

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Fundamentals of Electronics Engineering
(Code: 3322001)

Diploma Programmes in which this course is offered	Semester in which offered
Mechatronics Engineering	Second Semester

1. RATIONALE

The aim of introducing this course is to impart knowledge of electronic devices to the students of mechatronics engineering diploma holder. Now a day most of the controls of mechatronic products are electronic. Fundamental knowledge of electronic circuit and its use in control system has become essential for the technician. Hence, this preliminary course will assist student in maintenance and operation of mechatronic systems.

2. COMPETENCY

The course content should be implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- Implement various circuits using electronic components.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
4	0	2	6	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P - Practical; C – Credit;; ESE - End Semester Examination; PA - Progressive Assessment

Note: It is the responsibility of the institute heads that marks for **PA of theory & ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4. DETAILED COURSE CONTENT

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Semiconductor Diode & its Applications	1a.Explain p-type and n-type semi-conductor.	1.1 Comparison between Conductor, Insulator and Semiconductor using energy band diagrams 1.2 P-type semiconductor 1.3 N-type semiconductor
	1b.Describe operation of PN junction diode. 1c.Plot V-I characteristics of diode to test the performance	1.4 PN junction diode 1.5 Formation of depletion region 1.6 Forward bias of PN junction diode 1.7 Reverse bias of PN junction diode 1.8 V-I characteristics of PN junction diode
	1d.Analysis and design of rectifier circuits and filters used with the rectifier.	1.9 Half Wave Rectifier circuit 1.10 Full Wave Rectifier circuit 1.11 Bridge Rectifier circuit 1.12 Comparison of HW, FW and Bridge rectifier 1.13 Capacitor and inductor filter circuit
Unit – II Transistor	2a. Explain working of a transistor.	2.1 Symbol and basics of NPN and PNP Transistor 2.2 Working of NPN transistor 2.3 Operating regions for transistor 2.4 Transistor voltages and currents
	2b.Compare various transistor Configurations.	2.5 Types of transistor configurations (Only circuit diagrams) 2.6 Comparison of CB, CE and CC configurations
	2c.Describe the use of transistor as an amplifier and switch	2.7 Transistor as a switch 2.8 Transistor as an amplifier (Single stage CE amplifier)
Unit – III Optoelectronic Devices	3a. Explain working of various optoelectronic devices and their applications.	3.1 Photo diode 3.2 Light Emitting Diode (LED) 3.3 Seven Segment Display 3.4 Liquid Crystal Display (LCD) 3.5 Opto Coupler 3.6 Light Dependent Resistor (LDR)
Unit – IV Timer IC555 & OPAMP IC741	4a.Describe working of timer IC555and it's use in the building of Multivibrator circuits. 4b.Calculate time constant using multivibrators (IC555).	4.1 Pin diagram of Timer IC555 4.2 Astable multivibrator using IC555 4.3 Monostable multivibrator using IC555 4.4 Bistable multivibrator using IC555
	4c. Identify the pin specifications of IC741. 4d Design various applications using OPAMP IC741.	4.5 Pin diagram of OPAMP IC741 4.6 OPAMP as inverting amplifier 4.7 OPAMP as non-inverting amplifier 4.8 OPAMP as integrator, differentiator and comparator

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – V Regulated Power Supply	5a.Explain working of Zener diode.	5.1 Zener diode symbol, working, characteristics
	5b Explain working of Zener as voltage regulator.	5.2 Zener Diode as voltage regulator
	5c Explain working of IC voltage regulator.	5.3 Three Terminal Voltage Regulator: IC7805, IC7812 and IC7905, IC7912
	5d.Connect SMPS and UPS to the computer system.	5.4 SMPS: Block diagram, connections with the devices, working, Applications 5.5 UPS: Block diagram, working, connections with the devices, Applications

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Semiconductor Diode & its Applications	16	6	8	7	21
II	Transistor	10	4	6	4	14
III	Optoelectronic Devices	10	4	4	6	10
IV	Timer IC555 & OPAMP IC741	12	2	4	8	14
V	Regulated Power Supply	08	2	4	3	11
Total		56	18	26	28	70

Legends:

R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICALS

The experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency.

S. No.	Unit No.	Experiment	Apprx. Hrs. Required
1	I	Test the performance of PN junction diode.	1
2	I	Calculate ripple factor using half wave rectifier circuit.	1
3	I	Calculate ripple factor using full wave rectifier circuit.	1
4	I	Calculate PIV using Bridge rectifier circuit.	1
5	I	Test the performance of capacitor filter circuit.	1
6	II	Build a transistor switch and test the output condition.	1

7	II	Build a transistor amplifier (CE amplifier) and plot characteristic.	2
8	III	Test the performance of Zener diode.	1
9	III	Build on/off circuit patterns using Light Emitting Diode (LED).	1
10	III	Build a circuit to display numbers using 7 segment LED	1
11	IV	Generate square wave using astable multivibrator (using IC555).	1
12	IV	Calculate time constant of monostable multivibrator using IC555.	1
13	IV	Build bistable multivibrator using IC555 and calculate on and off time.	1
14	IV	Calculate gain of inverting amplifier using op-amp IC 741.	1
15	IV	Calculate gain of non-inverting amplifier using op-amp IC 741.	1
16	IV	Build integrator using op-amp .	1
17	IV	Build differentiator using op-amp	1
18	IV	Compare two dc voltages using opamp as comparator circuit.	1
19	V	Test the performance of Zener voltage regulator.	1
20	V	Test the performance voltage regulator IC7805 and calculate the drop out voltage of the given IC.	1
Total			21

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

1. Course/topic based seminars
2. Internet based assignments
3. Teacher guided self learning activities
4. Group discussion/debate
5. Symposium on application of electronic devices
6. Course/library/internet/lab based mini-projects etc.

These could be individual or group-based.

8. SUGGESTED LEARNING RESOURCES

(A) List of Books

S. No.	Author	Title of Books	Publication
1	V.K. Mehta	Principle of Electronics	S. Chand, latest edition
2	Robert Boylestad	Electronic Devices & Circuit Theory	PHI, latest edition
3	A.P.Malvino	Electronic Principles with simulation CD	MGH, latest edition
4	Paul B. Zbar	Basic Electronics – A text lab manual	MGH, latest edition

Other Learning Resources

- Practical Semiconductor Data manuals: BPB Publications; New Delhi
- Magazines like Electronics for you

(B). List of Major Equipment/ Instrument

- i. Breadboard ,Soldering Station ,Experimental Boards
- ii. Digital Multi Meter, Function Generator ,Cathode Ray Oscilloscope
- iii. DC Power supplies

(C). List of Software/Learning Websites

- Electronic Work Bench, MultiSIM
- www.nptel.com

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. H. A. Momaya**, Sr. Lecturer, EC Department, B. S. Patel Polytechnic, Kherva
- **Prof. K. P. Patel**, HOD, Mechatronics Department, B. S. Patel Polytechnic, Kherva

Coordinator & Faculty Members from NITTTR Bhopal

- **Prof. (Mrs.) Susan S. Mathew**, Associate Professor, Dept. of Electrical & Electronics Engg.
- **Dr.(Mrs.) Anjali Potnis**, Assistant Professor, Dept. of Electrical & Electronics Engg.