

COURSE OUTLINE

(1) GENERAL

SCHOOL	Faculty of Social, Political and Economic Sciences		
ACADEMIC UNIT	Department of Economics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NK84A	SEMESTER	8th
COURSE TITLE	DYNAMICAL SYSTEMS		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>	WEEKLY TEACHING HOURS	CREDITS	
Lectures	4	6	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Core		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS :	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://econ.duth.gr/courses/%ce%b4%cf%85%ce%bd%ce%b1%ce%bc%ce%b9%ce%ba%ce%ac-%cf%83%cf%85%cf%83%cf%84%ce%ae%ce%bc%ce%b1%cf%84%ce%b1/		

(2) LEARNING OUTCOMES

<p>Learning outcomes</p> <p><i>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.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i> 																		
<p>Presented dynamic mathematical methods used in economic analysis. (Difference Equations, Differential Equations and Dynamical Systems). Upon successful completion of the course the student / her will be able to:</p> <ul style="list-style-type: none"> ✓ Understands concepts of dynamic economic theory using mathematical methods. ✓ To use mathematical methods in dynamic economics (modeling using these methods) ✓ To analyze and synthesize data. ✓ To use various ways of thinking (eg inductive, productive). ✓ To develop different problem solving strategies. 																		
<p>General Competences</p> <p><i>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?</i></p> <table border="0"> <tr> <td><i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i></td> <td><i>Project planning and management</i></td> </tr> <tr> <td><i>Adapting to new situations</i></td> <td><i>Respect for difference and multiculturalism</i></td> </tr> <tr> <td><i>Decision-making</i></td> <td><i>Respect for the natural environment</i></td> </tr> <tr> <td><i>Working independently</i></td> <td><i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i></td> </tr> <tr> <td><i>Team work</i></td> <td><i>Criticism and self-criticism</i></td> </tr> <tr> <td><i>Working in an international environment</i></td> <td><i>Production of free, creative and inductive thinking</i></td> </tr> <tr> <td><i>Working in an interdisciplinary environment</i></td> <td><i>.....</i></td> </tr> <tr> <td><i>Production of new research ideas</i></td> <td><i>Others...</i></td> </tr> <tr> <td></td> <td><i>.....</i></td> </tr> </table>	<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>	<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>	<i>Decision-making</i>	<i>Respect for the natural environment</i>	<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>	<i>Team work</i>	<i>Criticism and self-criticism</i>	<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>	<i>Working in an interdisciplinary environment</i>	<i>.....</i>	<i>Production of new research ideas</i>	<i>Others...</i>		<i>.....</i>
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<ul style="list-style-type: none"> • Production of free, creative and inductive thinking • Analysis and synthesis of data and information • Decision-making • Working independently 																		

(3) SYLLABUS

<p>The goal of the course is to develop the quantitative and qualitative theory of differential and difference equations and to look at relevant examples which illustrate this theory.</p> <p>Section 1: Ordinary Differential Equations</p> <ol style="list-style-type: none"> First - order differential equations, Domar growth model, Dynamics of market prices Nonlinear differential equations: The qualitative approach. Solow growth model Second- order linear differential equations. A market model with price expectations. The interaction of inflation and unemployment <p>Section 2: Difference Equations</p> <ol style="list-style-type: none"> First - order linear difference equations, the dynamic stability of equilibrium, the cobweb model, a market model with inventory

- b. Nonlinear difference equations- the qualitative approach.
- c. Second- order linear difference equations, Samuelson multiplier- acceleration interaction model, inflation and unemployment in discrete time

Section 3: Systems of Differential and Difference Equations

- a. Linear systems of differential and difference equations. The inflation -unemployment model
- b. Nonlinear system: Two – variable phase diagrams, linearization of a nonlinear differential-equation system.

Section 4: Optimal Control Theory

- a. Potryagin’s Maximum Principle. Alternative of terminal conditions
- b. Autonomous problem
- c. Economic applications

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Lectures in auditorium	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	<ul style="list-style-type: none"> • Use of mathematical package (Mathematica) • Support of the learning process via e-class 	
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>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.</i> <i>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</i>	<i>Activity</i>	<i>Semester workload</i>
	Lectures	52
	Study	98
		Course total
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <i>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</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	<p>Written examination (written examination includes questions of various types (multiple choice questionnaires, short-answer questions, open-ended questions, problem solving))</p>	

(5) ATTACHED BIBLIOGRAPHY

- G. Sarafopoulos, N. Mylonas, Mathematical Economics (in Greek), Ed. Tziolas, 2019 (Primary textbook)

- Alrha C.Chiang-Kevin Wainwright, Fundamental Methods of Mathematical Economics (in Greek), Ed. Kritiki,2009
- A. Xepapadeas, Mathematical Methods for Economics (in Greek), Ed. Dardanos, 2011
- M. Hoy et al. Mathematics for Economists, Addison Wesley,2001
- C. Simon - L. Blume, Mathematics for Economists Norton Co., 2004