Course Title	**Digital Control Systems**
Course Code	**EE5306**
No. of Credit Hrs (Lecture + Tutorial + Lab)	**3 (2+0+1)**
No. of Contact Hrs (Lecture + Tutorial + Lab)	**4 (2+0+2)**
Level-Year	**9-5**
Prerequisite (if any)	**EE3409**

1) Course Objectives:

The main objective of this course is to introduce the fundamental concepts, principles and application of digital control system analysis. The students will gain familiarity with various aspects of digital control engineering which covers both classical control design methods as well as the modern control design techniques. A variety of problems/exercises are included to illustrate the concepts clearly.

2) Expected Learning Outcomes:

1. **Describe and explain** the fundamentals of digital control systems, including stability concepts and state-variable models. **PLO1 [1]**
2. **Analyze** the issues in sampling, digital data, and discrete-time systems. **PLO1 [1]**
3. **Design and implement** digital controllers using methods such as emulation of continuous-time compensators, root locus, and frequency response approaches. **PLO2 [2]**
4. **Evaluate and justify** the economic and environmental impacts of applying digital automatic control techniques. **PLO5 [4]**
5. **Collaborate and manage** teamwork to identify digital control problems of contemporary relevance and implement solutions using hardware or software. **PLO7 [5]**
6. **Communicate** project outcomes and technical findings effectively through structured reports and presentations. **PLO8 [3]**

3) Course Contents

1. Introduction, digital control system and analog control system.
2. Discrete time systems and the Z-transform and properties of the Z-transform.
3. Solution of difference equations.
4. The inverse Z-transform, simulation diagrams and flow graphs.
5. State variables, transfer functions, solutions of the state equations.
6. Sampling and reconstruction.
7. Open-loop discrete time systems.
8. State variable models, discrete state equations.
9. Closed-loop systems: derivation procedure, state-variable models.
10. Controllability and observability.
11. Stability analysis techniques.

7. Teaching Methods:

- Lectures and Discussion
- Videos
- Self-learning
- Tutorial sheets

8. Mode of Evaluation: Course Assessment Methods

- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Mid Exam
- Final Exam

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/Mini-Projects/Presentations/Reports and Quizzes	15%
2.	Mid Exam	25%
3.	Tutorial work (Homework/Mini-project, Report, Long essay ….)	20%
4.	Final Exam	40%

9. Textbook(s):

- Charles, Phillips and Nagle “Digital Control System Analysis and Design”, Prentice-Hall, 2000.

10. References:

- K. Ogata, “Discrete-Time Control Systems,” Second Edition, Prentice Hall, 1995