22EEHO205	DIGITAL CONTROLLER IN POWER ELECTRONICS APPLICATION				SEMESTER			
PREREQUISTIES			**CATEGORY**		**PEC**	**Credit**		**3**
Control systems, Power Electronics			**Hours\Week**		**L**	**T**	**P**	**C**
					3	**0**	**0**	**3**
Course Objectives:								
1.	To understand the concepts of discrete time systems.							
2.	To analyze systems in z domain.							
3.	To design the digital controllers							
UNIT I	**INTRODUCTION**				**9**	**0**	**0**	**9**
Introduction-Comparison between analog and digital control-Importance of digital control-Structure of digital control-Examples of digital control system-Difference equations-Z-transform-MATLAB examples. Frequency response of discrete time systems-Properties of frequency response of discrete time systems-Sampling theorem.								
UNIT II	**Z-PLANE ANALYSIS OF DISCRETE-TIME CONTROL SYSTEMS**				**9**	**0**	**0**	**9**
Impulse sampling and data hold -Pulse transfer function - Realization of digital controllers- Mapping between s-plane and zplane - Stability analysis of closed loop systems in z-plane–Transient and steady state analyses.								
UNIT III	**STATE SPACE APPROACH TO DISCRETE-TIME CONTROL SYSTEMS**				**9**	**0**	**0**	**9**
State space representation of continuous and digital control systems - Solution of continuous and discrete time state space equations -Pulse transfer function matrix - Discretization of continuous time state space equations.								
UNIT IV	**DIGITAL CONTROLLER DESIGN METHODS**				**9**	**0**	**0**	**9**
Cascade compensators using Root Locus- Design of PID controllers by using bilinear transformation- Digital controller design using bilinear transformation- Dead-beat response design- Deadbeat controller without and with prescribed manipulated variable-Choice of sample time for deadbeat controller-Realization of Digital controllers-Computer based simulation.								
UNIT V	**DIGITAL CONTROLLERS IN POWER ELECTRONICS APPLICATIONS**				**9**	**0**	**0**	**9**
Micro Controllers and Digital Signal Controllers for Converter Control Application, Interface Modules for Converter Control – A/D, Capture, Compare and PWM, Analog Comparators for instantaneous over current detection, interrupts, Discrete PI and PID equations, Algorithm for PI and PID implementation, Example Code for PWM generation.								
Total (45L+0T)= 45 Periods								

Text Books:	
1.	M. Gopal, "Digital Control and State Variable Methods", McGraw Hill Education, 4th Edition, 2014.
2.	K.Ogata "Discrete- Time control systems", Pearson Education, India, 2nd Edition, 2015.
3.	B.C.Kuo, "Digital Control System", Oxford University Press; 2ndEdition, 2012.
4.	Karl J. Astrom & Tore Hagglun. "PID Controllers: Theory, Design and Tuning" International Society for Measurement and Control, 1995.
Reference Books:	
1.	G.F.Franklin, J.David Powell and M.Workman, Digital Control of Dynamic Systems, 3rd ed., Addison Wesley, 2000.
2.	Constantine H. Houpis and Gary B. Lamont, Digital control systems: Theory, hardware, software, Mcgraw-Hill Book Company, 1985.
3.	M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
E-Reference	
1	https://nptel.ac.in/courses/108103008

Course Outcomes: Upon completion of this course, the students will be able to:			**Bloom's Taxonomy Mapped**
CO1	:	To understand the digital control system	L2: Understanding
CO2	:	Capable of determining the stability in z domain	L1: Applying
CO3	:	To understand the state space analysis	L1: Remembering
CO4	:	To design the various types of digital controllers	L3: Analysing
CO5	:	To check the digital controllers in power electronics design	L5: Evaluating

COURSE ARTICULATION MATRIX

COs/ POs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	1	1	1	1	1	1	1	1			1		1	1	1
CO2	1	3	3	3	2	1	2	1	1		1		1	1	1
CO3	1	2	2	3	2	1	2	1	1		1		1	1	1
CO4	1	3	2	3	2	1	2	1	1		1		1	1	1
CO5	1	2	3	3	2	1	2	1	1		1		1	1	1
Avg	1	2.2	2.2	2.6	1.8	1	1.8	1	1	0	1	0	1	1	1

3/2/1-indicates strength of correlation (3- High, 2-Medium, 1- Low)