MASTER 'S PROGRAMME
APPLIED MATHEMATICS - IN ENGLISH
1ST YEAR OF STUDY, 1ST SEMESTER

COURSE TITLE	GRAPHS THEORY
COURSE CODE	**MA1TGr**
COURSE TYPE	full attendance/tutorial
COURSE LEVEL	2nd cycle (master's degree)
YEAR OF STUDY, SEMESTER	1st year of study, 1st semester
NUMBER OF ECTS CREDITS	**6**
NUMBER OF HOURS PER WEEK	4 (2 lecture hours + 2 laboratory hours)
NAME OF LECTURE HOLDER	Dr. Tărnăuceanu Marius
NAME OF SEMINAR HOLDER	Dr. Tărnăuceanu Marius
PREREQUISITES	Curriculum: Logic and set theory, Fundamental algebraic structures, Arithmetics and Combinatorics Competencies: the students must be able to use basic notions of set theory, fundamental algebraic structures, and arithmetics and combinatorics Language: advanced level of English

A GENERAL AND COURSE-SPECIFIC COMPETENCES

General competences:

- ✓ Having a responsible attitude towards scientific research and teaching, being able to fully develop the personal potential in the professional career, respecting the principles of a rigorous and efficient work in order to fulfill complex tasks, respecting the ethical norms and principles in the professional activity
- ✓ Being able to work efficiently in a team and to coordinate and efficiently lead a team or an inter-disciplinary group
- ✓ Being able to make a selection of information resources and to use them efficiently in order to develop the professional activity and adapt it to the demands of a dynamical society

Course-specific competences:

- ✓ Manipulating notions, methods and mathematical models, specific techniques and technologies in scientific calculus and applications in economy and informatics
- ✓ Data processing, analysis and interpretation using mathematical, statistical and informatics tools
- ✓ Being able to develop, test and validate algorithms; implementation in high level programming languages
- ✓ Being able to construct and apply mathematical models for analysing and simulating some phenomena and processes
- ✓ Being able to develop, analyse and test computer systems and specific programming languages; being able to use them for solving problems in applied mathematics
- ✓ Being able to analyse and interpret some economic processes and phenomena

B LEARNING OUTCOMES

- ✓ The main goal of this course is to present some basic notions and results of graph theory. These will be use to develop algorithms and to write computer programs
- ✓ After successfully completing this course, the students will be able to:
  - ✧ Describe and exemplify the fundamental notions of graph theory
  - ✧ Apply the main studied results
  - ✧ Use some theoretical results in solving problems
  - ✧ Write computer programs based on algorithms

C LECTURE CONTENT

1. Graphs, digraphs, and generalizations
2. Methods of representing graphs and digraphs

	3. Subgraphs and graph homomorphismsi 4. Degrees. Indegrees and outdegrees 5. Paths, cycles, and circuits 6. Connectivity 7. Some important classes of graphs: complete graphs, planar graphs, bipartite graphs, regular graphs 8. Trees. Partial trees 9. Minimum cost trees. The algorithms of Kruskal and Prim 10. Counting problems for trees 11. Graph search algorithms 12. Shortest / longest path problems 13. The algorithms of Dantzig & Ford, Dijkstra,and Floyd & Warshall 14. The critical path method
D	**RECOMMENDED READING FOR LECTURES**
	1. Smadici, C., *Introducere în analiza combinatorie*, Ed. Matrix Rom, Bucureşti, 2007 2. Tomescu, I., *Introducere în combinatorică*, Ed. Tehnică, Bucureşti, 1972
E	**SEMINAR CONTENT**
	1. Graphs, digraphs, and generalizations 2. Methods of representing graphs and digraphs 3. Subgraphs and graph homomorphismsi 4. Degrees. Indegrees and outdegrees 5. Paths, cycles, and circuits 6. Connectivity 7. Some important classes of graphs: complete graphs, planar graphs, bipartite graphs, regular graphs 8. Trees. Partial trees 9. Minimum cost trees. The algorithms of Kruskal and Prim 10. Counting problems for trees 11. Graph search algorithms 12. Shortest / longest path problems 13. The algorithms of Dantzig & Ford, Dijkstra,and Floyd & Warshall 14. The critical path method
F	**RECOMMENDED READING FOR SEMINARS**
	1. Tomescu, I., *Probleme de combinatorică şi teoria grafurilor*, E.D.P., Bucureşti, 1981
G	**EDUCATION STYLE**
LEARNING AND TEACHING METHODS	Lectures: exposition, conversation, demonstration Laboratory: exercise, conversation
ASSESSMENT METHODS	Course: weight in the final grade 33% (oral evaluation during the semester and oral exam – N1) Laboratory: weight in the final grade 66% (Two tests with problems – N2, N3) The final mark: N=(N1+N2+N3)/3 Minimal requirements: 1. Describe and exemplify the fundamental notions of graph theory 2. Prove the main studied results 3. Use some theoretical results in solving problems 4. Write computer programs based on algorithms 5. Minimum grade 5
LANGUAGE OF INSTRUCTION	English