Course No.	Course Name	L-T-P -Credits	Year of Introduction
EE203	ANALOG ELECTRONICS CIRCUITS	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

- To impart an in depth knowledge in electronic semiconductor devices & circuits giving importance to the various aspects of design & analysis.
- To provide knowledge about different types amplifier & oscillator circuits and their design.
- To provide a thorough understanding of the operational amplifier circuits and their functions.

Prerequisites: Nil

Syllabus Diode clipping and clamping circuits and Zener voltage regulators, BJT biasing, AC Equivalent Circuit of BJT and CE amplifier analysis, Biasing of JFET and MOSFET, Frequency response of BJT and FET amplifiers, Power amplifiers using BJT, Feedback amplifiers &Oscillator Circuits

Operational Amplifier basics and OP-AMP Circuits, Wave form generation using Op-Amp, Multivibrators using Timer IC 555.

Expected outcome: Upon successful completion of the course the students will be able to

1. Design biasing scheme for transistor circuits
2. Model BJT and FET amplifier circuits
3. Choose a power amplifier with appropriate specifications for electronic circuit applications
4. Design & analyse oscillator circuits using BJT
5. Choose Operational amplifier(OPAMP) for specific applications including waveform generation.
6. Design & implement analog circuits using OPAMPs

Text Book:

1. Malvino A. and D. J. Bates, Electronic Principles 7/e, Tata McGraw Hill, 2010.
2. Boylestad R. L. and L. Nashelsky, Electronic Devices and Circuit Theory, 10/e, Pearson Education India, 2009.
3. Choudhury R., Linear Integrated Circuits, New Age International Publishers. 2008.

Data Book (Approved for use in the examination): Nil

References:

1. Floyd T. L., Fundamentals of Analog Circuits,, Pearson Education, 2012.
2. Robert T. Paynter and John Clemons, Paynter's Introductory electronic devices & circuits, Prentice Hall Career & Technology, New Jersey.
3. Bell D. A., Electronic Devices and Circuits, Prentice Hall of India, 2007.
4. Millman J. and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill, 2010.
5. Streetman B. G. and S. Banerjee, Solid State Electronic Devices, Pearson Education Asia, 2006.
6. Gayakward R. A., Op-Amps and Linear Integrated Circuits, PHI Learning Pvt. Ltd., 2012.

Course Plan			
Module	**Contents**	**Hours**	**Sem.ExamMarks**
I	**Diode Circuits**: Diode clipping circuits - Single level and two level clippers - Clamping circuits – Design of Zener Voltage Regulators. **Bipolar Junction Transistors** : Review of BJT characteristics- Operating point of a BJT – Factors affecting stability of Q point and DC Biasing – Biasing circuits: fixed bias, collector to base bias, voltage division bias and self bias. (Derivation of stability factors for Voltage Divider Biasing only) –Bias compensation using diode and thermistor. Low frequency equivalent circuit of BJT. Common Emitter amplifier - AC Equivalent Circuit – Role of coupling and emitter bypass capacitors – h parameter model of BJT -Amplifier gains and impedances calculations using h equivalent circuit.	9 hours	15%
II	**Field Effect Transistors** : Review of JFET and MOSFET construction, working and characteristics- Biasing a JFET and MOSFET using voltage divider bias–- CS and CD amplifiers – small signal models-FET as switch and voltage controlled resistance. **Frequency response of Amplifiers** : Miller's Theorem-BJT Internal Capacitances at high frequency operations-High frequency analysis of CE Amplifier using hybrid Pi Model -Low Frequency Response of Common Emitter amplifier -– CE High frequency response-Gain bandwidth product- ––Low and High Frequency response of FET amplifiers	9 hours	15%
FIRST INTERNAL EXAMINATION			
III	**Multistage amplifiers** : Direct, RC, transformer coupled amplifiers – **Power amplifiers using BJT** : Class A, Class B and Class AB and class C- Conversion efficiency and distortion in power amplifiers. **Feedback Amplifiers**- Effect of positive and negative feedbacks- Basic feedback topologies and their properties	**8 hours**	15%
IV	**Oscillators** : Bark Hausen's criterion – RC oscillators (RC Phase shift oscillator and Wein Bridge oscillator) –LC oscillators (Hartley and Colpitt's)- Derivation of frequency of oscillation for the above mentioned oscillators- Crystal oscillator.	**8 hours**	15%

	Operational Amplifiers: Review of Operational Amplifier basics - Analysis of fundamental differential amplifier- Properties of ideal and practical Op-Amp - Gain, CMRR and Slew rate of IC 741 and LM 301– Drift and frequency compensation in OP Amps- Open loop and Closed loop Configurations-Concept of virtual short and its relation to negative feedback		
SECOND INTERNAL EXAMINATION			
V	**OP-AMP Circuits** : Review of inverting and non-inverting amplifier circuits- Summing and difference amplifiers, Differentiator and Integrator circuits- Logarithmic amplifier- Half Wave Precision rectifier - Instrumentation amplifier. Comparators: Zero crossing and voltage level detectors, Schmitt trigger.	8hours	20%
VI	**Wave form generation using Op-Amps**: Square, triangular and ramp generator circuits using Op-Amp - Effect of slew rate on waveform generation. **Timer 555 IC** : Internal diagram of 555 IC– Astable and Monostable multivibrators using 555 IC. **Oscillator circuits using Op-amps** : RC Phase shift oscillator, Wein Bridge oscillator, LC Oscillators- (Derivation not required) - Crystal oscillator.	8 hours	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN (End semester exam)

Part A: 8 questions.

One question from each module of Module I - IV; and two each from Module V & VI. Student has to answer all questions. (8 x5)=40

Part B: 3 questions uniformly covering modules I&II

Student has to answer any 2 questions: (2 x 10) =20

Part C: 3 questions uniformly covering modules III&IV

Student has to answer any 2 questions: (2 x 10) =20

Part D: 3 questions uniformly covering modules V&VI

Student has to answer any 2 questions: (2 x 10) =20

Note: Each question can have maximum of 4 sub questions, if needed.