COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_ST361	**SEMESTER OF STUDIES**	6th
COURSE TITLE	SIMULATION METHODS		

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 and Tutorials	4	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*	Elective course
PREREQUISITE COURSES:	Recommended prerequisite knowledge: PROBABILITY I and II, STATISTICAL INFERENCE I
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP215/

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*

Upon succesful completion of the course, the students will have gained understanding of the notion and the meaning of the pseudorandom numbers and how these numbers can be used to generate (simulate) values of random variables, random vectors and stochastic processes. They will find out how mathematical quantities, connected with a particualar stochastic model, as for example integrals or system reliabilities, can be estimated using simulation. They will also be able to use a variety of techniques to reduce the variance of the estimator.

General Abilities

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	

- Decision making.
- Autonomous work.
- Teamwork.
- Ability to work in an interdisciplinary environment.
- Ability to promote free, productive and inductive thinking.

3. COURSE CONTENT

Pseudorandom numbers. The Monte Carlo approach. Generating discrete and continuous random variables and stochastic processes. Statistical analysis of simulated data. Variance reduction techniques. Markov chain Monte Carlo methods. Applications.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc.*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	Support of the course via the online platform *eClass* of the Department of Mathematics.
TEACHING ORGANIZATION *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 ASSESSEMNT *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*	**Assessment Language:** Greek **Assessment Language for Erasmus students**: English **Assessment methods:** Final written examination (100%) made up of exercises and theory questions Minimum passing grade: 5 Μαximum passing grade: 10

Activity	***Semester workload***
Lectures	26
Tutorials	26
Solving homework problems	30
Laboratory exercises	10
Personal study	55
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

5. RECOMMENDED LITERATURE

(*in Greek*)

- Μακρή, Ευφροσύνη Σ. *Μέθοδοι Προσομοίωσης*. Σημειώσεις μαθήματος, 2016.

(*in English*)

- Ross Sheldon M. *Simulation*, 5th ed., Elsevier (Academic Press), 2013.
- Gentle James J. *Random Number Generation and Monte Carlo Method*. 2nd ed., Springer, 20003.