COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_AM262	**SEMESTER OF STUDIES**	7th
COURSE TITLE	ANALYTICAL 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:	
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	

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*

A student who has successfully completed the course should be able to:

- solve variational problems using calculus of variations techiques, especially min/maximization under constraints and problems of mechanics using the formalisms of Hamilton and Lagrange.
- use generating function to derive canonical transformations.
- relate conserved quantities with symmetries.
- know Liouville theorem, understand phase diagrams and apply perturbation theory.
- derive the Hamilton-Jacobi equation and define and use action-angle variables.

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	

- Autonomous work.
- Promotion of free, creative and inductive thought.

3. COURSE CONTENT

Generalized coordinates. Constraints. Real and virtual displacements. Ideal constraints. Calculus of variations. Principle of least action. Euler-Lagrange equations. Legendre transformation. Hamilton equation and Poisson algebra. Perturbation theory. Generating functions. Canonical transformations. Liouville theorem. Hamilton-Jacobi equation. Action-angle variables.

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*	*eClass* platform of the University of Patras.
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	26
Tutorials	26
Individual Study	95
Final Exam	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:** Final Course Examination including comprehension questions and problem solving. Minimum passing grade: 5 Maximum passing grade: 10

5. RECOMMENDED LITERATURE

(*in Greek*)

- Χατζηδημητρίου Ιωάννης Δ. *Θεωρητική Μηχανική*. Εκδόσεις Σ. Γιαχούδης & ΣΙΑ, 2013.
- Ιωάννου Πέτρος και Αποστολάτος Θεοχάρης. *Θεωρητική Μηχανική*. 2η Έκδοση, Εκδόσεις Εταιρείας Αξιοποίησης και Διαχείρισης Περιουσίας Πανεπιστημίου Αθηνών, 2007.
- Ιχτιάρογλου Σίμος Ι. *Εισαγωγή στη Μηχανική Hamilton*. Εκδόσεις iWrite, 2014.