LEVEL V COURSES

5134 - INDUSTRIAL ELECTRONICS

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)					
					Theory		Practical Ex.		Total	
Lectures	Practical	Credits	25	25	3 Hrs	100	50		200	
3	2	5			Theory	Test	Total	TW	PR	Gr Total
Pre-requisite		Source	Semester		7 5	2 5	1 0 0	5 0	—	1 5 0
4135		EXN								

Rationale: This subject is intended to give the student an in-depth knowledge of the basic electronic techniques employed in industries. At the end of it the student will be able to offer his skill in an industry employing ultrasonic, various heating and welding techniques and motor control.

COURSE CONTENTS	Hrs.	Mks
	12	24

1. PHOTO DEVICES AND INDUSTRIAL CIRCUIT

Construction and characteristics of Photo diode photo resistor and phototransistor. Construction and working of LASCR. Photo clipper and modulated light. Photo device application: - Photo relay circuit operating with light and without light using transistor, SCR and O-Pamp. Burglar alarm, Smoke detector and Photo counter IC 555 and 556 timer. Time delay and interval timer. Long duration timer, UJT timer. Circuits: Phase preventer, temperature controller using SCR, power flasher, water level indicator, Water level controller, thermistor controlled heater (On/OFF), Emergency lighting (AC/DC), SCR controlled battery charger and other important circuits.

2. ULTRASONICS   3   6

Ultra-Sonics – Frequency band of ultrasonic wave, wave-length and velocity in solid, liquid and gas. Ultrasonic generation using piezo electric and magnetostriction effect. Ultrasonic application for flaw detection, distance and depth measurement.

3. HIGH FREQUENCY HEATING AND RESISTANCE WELDING   9   15

High frequency heating Dielectric and Induction heating. Merits and demerits over conventional type heating. Circuit diagram and working of induction and dielectric heaters/generators. Dielectric power loss per unit volume. Power coupling methods. Few applications.
Principle of working power loss in induction heating, depth of penetration application for annealing, surface hardening and brazing. Power loss and efficiency calculation in case of induction and dielectric heating.

4. MOTOR SPEED CONTROL   9   25

D.C. Motor relationship-constant HP and constant torque operation. Continuous conduction and discontinuous conduction working. Speed and voltage relationship for shunt and separately excited motors. Relationship between firing angle and cut off angle of field supply. Graph between both angles for different WL/R. SCR power supply for inductive load waveform of voltage and current.
Speed control and regulation of fractional H.P. D.C. motor using SCR supply. Speed control and regulation of low power AC motors. Relationship between speed coefficient and torque coefficients of motors and graph between Nc and Tc for controlled D.C. and bus bar main D.C. supply motors. Speed control and regulation of D.C. motor by tachometer method. Simple calculation between speed, firing angles, cut off angle and IaRa drop etc.

	9	20

5. RESISTANCE WELDING

Ignition and SCR line contractors. Ignitron ratings, Ignitron sizes for 250 Volts and 500 Volts supply SCR rating. Characteristic between Ignitron current and percent db. Percent duty, Averaging current and averring time of Ignitron. Typical calculation for percent duty and calculation of ignitrons for given percent duty.

Heat Control Circuit: Sequential weld timer, General heat control circuit. SCR/Ignitron line contractor. Synchronous weld control, Follow-up and trailing tube/SCR working. Merits and Demerits of synchronous weld control and follow-up tube/ with respect to normal heat control system. Energy storage system and application.

6. UPS AND BATTERIES

	3	7

Contents not given.

Total	48	100

PRACTICALS :   (Any 8)

1. Assemble and test burglar alarm circuit.
2. Assemble and test Smoke detector circuit.
3. Assemble and test IC 555/556 Timer for given time delay and select proper RC components.
4. Assemble and test thermistor controlled circuit.
5. Draw characteristics curve of reactor core for a given load and calculate current and power gain.
6. Draw the characteristic curve of self-Saturable magnetic amplifier and calculate current and power gain.
7. Study of induction and dielectric heater.
8. Study of motor speed control and power flasher.
9. Calculate firing angle and cut off angle for a given inductive load and plot the graph (Term work and Calculation).
1. Plot graph between load current and percent duty of different size tube. Calculate percent duty for given load current and select proper tubes.

TEXT BOOKS:

1. Engineering Electronic by J.D. Ryder
2. Industrial Electronics by Chut & Chut
3. Industrial Electronic & Control System by Dr. S. Bhattacharya & Chatterges