

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. (POWER ELECTRONICS AND ELECTRIC DRIVES)

PROPOSED TEACHING SCHEME

(W.E.F. July 2012)

## Semester III

SR. No.	SUBJECT	TEACHING SCHEME(HOURS)			CREDITS
		THEORY	TUTORIAL	PRACTICAL	
	Major Elective IV	3	0	2	4
734501	Application Of Power Electronics To Power System	3	0	0	3
730001	Seminar	0	0	4	2
730002	Presentation of Literature Review	0	0	0	2
730003	Dissertation Phase-I	0	0	18	9
	<b>TOTAL</b>	<b>6</b>	<b>0</b>	<b>24</b>	<b>20</b>

Major Elective - IV

Sr. No.	Major Elective - IV
734502	EMC in power electronics
734503	Embedded control of electric drives

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Electrical (Power Electronics and Electrical Drives)

**Semester: III**

**Subject Name:**Application of Power Electronics To Power System

**Subject Code:**734501

Sr. No.	Course content
1	<b>INTRODUCTION</b> Voltage source inverter (VSI), Synchronous reference frame theory, Instantaneous reactive power theory, Introduction to Active filter.
2	<b>REACTIVE POWER COMPENSATION</b> Analysis of uncompensated AC line, Passive reactive power compensation, Compensation by a series capacitor connected at the mid point of the line, Effect on Power Transfer capacity, Compensation by STATCOM and SSSC, Synchronous condenser, Saturated reactor, Thyristor-controlled reactor (TCR), Thyristor controlled transformer (TCT), Fixed capacitor-Thyristor controlled reactor (FC-TCR), Thyristor switched capacitor (TSC), Thyristor-switched capacitor-thyristor controlled reactor (TSC-TCR).
3	<b>STATIC VAR COMPENSATORS</b> Analysis of SVC, Configuration of SVC, SVC Controller, Modelling of SVC, Voltage regulator Design, Voltage control by the SVC, Advantages of the slope in the SVC Dynamic Characteristic, Influence of the SVC on System Voltage, Design of the SVC Voltage Regulator.
4	<b>STATIC SYNCHRONOUS COMPENSATOR (STATCOM)</b> Principle of operation, Analysis of a three phases six pulse STATCOM, Multi-pulse converters, Applications of STATCOM.
5	<b>THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND STATIC SYNCHRONOUS SERIES COMPENSATOR (SSSC)</b> Principle of operation, Analysis and control, Applications.
6	<b>UNIFIED POWER FLOW CONTROLLER (UPFC)</b> Operation of UPFC, Applications of UPFC.

**References:-**

1. Mathur R. Mohan & Varma R. K “Thyristor–based FACTS controllers for electrical transmission system”, Wiley Inter-Science, 2002.
2. Padiyar K.R. “FACTS controller in power transmission and distribution”, New Age international, Edition 1st 2007.
3. N.G. Hingorani , “Understanding FACTS”, IEEE Press 2001.
4. Acha E., Agelidis V.G., Anaya-Lara O., T.J.E. Miller, “Power Electronics Control in Electrical System”, Newnes Power Engineering Series, 2002.
5. Vijay K. Sood, "HVDC and FACTS Controllers: Applications of Static Converters in Power Systems", Springer; 1 edition, 2004.

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Electrical (Power Electronics and Electrical Drives)

M.E. Semester: III

**Subject Name:** EMC in Power Electronics (Elective-IV)

**Subject Code:**734502

Sr. No.	Course content
1	<b>Introduction:</b> History of EMC Standardization Efforts, Description of electromagnetic disturbances, Classifying Disturbances by Frequency Content, Classifying Disturbances by Character, Classifying Disturbances by Transmission mode.
2	<b>EMI Measurement:</b> EMI Measuring Instruments, Basic Terms and Conducted EMI References, Measuring the Interference Voltage, Measuring the Interference Current, Spectrum Analyzers, EMI Measurements for Consumer Appliances, Measuring Impulse-Like EMI.
3	<b>EMI in Power Electronic Equipment:</b> EMI from Power Semiconductors, EMI from Controlled Rectifier Circuits, EMI Calculation for Semiconductor Equipment, EMI Filter Elements, Measuring HF Characteristics of EMI Filter Elements,
4	<b>Noise Suppression:</b> Noise Suppression in Relay Systems, Application of AC Switching Relays, Application of RC-Snubbers to Power Semiconductors, Shielded Transformers, Capacitor Filters, EMI Generation and Reduction at Its Source, Influence of Layout and Control of Parasitics.
5	<b>EMI Filter Circuit:</b> Selection and Measurement, Definition of EMI Filter Parameters, EMI Filter Circuits, Insertion Loss Test Methods, EMI Filter Design, EMI Filter Design for Insertion Loss, Calculation of Worst-Case Insertion Loss, Design Method for Mismatched Impedance Condition, Design Method for EMI Filters with Common-Mode Choke Coils, Damped EMI Filters and Lossy Filter Elements, HF Characteristics of Noise Filter Circuit Elements
6	Testing for Susceptibility to Power Line Disturbances, Surge Voltages in AC Power Mains, EMC Tests per IEC Specifications, Other EMS Test Methods, Reduction Techniques for Internal EMI, Conductive Noise Coupling, Electromagnetic Coupling,

	Electromagnetic Coupling Reduction Methods, Wiring Layout Methods to Reduce EMI Coupling PCB Design Considerations.
7	<b>Transient stability:</b> Transient Susceptibility Analysis Method, Noise Filter Design Method for Voltage Attenuation, Calculating the Energy Content of Transient Disturbances, Impulse Characteristics and Noise Filter Design, Surge Protection Devices.

### Reference Books:

1. EMC in Power Electronics, L. Tihanyi, IEEE PRESS.
2. Power electronics Handbook, M. H. Rashid, PHI.
3. Power electronics Handbook, Mazda, Newnespress.
4. EMI/EMC computational modeling handbook, Bruce Archambeault, Colin Brench, Omar M. Ramahi , Kluwer press.
5. Research Papers on EMI, EMC etc...
6. A Handbook for EMC Testing and Measurement, D. Morgan.
7. EMC for product designers , Tim Williams – Newnespress.

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Electrical (Power Electronics and Electrical Drives)

**M.E. Semester: III**

**Subject Name:** Embedded Control of Electrical Drives (Elective-IV)

**Subject Code:** 734503

Sr. No.	Course content
1	<b>MC68HC11 MICROCONTROLLER 9</b> Architecture memory organization – Addressing modes – Instruction set – Programming techniques – simple programs
2	<b>PERIPHERALS OF MC68HC11 9</b> I/O ports – handshaking techniques – reset and interrupts – serial communication interface – serial peripheral interface – programmable timer – analog / digital interfacing – cache memory
3	<b>PIC 16C7X MICROCONTROLLER 9</b> Architecture – memory organization – addressing modes – instruction set – programming techniques – simple operation.
4	<b>PERIPHERAL OF PIC 16C7X MICROCONTROLLER 9</b> Timers – interrupts – I/O ports – I2C bus for peripheral chip access – A/D converter – UART
5	<b>SYSTEM DESIGN USING MICROCONTROLLERS 9</b> Interfacing LCD display – Keypad interfacing – AC load control – PID control of DC motor – stepper motor control – brush less DC motor control.

## References:-

1. John B. Peatman , “Design with PIC Microcontrollers,” Pearson Education, Asia 2004
2. Michael Khevi, “The M68HC11 Microcontroller Applications in control & Instrumentation and communication”, Prentice Hall, New Jersey, 1997.
3. John B. Peatman, “Design with Microcontrollers”, McGraw Hill