

COURSE TITLE	DSP BASED CONTROL OF POWER ELECTRONIC SYSTEMS
COURSE CODE	01EE0711
COURSE CREDITS	1

Objective:

- 1 Student will be able to develop algorithms in the DSP controller for control of Power Electronics based systems.

Course Outcomes: After completion of this course, student will be able to:

- 1 Develop Program to control Input / Output peripherals.
- 2 Compare Implementation approaches for Pulse Width Modulation algorithms.
- 3 Develop a program for acquisition of electrical quantities using ADC
- 4 Design an algorithm for Power Electronics based system.

Pre-requisite of course:Power Electronics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	2	0	0	0	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction: Interfacing of I/O devices, Timer/Counter operation and their role in power electronic control, , Interrupts operation and their role in contro, Introduction to TMS320F28335 DSP controller, architecture, peripherals, IQ math and use of DSP controller for IQmath, Boot ROM configuration	4
2	DSP controller and peripherals: General Purpose Input Output pins Introduction,, Multiplexing of I/O pins, Input qualification, Use of GPIO for control for converter	4
3	Analog to Digital Conversion Introduction, Internal structure of ADC in TMS320F28335 Auto conversion Sequencer, Principle of Operation, Sequential Sampling Mode,, Simultaneous Sampling Mode, Uninterrupted Autosequenced Mode, ADC Clock Prescaler, ADC Calibration, Offset Error Correction	6
4	Event Manager: Operation of Timer in various modes, ePWM Units and HRPWM and their operation,, eCAP Capture unit, eQEP circuit and their operation and other feature of Event Manager	10

Contents : Unit	Topics	Contact Hours
5	Communications Peripherals: Serial Communications Interface, , Serial Peripheral Interface, Inter-Integrated Circuit (I2C) Module	4
Total Hours		28

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment-1 Write a program to toggle I/O pins of the DSP controller	2
2	Experiment-2 Write a program to read ADC in sequential sampling mode and analyze the effect of ADC Prescaler on ADC reading	2
3	Experiment-3 Write a program to read ADC in simultaneous sampling mode with ADC calibration	2
4	Experiment-4 Write a program to operate timer in Up, Down, and Up-Down mode and generate PWM of fixed duty cycle.	4
5	Experiment-5 Develop a program for sine PWM scheme using sine table of Boot ROM space.	4
6	Experiment-6 Write a program to calculate the duty cycle and/or frequency of the signal using the eCAP unit	4
7	Experiment-7 Write a program to perform an exchange a byte using serial communication.	2
8	Experiment-8 Write a program to operate Serial Peripheral Interface (SPI) in loopback mode	2
9	Experiment-9 Write a program to generate Pulses for DC-DC converter in High-Resolution PWM mode.	2
10	Experiment-10 Advance Experiment: Write a program to calculate the speed of the motor using eCAP/eQEP module.	2
Total Hours		26

References:

- 1 TMS320F28335 DSP Controller, TMS320F28335 DSP Controller, Texas Instruments, Texas Instruments, 2018

References:

- 2 TMS320x2833x Analog-to-Digital Converter (ADC), TMS320x2833x Analog-to-Digital Converter (ADC), Texas Instruments , Texas Instruments , 2007
- 3 TMS320x2833x, 2823x Boot ROM, TMS320x2833x, 2823x Boot ROM, Texas Instruments, Texas Instruments, 2007
- 4 TMS320x2833x, 2823x Enhanced Capture (eCAP) , TMS320x2833x, 2823x Enhanced Capture (eCAP) , Texas Instruments, Texas Instruments , 2007
- 5 TMS320x2833x, 2823x Enhanced Pulse Width Modulator (ePWM) Module Reference Guide, TMS320x2833x, 2823x Enhanced Pulse Width Modulator (ePWM) Module Reference Guide, Texas Instruments, Texas Instruments, 2007
- 6 TMS320x2833x, 2823x Enhanced Quadrature Encoder Pulse (eQEP) Module Reference Guide, TMS320x2833x, 2823x Enhanced Quadrature Encoder Pulse (eQEP) Module Reference Guide, Texas Instruments, Texas Instruments, 2007
- 7 TMS320x2833x, 2823x System Control and Interrupts Reference Guide, TMS320x2833x, 2823x System Control and Interrupts Reference Guide, Texas Instruments, Texas Instruments, 2007
- 8 TMS320x2833x, 2823x Serial Communications Interface (SCI) Reference Guide, TMS320x2833x, 2823x Serial Communications Interface (SCI) Reference Guide, Texas Instruments, Texas Instruments, 2007
- 9 TMS320x2833x, 2823x Serial Peripheral Interface (SPI) Reference Guide, TMS320x2833x, 2823x Serial Peripheral Interface (SPI) Reference Guide, Texas Instruments, Texas Instruments, 207

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	25.00	30.00	20.00	15.00	0.00

Supplementary Resources:

- 1 <https://www.ti.com/tool/CCSTUDIO>
- 2 <https://www.ti.com/tool/C2000WARE>
- 3 <https://www.ti.com/tool/C2000WARE-MOTORCONTROL-SDK>
- 4 <https://www.ti.com/product/TMS320F28335>
- 5 <https://in.mathworks.com/products/ti-c2000-microcontroller.html>