

## COURSE OUTLINE

### (1) GENERAL

<b>SCHOOL</b>	SCHOOL OF SCIENCES		
<b>ACADEMIC UNIT</b>	DEPARTMENT OF MATHEMATICS		
<b>LEVEL OF STUDIES</b>	UNDERGRADUATE PROGRAM		
<b>COURSE CODE</b>		<b>SEMESTER</b>	<b>C*</b>
<b>COURSE TITLE</b>	GEOMETRY OF SPACE		
<b>INSTRUCTOR</b>	Charalambos Kornaros		
<b>INDEPENDENT TEACHING ACTIVITIES</b>		<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>
		4	6
<b>COURSE TYPE</b>	Special background		
<b>PREREQUISITE COURSES:</b>	NO		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	GREEK		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	YES		
<b>COURSE WEBSITE (URL)</b>	<a href="http://www.math.aegean.gr/index.php/en/academics/undergraduate-programs">http://www.math.aegean.gr/index.php/en/academics/undergraduate-programs</a>		

### (2) LEARNING OUTCOMES

<b>Learning outcomes</b>
<p>At the end of the lesson, a student who has studied and learned the material should be able to:</p> <ol style="list-style-type: none"> <li>1. Solve problems involving lengths and distances in the plane, including the measurement of the angle between two lines, parallel lines and perpendicular lines.</li> <li>2. Perform translations and rotations of the coordinate axes to eliminate certain terms from a second order equation with two or three variables.</li> <li>3. Recognize the type of a conic section and sketch its graph given an equation. Conversely, calculate the second order equation of a given conic section and use this to find pertinent information such as positions of the foci, curvature, tangent lines etc.</li> <li>4. Use the polar coordinate system, relate it to the rectangular coordinate system, and calculate equations of conic sections using polar coordinates.</li> <li>5. Determine the rigid motions(isometries) in the plane and the space and classify them.</li> <li>6. Calculate the equations of the basic 3D shapes like plain and sphere. Sketch graphs of and discuss relevant features of curves in the plane determined.</li> <li>7. Determine the geometric shape of a surface given its second order equation. Find the tangent plane at a specific point of the surface.</li> <li>8. Determine any symmetries of a given shape given its analytical equation or some geometrical description.</li> <li>9. Classify the platonic solids, know about their symmetries and their properties.</li> </ol>
<b>General Competences</b>
Working independently. Team working. Working in an interdisciplinary environment.

### (3) SYLLABUS

<p>Conic Sections as second degree curves Geometric and analytical definitions of Conic Sections. Tangent lines.</p>
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\*In the academic year 2023-2024 this lesson will be taught in the 4<sup>th</sup> semester.

Rigid motions in plane. Classification of Euclidean plane isometries. Classification of Conics sections of the plane. Conic sections in polar coordinates. Second degree surfaces Rigid motions in space. Isometries in three dimensions (rotation, translation, screw translation) Classification of Quadratic Surfaces. Tangent planes to quadratic surfaces. Platonic Solids Symmetry Groups of platonic Solids Symmetries of surfaces	
<b>TEACHING MATERIAL DISTRIBUTION</b>	The teaching material of the course is uniformly distributed during the semester.

#### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b>	Face-to-face lectures	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b>	Communication with students via e-mail	
<b>TEACHING METHODS</b>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	52
	Independent study	98
	Course total (25 per ECTS)	<b>150</b>
<b>COURSE COMMITMENTS</b>	Attending course is not obligatory.	
<b>STUDENT PERFORMANCE EVALUATION</b>	Student's evaluation is done in Greek through a written examination which includes short-answer questions, problem solving and laboratory work. For students with disabilities, evaluation takes place via oral exams.	

#### (5) ATTACHED BIBLIOGRAPHY

<ol style="list-style-type: none"> <li>1. Γραμμική Άλγεβρα και Αναλυτική Γεωμετρία, Θανάσης Χρυσάκης.</li> <li>2. Αναλυτική Γεωμετρία, Ανδρεαδάκης Σ.</li> <li>3. Αναλυτική Γεωμετρία με στοιχεία Γραμμικής Άλγεβρας, Δημήτρης Γεωργίου και Σταύρος Ηλιάδης.</li> <li>4. Treks into Intuitive Geometry. The World of polygons and Polyedra. Jin Akiyama and Kiyoko Matsunaga.</li> <li>5. Analytic Geometry, 7th ed. Gordon Fuller and Dalton Tarwater.</li> </ol>
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