COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	7.009	**SEMESTER**	7
COURSE TITLE	Automatic Control Systems II		

COURSEWORK BREAKDOWN	**TEACHING WEEKLY HOURS**	**ECTS Credits**
Theory and Exercises (Lectures)	5	5
Laboratory	1	
TOTAL	6	5
COURSE UNIT TYPE	Specialized general knowledge/Skills development	

PREREQUISITES	General High School Knowledge in Mathematics and Physics.
LANGUAGE OF INSTRUCTION/EXAMS	Greek
COURSE DELIVERED TO ERASMUS STUDENTS	No
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE119/

(2) LEARNING OUTCOMES

Learning Outcomes

The subject of this course is modern control theory, involving both linear and non-linear dynamical systems in continuous time. The course covers mainly the fields of mathematical modelling, analysis and design of controllers in state space, as well as the notions of stability, observability and controllability of linear and non-linear systems, which may involve a single or multiple inputs-outputs.

Upon completion of the course the student will have acquired the necessary knowledge and skills to:

- Model a dynamical system using the state space representation
- Simulate a dynamical system in state space
- Know the correspondence between different physical systems with respect to their dynamic properties
- Determine the design criteria of an automatic control scheme, based on the state equations of the system
- Analyze a system in state space
- Prove the stability of a dynamical system after applying a specific control
- Estimate whether a system is controllable and/or observable, or not.
- Understand the practical application of automatic controllers designed in state space

General Skills

The study and successful completion of the course will contribute to the development of general skills related to:

- Analysis and design of solutions in real problems utilizing mathematical tools
- Promotion of creative and inductive thinking

- Connection of theoretical knowledge and thinking with practical skills
- Decision making

(3) SYLLABUS

- State space representation of dynamical systems
- Modelling of physical systems utilizing state space (electrical, mechanical, hydraulic, pneumatic etc.)
- Simulation of dynamical systems
- Linearization of systems in state space
- Transitions between the state space expression and the transfer function, and vice versa.
- Equilibrium state and stability of linear and non-linear systems
- Observability, controllability
- Jordan normal form, controllable and observable canonical forms
- Controller design in state space (state feedback, pole placement)
- Observers

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs in lecturing • Use of ICTs in laboratory exercises. • Use of ICTs for the communication with students via the e-class platform
TEACHING ORGANIZATION	

Method description/Activity	Semester Workload
Lectures	13X6=78 H
Non-guided personal study	13X3=39 H
Study for the intermediate exams	1X13=13 H
Final exams	1X20=20 H
Total Contact Hours	150
ECTS	150:30=5
Total	**150**

ASSESSMENT METHODS	1. Written intermediate and final exams (30% + 40% = 70%) 2. Laboratory reports (30%) The assessment criteria are clearly stated in the detailed description of the course located in the relevant course area in eClass.

(5) RECOMMENDED BIBLIOGRAPHY

Suggested Bibliography:

- «Modern Control Engineering», Ogata K., Pearson
- «Automatic Control Systems», FARID GOLNARAGHI, BENJAMIN C. KUO, John Wiley & Sons

Related scientific journals:

- IEEE Transactions on Automatic Control
- IEEE Transactions on Control Systems Technology
- Automatica

- IEEE Control Systems Letters