COURSE OUTLINE

1. GENERAL

SCHOOL	HUMANITIES AND SOCIAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF HISTORY AND ARCHAEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**EDG604**	**SEMESTER**	**5th**
COURSE TITLE	DISCRETE STRUCTURES AND COMBINATORICS		

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**
Lectures	3	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*	ELECTIVE (Digital Humanities)
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	http://www.ha.upatras.gr/en/undergraduate-studies/courses/f-semester/edg604/

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 evolution of ancient civilizations was based on the use and understanding of numbers. Mathematics constitutes a global language for storing, disseminating and processing data with unprecedented efficiency. An important problem-solving skill is the ability to count or enumerate objects. Discrete objects and relationships between these objects are can be represented via discrete structures, which are the abstract mathematical structures including sets, permutations, relations, graphs, trees, finite-state machines.

Combinatorial analysis is used to solve counting problems. Enumeration, the counting of objects with certain properties, is an important part of combinatorics. Many counting problems can be phrased in terms of ordered or unordered arrangements of the objects of a set with or without repetitions. These arrangements, called permutations and combinations, are used in many counting problems.

In the context of this course we study introductory elements of set theory as well as basic and advanced methods of enumerating discrete objects (combinations, permutations, inclusion-exclusion). In addition, we examine basic types of practical arithmetic problems.

The course contributes to the development of "computational thinking" and offers the necessary background for the exploitation and use of methods, techniques and tools from the area of computer science and technology in the study of issues in the field of modern history-archaeology.

Students who regularly participate in course activities and successfully complete the course:

- have knowledge and understanding of fundamental issues regarding logic and proofs, set theory, basic and advanced counting methods, as well as issues related to practical arithmetic
- are able to use knowledge and understanding they have acquired in a way that shows a professional approach to their work or profession, and appropriately skilled to develop and support arguments and solve problems within their field
- have the ability to collect and interpret relevant data (typically within their field) to form judgments that include reflection on relevant social, scientific or ethical issues
- are able to communicate information, ideas, problems and solutions to specialized and non-specialized audience
- have developed knowledge acquisition skills necessary to further continue their studies with a high degree of autonomy
- have become familiar with computational thinking and are able to exploit its advantages in scientific, professional and practical issues

In particular, students who regularly participate in course activities and successfully complete the course:

1. have knowledge of fundamental principles and techniques in logic, proofs, set theory, basic and advanced counting methods
2. understand problems relevant to logic, set theory, basic and advanced counting methods
3. are able to apply principles and techniques for computing solutions to corresponding problems
4. analyze problems / questions in order to gain understanding of their structure and components
5. suggest solutions to these problems by applying existing or new techniques and methods
6. evaluate findings (solutions or hardness results) through comparative application of alternative approaches
7. are familiar with computational thinking

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*
	Showing social, professional and ethical responsibility and sensitivity

Working independently	*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	*……*
Production of new research ideas	*Others…*
	…….

Familiarity with computational thinking

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

Criticism and self-criticism

Production of free, creative and inductive thinking

3. SYLLABUS

The evolution of ancient civilizations was based on the use and understanding of numbers. Mathematics constitutes a global language for storing, disseminating and processing data with unprecedented efficiency. An important problem-solving skill is the ability to count or enumerate objects. Discrete objects and relationships between these objects are can be represented via discrete structures, which are the abstract mathematical structures including sets, permutations, relations, graphs, trees, finite-state machines.

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Lectures are scheduled as follows:

- Introduction: Course outline, objectives and role in the curriculum
- Logic and Proof, Sets, Functions
- Counting: Introduction
- Counting: Permutations and Combinations
- Counting: Generalized Permutations and Combinations
- Advanced Counting Methods: Inclusion-Exclusion
- Elements of Practical Arithmetic

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face to face, Distance learning

Face-to-face, Distance learning, etc.	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT in teaching (online lectures, course website, extensive use of Web resources), in communication/colaboration with students (mailing lists, social networks (Feacebook), course website, Doodles) and in the process of progress monitoring and evaluation (use of specialized software for the monitoring and evaluation of student progress)
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.*	Assessment - Grading Process (it is announced on the course website before the beginning of the semester and remains available throughout the semester) The final score is obtained as a function of: (A) 2 intermediate computer-based multiple choice examinations. They contribute by 40% to the final score. - All students attending the course can participate in the intermediate examinations. - Scores are valid only for the current academic year. - Participation in the intermediate exams is not mandatory: students who decide not to participate in intermediate examinations are not excluded from the final examination in February. However, the 2 intermediate examinations contribute to the final score (by 40%). (B) a final, computer-based, multiple choice examination. It contributes by 60% to the final score.

Activity	***Semester Workload***
Lectures	39
Intense cooperation among professor and students also using ICT	8
Independent study	60
Study and analysis of bibliography	18
Course total (25 hours per credit)	**125**

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

DISCRETE MATHEMATICS AND ITS APPLICATIONS, K. Rosen

DISCRETE MATHEMATICS, D. Hunter

- Related academic journals:

Discrete Mathematics, Elsevier

Discrete Applied Mathematics, Elsevier

Combinatorica, Springer