IV. DESCRIPTION OF UNDERGRADUATE COURSES

1st Semester (I) (applied since 2016-17)

Mathematics for Chemists

1. GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	CHEMISTRY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MA102**	**SEMESTER**	**1st**
COURSE TITLE	MATHEMATICS FOR CHEMISTS		
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*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures		4	5
Seminars		1	
Laboratory work		1	
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:	There are no prerequisite courses. However, the students should already have a satisfactory knowledge of algebra, derivatives and integrals.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/CHEM2042/		

2. 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 aim of the course is to give to the student of the Department of Chemistry the knowledge of advanced applied mathematics that he/she needs in his/her science in the areas of differential and integral calculus of

one variable and of several variables, of linear algebra, differential equations, probabilities and statistics. This knowledge is necessary and is used in many subsequent specialization courses in chemistry. In addition, by solving chemistry problems requiring knowledge of mathematics, students comprehend the usefulness of mathematics as a tool for solving problems of their science.

At the end of the course the student will have developed the following skills/competences:

1. To be able to efficiently use the differential and integral calculus, linear algebra, differential equations and statistics in the subsequent courses in his/her studies in chemistry as well as in related problems of chemical.

2. To be able to mathematically formulate problems of chemistry which make use of the above mathematical fields.

3. To be able to efficiently use the computer and computer algebra software in mathematics and chemical applications.

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

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):

Autonomous (Independent) work

Exercise of criticism and self-criticism

Promotion of free, creative and inductive thinking

3. SYLLABUS

1. Differential calculus of functions of a single variable.
2. Integral calculus of functions of a single variable.
3. Matrices and systems of linear equations.
4. Differential calculus of functions of several variables.
5. Integral calculus of functions of several variables.
6. Introduction in differential equations.
7. Introduction to Probability and Statistics.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures, seminars and laboratory work face to face.	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of Information and Communication Technologies (ICTs) (e.g. PowerPoint) in teaching. The major part of lectures content is uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them. Tutorials with exemplary mathematical problem solving. Computer laboratory for learning Symbolic Algebra as a tool for solving Mathematical problems.	
TEACHING METHODS	***Activity***	***Semester workload***

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*	Lectures (4 contact hours per week x 13 weeks)	52
	Seminars (1 contact hour per week x 13 weeks) - solving of representative problems; techniques and theory associated to each laboratory experiment)	13
	Laboratory work (1 contact hour per week)	13
	Final examination (3 contact hours)	3
	Hours of Private Study of the Student for the preparation of the Final Examination	44
	Course total	***125***
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.*	1. Final written examination (70% of the final grade). 2. Laboratory examination (30% of the final grade). Greek grading scale: 1 to 10. Minimum passing grade: 5.	

5. ATTACHED BIBLIOGRAPHY

1. K.E. Papadakis, "Introduction to Mathematica", 3rdEdition. Tziolas Publications, 2010.
2. V.V. Markellos, "Applied Mathematics, Vol. II: Linear Algebra, Differential Equations". Symmetria Publications, 2000.
3. J. Koutrouvelis, "Statistics methods", Vol. I, Symmetria Publications, 1999.
4. R. E. Walpole, R. H. Myers, S. L. Myers and K. Ye, "Probability and statistics for engineers and scientists" https://drive.google.com/file/d/0B5T4JPIHf-6oSUxtZlBmd0Mxc0E/edit