

25MECT301	ELECTRONIC CIRCUITS AND LINEAR ICs	Category	L	T	P	R	Credit	Year of Introduction
		VAC	3	1	0	0	4	2025

Preamble: This course aims to introduce the working principles of fundamental electronic circuits and to provide an understanding of operational amplifiers (op-amps) and other linear integrated circuits.

Prerequisite : IEE 104 Introduction to Electrical & Electronics Engineering

Course Outcomes: After the completion of the course, the student will be able to:

Course Outcome		Knowledge Level
CO1	Summarize simple wave shaping circuits using diodes, resistors and capacitors.	K2 Understand
CO2	Describe the working of amplifier circuits.	K2 Understand
CO3	Illustrate operational amplifier circuits for various applications.	K3 Apply
CO4	Describe the working and applications of voltage regulator ICs and data converters.	K2 Understand

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	-	-	-	-	-	-	-	2	3	3
CO2	3	3	2	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO4	3	3	2	-	-	-	-	-	-	-	2	3	3
Avg	3.0	3.0	2.0	-	-	-	-	-	-	-	2.0	3.0	3.0

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	

CO2	*	*	*	*	*			*	
CO3	*	*	*	*	*			*	
CO4	*	*	*	*	*			*	

Wks Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*			*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance : 5 marks

Continuous Assessment Test : 20 marks

Continuous Assessment Assignment : 15 marks

SYLLABUS

Module 1 (14 Hrs)

Wave shaping circuits: Principle and working of RC differentiating and integrating circuits, Diode Clipping circuits - Positive, negative and biased clipper. Diode Clamping circuits - Positive, negative and biased clamper.

Module 2 (14 Hrs)

Amplifiers: Multistage amplifiers - effect of cascading on gain and bandwidth. Feedback in amplifiers - Effect of negative feedback on amplifiers, The four basic feedback topologies (Block diagram level only) MOSFET - Types, Structure, Operation and Characteristics of Enhancement type. MOSFET Amplifier - Circuit diagram and working of common source MOSFET amplifier.

Module 3 (14 Hrs)

Operational Amplifiers (Op-Amps): The 741 Op-Amp, Block diagram, Ideal Characteristics of op-amps (gain, bandwidth, slew rate, CMRR, offset voltage, offset current). Applications of op-amps - Inverting amplifier, non-inverting amplifier (Derive gain of both), Adder/summing amplifier, comparator, Schmitt trigger, Instrumentation amplifier. Op-amp based Oscillators : Phase Shift and Wien-bridge Oscillators

Module 4 (14 Hrs)

Regulated power supplies: Review of simple Zener voltage regulator, 3 pin regulators - 78XX and 79XX, Circuit/block diagram and working of SMPS. Data Converters: Digital to Analog converters, Specifications, Weighted Resistor type DAC, R-2R Ladder type DAC. Analog to Digital Converters: Specifications, Flash type ADC, Successive Approximation Type ADC, Dual slope ADC.

Textbooks

1. Boylestad, R. L., & Nashelsky, L. (2015). *Electronic devices and circuit theory* (11th ed.). Pearson.
2. Sedra, A. S., & Smith, K. C. (2013). *Microelectronic circuits* (6th ed.). Oxford University Press.
3. Salivahanan, S., & Bhaaskaran, V. S. K. (2008). *Linear integrated circuits*. Tata McGraw-Hill.
4. Roy, D. C., & Jain, S. B. (2010). *Linear integrated circuits* (3rd ed.). New Age International.

Reference Books

1. Bell, D. A. (2008). *Electronic devices and circuits*. Oxford University Press.
2. Neamen, D. A. (2007). *Electronic circuits: Analysis and design* (3rd ed.). Tata McGraw-Hill.
3. Gayakwad, R. A. (2010). *Op-amps and linear integrated circuits* (4th ed.). Prentice Hall.

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code	25MECT301
Course Name	ELECTRONIC CIRCUITS AND LINEAR ICs
Max. Marks: 60	Duration: 2.5 Hours

Part A <i>(Answer all questions. Each question carries 3 marks)</i>				
Qn No.	Question	Marks	CO	BL
1	Differentiate between RC differentiator and RC integrator.	3	1	L2
2	Explain the working of a positive clipper circuit.	3	1	L2

3	An electronic circuit requires high input impedance and low power consumption. Explain why a MOSFET is suitable for this application.	3	2	L2
4	A public-address system requires higher amplification than a single amplifier stage can provide. Explain the need for cascading amplifier stages.	3	2	L2
5	Explain the effect of real surfaces of a MOS capacitor.	3	3	L2
6	A power supply circuit uses a metal–n-type semiconductor junction to allow current flow in one direction while blocking it in the opposite direction. Apply the concept of a metal–semiconductor contact to illustrate the rectifying behaviour of the junction and explain how it controls current flow under forward and reverse bias conditions.	3	3	L3
7	Explain Drain induced barrier lowering.	3	4	L2
8	A semiconductor company is developing next-generation processors and requires transistors with better control over channel conduction and reduced leakage current than conventional MOSFETs. Illustrate how a FinFET structure addresses these requirements by drawing and explaining its structure and highlighting the role of the fin-shaped channel in improving device performance.	3	4	L3

Part B

(Answer any one full question from each Module. Each carry 9 marks)

Module I

Qn No.	Question	Marks	CO	BL
9	In a television receiver, the DC level of incoming signals must be restored before processing. Explain the operation of positive, negative, and biased clamping circuits with suitable diagrams and waveforms.	9	1	L2

OR

10	A signal-conditioning circuit must protect sensitive components from excessive positive and negative voltage excursions. Explain the operation of positive, negative, and biased clipping circuits with suitable diagrams and waveforms.	9	1	L2
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Module II

Qn No.	Question	Marks	CO	BL
11	An amplifier used in an instrumentation system requires improved stability and reduced distortion. Discuss the effects of negative feedback on amplifier characteristics.	9	2	L2
OR				
12	A biomedical instrument must amplify a weak differential signal while rejecting common-mode noise. Develop an instrumentation amplifier and explain its operation.	9	2	L2

Module III				
Qn No.	Question	Marks	CO	BL
13.	A signal-conditioning circuit requires a gain of -20 for a low-level sensor output. Design an inverting amplifier and derive the voltage gain expression.	9	3	L3
OR				
14. a	Three sensor outputs need to be combined into a single monitoring signal. Design an op-amp summing amplifier and explain its working.	9	3	L3
Module IV				
Qn No.	Question	Marks	CO	BL
15.	A digital control system requires analog voltage generation from binary inputs. Explain the operation of weighted-resistor and R-2R ladder DACs.	9	4	L2
OR				
16. a	A computer power supply must provide high efficiency and compact size. Explain the block diagram and working of an SMPS.	6	4	L2
16. b	A regulated power supply is required for a microprocessor-based control system. Explain the operation of a Zener voltage regulator and discuss the working of 78XX and 79XX regulators.	3	4	L2
