SHRI VENKATESHWARA UNIVERSITY

EVALUATION SCHEME & SYLLABUS

M.TECH

Power Electronics

(Two Years Post Graduation Programme)

II Semester
(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

M.TECH Power Electronics SEMESTER-II													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	MPE 201	Power Electronic Converters	3	0	0	20	10	30		70		100	3
2	MPE 202	Digital Control of Power Electronic and Drive Systems	3	0	0	20	10	30		70		100	3
3	MPE-031	Switched Mode and Resonant Converters	3	0	0	20	10	30		70		100	3
4	MPE-041	Advanced Microcontroller based Systems	3	0	0	20	10	30		70		100	3
5	MPE-221	Mini Project	0	0	4			50		50		100	2
6	MPE-211	Power Electronics Lab	0	0	4				25		25	50	2
7	MPE-212	Micro-controller Lab	0	0	4				25		25	50	2
8	AUD102	Disaster Management	2	0	0	20	10	30		70		100	0
		Total										700	18

CORE 3: POWER ELECTRONIC CONVERTERS

Course Objectives: Students will be able to:

Understand the concepts and basic operation of PWM converters, including basic circuit operation and design.

Understand the steady-state and dynamic analysis of PWM converters along with the applications like solid state drives and power quality.

Syllabus

Units	**Content**
1	Analysis of power semiconductor switched circuits with R, L, RL, RC loads D.C. motor load. Battery charging circuit.
2	Single-Phase and Three-Phase AC to DC converters.Half controlled configurations-operating domains of three phase fullconverters and semi-converters. Reactive power considerations.
3	Analysis and design of DC to DC converters.Control of DC-DC converters: Buck converters, Boost converters, Buck-Boost converters, Cuk converters.

4	Single phase and three phase inverters.Voltage source and Current source inverters.Voltage control and harmonic minimization in inverters.
5	AC to AC power conversion using voltage regulators.Choppers and cyclo-converters.
6	Consideration of harmonics, introduction to Matrix converters. Design aspects of converters, Few practical applications.

Suggested reading

Ned Mohan, Undeland and Robbin, "Power Electronics: converters, Application and design",John's Wiley and sons. Inc, Newyork.

M.H.Rashid, "Power Electronics", Prentice Hall of India 1994.

Course Outcomes:

Students will be able to:

To give a systematic approach for transient and steady state analysis of all power electronicconverters with passive and active loads.

To know and carry out transient and steady state analysis of different power converters ofdifferent types of loads and switching sequences.

CORE 4: DIGITAL CONTROL OF POWER ELECTRONICS AND DRIVESYSTEMS

Course Objectives:

Students will be able to:

To understand different control strategies

To understand state space modeling of different converters

To perform simulation of different power converters

Syllabus

Units	Content
1	Review of numerical methods.Application of numerical methods to solve transients in D.C. Switched R, L, R-L, R-C and R-L-C circuits. Extension to AC circuits.
2	Modelling of diode in simulation.Diode with R, R-L, R-C and R-L-C load with AC supply. Modelling of SCR, TRIAC, IGBT and Power Transistors in simulation.Application of numerical methods to R, L, C circuits with power electronic switches. Simulation of gate/base drive circuits, simulation of snubber circuits.
3	State space modelling and simulation of linear systems.

Introduction to electrical machine modelling: induction, DC, and synchronous machines, simulation of basic electric drives, stabilityAspects.

4.Simulation of single phase and three phase uncontrolled and controlled (SCR) rectifiers.
Converters with self-commutated devices- simulation of power factor correction schemes.

5.Simulation of converter fed DC motor
drives.Simulation of thyristor choppers with
voltage.

Current and load commutation schemes.Simulation of chopper fed DC motor. Simulation of single and three phase inverters with thyristors and self commutated devices.

6. Space vector representation.Pulse-width modulation methods for voltage control.Waveform control. Simulation of inverter fed induction motor drives.

Suggested reading

1. Simulink Reference Manual, Math works, USA

Course Outcomes

Students will be able to:

To provide knowledge on modelling and simulation of power simulation circuits and systems. The candidate will be able to simulate power electronic systems and analyze the system response

PE3: SWITCHED MODE AND RESONANT CONVERTERS

Course Objectives:

Students will be able to:

To understand different types of converters
To understand different switch mode topologies & control methodsTo understand different resonant converter topologies.

Units	Content	Hours
1	Buck, Boost, Buck-Boost SMPS Topologies. Basic Operation-Waveforms - modes of operation -switching stresses.Switching and conduction losses. Optimum switching frequency. Practical voltage, current and power limits - design relations.Voltage mode control principles. Push-Pull and Forward Converter Topologies - Basic Operation,Waveforms. Flux Imbalance Problem and Solutions Transformer Design. Output Filter Design. Switching Stresses and Losses.Forward Converter Magnetics. Voltage Mode Control. Half and Full Bridge Converters. Basic Operation and Waveforms. Magnetics, Output Filter, Flux Imbalance, Switching Stresses and Losses,Power Limits, Voltage Mode Control.	
2	Classification of Resonant Converters. Basic Resonant Circuit Concepts. Load Resonant Converter, Resonant Switch Converter, Zero.	

3		Voltage Switching Clamped Voltage Topologies. Resonant DC Link Inverters with Zero Voltage Switching. High Frequency Link Integral Half Cycle Converter. Fly back Converter- discontinuous mode operation, waveforms, control. Magnetics- Switching Stresses and Losses, Disadvantages - Continuous Mode Operation, waveforms, control, design relations.
	4	Voltage Mode Control of SMPS- Loop Gain and Stability Considerations.Error Amp– frequency Response and Transfer Function. Trans-conductance Current Mode Control of SMPS. Current Mode Control Advantages, Current Mode Vs Voltage Mode. Current Mode Deficiencies. Slope Compensation.
	5	Study of a typical Current Mode PWM Control IC UC3842. Modeling ofSMPS. Small Signal Approximation- General Second Order Linear Equivalent Circuits. Study of popular PWM Control ICs (SG 3525,TL 494,MC34060 etc.) DC Transformer, Voltage Mode SMPS Transfer Function. General Control Law Consideration.
	6	EMI Generation and Filtering in SMPS - Conducted and Radiated Emission Mechanisms in SMPS. Techniques to reduce Emissions, Control of Switching Loci. Shielding and Grounding, Power Circuit Layout for minimum EMI. EMI Filtering at Input and Output, Effect of EMI Filter on SMPS ControlDynamics. Introduction to Resonant Converters.

Suggested reading

Abraham I Pressman, "Switching Power Supply Design,". McGraw Hill PublishingCompany,2001.

Daniel M Mitchell,"DC-DC Switching Regulator Analysis," McGraw Hill Publishing Company-1988.

Ned Mohan et.al, "Power Electronics," John Wiley and Sons 2006.

Course Outcomes

Acquire knowledge about the principles of operation of non-isolated and isolatedhard-switchedDC-DC converters.

Acquire knowledge on various loss components in a switched mode converter andchoice ofswitching frequency with a view towards design of such converters.

PE 4 : ADVANCED MICRO-CONTROLLER BASED SYSTEMS

Course Objectives:

Students will be able to:

To understand the architecture of advance microcontrollersTo understand the applications of these controller

		Hours
1	Basic Computer Organization. Accumulator based processes-Architecture-MemoryOrganization-I/O Organization	
2	Micro-Controllers-Intel 8051, Intel 8056- Registers, Memories.	
3	Intel 8051 – Assembly language programming-Addressing-Operations-Stack & Subroutines,Interrupts-DMA.	
4	Interfacing Memory/ I/O Devices, Serial I/Oand data communication	
5	Digital Signal Processor (DSP) - Architecture – Programming, Introduction to FPGA	
6	Microcontroller development for motor control applications.	

Suggested reading

John.F.Wakerly: "Microcomputer Architecture and Programming", John Wiley and Sons 1981.Ramesh S.Gaonker: "Microprocessor Architecture, Programming and Applications with the 8085", Penram International Publishing (India), 1994.

Raj Kamal: "The Concepts and Features of Microcontrollers", Wheeler Publishing, 2005.Kenneth J. Ayala, "The 8051 microcontroller", Cengage Learning, 2004.

John Morton," The PIC microcontroller: your personal introductory course", Elsevier, 2005.Dogan Ibrahim," Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F Series", Elsevier, 2008.

Microchip datasheets for PIC16F877.

Course Outcomes

Students will be able to:

To learn how to program a processor in assembly language and develop an advanced processorbased system

To learn configuring and using different peripherals in a digital systemTo compile and debug a Program

To generate an executable file and use it

LAB 3- POWER ELECTRONICS LABORATORY

To study V-I characteristics of SCR and measure latching and holding currents.To study UJT trigger circuit for half wave and full wave control.

To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load withand without freewheeling diode.

To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive andinductive loads.

To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.To study single-phase ac voltage regulator with resistive and inductiveloads.

To study single phase cyclo-converter.

To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor.To study operation of IGBT/MOSFET chopper circuit.

To study MOSFET/IGBT based single-phase series-resonant inverter.To study MOSFET/IGBT based single-phase bridge inverter.

LAB 4–MICROCONTROLLER LAB/DIGITAL SIGNAL PROCESSING LAB

Microcontroller Lab

EXPERIMENTS ON ASSEMBLY PROGRAMMING

Write a program to multiplication and division using MUL and DIV instructions. Write a program to transfer a block of data from internal memory to external memory.Write a program to exchange two set of eight-byte data.
Write a program to find the sum of two numbers in decimal. Write a program to convert decimal number to hexadecimal. Write a program to add a number n, m number of times.
Write program to find the largest from a set of n numbers. Write program for sorting the given set of numbers.

EXPERIMENTS ON 8051 INTERFACING

Write an assembly language program for generating a triangular wave.
Write a program to find the largest from a set of ten numbers and display it usingLEDs.Write a program to for displaying the decimal numbers in 7 Segment display.
Write a program to read the DIP switches for displaying the reading using 7 Segmentdispla

Code	Course Name	L-T-P	Cr.
AUD -102	Disaster Management	2-0-0	0

Course Objectives: -Students will be able to:
learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. Develop an understanding of standards ofhumanitarian response and practical relevance in specific types of disasters and conflictsituations.

Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Unit No.	Heading	Content
1	**Introduction**	Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

2	**Repercussions Of Disasters And Hazards**	Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.
3	**Disaster Prone Areas In India**	Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

4	**Disaster Preparedness And Management**	Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.
5	**Risk Assessment**	Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival
6	**Disaster Mitigation**	Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SUGGESTED READINGS:

R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies"'New Royal book Company.

Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", PrenticeHall Of India, New Delhi.

Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep&Deep Publication Pvt. Ltd., New Delhi.