



**DIRECTORATE OF TECHNICAL EDUCATION**

**DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING**

**II YEAR**

**M SCHEME**

**IV SEMESTER**

**2015-2016 onwards**

**INDUSTRIAL ELECTRONICS**

**CURRICULAM DEVELOPMENT CENTRE**

## M-SCHEME

(Implemented from the Academic year 2015-2016 onwards)

**Course Name : Electronics and Communication Engineering**

**Subject code : 34041**

**Semester : IV**

**Subject title : INDUSTRIAL ELECTRONICS**

### TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
	Hrs./ Week	Hrs./ Sem ester	Marks			Duration
			Internal Assessm ent	Board Examination	Total	
INDUSTRIAL ELECTRONICS	5	75	25	75	100	3 Hrs

### TOPICS AND ALLOCATION:

Unit	Topic	Time (Hrs.)
I	Power devices and Trigger circuits	13
II	Converters and choppers	13
III	Inverters and applications	13
IV	Programmable logic controller	14
V	DCS	12
VI	Revision – Tests – Model (3 +4+3)	10
	TOTAL	75

## **RATIONALE**

The rationale behind the modifying this subject is to give clear explanation of power devices and circuits that are widely used today in modern industry. It also gives exposure to PLCs & DCS which can perform various control functions in industrial environments.

## **OBJECTIVES:**

On completion of the following units of the syllabus contents, the students must be able to

- Study working principle of MOSFET, IGBT
- Study the methods of triggering
- learn about converters and its types.
- understand commutation concepts in SCR
- learn about choppers.
- Study about inverters and types.
- understand the concept of HVDC.
- know about SMPS.
- understand about UPS and its types.
- learn about PLC.
- discuss about ladder diagrams.
- know about the architecture of DCS
- know about LCU and display units of DCS

## 34041 -- INDUSTRIAL ELECTRONICS

## DETAILED SYLLABUS

<b>UNIT</b>	<b>NAME OF THE TOPIC</b>	<b>HOURS</b>
<b>1</b>	<p align="center"><b><u>POWER DEVICES AND TRIGGER CIRCUITS</u></b></p> <p><b>POWER DEVICES</b></p> <p>Insulated gate bipolar transistor (IGBT), MOSFET and GTO - Symbol, principle of working, VI characteristics and applications. Comparison between power MOSFET, power transistor and power IGBT[5](page – 298)</p> <p><b>TRIGGER CIRCUITS</b></p> <p>Triggering of SCR - Gate triggering –Types –Concepts of DC triggering, AC triggering, Pulse gate triggering – Pulse transformer in trigger circuit – Electrical isolation by opto isolator - Resistance capacitor firing circuit and waveform, Synchronized UJT triggering (ramp triggering) circuit and waveform.</p>	7  6
<b>2</b>	<p><b><u>CONVERTERS AND CHOPPERS</u></b> (Qualitative treatment only)</p> <p><b>CONVERTERS</b></p> <p>Converters – Definition – Single phase Half controlled bridge converter with R load and RL load - importance of flywheel diode – Single phase fully controlled bridge converter with resistive load – voltage and current waveforms – Single phase fully controlled bridge converter with RL load – voltage and current waveforms Commutation- Natural commutation – Forced commutation – Types</p> <p><b>CHOPPERS</b></p> <p>Chopper – Definition –principle of DC chopper operation – Typical chopper circuit (Jones chopper) –Applications of DC chopper – Principle of working of single phase AC chopper - Chopper using MOSFET.</p>	9  4
<b>3</b>	<p><b><u>INVERTERS &amp; APPLICATIONS</u></b></p> <p><b>INVERTERS</b></p> <p>Inverter with resistive load – Single phase inverter with RL load – Methods to obtain sine wave output from an inverter- Output voltage control in inverters - McMurray inverter – advantages – Parallel</p> <p><b>INVERTER APPLICATIONS</b></p> <p>SMPS Types - Block diagram of SMPS – advantages and disadvantages. UPS-Type (ON Line, OFF Line), Comparison.- Battery Banks.</p>	8  5

4	<p><b><u>PROGRAMMABLE LOGIC CONTROLLER</u></b></p> <p>Evolution – advantages over relay logic [webb - 7] Introduction to PLC – Relays- Block diagram of PLC - PLC Programming Languages - Arithmetic Functions – (add, sub, mul, div, sqr)[petruzela](P304-313) – Comparison of functions[ Webb - 7] (P190-199) - Basics of Input and output module (digital input and output module) - Logic functions- AND logic, OR logic, NAND logic, EX-OR logic -symbols used in ladder logic diagram. Ladder programming – Ladder diagram for simple systems – Star delta starter, Conveyer control and Lift control. PLC interface with GSM</p>	14
5	<p><b><u>Distributed Control Systems</u></b></p> <p>Evolution - Hybrid system Architecture(Page -7) – Central system Architecture(Page - 7) – Generalized Distributed Control - Architecture(Page 10,11) – comparison of architectures(Page 12) – Local control unit(Page 19) –Basic Elements of LCU(Page 19-21) – Displays – Plant – Area – Group- Loop(Page 189-201) – Features of DCS – Advantages of DCS (SK singh Page 698)</p>	12
Revision-Test		10

### **TEXT BOOKS**

1. Power Electronics by M.H.Rashid - PHI Publication-3<sup>rd</sup> Edition-2005
2. Industrial Electronics and control by Biswanath Paul –PHI publications- 2<sup>nd</sup> Edition -2010
3. Programmable Logic Controllers - “Frank D.Petruzela “PHI publications
4. Power Electronics by Dr.P.S.Bimbhra, Khanna publishers -2<sup>nd</sup> Edition-1998

### **REFERENCE BOOKS**

1. Industrial & Power Electronics By Harish C.Rai, Umesh Publication, 5<sup>th</sup> Edition 1994
2. ‘Programmable Logic Controllers – Principles and applications - John W. Webb. Ronald A. Reis PHI publications 2017
3. Programmable Logic Controller –Pradeep Kumar& Srivashtava- BPB Publications