COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_PM101	**SEMESTER OF STUDIES**	1st
COURSE TITLE	ANALYTIC GEOMETRY		

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*	Background
PREREQUISITE COURSES:	
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP204/ https://eclass.upatras.gr/courses/MATH914/

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*

After the course, students are expected to be able to:

- Use matrices and determinants and solve systems of linear equations.
- Use basic vector algebra (dot product, cross product and mixed product), find equations of lines and planes defined in various ways and use the Cartesian coordinate system with ease in order to solve basic geometric problems.
- Use transformations of coordinate systems in two and three dimensions.
- Work with surfaces of second degree.

After the successful completion of the course the students will know:

- basic Matrix Algebra, the Gauss-Jordan method for solving linear systems, the basic properties of determinants.
- the various forms of line and plane equations in space, the distance of a point from a line and a plane, the relative positions of lines and planes in space.
- the properties of the dot product, cross product and mixed product, as well as the geometric interpretation of these concepts.
- second-degree surfaces.

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	

- Search, analysis and synthesis of data and information using appropriate technologies.
- Decision making.
- Adaptation to new situations.
- Working in an interdisciplinary environment.
- Autonomous Work.
- Teamwork.
- Production of new research ideas.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Matrices. Matrix operations and their basic properties. Row-echelon form of matrix. Rank of a matrix. Transpose and inverse of a square matrix. Elementary matrices and elementary row operations. Equivalent matrices. Calculation of the inverse matrix by reduction to reduced row-echelon form.
Determinant of square matrix. Properties of determinants. Minors and cofactors. Finding the inverse matrix using determinants.
Methods of solving systems of linear equations. (Gauss method and Cramer method). Study of systems of linear equations. Homogeneous systems of linear equations.
Vector space. Vector operations. Linearly dependent and linearly independent vectors. Orientation of plane and space. Coordinate systems in the plane and in space (general, orthonormal and polar). Transformations of coordinate systems. Vector Algebra (dot products, cross products and mixed products and their applications in calculating areas and volumes).
Lines and planes in space (parametric equations, vector equations, equations of straight line as the intersection of two planes, Cartesian equation of a plane). Bundle of parallel levels. Bundle of planes intersecting at a line. Distance of a point from a line and a plane. Distance between lines. Orthogonal projections.
Surfaces of second degree.

In order to highlight the special educational and didactical aspects of a course, special emphasis is given on the historical evolution and scientific development of the subject as well as on its applications in technology and/or other sciences.

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*	Supporting learning through • the online platform *eClass* of the Department of Mathematics, and the • online platform *eClass* 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*	
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 Course Examination (100%) including ✓ Theory, ✓ Exercises, ✓ Applications of Analytic Geometry. Minimum passing grade: 5 Maximum passing grade: 10

Activity	***Semester workload***
Lectures	39
Tutorials	26
Solving suggested exercises	39
Hours of personal study by the student	68
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***175***

5. RECOMMENDED LITERATURE

(in Greek)

- Γεωργίου Δημήτριος και Ηλιάδης Σταύρος. *Αναλυτική Γεωμετρία (Με Στοιχεία Γραμμικής Άλγεβρας)*. 2η Έκδοση, Εκδόσεις Τζιόλα, 2017.
- Χρυσάκης Θανάσης. *Γραμμική Άλγεβρα και Αναλυτική Γεωμετρία*. 2η Έκδοση, Εκδόσεις Τσότρας, 2013.