GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Electronics and Communication Engineering		
Semester	II	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch Admitted in	JULY 2025
Course code	1EC2101	Course Name	Electronic Devices and Circuits

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	1EC2101	3	-	2	3	8	4	40	60	100	40	30	20	50	20	20	8	170

Abbreviation:	**CL-** Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**NLH -** Notional Learning Hours	**SLA -** Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA -** Summative Assessment

II. PRE-REQUISITES

Basic knowledge of Diode and Transistors

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

Competence with Electronic Components Circuit Analysis and Troubleshooting Utilization of Electronic Test Equipment Preparedness for Further Specialization

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1. Interpret sectional views of different solids. Understand the concepts of transistor biasing methods

CO2. Develop the surface requirement of a given application. Describe the use of transistors in amplifier circuits.

CO3. Understand the concepts of field effect transistors and MOSFETs, their design and use in electronics circuit

CO4. Understand different oscillator and timer circuits for various applications.

CO5. Know about different power amplifier circuits

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit-1 BJT Biasing Circuits	**TLO 1.1** Justify the need of Biasing **TLO 1.2** Describe the concepts of DC load line and Q-Point for stability **TLO 1.3** Describe the procedure to minimize the thermal runaway effect. **TLO 1.4** Analyze various biasing methods for transistor circuit operations	**1.1** Transistor biasing concepts **1.2** DC load line and operating point **1.3** Requirement of biasing, Bias stabilization, Thermal runway **1.4** Transistor biasing methods: Fixed bias, voltage divider bias, base bias, emitter feedback bias	**14**	**10**
Unit-2 BJT Amplifiers	**TLO 2.1** Explain with sketches the working principle of the given type	**2.1** Classification of amplifier, BJT as an amplifier. **2.2** Single Stage Amplifier:	**14**	**10**

	of amplifier. **TLO 2.2** Describe working of Single Stage Transistor Amplifier. **TLO 2.3** Calculate Voltage gain and bandwidth **TLO 2.4** Describe working of Multistage amplifiers	Working, various currents (Ib, Ic, Ie), Voltage gain of CE amplifier (no derivations required), Frequency response of CE amplifier. Simple numerical. **2.3** Multistage amplifiers: General Multistage BJT based amplifiers **2.4** Types of BJT amplifier coupling: Circuit diagram, operation frequency response and applications of Direct coupled, RC coupled and transformer coupled.		
Unit-3 Field Effect Transistors	**TLO 3.1** Explain the working of given type of FET **TLO 3.2** Explain the given type of FET biasing method. **TLO 3.3** Describe working of FET Amplifier. **TLO 3.4** Explain working of given type of MOSFET. **TLO 3.5** Differentiate working principle of FET and MOSFET based on the given characteristics of curve.	**3.1** Voltage operating device, Construction of JFET (N-channel and P- channel), symbol, working principle and characteristics (Drain and Transfer characteristics), different parameters of FET, FET applications **3.2** FET Biasing: Source self-bias, drain to source bias. **3.3** Common source FET amplifier. **3.4** MOSFET: Construction, working principle and characteristics of Enhancement and depletion MOSFET, MOSFET handling.	**10**	**08**
Unit-4 Feedback and Waveform Generators	**TLO 4.1** Explain the principle of positive and negative feedback for amplifier circuit. **TLO 4.2** State Barkhausen's criteria for oscillation. **TLO 4.3** Describe the working principle of given type of oscillator. **TLO 4.4** Calculate the frequency of oscillation for given oscillator. **TLO 4.5** Describe the working of 555 IC in both modes and know about various applications	**4.1** Principle of feedback amplifier. Types of feedback: Negative and Positive feedback, advantages and disadvantages of negative feedback, Types of feedback connections (Block Diagrams and features only) **4.2** Oscillator: need of oscillator, compare oscillator and amplifier **4.3** Condition for oscillations: Barkhausen's criteria, classification of oscillator **4.4** Oscillators Circuits : Phase shift oscillator, Hartley oscillator using BJT & FET, crystal oscillator **4.5** Multivibrators using IC 555 Astable and Monostable modes, Schmitt trigger circuit, saw tooth wave generator	**14**	**10**
Unit-5 Power Amplifiers	TLO **5.1** Describe the Performance of the given power amplifier parameters. TLO **5.2** Explain with sketches the working of given type of power amplifier. TLO **5.3** Compare the given type of power amplifier s based on performance parameter.	**5.1** Power Amplifier: Concept, Performance parameters like: Gain, Bandwidth, frequency band, efficiency and distortion **5.2** Classification: Class A, Class B, Class AB and Class C power amplifier and their applications **5.3** Circuit diagram, working, input output waveforms and efficiency of single stage Class A, Class B, Class AB and Class C power amplifier, Push Pull amplifier, Complementary symmetry	**8**	**7**

	TLO **5.4** Select relevant type of power amplifier for the given applications.	push–pull amplifier. Transformer less push-pull amplifier. Distortions in Power amplifier **5.4** Generalized features of audio power amplifier IC's, Heat Sink		

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	**Practical/Laboratory Learning Outcome (LLO)**	**Practical Titles**	**Relevant COs**
1	**LLO 1.1** Understand the self- bias circuit and decide about the circuit is stable or not.	1.1 To design a self-bias circuit and to observe stability	CO1
2	**LLO 2.1** To design voltage divider bias circuit and observe output	2.1 To study and perform voltage divider bias circuits using BJT.	CO1
3	**LLO 3.1** To build single stage CE amplifier circuit and observe output	3.1 Build and Test the performance of single stage Common emitter amplifier	CO2
4	**LLO 4.1** To design RC Coupled 2 stage amplifier circuit and observe output	4.1 Build and Test the performance of RC coupled two-stage amplifier.	CO2
5	**LLO 5.1** To understand the drain characteristics of JFET.	5.1 Test the performance of JFET drain characteristics	CO3
6	**LLO 6.1** To understand the drain characteristics of MOSFET	6.1 Test the performance of MOSFET drain characteristics	CO3
7	**LLO 7.1** To use the coliptt's oscillator kit to find the practical frequency	7.1 Find practical frequency of Colpitt's oscillator and to compare it with theoretical	CO4
8	**LLO 8.1** Demonstrate the operation of 555 timer IC in bistable mode.	8.1 Design and study of bistable operation of multivibrators using IC 555	CO4
9	**LLO 9.1** Demonstrate the operation of 555 timer IC in Astable mode.	9.1 Design and study of astable operation of multivibrators using IC 555	CO4
10	**LLO 10.1** To design Schmitt trigger circuit and observe the output.	10.1 To study Schmitt Trigger circuit	CO4
11	**LLO 11.1** To study operation of Class A Power amplifier	11.1 To study Class A Power Amplifier and analyze the circuit in LTSPICE	CO5
12	**LLO 12.1** To study operation of Class B Power amplifier	12.1 To study Class B Power Amplifier and analyze the circuit in LTSPICE	CO5
13	**LLO 13.1** To study operation of Class AB Power amplifier	13.1 To study Class AB Power Amplifier and analyze the circuit in LTSPICE	CO5

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Study working of OLED display.
- Study of different Audio amplifier ICs (min 4).
- Study working of MOSFET as variable capacitor.
- Select specific FET and Study datasheet for same.

Mini projects

- Automatic street light system
- Smart energy meter
- Fire alarm system
- Rain sensing wiping system
- Digital temperature display

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD	
1	Resistors, Capacitors, Inductors, Diodes, Transistors, FET, MOSFETs
2	Bread boards
3	Multi-meters, Function Generator and CRO/DSO
4	DC Power Supply
5	Electronic circuit simulation kits

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	Electronics Principles	Albert Paul Malvino	TMH
2	Principle of Electronics	V. K. Mehta	S. Chand & Co.
3	Electronic Devices and Circuit Theory	Boylstead, Nashelsky	Pearson
4	Electronic Devices and circuits	S.Salivahanan, N.SureshKumar	McGraw Hill Education

X. LINK OF LEARNING WEB RESOURCE	
1	https://nptel.ac.in/courses/122106025
2	https://nptel.ac.in/courses/117102061
3	https://nptel.ac.in/courses/108101091
4	https://learn.sparkfun.com/tutorials/transistors
5	https://www.analog.com/en/resources/design-tools-and-calculators/ltspice-simulator.html

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	BJT Biasing Circuits	CO1	10	5	5	4	**14**
2	BJT Amplifiers	CO2	10	5	5	4	**14**
3	Field Effect Transistors	CO3	8	4	3	3	**10**
4	Waveform Generators	CO4	10	5	5	4	**14**
5	Power Amplifiers	CO5	7	3	3	2	**8**
		Grand Total	**45**	**22**	**21**	**17**	**60**

XII. COs AND POs AND PSOs MAPPING

Course outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	0	2	1	1
CO2	3	2	3	3	2	2	2	3	2	3
CO3	3	2	2	2	2	2	2	2	2	3
CO4	3	3	2	2	2	2	0	2	3	2
CO5	3	2	2	1	2	3	0	3	1	1

Legends: - *3- High 2-Moderate/Medium 1-Slight/Low 0-None*