COURSE OUTLINE: ECONOMIC DYNAMICS

GENERAL

SCHOOL	ECONOMICS AND BUSINESS		
ACADEMIC UNIT	ECONOMICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**ZE2002**	**SEMESTER**	**7th (Major B)**
COURSE TITLE	**ECONOMIC DYNAMICS**		

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**
	3	6
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, specialized general knowledge, skills development*	ECONOMIC ANALYSIS, SPECIAL BACKGROUND
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://www.econ.uth.gr

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*

The course is designed for forth-year students and aims to introduce them to mathematical concepts not covered in secondary education, as well as to demonstrate how these concepts are applied in Economic Science. Additionally, the course aims to provide Economics students with the necessary mathematical tools to understand economic

concepts that are closely linked to mathematics. Upon successful completion of the course, students will be able to:

- Solve **differential equations**.
- Interpret results based on economic functions.
- Make predictions in continuous time.
- Solve **difference equations**.
- Interpret results and apply them to economic problems in discrete time.
- Make predictions in discrete time.
- Handle **systems of differential equations**.
- Interpret results and relate them to corresponding problems in Economics.
- Understand concepts such as **phase space**, equilibrium points, stability of equilibrium points, bifurcations, attractors, and the emergence of chaos (in problems involving nonlinear systems).

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

Research, analysis, and synthesis of data and information, utilizing the necessary technologies.

- Decision-making.
- Independent work.
- Work in an international environment.
- Critical thinking and self-reflection.
- Development of free, creative, and inductive thinking.

SYLLABUS

1. **Introduction to Economic Dynamics**: Basic concepts.
2. **Continuous Dynamic Systems**:
   - Definitions.
   - First-order linear differential equations.
   - Differential equations with separable variables.
   - Phase space.
3. **Second-Order Differential Equations**:
   - Homogeneous second-order linear differential equations.
   - Non-homogeneous second-order linear differential equations.

4. **Discrete Dynamic Systems**:
   - Categorization.
   - Initial value problems.
   - The cobweb model.
   - Equilibrium and stability.
   - Solving first-order difference equations.
5. **Second-Order Difference Equations**:
   - Solving second-order difference equations.
   - The logistic equation as a difference equation.
6. **First-Order Systems of Differential Equations**:
   - Definitions.
   - Phase plane.
   - Steady points and stability.
   - Using matrices in autonomous systems.
   - Solving homogeneous systems of differential equations.
   - Nodes, spirals, and saddles.
7. **Discrete Systems of Equations**:
   - Introduction.
   - Eigenvalues and eigenvectors for solving discrete systems.
   - Stability of discrete systems.
   - Non-linear discrete systems.

Tutorial exercises and laboratory sessions are conducted throughout the semester, utilizing the open-source software **Maxima (Computer Algebra System)** for practice and problem-solving.

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*	
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*	

Activity	***Semester workload***
Lectures	39
Study and analysis of bibliography	112
Tutorial exercises	13
Lab exercises	13
Exams	3
Course total	***180***

as well as the hours of non-directed study according to the principles of the ECTS	
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.*	• A **written examination** at the end of the semester on the material covered, including problems and exercises. • **Homework assignments** that the student is required to solve exclusively using the computational program **Maxima**. • A **final written examination** with exercises and problems. **ERASMUS students** follow the same assessment methods but are taught and examined in **English**.

ATTACHED BIBLIOGRAPHY

- Μαθηματικά Οικονομικών Επιστημών, Michael Hoy, John Livernois, Chris McKenna, Thanasis Stengos, Εκδόσεις Γ. ΔΑΡΔΑΝΟΣ ΚΑΙ ΣΙΑ Ε.Ε.
- Μαθηματικά για Οικονομολόγους με Εφαρμογές, James Bergin, Εκδόσεις Γ. ΔΑΡΔΑΝΟΣ ΚΑΙ ΣΙΑ Ε.Ε.
- Γραμμική Άλγεβρα, Βελτιστοποίηση και Δυναμική Ανάλυση στις Οικονομικές Επιστήμες, Σαραφόπουλος Γεώργιος, Μυλωνάς Νίκος, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.