COURSE OUTLINE

GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Department of Mathematics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**MAY422**	**SEMESTER**	**4**
COURSE TITLE	Algebraic Structures 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*	**WEEKLY TEACHING HOURS**	**CREDITS**
	5	7,5
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*	General Background
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://users.uoi.gr/abeligia/AlgebraicStructuresI/ASI2016/ASI2016.html

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*

The course aims to introduce the students to the study algebraic properties of sets which

are equipped with one or more (binary) operations. Such mathematical objects are called algebraic structures. We will mainly deal with two types of algebraic structures:

1. Groups. The standard example is the group of permutations of a, usually finite, set. This is the set of all bijective functions from a set to itself endowed with the operation of composition of functions.
2. Rings. The standard example of a ring is the set of integers equipped with the operations of addition and multiplication of integers.

We will formulate various theorems concerning the structure and basic properties of groups and rings emphasizing the concept of isomorphism of groups or rings. From the perspective of Algebra two algebraic structures which are isomorphic, they have exactly the same algebraic properties. As a direct consequence, results concerning an algebraic structure are valid in any isomorphic algebraic structure. In the course we present several examples illuminating various notions of symmetry. It should be noted that the notion of symmetry is the central theme which underlies the concept of group/ring.

At the end of the course we expect the student: (a) to have understood the definitions and basic theorems which are discussed in the course, (b) to have understood how they are applied in discrete examples, (c) to be able to apply the material in order to extract new elementary conclusions, and finally (d) to perform some (no so obvious) calculations.

General Competences

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
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
Others

The course aims to enable the undergraduate student to acquire the ability to analyse and synthesize basic knowledge of the theory of algebraic structures, in particular of the theory of Groups and Rings, which form an important part of modern algebra. The contact of the undergraduate student with the ideas and concepts of the theory of groups and rings, promotes the creative, analytical and deductive thinking and the ability to apply abstract knowledge in various fields.

SYLLABUS

1. Preliminaries: Sets, functions, equivalence relations, partitions, (binary) operations.
2. Groups – Permutation groups.
3. Cyclic groups – generators.
4. Cosets with respect to a subgroup – Lagrange's Theorem.

5. Homomorphisms of groups – Quotient groups.
6. Rings and fields - Integral domains.
7. The theorems of Fermat and Euler.
8. Polynomial rings – Homomorphisms of Rings.
9. Quotient rings – Prime and maximal ideals.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	
TEACHING METHODS *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 PERFORMANCE EVALUATION *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.*	Written final exams, in Greek language, combining analysis of theoretical topics and problem solving.

Activity	***Semester workload***
Lectures	65
Study of the elements of the theory and methods for solving exercises	*32.5*
Course total	***97,5***

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. **J. Fraleigh**: "*Introduction to Algebra*", Greek edition, Crete University Press, (2005).
2. **D. Varsos, D. Deriziotis, M. Maliakas, O. Talleli, I. Emmanouil:** "*An Introduction to Algebra*", Sofia Press, (2007).
3. **K. Kalfa**: "*Introduction to Algebra*", Ziti Press, (2003).
4. **D**. **Poulakis**: "Algebra", Ziti Press, (2013).

- Related academic journals: -