Course Code	Course Title	ECTS Credits
ECE-464	Digital Control Systems	6
Department	**Semester**	**Prerequisites**
Engineering	Fall or Spring	ECE-364
Type of Course	**Field**	**Language of Instruction**
Elective	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr George Gregoriou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Introduce the fundamental concepts of digital control systems.
- Develop skills for the analysis and design of digital feedback systems to meet stability and other performance specifications using z-transform and state-space techniques.

Learning Outcomes:

After completion of the course students are expected to:

- Apply the principles of control theory to digital systems.
- Define and identify linear difference equations, z-transform methods, impulse sampling, sample and hold methods.
- Use the z-transform to represent discrete systems and derive the discrete equivalent of a continuous transfer function.
- Analyze the performance and stability of a discrete system.
- Perform state-space analysis including state-space realization of transfer functions, solution of discrete time state-space equations, and stability in state-space.
- Use numerical integration, pole-zero mapping and hold equivalence for the design of digital filters and controllers.
- Demonstrate controllability and observability concepts, and system identification.
- Develop simulation skills for the analysis and design of digital control systems.

Course Contents:

- Linear difference equations, representation of digital systems using the z-transform, block diagrams, flow graphs
- Sampling, impulse modulation, sample and hold, sampled data systems, state-space system representation, state-equation solutions
- Digital filter design, numerical integration, pole-zero mapping, hold equivalence

- Bilinear transformation, stability, Jury's test
- Digital control system specifications, design using emulation/root locus in the z-plane and frequency response methods (z- and w- transform), compensator design, PID control
- Control-law design, estimator and regulator design, reference input, controllability, observability
- System identification, least squares, recursive least squares, stochastic least squares, maximum likelihood

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises.

Assessment Methods:

Homework, exams, final exam.

Required Textbooks/Reading:

Authors	**Title**	**Publisher**	**Year**	**ISBN**
G. F. Franklin J. D. Powell M. Workman	Digital Control of Dynamic Systems	Addison-Wesley Ellis-Kagle Press	1998	0-201-82054-4 978-0-9791226-0-6

Recommended Textbooks/Reading:

Authors	**Title**	**Publisher**	**Year**	**ISBN**
C. L. Phillips H. T. Nagle	Digital Control Systems Analysis and Design	Prentice Hall	1995	013309832X
K. Ogata	Discrete-Time Control Systems	Prentice Hall	1995	0130342815