

COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	INFORMATICS AND COMPUTER ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE		SEMESTER	8th
COURSE TITLE	GAME THEORY		
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		2	
Tutorials		2	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		4	5
COURSE TYPE general background, special background, specialised general knowledge, skills development	SPECIALIZED GENERAL KNOWLEDGE, SCIENTIFIC AREA.		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (Instruction and Examination)		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in ENGLISH)		
COURSE WEBSITE (URL)			

(2)

(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

Game Theory is the mathematical modeling of strategic interactive situations. In an interaction between two parties, everyone thinks about the situation in which they find themselves, in order to decide in the future how they should act for their own interest. Game Theory, founded in 1944 by John von Neumann (creator of the corresponding computer architecture) and Oscar Morgenstern, and applies to all areas of interaction, such as Computer Science, Economics, Law, Biology, Psychology and Political Philosophy.

The Game Theory course covers the fundamental principles of Game Theory and Mechanism Design. It aims at understanding the games, their construction, examining different solution approaches towards answering certain questions regarding interactions, and applying Game Theory in different branches of Informatics (Information and Communication Systems Security, Networks, Cloud Computing, etc.).

Upon successful completion of the course, the student:

- **Will know the games that model interactive situations.**
- **Will be able to construct games by defining players, preferences, actions and payoffs, to model interactive situations.**
- **Will know, depending on the game, how to solve it and will solve it either directly or using a tool.**
- **Will be able to design a game in reverse (mechanism design), determining how two parts should interact under specific rules, regulations, and limitations.**
- **Will be able to use Game Theory as a tool where needed in his research.**
- **Will have further developed his mathematical and algorithmic 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
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
Production of new research ideas	Others...

- Examine, retrieve, analyze and synthesize data and information by utilizing necessary technologies
- Decision-Making
- Work independently / Teamwork
- Project planning and management
- Work in an interdisciplinary environment
- Production of new research ideas
- Promoting free, creative and inductive thinking

The course includes the topics described in the following list:

- Introduction to Game Theory, games and solutions, Game Theory and Mechanism Design. Network applications.
- Game Theory and Computer Science, Algorithmic Game Theory, Applications.
- Strategic games, application of dominance criterion, existence and location of Nash Equilibrium, NE uniqueness in mixed strategies and behavioral strategies.
- Bayesian type games, calculation of NE in board games.
- Repetitive games, grim strategies, Folk Theorem, games with imperfect information games (imperfect information games).
- Incomplete information games, study of mixed strategies and behavioral strategies. Bayesian Nash equilibrium.
- Signaling Games.
- Mechanism Design, application at the operating system level for the implementation of security policy.
- Applications: Games on Computer Networks, Games on Information and Communication Systems Security, Games on Cloud Computing.

(4)

(4) TEACHING and LEARNING METHODS - EVALUATION

<p>DELIVERY Face-to-face, Distance learning, etc.</p>	<p>Face to face</p>										
<p>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students</p>	<ul style="list-style-type: none"> • The Gambit Software tools for Game Theory. • Use of ICT in Course Teaching • Use of the Open eClass course management system, for distributing lecture notes and exercises for practice, and for communication with students. 										
<p>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.</p> <p>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</p>	<p>Activity Semester workload</p> <table border="0"> <tr> <td>Lectures</td> <td>26</td> </tr> <tr> <td>Tutorials</td> <td>26</td> </tr> <tr> <td>Essays / Project</td> <td>20</td> </tr> <tr> <td>Independent Study</td> <td>53</td> </tr> <tr> <td>Course total</td> <td>125</td> </tr> </table>	Lectures	26	Tutorials	26	Essays / Project	20	Independent Study	53	Course total	125
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Course total	125										
<p>STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure</p> <p>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</p> <p>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</p>	<p>I. Final theory written exam (100%), which includes:</p> <p>Questions that combine knowledge and criticism, with complete justification and description of arguments, through which it is established the level of understanding of the topics.</p> <ul style="list-style-type: none"> - Short answer questions - Problem solving <p>II. II. Additional (20%) score that derives from individual optional projects, over the grade of the final theory written exam, when this is at least 5.</p> <p>For successfully qualifying the course, a minimum grade of 5.0 marks (of 10 in total) is mandatory in both written exams and projects evaluation.</p>										

(5)

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Dixit, A. and Skeath, S., Games of Strategy, 2nd edition, W.W. Norton and Company, 2004.
2. Gintis, H., Game Theory Evolving - A Problem-Centered Introduction to Modeling Strategic Interaction, Princeton University Press, 2000.
3. Kreps, D., Game Theory and Economic Modelling, Oxford University Press, 1990.
4. Osborne, M., Rubinstein, A., A Course in Game Theory, The MIT Press, 1994.
5. Osborne M., An Introduction to Game Theory, Oxford University Press, 2004.
6. Noam, N., Rough garden, T., Tardos, E., Vazirani, V., Algorithmic Game Theory, Cambridge University Press, 2007.
7. Binmore, K., Playing for Real - A Text on Game Theory, Oxford University Press, 2007.
8. Leyton-Brown K., Shoham Yoav, Essentials of Game Theory: A concise, Multidisciplinary Introduction, 2008.
9. Σταματόπουλος, Γ., 2015. Θεωρία παιγνίων. [ηλεκτρ. βιβλ.], Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: <http://hdl.handle.net/11419/3007>, (in Greek).
10. Gibbons Robert, Εισαγωγή στη Θεωρία Παιγνίων, Εκδόσεις Gutenberg - Γιώργος & Κώστας Δαρδανός, 2009, (in Greek).
11. Osborne M., Εισαγωγή στη Θεωρία Παιγνίων, Κλειδάριθμος, 2010, (in Greek).
12. Νεάρχου Ανδρέας, Εισαγωγή στη Θεωρία Παιγνίων, Εκδότης: Εταιρεία Αξιοποίησης και Διαχείρισης Περιουσίας Πανεπιστημίου Πατρών, 2016, (in Greek).
13. Βολιώτης Δ., Διαλέξεις στη θεωρία Παιγνίων: Πληροφορία και λήψη αποφάσεων, Πεδίο Εκδοτική, 2015, (in Greek).
14. Μαγείρου Ε., Πάιγνια και αποφάσεις: Μια Εισαγωγική Προσέγγιση, Εκδόσεις Κρητική, 2015, (in Greek).

- Related academic journals:

1. International Journal of Game Theory, Springer
2. Games and Economic Behavior, Elsevier

- Internet Sources:

1. Giacomo Bonanno , Game Theory, 2018, http://faculty.econ.ucdavis.edu/faculty/bonanno/GT_Book.html.
2. Jackson, Matthew O., A Brief Introduction to the Basics of Game Theory (December 5, 2011). Available at SSRN: <https://ssrn.com/abstract=1968579> or <http://dx.doi.org/10.2139/ssrn.1968579>
3. Kevin Leyton-Brown and Yoav Shoham, Essentials of Game Theory (E-Book Only), A Concise Multidisciplinary Introduction, ISBN: 9781598295931 | PDF ISBN: 9781598295948, 2008, DOI: 10.2200/S00108ED1V01Y200802AIM003.