



# GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering Power Electronics

Subject Code: 3722915

Semester – II

Subject Name: Digital Control of Power Electronic Systems

Type of course: Core III

Prerequisite: fundamental knowledge of working and characteristics of passive and active devices.

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	<ul style="list-style-type: none"><li>Review of numerical methods.</li><li>Application of numerical methods to solve transients in D.C.</li><li>Switched R, L, R-L, R-C and R-L-C circuits. Extension to AC circuits.</li></ul>	6
2	<ul style="list-style-type: none"><li>Modelling of diode in simulation.</li><li>Diode with R, R-L, R-C and R-L-C load with AC supply.</li><li>Modelling of SCR, TRIAC, IGBT and Power Transistors in simulation.</li><li>Application of numerical methods to R, L, C circuits with power electronic switches.</li><li>Simulation of gate/base drive circuits, simulation of snubber circuits.</li></ul>	8
3	<ul style="list-style-type: none"><li>State space modelling and simulation of linear systems.</li><li>Introduction to electrical machine modelling: induction, DC, and synchronous machines, simulation of basic electric drives, stability aspects.</li></ul>	6
4	<ul style="list-style-type: none"><li>Simulation of single phase and three phase uncontrolled and controlled (SCR)</li></ul>	8



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	rectifiers. <ul style="list-style-type: none"><li>Converters with self-commutated devices- simulation of power factor correction schemes.</li></ul>	
5	<ul style="list-style-type: none"><li>Simulation of converter fed DC motor drives.</li><li>Simulation of thyristor choppers with voltage.</li><li>Current and load commutation schemes.</li><li>Simulation of chopper fed DC motor.</li></ul>	8
6	<ul style="list-style-type: none"><li>Simulation of single and three phase inverters with thyristors and self-commutated devices.</li><li>Space vector representation.</li><li>Pulse-width modulation methods for voltage control.</li><li>Waveform control. Simulation of inverter fed induction motor drives.</li></ul>	8

**Reference Books: Simulink Reference Manual, Math works, USA**

### Course Outcomes:

Students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	To provide knowledge on modelling of power electronics circuits and systems.	25%
CO-2	To provide knowledge on simulation of power electronics circuits and systems.	25%
CO-3	To verify design of power electronics circuits.	25%
CO-4	The candidate will be able to simulate power electronic systems and analyse the system response.	25%

### List of Experiments:

1. To simulate diode modelling.
2. To simulate gate/base drive circuits for power devices
3. To study and to simulate state space modelling of linear systems.



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4. To study and to simulate modelling of various electrical machines
5. To simulate single phase and three phase uncontrolled rectifiers with different loads.
6. To simulate single phase and three phase controlled rectifiers with different loads.
7. To simulate various chopper circuits.
8. To simulate converter fed DC motor drive.
9. To simulate chopper fed DC motor drive.
10. To simulate single phase inverter using SCR.
11. To simulate three phase inverter using SCR.

### Major Equipment:

- ✓ Simulation software like MATLAB along with necessary toolbox, PSIM or Scilab

### List of Open Source Software/learning website:

1. Courses available through NPTEL.  
- website : [nptel.ac.in](http://nptel.ac.in)