INSTITUTION	NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS					
SCHOOL	SCHOOL OF SCIENCE					
DEPARTMENT	INFORMATICS AND TELECOMMUNICATIONS					
COURSE LEVEL	GRADUATE					
COURSE TITLE	**Algorithmic Graph Theory**					
COURSE CODE	**M101**		**Semester**	**2**	**ECTS**	**6**
TEACHING HOURS per week	**THEORY**	**4**	**SEMINAR.**	**0**	**LABORATORY**	**0**
URL	https://eclass.uoa.gr/courses/DI459/					

COURSE CONTENT

- Review of basic notions of Graph Theory.
- Flows.
- Matchings and Vertex Covers: structural properties and algorithms.
- Vertex and edge colorings.
- Special graph classes: structural properties, membership testing, faster algorithms for hard problems when input restricted to the classes.
- Treewidth: separators and dynamic programming.
- Parameterized Problems and Algorithmic Techniques.

STUDENT LEARNING OBJECTIVES

Upon successful completion of the course the student will be able to:

- Identify/Describe the structural properties of graphs that are interconnected to the design of graph algorithms, such as, connectivity/separators, planarity, and colorability.
- Describe and apply algorithms on coloring problems, flows, and separability.
- Design algorithms for NP-hard problems by utilizing the structural properties of tree decompositions and Parameterized Algorithmic techniques.
- Prove lower bounds in the time complexity of problems on graphs by utilizing the Exponential Time Hypothesis.

TEACHING AND LEARNING METHODS - ASSESSMENT	
TEACHING METHOD	In Class (Face to Face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Learning process supported by the e-class platform (Discussions, Announcements, Task assignments) Email communication
TEACHING ORGANIZATION *Describe in detail the way and methods of teaching:* *Enhanced Lectures,* *Online Lectures,* *Seminars,* *Tutorial,*	

Activity	***Student Workload*** *(hours)*
Lectures	52
Small Individual Exercises	20

Laboratory, *Laboratory Exercise,* *Study & analysis of literature,* *Practice (Positioning),* *Interactive teaching,* *Developing a project,* *Individual / group work* *Telework (reference to tools) etc.* *Details of the student's study hours for each learning activity and hours of non-guided study are shown to ensure that the total workload at the semester corresponds to the ECTS*	Project work 38 Individual study 40 ***Total Course*** ***150***
ASSESSMENT OF STUDENTS *Description of the assessment process* *Assessment Methods, Formative or Concluding, Multiple Choice Test, Quick Response Questions, Test Development Questions, Problem Solving, Written Work, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Other / Other* *Fully defined evaluation criteria are mentioned and if and where they are accessible to students.*	

Assessment methods	***Number***	***Percentage***
Exercises	2	20%
Presentation	1	50%
Final work	1	30%

LITERATURE AND STUDY MATERIALS / READING LIST

- Reinhard Diestel. Graph Theory
- J. A. Bondy and U. S. R. Murty. Graph Theory with Applications
- Laszlo Lovasz and Michael D. Plummer. Matching Theory
- Jon Kleinberg and Éva Tardos. Algorithm Design
- Marek Cygan et al. Parameterized Algorithms
- Douglas B. West. Combinatorial Mathematics