ANALOG ELECTRONICS

III Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AECB02	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

I. Explain the components such as diodes, BJTs and FETs their switching characteristics, application
II. Learn the concepts of high frequency analysis of transistors.
III. Describe the various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
IV. Discuss the basic building blocks of linear integrated circuits.
V. Understand the concepts of waveform generation and introduce some special function ICs.

COURSE OUTCOMES (COs):

CO 1: Describe the concept of diode and transistor operation with applications.
CO 2: Understand the principle of operation of MOSFET in CS, CG, CD amplifiers and analyze MOSFET with high frequency equivalent circuit.
CO 3: Analyze the different types of multistage amplifiers and Power amplifiers.
CO 4: Study and analyze the different characteristics of feedback amplifiers and oscillators.
CO 5: Understand the principle of operation of Op-amp characteristics with different applications.

COURSE LEARNING OUTCOMES(CLOs):.

1. Understand the basic concept of PN diode with characteristics.
2. Analyze the application of diode in Rectifiers, clippers and clampers.
3. Understand the working of different configurations of Bipolar Junction Transistor.
4. Design the various biasing circuits.
5. Analyze the different types of Amplifiers with BJT.
6. Understand the principle of operation of MOSFET and as switch.
7. Apply small-signal model to MOSFET and determine the voltage gain and input and output impedances.
8. Analyze the MOSFET characteristics of common source, common gate and common drain amplifiers.
9. Determine the parameters of MOSFET amplifier from drain and transfer characteristics.
10. Analyze the high frequency equivalent circuit model of MOSFET.
11. Understand the classification of transistor amplifiers.
12. Understand the different coupling schemes used in amplifiers.
13. Analyze frequency response of multistage amplifiers.
14. Analyze hybrid-pi model of BJT.
15. Analyze the different types of power amplifiers.
16. Understand the concept of characteristics of feedback amplifiers.
17. Analyze the different configurations of feedback amplifiers.

18. Distinguish the constructional features and operation of feedback amplifiers and oscillators.
19. Understand the basic concept of condition for oscillations.
20. Analyze the different types of oscillators.
21. Understand the basic concept Operational amplifier.
22. Analyze different characteristics of OP-amp.
23. Understand the different types of op-amp based on input.
24. Analyze the different applications of Op-amp.
25. Design the different types of waveform generators.

MODULE-I	DIODE CIRCUITS	Classes:09

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, common emitter, common base and common collector amplifiers; Small signal equivalent circuits.

MODULE-II	MOSFET CIRCUITS	Classes: 09

MOSFET structure and I-V characteristics. MOSFET as a switch. small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

MODULE-III	MULTI-STAGE AND POWER AMPLIFIERS	Classes: 09

Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade amplifier, Darlington pair.

Transistor at High Frequency: Hybrid - model of Common Emitter transistor model, fα, β and unity gain bandwidth, Gain band width product. Differential Amplifiers, Power amplifiers - Class A, Class B, Class C, ClassAB.

MODULE-IV	FEEDBACK AMPLIFIERS	Classes: 09

Concepts of feedback: Classification of feedback amplifiers, general characteristics of Negative feedback amplifiers, effect of feedback on amplifier characteristics, voltage series, voltage shunt, current series and current shunt feedback configurations, simple problems; Oscillators: Condition for Oscillations, RC type Oscillators RC phase shift and Wien-bridge Oscillators, LC type Oscillators, generalized analysis of LC Oscillators, Hartley and Colpitts oscillators.

MODULE-V	OPERATIONAL AMPLIFIERS	Classes: 09

Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular-wave generators.

Text Books:

1. Jacob Millman, Christos C Halkias, "Integrated Electronics", McGraw Hill Education, 2nd Edition 2010.
2. Ramakanth A Gayakwad, "Op-Amps & Linear ICS", PHI, 1st Edition, 2003.

Reference Books:

1. Matthew N O Sadiku, S V Kulkarni, "Principles of Electromagnetics", Oxford University Press, 6th Edition, 2015.
2. J D Krauss, Fleish, "Electromagnetics with Applications", McGraw-Hill Publications, 5th Edition, 1999.
3. Matthew N O Sadiku, "Numerical Techniques in Electromagnetics", CRC Press, 2nd Edition, 2001.
4. William H Hayt, John A Buck, "Problems and Solutions in Electromagnetics", McGraw-Hill Publications, 1st Edition, 2010.

Web References:
1. https://www.calvin.edu/~pribeiro/courses/engr315/EMFT_Book.pdf 2. https://www.web.mit.edu/viz/EM/visualizations/coursenotes/modules/guide02.pdf 3. https://www.nptel.ac.in/courses/108106073/ 4. https://www.iare.ac.in
E-Text Books:
1. https://www.bookboon.com/en/electromagnetism-for-electronic-engineers 2. https://www.books.google.co.in/books/.../Fundamentals of Electromagnetic Fields 3. https://www.aliexpress.com/item/EBOOK...Electromagnetic-Fields-2