COURSE OUTLINE

(1) GENERAL

SCHOOL	Economic and Political Sciences		
ACADEMIC UNIT	Department of Economics		
LEVEL OF STUDIES	Undergraduate Study Program		
COURSE CODE	**MTH302**	**SEMESTER**	**5th**
COURSE TITLE	DYNAMICAL MATHEMATICS		

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+Labs	6	7
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized Background
PREREQUISITE COURSES:	Mathematics I and Mathematics II
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON264/

(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*

Upon successful completion of the course, students will be able to:

- Solve all basic first-order differential equations.
- Solve linear differential equations with constant coefficients, of any order.
- Solve linear systems of differential equations.
- Understand the concept of stability.
- Optimize integrals using the Calculus of Variations method.
- Understand the concepts of dynamical economics and study dynamic economic phenomena through differential equations.
- Model dynamic economic phenomena in continuous time using differential equations.

- Understand the difference between differential equations and difference equations.
- Solve linear difference equations.
- Solve systems of difference equations.
- Use difference equations to study dynamic economic phenomena in discrete time.
- Use the basic commands and procedures of the MATHEMATICA software to solve fundamental mathematical problems applied to economics.

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
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

Scientific way of thinking and expression
Mathematical way of thinking and analysis
Ability to understand dynamic models and their economic interpretation
Ability to model economic problems
Ability to use specialized software for problem analysis
Generation of new research ideas
Promotion of creative and inductive thinking

(3) SYLLABUS

The course consists of two parts: **theory**, where differential equations and difference equations are taught, and **a paper-based laboratory**, where the Mathematica software is introduced and practiced. Specifically:

THEORY:

Introduction to Dynamical Mathematics and Economics – The concept of the Differential Equation – Basic notions.
Separable Variable Differential Equations – Homogeneous Differential Equations.
Homogeneous Differential Equations – Exact Differential Equations.
First-Order Linear Differential Equations.
First-Order Linear Differential Equations – Bernoulli Equation.
Economic Applications.
Higher-Order Linear Differential Equations – Samuelson Continuous-Time Model.
Introduction to the Calculus of Variations.
Linear Systems of Differential Equations.
Linear Systems of Differential Equations – Qualitative Theory of Differential Equations (Phase Space).

Introduction to Difference Equations.
Solution of Linear Difference Equations.
Applications – Samuelson-Hicks Model.
Systems of Difference Equations.
Qualitative Theory of Difference Equations.
LABORATORY:
Introduction to **Mathematica** – Basic commands and usage.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of the e-class electronic platform for uploading learning materials and announcements. Use of email for communication with students. Use of a projector for presentations in the Mathematica software laboratory.
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.* *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*	

Activity	***Semester workload***
Lectures	78
Assignment Writing	26
Literature review and analysis.	16
Preparation for exams and tests	35
Study of laboratory exercises	20
Course total	***175***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Students are examined on topics covering the entire syllabus on the official examination date of the course during the semester's exam period. In addition, during the semester they submit **three assignments in mathematics** and **two assignments in the laboratory**. The **final grade** is determined by an algorithm which requires that the student achieve at least the **minimum passing grade** in the final examination, after which additional credit is awarded according to the assignments submitted. The **exam material**, **procedures**, and **evaluation criteria** are communicated to the students during lectures and through related announcements and materials posted on the **e-class electronic platform**.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Mathematical Methods for Economic Analysis. *New Revised Edition.* Alpha C. Chiang, Kevin Wainwright. Kritiki Publications, 2009. (in Greek)

Mathematical Methods for Economics and Management Sciences. Malcolm Pemberton, Nicholas Rau. Broken Publications, 2018. (in Greek)

Economic Dynamics: Phase Diagrams and their Economic Application, Ronald Shone, Cambridge University Press, 2002.

S Kotsios. DYNAMICAL MATHEMATICS. Teaching notes, first draft

- Related academic journals:

Journal of Economic Dynamics and Control,
Review of Economic Dynamics .