

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD

FUNDAMENTALS OF ELECTRONICS

1. RATIONALE: -

All the controls now a day found common in every machine, are electronically controlled. Fundamental circuitry knowledge of electronics and its use in control circuitry has become most essential to any technician. Hence, this preliminary course will assist student in maintenance and operation of machines they use. More emphasis on application of electronic devices in control circuit for the machine is envisaged.

2. SCHEME OF TEACHING:

Sr. No.	Name of Topics	No of Hours			% weightage
		Lect	Pract	Total	
1.	Semi conductor devices	08	02	10	20
2.	Special semi conductor devices	04	02	06	08
3.	Rectifiers	04	02	06	10
4.	Amplifiers and oscillators	06	02	08	15
5.	Opto-electronic devices	06	02	08	12
6.	Electronic controls	10	04	14	20
7.	Transducers	04	04	08	15
8.	PCB fabrication and soldering	00	10	10	00
	Total	42	28	70	100

3. OBJECTIVES:

1. Understand semi conductor devices
2. Understand the use of diode as a rectifier
3. Understand the use of transistor as an amplifier
4. Understand the basic action of an amplifier
5. Understand the basic action of an oscillators
6. Understand the Opto-electronic devices
7. Understand the speed control of DC and AC motor
8. Know the simple open loop ON-OFF control system for temperature, pressure & level
9. Know different types of transducers
10. Prepare the PCB for a given circuit diagram
11. Test the electronic circuit
12. Get soldering skill

4. COMMUNICATION SKILL

1. Ask pertinent questions as well as to answer them
2. Speak on a topic fluently and confidently for five minutes (or more)
3. Give instructions orally

4. Take down lecture notes
5. Write assignments (class room, library, home)
6. Write reports on demonstration in laboratory and industrial visits

5. TOPICS AND SUB –TOPICS:

1. SEMI CONDUCTOR DEVICES

- 1.1 Introduction to semi conducting materials
- 1.2 Donor and acceptor impurities
- 1.3 P-N junction and conduction in P-N junction
- 1.4 Construction, characteristics and application of junction diodes, Zener diode, Tunnel diode and Varactor diode
- 1.5 Bi-polar junction transistors and leakage current
- 1.6 NPN and PNP transistors
- 1.7 CB, CC and CE configuration
- 1.8 Meaning of h-parameters

2. SPECIAL SEMI CONDUCTOR DEVICES

- 2.1 Construction, characteristics and applications of:
 - FET
 - MOS FET
 - UJT
 - SCR
 - Diac
 - Triac
- 2.2 Use of semi conductor data manual
- 2.3 Testing of semi conductor devices

3. RECTIFIERS

- 3.1 Single phase rectifier circuits
 - Half wave rectifier
 - Full wave rectifier
 - Bridge rectifier
- 3.2 Filter circuit
- 3.3 Three phase rectifier

4. AMPLIFIERS AND OSCILLATORS

- 4.1 Transistor as an amplifier
- 4.2 Methods of coupling
- 4.3 Small signal amplifier
- 4.4 Basic concepts of power amplifier
- 4.5 Classification of amplifier
- 4.6 Introduction of OPAMP (741 IC)
- 4.7 Requirements of feedback oscillator circuit
- 4.8 Basic oscillator circuit

- 4.9 Types of oscillator
- LC Oscillator
 - Crystal Oscillator

5. OPTO-ELECTRONIC DEVICES

- 5.1 Construction, characteristics and applications of:
- Photo diode, Photo transistor, Solar cell
 - LDR, LED, LCD
 - OPTO Coupler
- 5.2 Introduction to fiber optics
- 5.3 Simple circuits using OPTO devices
- Flame failure circuit
 - Temperature controller
 - Smoke detector
 - AC and DC operative relays

6. ELECTRONIC CONTROLS

- 6.1 Electronic controls of drivers
- 6.2 Use of SCR for speed control of DC motor
- 6.3 Speed control of single phase AC motor with RC feedback
- 6.4 Techo generator
- 6.5 Classification of controls
- 6.6 Simple open-loop ON-OFF control system for following applications:
- Temperature
 - Pressure in compressor
 - Level in under ground and overhead water tanks

7. TRANSDUCERS

- 7.1 General transducers
- 7.2 Classification of transducers
- 7.3 Ultrasonic transducers
- 7.4 Temperature transducers
- 7.5 Ultrasonic flow detector
- 7.6 Operation of CRO

8. PCB FABRICATION AND SOLDERING

6. LABORATORY EXPERIENCES:

1. To study various semi conductor devices and their testing
2. To build a full wave rectifier and test it
3. To build and test the audio amplifier
4. To build and test various oscillator circuits Hearly/Colpilt/Phase shift
5. To build and test the light operated switch
6. Study of various OPTO-Electronic devices

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7. To understand and test various transistors
8. To understand various electronic control devices

9. To prepare a PCB for a given circuit
10. To solder the given components on a given PCB
11. To test the electronic circuit.

7. SUGGESTIVE INSTRUCTIONAL STRATEGIES

Sr. No.	TOPICS/SUB-TOPICS	INSTRUCTIONAL STRATEGY
1.	1.0	Slides, video cassettes
2.	2.1	Demonstration in lab video cassettes
3.	3.0	Visit to electronic lab
4.	4.6	Demonstration in laboratory
5.	4.9	Demonstration in laboratory
6.	5.1	Slides, lab visit
7.	5.2	Demonstration in class room
8.	5.3	Video cassette, industrial visit
9.	6.0	Industrial visit
10.	6.2	Cassette
11.	7.1 to 7.5	Demonstration in class room
12.	7.6	Show cassette of CRO in laboratory

8. REFERENCES:

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|--------------------------------------|-----------------------|
| 1. Basic Electronics | By Anokhsingh |
| 2. Electronic principles | By Malvino |
| 3. Electronic devices and circuits | By Allen Motter Shead |
| 4. Thyristor and their application | By M. Ramamoorthy |
| 5. Industrial Instrumentation | By S.K. Singh |
| 6. A Textbook of Applied Electronics | By R.S. Shedha |
| 7. Principles of electronics | By V.K. Mehta |