COURSE OUTLINE

GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Department of Mathematics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**MAE725**	**SEMESTER**	**7**
COURSE TITLE	Ring Theory		

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**
	3	6
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*	*Specialised general knowledge*
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/RingTheory/RingTheory2014/RingTheory2014.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 principal aim of the course is to introduce the students to the main tools and methods of the theory of non-commutative rings, where by non-commutative ring is meant an associative ring with

unit, which is not necessarily commutative.

The main objective of the course is to present the basic theory of rings and the ideas which lead to the proof of: (a) the fundamental theorem of Wedderburn-Artin concerning the structure of semisimple rings and, (b) the fundamental density theorem of Jacobson concerning the structure of primitive rings. A key element in the study of a ring is the interaction and interplay between ring-theoretical properties of the ring and the structure of its (left or right) ideals or modules. In the course a variety of examples and constructions will be analyzed and various applications of ring theory to other areas of mathematics (in particular of algebra) will be explored.

At the end of the course we expect the student to have understood the definitions and basic theorems which are discussed in the course, to have understood how they are applied in discrete examples, to be able to apply the material in order to extract new elementary conclusions, and finally 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 Rings, which is an important part of modern algebra. The contact of the undergraduate student with the ideas and concepts of the theory of rings, promotes the creative, analytical and deductive thinking and the ability to apply abstract knowledge in various fields.

SYLLABUS

Rings – Homomorphisms – Ideals – Quotient Rings – Modules – Rings arising from various constructions – Algebras – Group algebras – Modules over group algebras – Module homomorphisms – The bicommutator – Simple faithful modules and primitive rings – Artin rings – Simple finite dimensional algebras over algebraically closed fields – Artinian modules – Noetherian rings and modules – Jacobson radical.

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.*	Combination of: Weekly homework, presentations in the class by the students, written work, and, at the end of the semester, written final exams in Greek combining analysis of theoretical topics and problem solving.

Activity	***Semester workload***
Lectures	39
Study of the elements of the theory and methods for solving exercises	*18*
Course total	***57***

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Nathan Jacobson: "Basic Algebra I & II ", W. H. Freeman and Company, (1985 & 1989).
- I.N. Herstein: "Non-commutative Rings", AMS, Carus Mathematical Monographs 85, (1971).
- Luis Rowen: "Ring Theory (student edition)", Academic Press, Second Edition, (1991).
- T.Y. Lam: "A First Course in Noncommutative Rings", GTM 131, Springer, (2001).
- P. M. Cohn: "Introduction to Ring Theory", Springer (2000).
- Y. Drozd and V. Kirichenko: "Finite Dimensional Algebras", Springer (1994).

- Related academic journals: -