

GRAPH THEORY

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
DEPARTMENT	CIVIL ENGINEERING/ MSc APPLIED MATHEMATICS		
LEVEL OF STUDIES	MSc - LEVEL 7		
COURSE CODE		SEMESTER	2 nd SEMESTER
COURSE TITLE	GRAPH THEORY		
TEACHING ACTIVITIES <i>If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.</i>		TEACHING HOURS PER WEEK	ECTS CREDITS
		3	7,5
<i>Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.</i>			
COURSE TYPE <i>Background, General Knowledge, Scientific Area, Skill Development</i>	Scientific area		
PREREQUISITES:	NO		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	NO		
COURSE URL:	https://eclass.duth.gr/courses/ENG158/		

2. LEARNING OUTCOMES

Learning Outcomes <i>Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.</i>
Upon successful completion of the course, participants will be able to: - Extend and deepen the graduate student's understanding of advanced topics in the application of Graph Theory to Industrial Production. - understand the aforementioned theory so that the graduate student can make use of Graph Theory to solve problems related to the production process (sequencing of tasks - minimizing total machine running time).
General Skills <i>Name the desirable general skills upon successful completion of the module</i> <i>Search, analysis and synthesis of data and information, Project design and management</i> <i>ICT Use Equity and Inclusion</i> <i>Adaptation to new situations Respect for the natural environment</i> <i>Decision making Sustainability</i>

<i>Autonomous work</i>	<i>Demonstration of social, professional and moral responsibility and sensitivity to gender issues</i>
<i>Teamwork</i>	<i>Critical thinking</i>
<i>Working in an international environment</i>	<i>Promoting free, creative and inductive reasoning</i>
<i>Working in an interdisciplinary environment</i>	
<i>Production of new research ideas</i>	

<ul style="list-style-type: none"> – Search, analysis and synthesis of data and information, using the necessary technologies. – Autonomous work. – Production of free, creative and inductive thinking. – Decision making.

3. COURSE CONTENT

Introduction to Graphs and Graph Theory (basic concepts and mathematical definitions). Graph isomorphisms. Representation of Graphs (adjacency matrix, incidence matrix, edge lists). Graph sequence and graph construction (Graph Sequence Algorithm). Operations with Graphs and properties (union - intersection - ring sum - convolution - complement - edge swap - sum of Graphs). Basic Graphs (complete Graph - complementary Graph - Signature - bilateral Graph). Directed Graphs. Coherence (Menger's Theorem). Permeability (paths - paths - circles - Hamilton's Theorem and Euler's Theorem). Trees (Arranged Trees - Binary Trees - Tree Crossing - Overlapping Trees). Representation of discrete structures in the real world with tree structures. Planar and Planar Graphs . Graph coloring. Applications of Graph Theory in Industrial Production.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD <i>Face to face, Distance learning, etc.</i>	Distance learning	
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with students</i>	Use of ICT technologies in Teaching and Communication with students	
TEACHING ORGANIZATION <i>The ways and methods of teaching are described in detail.</i> <i>Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.</i> <i>The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</i>	Activity	Workload/semester
	Lectures	39
	Research & Analysis	0
	Review studies	108
	Examinations	3
	Total	150
STUDENT EVALUATION <i>Description of the evaluation process</i> <i>Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,</i>	Examinations	

Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

5. SUGGESTED BIBLIOGRAPHY

1. Λ. Κυρούσης, Χ. Μπούρας, Π. Σπυράκης, Γ. Σταματίου. Εισαγωγή στους Γράφους. CTI Press, ISBN 960-01-0815-3, 1999.
2. Γιάννης Μανωλόπουλος, Μαθήματα Θεωρίας Γράφων: Θεμελιώσεις – Αλγόριθμοι – Εφαρμογές. Εκδόσεις Νέων Τεχνολογιών, ISBN 960-7235-87-8, Έκδοση 2η (2000).
3. Μάριος Μαυρονικόλας, Διακριτά Μαθηματικά και Μαθηματική λογική, τόμος Β, Θεωρία Γράφων , ISBN : 960 538-461-2 5. Reinhard Diestel, Graph Theory, Electronic Edition 2005, Springer- Verlag Heidelberg ,New York 1997,2000,2005.
4. Reinhard Diestel, Graph Theory, Electronic Edition 2005, Springer- Verlag Heidelberg, New York 1997,2000,2005.

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	Stefanos Spartalis
Contact details:	sspart@pme.duth.gr
Supervisors: (1)	NO
Evaluation methods: (2)	Written examination by distance learning methods
Implementation Instructions: (3)	<ul style="list-style-type: none">• Failure to enter or entry at an unscheduled time will result in the student being disqualified from the exam.• Throughout the exam, examinees are connected to MS Teams and should have an open microphone so that there is uninterrupted audio contact between the examinee and the examiner. At the same time, they should immediately activate their microphone and camera in case they are asked for identification.• Required technological equipment: Ability to connect to the internet, use a camera, speakers, microphone, ability to scan/photograph the manuscript and create a pdf or compressed file in case of more than one page of response to a topic.• For the written exam, the examinees: (1) they will read the topics that will be posted in the eclass in the “Tasks” of the course one by one, (2) they will write their answer in Ms-Word (3) they will create a pdf or compressed zip/rar file and (4) they will upload it to eClass – Assignments - Submit Assignment, in a predetermined time (for each topic will be given a time proportional to its difficulty and extent) CAUTION!

	<p>The file must be readable, otherwise they cannot be corrected and will be rejected. • Within the framework of actions for the protection of personal data, it is prohibited to record the examination process in any way, as well as to record or publish or post on websites or share with third parties or transmit or distribute in any way all or part of the distance examination. Also, it is the students' responsibility to protect their personal data by showing only what is required on camera. • Non-compliance of examinees with the rules of the examination and a finding of fraud on their part will result in the application of the plagiarism provisions. In the case of inability to participate in a remote assessment, the decision of the Rector's Council of the IFT will be made.</p>
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(37) Please write YES or NO

(38) Note down the evaluation methods used by the teacher, e.g.

6. *written assignment or/and exercises*
7. written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(39) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises**: the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and **any other necessary information**.

b) in case of **oral examination with distance learning methods**: the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.