COURSE TITLE- **FUNDAMENTALS OF ELECTRONICS**
COURSE CODE **6E202**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Electrical	Second

1. RATIONALE

Electronics is becoming a part and parcel of electrical systems in the industry/power system. Hence it is essential for an electrical diploma engineer to have fundamental understanding of use of various electronic devices and circuits. This course provides the knowledge of working and applications of various types of semiconductor components.

2. COMPETENCY

At the end of studying this course students will be able to

"Identify the discrete electronic devices and components in various electrical circuits."

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE (PR)	PA (TW)	150
4	-	2	6	80	20	25 @	25	
Duration of the Examination (Hrs)				3	1	--	--	

Legends : **L**-Lecture; **T**-Tutorial/Teacher Guided Theory Practice ; **P**- Practical; **C**- Credits; **ESE**- End Semester Examination; **PT – Progressive Test, PA**- Progressive Assessment; **OR**-Oral Examination, **PR**- Practical Examination; **TW** - Term Work, # External, @ Internal,~ Online.

4. COURSE OUTCOMES

At the end of studying this course students will be able to: -

1. Identify the semiconductor diodes and its characteristics.
2. Select a suitable rectifier and filter for given application.
3. Use transistors and transistor biasing in electronic circuit.
4. Select power amplifier for given application.
5. Select the proper regulated power supplies and instruments.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in Cognitive Domain only)	Topics and Sub-topics
Unit – I Semiconductors and Semiconductor devices	1a. Compare conductor, insulator & semiconductor. 1b.Distinguish the intrinsic and extrinsic semiconductor materials. 1c.Select Zener diode for given application.	1.1Classification of materials as conductors, insulators & semiconductor. 1.2 Extrinsic & Intrinsic semiconductor (P & N type) Effect of temperature on Extrinsic semiconductors. 1.3 Concept of P-N junction Diode & Zener diode, formation of depletion layer, forward biased and reverse biased P-N junction Diode, working, characteristics of P-N junction Diode and Zener diode. 1.4 Zener diode as load voltage Regulator. 1.5 Photo diode, Varactor diode, Light Emitting Diode. 1.6 Symbols of FET, MOSFET, UJT, SCR, Static Induction Thyristor (SIT)
Unit-II Rectifiers and filters	2a.Select the rectifier circuit for given application. 2b. Differentiate between C, L, LC and Π filters.	2.1 Rectifier circuits: Half wave Rectifier, Full wave Rectifier--Centre tap & Bridge Rectifier. Their Merits & Demerits. 2.2 Ripple factor, Transformer utilization factor, Rectification Efficiency, Peak Inverse Voltage. 2.3 Simple numericals on rectifiers based on 2.2 2.4 Filters-Necessity of filter, Types of Filters-L,C, LC, Π

5	Select the proper regulated power supplies and instruments.		2	1		1						1	

Course Curriculum Design Committee

Sr. No.	Name of the faculty members	Designation and Institute
1	**L.B.Nehate**	Lecturer in Electrical Engineering, Govt. Polytechnic,Aurangabad
2	**S.R.Bhasme**	Lecturer in Electrical Engineering, Govt Polytechnic, Aurangabad
3	**V.R.Jadhav**	Lecturer in Electrical Engineering, Govt Polytechnic, Aurangabad

(Member Secretary PBOS) (Chairman PBOS)

GOVERNMENT POLYTECHNIC शासकीय तंत्रनिकेतन औरंगाबाद AURANGABAD

	Oscilloscope	sampling rate refresh rate upto 2000 wfams/s , RS232 & USB connectivity
4	C.R.O	30 MHz Bandwidth, 2 channels, 20 ns sampling time.
5	Function generator	10 HZ to 10 MHZ, 10 Vpp, rise & fall time =20ns, manual / external triggering
6	Digital Multimeter	51/2 digits resolutions with all basics measurement facility like DC Voltage: 200 mV ~ 1000 V, DC Current: 200 µA ~ 10 A, AC Voltage: True-RMS, 200 mV ~ 750 V, AC Current: True-RMS, 20 mA ~ 10 A, 2-Wire, 4-Wire Resistance: 200 Ω ~ 100 MΩ, Capacitance Measurement: 2 nF ~ 10000µF, Frequency Measurement: 20 Hz ~ 1 MHz etc., 0.015% DC Voltage Accuracy.

12. LEARNING WEBSITE & SOFTWARE

i. http://www.radio-electronics.com/info/data/semicond/semiconductor/diodes-theory-basics-tutorial.php
ii. www.academia.edu/.../UNIT_II_RECTIFIERS_FILTERS_AND_REGULATORS
iii. http://www.electronics-tutorials.ws/amplifier/amp_5.html
iv. https://www.electrical4u.com/what-is-an-oscillator/
v. http://www.sigmainstruments.com/p03_dc_regulated_power_supply.htm

13. MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

SNo	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
1	Identify the semiconductor diodes and its characteristics.	1	3	1	1								
2	Select a suitable rectifier and filter for given application.		3	2									
3	Use transistors and transistor biasing in electronic circuit.		3	1									
4	Select power amplifier for given application.		2	1	1								

Unit– III Transistor and Transistor biasing	3a. Distinguish between PNP and NPN transistors. 3b. Compare CB, CE and CC transistors.	3.1 Construction, working of PNP and NPN transistors, relationship between α and β. 3.2 Transistor as a switch. 3.3Transistor configurations & characteristics for CB, CE, CC configurations. 3.4 Concept of Load line. 3.5 Biasing methods of transistors: a) Base bias b) Base bias with emitter feedback c) Base bias with collector feedback d) Voltage Divider Bias e) Emitter Bias
Unit–IV Power Amplifier	4a. Identify the transistor amplifier as an CE amplifier. 4b. Identify the power amplifier for the given application.	4.1 Transistor as an amplifier-CE amplifier. 4.2 Different Methods of Cascading of amplifiers. 4.3 R-C coupled amplifier 4.4 Concept of Oscillatory circuit and enlist its type of oscillator.
UNIT –V Regulated power supplies and Instruments	5a. Identify the different types of voltage regulator circuits. 5b.Genearate the different waveforms through function generator. 5c.Use CRO to plot output of function generator.	5.1 Regulated power supply, Shunt voltage regulator. 5.2 Transistorized series voltage regulator – basic circuit and circuit with feedback, (without derivation) 5.3 3Terminal Fixed/variable voltage regulator: 78xx, 79xx, LM317 5.4 Function Generator. 5.5 Cathode Ray Oscilloscope(CRO)

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Semiconductor and Semiconductor devices	18	10	8	6	24
2	Rectifiers and filters	14	6	8	2	16
3	Transistor and Transistor biasing	16	6	8	6	20
4	Power amplifier	08	4	4	2	10
5	Regulated power supplies and Instruments	08	4	4	2	10
Total		64	30	32	18	80

Legends: *R – Remember, U – Understand, A – Apply and above (Bloom's revised Taxonomy)*

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1	1	Identify passive Components and Active components.	02
2	1	Identify the terminals of PNP and NPN	02
3	1	Test the performance of PN junction diode.	02
4	1	Test the performance of Zener diode.	02
5	2	Build/ test Half wave Rectifier & measure output voltage.	02
6	2	Build/ test Full wave Rectifier & measure output voltage.	02
7	2	Use LC filter to minimize ripples in o/p waveform of rectifier.	02
8	3	Test different transistor using multimeter	02
9	3	Plot input & output characteristics of transistor in CE configuration	02
10	3	Plot input & output characteristics of transistor in CB configuration	02
11	4	Identify the different transistor as an amplifier	02
12	5	Test the performance of regulator -IC 78XX,79XX	02
13	5	Connect the function generator to CRO and plot different waveforms	02
14	5	Troubleshoot given DC regulated power supply	02
Total Hours			28

8. SUGGESTED STUDENTS ACTIVITIES

Other than class room and laboratory activities following are the suggested guided co-curricular students activities which need to be undertaken to facilitate the attainment of various course outcomes of this course. The students are required to maintain portfolio of their experiences which he/ she will submit at the end of the term.

a. Test the electronic components such as diode, transistor, SCR, IC etc.
b. Prepare mini project on semiconductor/rectifier/transistors.
c. Prepare chart for characteristic of various electronics components.
d. Field survey for various electronics components used in different circuits.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

These are sample strategies, which a teacher can use to facilitate the attainment of course outcomes.

a. Improved Lecture methods
b. Demonstration

10. SUGGESTED LEARNING RESOURCE

S.No.	Name of Book	Author	Publication
1.	Basic Electronics and linear circuits	Bhargava, N.N.	TMH, New Delhi 2012
2.	Principle of Electronics	Mehta, V.K.	S.Chand, New Delhi 2012
3	Electronics Principles	Malvino, Albert	TMH, New Delhi 2012
4	Electronics Fundamental and application	Chattopadhyay , D.	New Age International Publishers 2011
5	Basic electronics	B. L. Theraja	S. Chand, New Delhi2012

LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1.	Regulated power supply	Dual DC, 0-30V/1A & 5V /1A with resolution of 10mV, 2mA
2.	Digital Storage	300 MHZ Bandwidth , 2GSa/s maximum real time