COURSE OUTLINE

GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Department of Mathematics		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE	**ΑΛ2**	**SEMESTER**	**2**
COURSE TITLE	Algebra II		

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	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*	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/AlgebraII/AlgebraII2015.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 main tools and methods of Homological Algebra. Additionally, several applications in various areas of mathematics are presented.

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 postgraduate student to acquire the ability to analyse and synthesize basic knowledge of the methods of Homological Algebra and its applications to various areas on Mathematics. The contact of the undergraduate student with the ideas and concepts of Homological Algebra, promotes the creative, analytical and deductive thinking and the ability to apply abstract knowledge in various fields.

SYLLABUS

1. Preliminaries: elements of basic ring theory.
2. Introduction to module theory.
3. Fundamental constructions of modules.
4. Categories and functors.
5. Projective, injective and flat modules.
6. Complexes and Homology.
7. Projective and injective resolutions.
8. Derived functors.
9. Ext and Tor.
10. Homological dimensions.
11. Applications of Homological Algebra.

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*	

Activity	***Semester workload***
Lectures	39
Study of the elements of the theory and methods for solving exercises	*32,5*
Course total	***57***

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.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. P. Hilton and U. Stammbach: "*A Course in Homological Algebra*", Springer-Verlag, (1971).
2. J. Rotman: "*An Introduction to Homological Algebra*", Springer, Second Edition, (2009).
3. M. Scott Osborne: "*Basic Homological Algebra*", Springer, (2000).
4. Ch. Weibel: "*An Introduction to Homological Algebra*", Cambridge University Press, (1994).
5. S.I. Gelfand and Yu. Manin: "Methods of Homological Algebra", Springer, Second Edition, (2003).
6. P. Bland: "*Rings and their Modules*", De Gruyter, (2011).

- Related academic journal: -