

M.E Semester: 3
Electrical Engineering (Electrical Power System)
Subject Name: Microcontroller based System Design (Major Elective-III)*

A. Course Objective:

- To study application of microcontroller in the field of power electronics
- To study implementation of digital control systems in power system & power electronics.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
MEEPS-302A	Microcontroller based System Design*	4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus:

SR No.	Unit No	Topic	No. of Hours	Approx. Weightage In exams
1	Unit-1	Introduction: Interfacing of I/O devices, Timer/Counter operation and their role in power electronic control, Interrupts operation and their role in control Introduction to TMS320F2812 DSP controller, architecture, peripherals, IQ math and use of DSP controller for IQmath	10	10%
2	Unit-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 Analog to Digital Conversion Introduction, Internal structure of ADC in TMS320F281x, Autoconversion Sequencer Principle of Operation, Uninterrupted Autosequenced Mode, Control word and application Event Manager Operation of Timer in various modes, PWM/CMP Units and their operation, SVPWM unit, Capture unit, QEP circuit and their operation and other feature of Event Manager	16	30%

3	Unit-3	AC/DC converter: Interfacing circuits for AC/DC converter, Zero crossing detection method, control in discontinuous conduction, Algorithm development, Single phase half/fully controlled converter, Three phase converters and their control in open loop and closed loop mode DC/DC converter: Implementation of DSP algorithm in buck, boost and buck-boost converters, interfacing circuits, closed loop control	12	20%
4	Unit-4	DC/AC converter(Inverter): Control of VSI in six-step mode, implementation of various PWM schemes with DSP controller, Implementation of SVPWM algorithm using PWM unit/SVPWM unit AC/AC converter Control of matrix converter and algorithm implementation	16	30%
5	Unit-5	Case Study Development of case study for any real time power electronic system	06	10%

D. Instructional Methods

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- Two internal exams may be conducted and average of the same may be converted to equivalent of 15 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

- Experiments shall be performed in the laboratory related to course contents.

E. Students Learning Outcomes

- Students can develop microcontroller based system in the area of power electronics and power system.

F. Recommended Study Materials

Text & Reference Books:

1. B.K.Bose , *‘Microcomputer control of Power Electronic and Drives’*, IEEE Press –USA.
2. Study material on ‘Microprocessor control of Electric Drives’, QIP Centre publication, P. Agarwal, V.K. Verma
3. Datasheet on ‘TMS320F2812 DSP controller family’
4. A manual on ‘TMS320F281x DSP CPU and Instruction set reference guide©’, Texas Instruments Co.
5. A manual on ‘TMS320F281x ADC reference guide©’, Texas Instruments Co.
6. A manual on ‘TMS320F281x Event Manager guide©’, Texas Instruments Co.
7. Application notes on TMS320F281x DSP controllers.

