COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_IC103	**SEMESTER OF STUDIES**	2nd
COURSE TITLE	DISCRETE MATHEMATICS		

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	5	7
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*	Background
PREREQUISITE COURSES:	
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP203/

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*

With this course a student acquires basic knowledge of the use of typical formulas within the Propositional Logic's framework. He/she becomes able to use truth tables to identify tautologies, contradictions, logical consequences and equivalences. He/she becomes familiar with the syntax of first-order types and learns to construct types that express simple properties. The student learns the use of the pigeonhole principle, of mathematical induction and the principal of inclusion-exclusion in various problems of Discrete Mathematics. He/she becomes able to use the basic formulas of Combinatorics to solve problems involving combinations and permutations with or without repetition. He/she can use generating functions in solving combinatorial problems and linear recursive relations. Acquires good understanding of the basic concepts of Graph Theory (vertex degree, connectivity, cycle, Euler cycle, Hamilton cycle, planarity, trees, coloring) and some basic theorems (Euler, Dirac, Cayley, Kuratowski) and their use in solving theoretical and practical problems. After successfully attending the course, a student has a basic understanding of Propositional Logic, a first encounter of First-order Logic, a first encounter of the basic methods of Combinatorics and their use and an introductory knowledge of the basic concepts of Graph Theory.

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	

- Adaptation to new situations.
- Work in an interdisciplinary environment.
- Excercise of criticism and self-criticism.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

(i) Logic. The language of propositional logic, alphabet and syntax. Types and tree graphs. Truth assignment and the meaning of the logical connectives. Truth tables. Regular forms. Logical implication. Basic equivalences. Applications. The expressibility of propositional logic. The propositional calculus and formal proofs. The syntax of first-order types and their use in expressing mathematical statements.

(ii) Combinatorics. Counting of discrete structures. The addition and multiplication rule. Permutations and combinations without and with repetition. Examples. The balls in urns paradigm. The principle of inclusion-exclusion. Generating functions and recursive relations.

(iii) Introduction to Graph Theory. Definition and graph types. Connectivity in simple graphs. Subgraphs. Multigraphs. Euler cycle. Euler's theorem. Hamilton cycle. Graph matrices. Isomorphic and homomorphic graphs. Planar graphs. Kuratowski's theorem. Graph coloring. Trees. Binary trees. Directed graphs.

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*	

Activity	***Semester workload***
Lectures	39
Tutorials	26
Solving suggested exercises	39
Hours of personal study by the student	68
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***175***

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:** --- **Assessment methods** • Final exam (80%) that includes ✓ Theory ✓ Exercises • Soving on-line quizzes on the *eClass* platform (one every one or two weeks) (20%) Minimum passing grade: 5 Μαximum grade: 10

5. RECOMMENDED LITERATURE

(in Greek)

- Liu C.L. *Στοιχεία Διακριτών Μαθηματικών*. Εκδόσεις ΙΤΕ – Πανεπιστημιακές Εκδόσεις Κρήτης, 2015.
- Μωϋσιάδης Χρόνης Θ. *Συνδυαστική Απαρίθμηση*. *Η τέχνη να μετράμε χωρίς μέτρημα*. Εκδόσεις Ζήτη, 2002.