COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_PM308	**SEMESTER OF STUDIES**	5th
COURSE TITLE	DIFFERENTIAL GEOMETRY 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*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	5	7
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*	Scientific Area
PREREQUISITE COURSES:	Recommended prerequisite knowledge: LINEAR ALGEBRA I, CALCULUS III
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP217/ https://eclass.upatras.gr/courses/MATH913/

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*

Students should be able to: Find Frenet's frame for a space curve parametrized by arclength, and compute its curvature and torsion. Check that a surface is regular and find its tangent plane. To compute the first and second fundamental form, as well as various curvatures (Gauss curvature, mean curvature, principal curvatures and normal curvature). To state and understand the significance of Gauss' Theorema Egregium.

Upon completing this course, students should have understood the fundamental notions and theorems of elementary differential geometry of curves and surfaces in the three-space.

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	

- Investigation, analysis and synthesis of data and information, by using appropriate technology tools.
- Adaptation into new environments.
- Independent work.
- Team work.
- Exercise judgment and self-evaluation.

3. COURSE CONTENT

Curves in the plane and in space, tangent line to a curve, arclength-natural parameter, Frenet's moving frame, curvature and torsion, generalized helices, the fundamental theorem of space curves, global theory of curves, isoperimetric inequality, regular surfaces, construction of regular surfaces using the implicit function theorem, tangent plane, first and second fundamental form, surface area, Gauss map, shape operator (Weingarten map), normal curvature, principal curvatures, Euler's formula, Gauss curvature, mean curvature, Theorema Egregium.

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*	There is use of *Mathematica©* for graphing surfaces. Various problems and other course material is posted in *eClass*.
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*	
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 which includes theory and problems Minimum passing grade: 5 Maximum passing grade: 10

Activity	***Semester workload***
Lectures	39
Tutorials	26
Solving course assignments	37
Personal study by the student	70
Final Examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***175***

5. RECOMMENDED LITERATURE

(*in Greek*)

- Παπαντωνίου Βασίλειος. *Διαφορική Γεωμετρία.* Εκδόσεις Εταιρείας Αξιοποίησης και Διαχείρισης Περιουσίας Πανεπιστ. Πατρών, 2016.
- Αρβανιτογεώργος Ανδρέας. *Στοιχειώδης Διαφορική Γεωμετρία.* (e-book). Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Αποθετήριο "Κάλλιπος", 2015.
- Pressley Andrew. *Στοιχειώδης Διαφορική Γεωμετρία.* 3η Έκδοση, Εκδόσεις ΙΤΕ – Πανεπιστημιακές Εκδόσεις Κρήτης, 2011.
- Barett O'Neil. *Στοιχειώδης Διαφορική Γεωμετρία.* 3η Έκδοση, Εκδόσεις ΙΤΕ – Πανεπιστημιακές Εκδόσεις Κρήτης, 2005.

(*in English*)

- Pressley Andrew. *Elementary Differential Geometry*. 2nd Edition, Springer, 2010.
- Do Carmo Manfredo. *Differential Geometry of Curves and Surfaces*. Prentice Hall, 1976.