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:

Students will try to learn:

1. The operational principles of analog electronic circuits such as feedback amplifiers and operational amplifiers.
2. The analog circuits fundamental theory to build signal conversion circuits, filter circuits, Data converters and Automatic Gain Control.
3. The analog circuits applications in the advanced fields power electronics such as power factor monitoring circuits, power quality measurement, SMPS and battery controls.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. **Demonstrate** the principle of operation of pn diode for plotting V-I characteristics. **(Understand)**
2. **Apply** pn junction characteristics for the diode applications such as rectifiers, clippers, and clampers.(**Apply**)
3. **Illustrate** the principle of operation of bipolar and uni polar transistor for operating in different regions of operation. (**Understand**)
4. **Compute** voltage gain, current gain and frequency response of multistage amplifiers using various coupling methods. (**Understand**)
5. **Make use of** low frequency model for analyzing the bipolar and uni polar transistor amplifier. (**Understand**).
6. **Apply** hybrid pi model of common emitter amplifier for estimating unity gain bandwidth and gain bandwidth product.(**Apply**)
7. **Explain** differential amplifiers and power amplifiers using transistor high frequency model.(**Understand**)
8. **Classify** feedback amplifiers based on sampling and mixer circuits. (**Understand**)
9. **Calculate** frequency of oscillations for the RC, LC, Hartley and Colpits oscillators.(**Apply**)
10. **Demonstrate** ideal and practical op- amp circuit for finding performance characteristics.(**Understand**)
11. **Utilize** inverting and non inverting amplifiers as waveform generators and in IC related real time applications.(**Understand**)
12. **Apply** electronic circuits to conduct experiments and analyze results.(**Apply**)

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 Edition2010.
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.