this course, every student must be in a position to identify and apply the basic methods of study for each physical system. More analytically, every student will be able to:

1. Identify and explain the basic principles of Newtonian Mechanics and its limits of validity.
2. Recall and use the conservation of physical quantities (momentum, angular momentum, energy).
3. Apply the above into advanced physical problems (study of the realistic motion of bodies, coupled oscillations, collisions, variable-mass systems etc).

4. Discriminate and explain the notions of conservative forces and central forces.
5. Solve problems in central potentials (attractive or repulsive) and reproduce the motion of the celestial bodies in the gravitational potential of the Sun.
6. Describe the motion of bodies in non-inertial reference frames and combine the previously acquired knowledge and techniques to solve problems in non-inertial frames.

General Competences

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	*……*
Production of new research ideas	*Others…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making
Working independently
Criticism and self-criticism
Production of free, creative and inductive thinking

(3) SYLLABUS

Principles of Newtonian Mechanics. Statics. Dynamics. Potential – Conservative forces. Conservation of momentum and energy. Collisions – systems of variable mass. Coupled oscillators. Central potential. Kepler's problem, trajectories in gravitational potential, stability of solutions. Three-dimensional harmonic oscillator. Elastic scattering. Non-inertial reference systems.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of the course web page on http://ecourse.uoi.gr to post notes, exercise sheets and solutions Use of electronic mail to communicate with the students
TEACHING METHODS *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.*	

Activity	*Semester workload*
Lectures	39
Problem Solving	13
Study of Bibliography	93
Exams	5

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		
	Course total	***150***
STUDENT PERFORMANCE EVALUATION *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.*	Problem solving (every second week) and submission for assessment Mid-semester written exams (2 hours) and end-of-semester written exams (3 hours) during which the students are asked to solve problems related to the material taught at the course	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. "Introduction to Theoretical Mechanics", Kanaris Tsigganos, Stamoulis Publications A.E., 2004.
2. "Theoretical Mechanics, Volume A", Ioannis Chatzidimitriou, Giachoudi Publications, 2000.
3. "Introduction to Classical Mechanics", David Morin, Cambridge University Press, 2007.
4. "Classical Mechanics", John R. Taylor, University Science Books, 2005.
5. "Classical Dynamics of Particles and Systems", S.T. Thornton and J. Marion, Brooks/Cole – Thomson Learning, 2004.