INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

ANALOG ELECTRONICS								
IV Semester: ECE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AECD09	Core	3	-	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Electronic Devices and Circuits								

I. COURSE OVERVIEW:
This course provides circuit analysis to design high frequency amplifiers and wave shaping circuits using discrete components. It covers multistage amplifiers, power amplifiers, feedback concepts, sampling gates and multi vibrators. Analog electronics are widely used in radio and audio equipment and in many applications where signals are derived from analog sensors and transducers.

II. COURSES OBJECTIVES:
The students will try to learn

I. The design and analysis of transistor amplifiers using low frequency and high frequency signals.
II. The response for a linear wave shaping circuits of low pass filter and high pass filters.
III. The generation of non-linear oscillations by using regenerative feedback circuit for multi vibrators.

III. COURSE OUTCOMES:
At the end of the course students should be able to:

CO1 Illustrate Bipolar Junction Transistor (BJT) amplifier circuits and their frequency responses atlow, mid and high frequencies for determining amplifier characteristics.
CO2 Summarize the concept of feedback in amplifiers for the distinction between negative and positive feedback.
CO3 Obtain the expression to find frequency of oscillations for RC and LC type oscillator circuits.
CO4 Identify the suitable large signal amplifiers or power amplifiers for practical applications with given specifications.
CO5 Analyze the response of linear and non-linear wave shaping circuits for impulse and pulse inputswith different time constants.
CO6 Build bi-stable, mono-stable and astable multi vibrator circuits using transistors for real timeapplications.

IV. COURSE CONTENT:
MODULE - I: MULTISTAGE AMPLIFIERS (09)
Overview of single stage versus multistage amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Millers theorem and its dual for single stage amplifier, Frequency response and Analysis of multistage amplifiers, Cascode amplifier, Darlington pair. Transistor at High Frequency: Hybrid - model of Common Emitter transistor model, fα, β and unity gain bandwidth, Gain band width product.

MODULE –II: FEEDBACK AMPLIFIERS (08)
Definition and types of feedback, classification of feedback amplifiers, general characteristics of negative feedback amplifiers, Analysis of feedback amplifiers: voltage series, voltage shunt, current series and current shunt feedback configurations to calculate Gain, input and output resistances.

MODULE –III: OSCILLATORS AND LARGE SIGNAL AMPLIFIERS (12)
Barkhausen criteria for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators, generalized analysis of LC oscillators, hartley and colpitts Oscillators, frequency and amplitude

stability of Oscillators, crystal Oscillator.

Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class C Amplifiers. Tuned Amplifiers: Single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

MODULE –IV: LINEAR WAVE SHAPING AND SAMPLING GATES (10)

Linear wave shaping circuits: High pass RC and low pass RC circuits, response to step and square inputswith different time constants, high pass RC circuit as a differentiator, low pass RC circuit as an integrator. Sampling gates: basic operating principle of sampling gate, uni and bi directional sampling gates.

MODULE –V: MULTIVIBRATORS (10)

Multivibrators: Bistable multivibrator, unsymmetrical triggering, symmetrical triggering; Schmitt trigger; Monostable multivibrator, Astable multivibrator.

V. TEXT BOOKS:

1. Jacob Millman, Christos C Halkias, "Integrated Electronics" McGraw Hill Education, 2nd edition, 2010.
2. Thomas L. Floyd, "Electronic Devices Conventional and Current Version", Pearson Education,2015.
3. A. Anand Kumar, "Pulse and Digital Circuits", PHI learning, 2nd edition, 2005.

VI. REFERENCE BOOKS:

1. David A. Bell, "Electronic Devices and Circuits", Oxford, 5th edition, 1986.
2. Robert L. Boylestead, Louis Nashelsky, "Electronic Devices and Circuits Theory", PearsonEducation, 11th edition, 2009.
3. Millman J., Taub, "Pulse, Digital and Switching Waveforms", Tata McGraw-Hill, 2nd edition, 2007.

VII. ELECTRONICS RESOURCES:

1. www.nptel.ac.in
2. notes.specworld.in/pdc-pulse-and-digital-circuits
3. http:// www.introni.it/pdf/Millman-Taub- Pulse and Digital Switching Waveforms1965.pdf
4. https://www.jntubook.com/pulse-digital-circuits-textbook-free-download/

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Definition and terminology
4. Tech-talk topics
5. Assignments
6. Model question paper - I
7. Model question paper - II
8. Lecture notes
9. Early learning readiness videos (ELRV)
10. Power point presentations