

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRICAL & ELECTRONICS ENGINEERING

B. E. SEMESTER: VII

Subject Name: **Digital Control System (Department Elective – I)**

Subject Code: **170806**

| Teaching Scheme | | | | Evaluation Scheme | | | |
|-----------------|----------|-----------|-------|---------------------|-----------|---------------------------|----------------------|
| Theory | Tutorial | Practical | Total | University Exam (E) | | Mid Sem Exam (Theory) (M) | Practical (Internal) |
| | | | | Theory | Practical | | |
| 4 | 0 | 2 | 6 | 70 | 30 | 30 | 20 |

| Sr. No | Course Content | Total Hrs. |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1. | Introduction: Control system terminology, an overview of the classical approach to analog controller design, | 4 |
| 2. | Signal Processing in Digital Control: Basic digital control scheme and configuration, Principle of signal conversion, Basic discrete-time signal, Time-domain model for discrete-time systems. The z-transforms, transfer function models, frequency response, stability on the z-plane and stability criterion. | 10 |
| 3. | Sample and Hold Systems: Sampled spectra and aliasing, reconstruction of analog signals, practical aspects of the choice of sampling rate, principles of discretization. | 7 |
| 4. | Models of Digital Control Devices and Systems: Z-domain description of sampled continuous-time plants, z-domain description of system with dead-time, Implementation of digital controllers, tuneable PID controllers, digital temperature control system, digital position control system. | 12 |
| 5. | Design of Digital Control Algorithms: Z-plan specifications of control system design, digital compensator design using frequency response plot, digital compensator design using root locus plots. | 12 |

Laboratory & Assignments:

- Simulation and design of various digital signals and digital control systems using MATLAB

Text Books:

1. Gopal, M., “Digital Control and State Variable Methods”, Tata McGraw Hill, New Delhi, 2009.
2. Kuo, Benjamin C., “Digital Control Systems”, Oxford University Press, 1995.

Reference Books:

1. Ogata, Katsuhiko, “Discrete-time Control Systems”, Prentice-Hall, 1987.
2. Rolf Isermann, “Digital Control Systems: Fundamentals, deterministic control”, Springer, 1989.
3. Yoan D. Landau, Gianluca Zito, “Digital Control Systems: Design, Identification and Implementation”, Springer, Birkhäuser, 2006.