Annexure 'D'

Course Title	*Discrete Data System*	Course No	To be allotted later on by the office		
Specialization	Electronics Engineering	Structure (IPC)	3	0	3
Offered for	All streams of M Des, B Tech and Dual Degree	Status	Core ☐	Elective ▬	
Pre-requisite	Control Systems	To take effect from			
Objectives	The purpose of this course is to present the fundamentals of the theory and application of digital control system. In particular, this course will provide methods for design and analysis of digital control system.				
Course Outcomes	Students will be introduced to the fundamental concepts, principles and application of digital control system analysis and design. Students will be able to design systems applying classical control methods as well as the modern control design.				
Contents of the course *(With approximate break up of hours)*	**Introduction to digital control** Discrete time system representation, Mathematical modeling of sampling process, Data reconstruction (4) **Modeling discrete-time systems by pulse transfer function** Revisiting z-transform, Mapping of s-plane to z-plane, Pulse transfer function, Pulse transfer function of closed loop system, Sampled signal flow graph (6) **Design of sampled data control systems** Lead, Lag and Lag-Lead compensator design using Bode plot and root locus (8) **Deadbeat response design** Design of digital control systems with deadbeat response, Practical issues with deadbeat response design, Sampled data control systems with deadbeat response (6) **Discrete state space models** Controllability and observability, Stability, Lyapunov stability theorem, Popov's stability Theorem and circle criterion for stability (8) **State feedback and Output feedback design** Pole-placement by state feedback, Set point tracking controller, Full order observer, Reduced order observer, output feedback design, Kalman Filter (6) **Introduction to optimal control** Basics of optimal control, Performance indices, Linear Quadratic Regulator (LQR) design (4)				
Text and References	**Text Book:** 1. M. Gopal, Digital Control and State Variable Methods, Tata Mcgraw Hill, 2/e, 2003. 2. G. F. Franklin, J. D. Powell and M. L. Workman, Digital Control of Dynamic Systems, Pearson Education, Asia, 3/e, 2000. **Reference Books:** 1. B. C. Kuo, Digital Control Systems, Oxford University Press, 2/e, Indian Edition, 2007. 2. K. Ogata, Discrete Time Control Systems, Prentice Hall, 2/e, 1995. 3. K. J. Astroms and B. Wittenmark, Computer Controlled Systems - Theory and Design, Prentice Hall, 3/e, 1997.				