UNIVERSITY of NICOSIA

Course Syllabus

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

Course Objectives:

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 be able 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 Content:

- 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 / Readings:

Title	Author(s)	Publisher	Year	ISBN
Digital Control of Dynamic Systems	G. F. Franklin J. D. Powell M. Workman	Addison-Wesley Ellis-Kagle Press	1998	0201820544 9780979122606

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Digital Control Systems Analysis and Design	C. L. Phillips H. T. Nagle	Prentice Hall	1995	013309832X

Discrete-Time Control Systems	K. Ogata	Prentice Hall	1995	0130342815