SEMESTER S3

ANALOG CIRCUITS

Course Code	**PCECT303**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	BEE/(GYEST104)	**Course Type**	Theory

Course Objectives:

1. By the end of this course, students will be able to design and analyze various analog circuits, including wave shaping circuits, amplifiers, oscillators, and voltage regulators.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Wave Shaping Circuits:** RC differentiating and integrating circuits, Analysis of First order RC low pass and high pass filter for step input -rise time, band width. Diode Clipping and clamping circuits. **BJT/MOSFET Biasing:** Need for biasing, DC load line, operating point, BJT biasing (CE configuration)– fixed bias & voltage divider bias (Design & analysis). MOSFET biasing,	**10**
2	**BJT Amplifiers:** Design of RC coupled CE amplifier - Small signal analysis of CE amplifier using hybrid-π model (low and mid frequency`). The high-frequency hybrid-π model of BJT, Miller effect, High frequency response of single stage CE amplifier, short circuit current gain, cut-off frequency f_β & unity gain bandwidth f_T . **MOSFET Amplifiers:** Design of CS amplifier, Small signal analysis using hybrid-π model (mid frequency only), Small signal voltage gain, input & output impedance, CS stage with current source load and diode connected load. **Multistage BJT Amplifiers:** Types of multistage amplifiers, Effect of cascading on gain and bandwidth.	**12**

	Small signal voltage gain, input & output impedance of BJT cascode amplifier using hybrid-π model.	
3	**Feedback amplifiers:** The general feedback structure, Effect of negative feedback on gain, bandwidth, noise reduction and distortion. The four basic feedback topologies, Analysis of discrete BJT circuits in voltage-series and voltage-shunt feedback topologies - voltage gain, input and output impedance. **Oscillators:** Classification, criterion for oscillation, Wien bridge oscillator, Hartley and Crystal oscillator. (working principle and design equations of the circuits; analysis of Wien bridge oscillator only required).	**11**
4	**Power amplifiers:** Classification, Transformer coupled class A power amplifier, push pull class B and class AB power amplifiers, complementary-symmetry class B and Class AB power amplifiers, class C and D power amplifier - efficiency and distortion (no analysis required) **Linear Voltage Regulators:** Types of voltage regulators- series and shunt - working and design, load & line regulation, short circuit protection and fold back protection.	**11**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Design wave shaping circuits using first order RC network and diodes.	**K3**
CO2	Analyze single stage and multistage BJT amplifier circuits using equivalent models.	**K3**
CO3	Apply the principles of feedback in the design of oscillators.	**K3**
CO4	Design power amplifiers and voltage regulator circuits.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		2							2
CO2	3	3			2							2
CO3	3	3	`2		2							2
CO4	3	3	2		2							2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Electronic Devices and Circuit Theory.	Robert Boylestad and L Nashelsky	Pearson	11th edition, 2015
2	Microelectronic Circuits	Sedra A. S. and K. C. Smith,	Oxford University Press, 2013	6th edition, 2013
3	Electronic Circuits and Devices	Theodore F. Bogart; Beasley, Jeffrey S.; Guillermo Rico	Pearson Education India	6th edition

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Fundamentals of Microelectronics	Razavi B.	Wiley	2nd edition, 2015
2	Electronic Devices and Circuits	David A Bell	Oxford University Press	5th edition, 2008
3	Electronic Circuits Analysis and Design 1	D. Meganathan	Yes Dee Publishing	1st edition, 2023
4	Analysis and Design of Electronic Circuits	K. Gopakumar	OWL Books	1st edition, 2023

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/108/106/108106188/
2	https://archive.nptel.ac.in/courses/108/106/108106188/
3	https://archive.nptel.ac.in/courses/108/106/108106188/