

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	POSTGRADUATE Studies in Mathematics		
COURSE CODE	A1	SEMESTER	
COURSE TITLE	ALGEBRAS AND LIE GROUPS		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
		3	10
COURSE TYPE	SPECIALISED GENERAL KNOWLEDGE		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.math.aegean.gr/index.php/en/academics/undergraduate-programs		

(2) LEARNING OUTCOMES

Learning outcomes
<p>Understanding the notions of manifold and differential. Tangent space, Tangent bundle. Understanding the notion of Lie group and relation with the tangent space. Description of the action of Lie groups on differential manifolds. Examples of classical Lie groups.</p> <p>Understanding the Lie commutator. How the Lie commutator shapes the classical definitions of the Algebra. Understanding examples. Ability of the students to provide examples of the soluble and nilpotent Lie algebras. Understanding of the theorems by Engel and Lie.</p>
General Competences
<p>Working independently</p> <p>Team work</p> <p>Search for, analysis and synthesis of data and information</p> <p>Production of free, creative and inductive thinking</p>

(3) SYLLABUS

<p>Differentiable manifolds. Definitions/Examples. Differentiable functions.</p> <p>Differential of a differentiable function. Tangent space. Tangent fields. Vector Fields. Integral curves.</p> <p>Lie groups. Definition/Examples. Tangent space at the identity element. Lie algebra of a Lie group. Left invariant vector fields.</p> <p>One parameter subgroups. Exponential function. Action of Lie groups of differentiable manifolds. Classical Lie groups.</p> <p>Basic definitions in Lie algebras, Lie subalgebras. Isomorphisms. Bundle of Lie algebras. Ideals. Classification of Lie algebras with dimensions 1,2 and 3. Quotient algebras.</p> <p>Soluble/Nilpotent Lie algebras: Definitions, properties. Semisimple Lie algebras. Theorems by Engel and Lie. Killing form. Classical Lie algebras.</p>
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(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Communication with students via e-mail	
TEACHING METHODS	Activity	Semester workload
	Lectures	39
	Independent study	148.5
	Assignments	62.5
	Course total (25 per ECTS)	250
STUDENT PERFORMANCE EVALUATION	Student evaluation is done in Greek through a written examination which includes short-answer equations and problem solving. For students with disabilities, evaluation takes place via oral exams.	

(5) ATTACHED BIBLIOGRAPHY

1. W. Rossmann, Lie Groups: An introduction through Linear Groups. Oxford Science Publications, 2002.
2. B. Hall, Lie Groups, Lie Algebras and Representations, Springer, 2003.