B. P. Poddar Institute of Management & Technology

Department of Electronics & Communication Engineering

Course Data Sheet

Academic Year: 2018-19, Odd Sem

Program: ECE	Degree: B.Tech
Course: Analog Electronic Circuits	Semester: 3rd Credits: 4
Course Code: EC304	Course Type: **Core** /Elective / Breadth/ S&H
Course Area/Domain: Electronics Engineering	Contact Hours: 3L+1T Hours/Week

MAKAUT Syllabus:

Module	Topic	Hours
1	1. Filters and Regulators: Capacitor filter, π-section filter, ripple factor, series and shunt voltage regulator, percentage regulation, 78xx and 79xx series, concept of SMPS. 2. Transistor Biasing and Stability: Q-point, Self-Bias-CE, Compensation techniques, h-model of transistors. Expression for voltage gain, current gain, input and output impedance, trans-resistance & trans-conductance; Emitter follower circuits, High frequency model of transistors.	10
2	1. Transistor Amplifiers: RC coupled amplifier, functions of all components, equivalent circuit, derivation of voltage gain, current gain, input impedance and output impedance, frequency response characteristics, lower and upper half frequencies, bandwidth, and concept of wide band amplifier. 2. Feedback Amplifiers & Oscillators: Feedback concept, negative & positive feedback, voltage/ current, series/shunt feedback, Barkhausen criterion, Colpitts, Hartley's, Phase shift, Wein bridge and crystal oscillators.	10
3	1. Operational Amplifier: Ideal OPAMP, Differential Amplifier, Constant current source (current mirror etc.), level shifter, CMRR, Open & Closed loop circuits, importance of feedback loop (positive & negative), inverting & non-inverting amplifiers, voltage follower/buffer circuit. 2. Applications of Operational Amplifiers: adder, integrator & differentiator, comparator, Schmitt Trigger, Instrumentation Amplifier, Log & Anti-log amplifiers, Trans-conductance multiplier, Precision Rectifier, voltage to current and current to voltage converter, free running oscillator.	12
4	1. Power amplifiers – Class A, B, AB, C, Conversion efficiency, Tuned amplifier 2. Multivibrator – Monostable, Bistable, Astable multivibrators; Monostable and astable operation using 555 timer. 3. Special Functional Circuits: VCO and PLL.	8
	Total Hours	40

Course Pre-Requisites:

Course Code	Course Name	Description	Sem
ES101	Basic Electronics engineering-I	Diode as a rectifier, BJT biasing & its stability	1
ES201	Basic Electronics engineering-II	Feedback amplifier, Opamp & its applications	2

Course Objectives:

The purpose of this course is to

1	Explain the concept of filter and regulator circuit for designing power supply.
2	Explain various amplifier circuits with various method of transistor biasing.
3	Distinguish various oscillator circuits.
4	Explain the concept of feedback amplifier and various applications of Op-Amp circuits .
5	Achieve the concept of different multivibrator and its application in real life.

Course Outcomes:

After successfully completing the course, students should be able to

CO	Description	Cognitive Level
CO1	Acquire the fundamental knowledge of semiconductor electronics components.	Remember
CO2	Explain the concept of filter and regulators circuit and the various biasing of transistor as an amplifier.	Understand
CO3	Construct oscillator circuits by the use of feedback amplifier.	Apply
CO4	List the different applications of OPAmp in analog electronic circuits.	Apply
CO5	Differentiate different types of multivibrator and its applications using 555 timer.	Analyse

Course Outcomes (CO) to Program Outcomes (PO) & Program Specific Outcomes (PSO) mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	-	-	-	-	2	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	2	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2	-	2
CO4	3	2	2	-	-	-	-	-	-	-	-	2	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	2	-	2
	3	**1.8**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**2**

Note: Correlation levels are as defined: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High).

If there is no correlation, put "-"

POs & PSO Reference:

PO1	Engineering knowledge	PO7	Environment and sustainability	PSO1	Students will acquire knowledge in Advance Communication Engineering, Signal and Image Processing, Embedded and VLSI System Design.
PO2	Problem analysis	PO8	Ethics		
PO3	Design/development of solutions	PO9	Individual and team work:		
PO4	Conduct investigations of complex problems	PO10	Communication	PSO2	Students will qualify in various competitive examinations for successful employment, higher studies and research.
PO5	Modern tool usage	PO11	Project management and finance		
PO6	The engineer and society	PO12	Life-long learning		

JUSTIFICATION FOR MAPPING

SNO	PO/PSO MAPPED	JUSTIFICATION
CO1	PO1,PO2,PO12,PSO2	The student is able to explain the basics semiconductor electronics by applying the knowledge of mathematics, science and engineering fundamentals.
CO2	PO1,PO2,PO3,PO12,PSO1,PSO2	The student is able to explain the different amplifier circuits using various transistor biasing methods.
CO3	PO1,PO2,PO3,PO12,PSO2	The student is able to construct various oscillator circuits using feedback amplifier
CO4	PO1,PO2,PO3,PO12,PSO1,PSO2	The student is able to identify the use of Opamp in different applications.
CO5	PO1,PO2,PO12,PSO2	The student is able to identify different types of multivibrator and its applications.

GAPS WITHIN SYLLABUS -

Sl. No.	Topic	Proposed Actions	CO	PO/PSO	Level of mapping
1	Clipper and Clamper	Topics to be covered along with syllabus	CO1	PO1, PO2, PSO2	3,2,2
2	Active filters: Low pass, high pass, band pass and band stop	Topics to be covered along with syllabus	CO4	PO1, PO2, PO3, PO12, PSO2	3,2,2,2,2

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl. No.	Topic	Proposed Actions	PO/PSO	Level of mapping
1	CMOS and its applications	Guest lecture/ Assignment/ NPTEL	PO1,PO3,PO12, PSO2	3,3,3,2

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/downloads/117101106/
2	https://www.researchgate.net/publication/264005057_Analog_Electronics
3	https://www.researchgate.net/publication/264005069_Analog_Electronic_Circuits
4	http://www.allexamreview.com/2017/09/e-book-free-download-analog-electronics-by-godse-and-bakshi.html
5	https://www.sciencedirect.com/book/9780750644167/analog-electronics
6	http://www.analog.com/en/education/education-library/tutorials/analog-electronics.html

Lesson Plan

Sl No	L/T No.	Module	Topics to be covered	Ref erences	Teaching Aid	Teaching Methodology
1	L1	1	Familiarization of the students with POs, COs, Clipper and Clamper*	Te2	GGB, Chalk & Duster	Lecturing, Discussion
2	L2		Concept of rectifier without & with capacitor filter, π section filter	Te2	GGB, Chalk & Duster	Lecturing, Discussion
3	L3		Series & shunt voltage regulator, Concept of SMPS,78xx &79xx series	Te2	GGB, Chalk & Duster	Lecturing, Assignment
4	T1		Tutorial on rectifier and filter circuit	Te2, Re2	GGB, Chalk & Duster	Discussion, Numericals
5	L4		Transistor biasing, Q-point, self bias CE mode	Te1,Te3	GGB, Chalk & Duster	Lecturing, Role reversal
6	L5		Compensation techniques, h-model of transistors	Te1	GGB, Chalk & Duster	Lecturing, assignment
7	L6		Expression for voltage gain , current gain	Te1,Te3	GGB, Chalk & Duster	Lecturing, Discussion
8	T2		Tutorial on rectifier and voltage regulator	Te1,Re2	GGB, LMS Chalk & Duster	Discussion, Quiz, moodle
9	L7		Derivation of input & output impedance, trans-resistance &trans-conductance	Te1,Te3	GGB, Chalk & Duster	Lecturing, Discussion
10	L8		Emitter follower circuit, High frequency model of transistor	Te1,Te3	GGB, Chalk & Duster	Lecturing, Assignment
11	L9	2	RC coupled amplifier, function of all components, equivalent circuit	Te1	GGB, Chalk & Duster	Lecturing, Discussion
12	T3		Tutorial on transistor amplifier	Te1,Re2	GGB, Chalk & Duster	Quiz Numericals
13	L10		Derivation of voltage gain, current gain, input & output impedance	Te1	GGB, Chalk & Duster	Lecturing, Assignment
14	L11		Frequency response characteristics, concept of lower & upper half power frequency, bandwidth	Te1,Te3	GGB, Chalk & Duster	Lecturing, Role reversal,
15	L12		Low & high frequency gain, lower & upper half power frequency	Te1	GGB, Chalk & Duster	Lecturing, Numericals
16	T4		Tutorial on RC coupled amplifier	Te1,Re2	GGB, Chalk & Duster	Discussion, Numericals

17	L13		Negative & positive feedback, voltage/current, series/shunt feedback	Te1	GGB, Chalk & Duster	Lecturing, Role reversal
18	L14		Barkhausen criterion, Wien bridge, Colpitts, oscillator	Te1	GGB, Chalk & Duster	Lecturing, Discussion
19	L15		Hartley's , phase shift oscillator	Te1	GGB, Chalk & Duster	Lecturing, Discussion
20	T5		Tutorial on feedback amplifier & Oscillator	Te1,Re2	GGB, LMS Chalk & Duster	Numericals, Quiz, moodle
21	L16	3	Concept of OP AMP, differential amplifier, Open & Closed loop Circuits	Te1	GGB, Chalk & Duster	Lecturing, Discussion,
22	L17		Inverting & non-inverting amplifiers	Te1	GGB, Chalk & Duster	Lecturing, Role reversal,
23	L18		Current mirror, CMRR	Te1	GGB, Chalk & Duster	Lecturing, Assignment
24	T6		Tutorial on OPAmp characteristics	Te1,Re1	GGB, Chalk & Duster	Discussion, Quiz
25	L19		Application of OP AMP- adder, subtractor	Te1	GGB, Chalk & Duster	Lecturing, Numericals
26	L20		Integrator & differentiator	Te1	GGB, Chalk & Duster	Lecturing, Role reversal
27	L21		Voltage follower/buffer circuits, Comparator & Schmitt Trigger	Te1,Re1	GGB, Chalk	Lecturing Discussion
28	T7		Tutorial on OPAmp applications	Te1	GGB, Chalk & Duster	Lecturing, Numericals
29	L22		Instrumentation amplifier, Log & antilog amplifier	Te3	GGB, Chalk & Duster	Lecturing, Assignment,
30	L23		Current to voltage converter, voltage to current converter,	Te3	GGB, Chalk & Duster	Lecturing, discussion
31	L24		Active filters: Low pass, high pass, band pass and band stop*	Te2,Re1	GGB, Chalk & Duster	Lecturing, Discussion
32	T8		Tutorial on OPAmpapplications	Te1	GGB, LMS Chalk & Duster	Numericals, Quiz, moodle
33	L25	4	Power amplifiers class A, class B, conversion efficiency	Te1	GGB, Chalk & Duster	Lecturing, Discussion,

34	L26		Class AB, class C amplifier, conversion efficiency, Tuned amplifiers	Te1	GGB, Chalk & Duster	Lecturing, Discussion
35	L27		Internal circuit diagram of 555 timer	Te1	GGB, Chalk & Duster	Lecturing, Discussion
36	T9		Tutorial on Power amplifier	Te1	GGB, Chalk & Duster	Discussion, Quiz
37	L28		AstableMultivibrator using 555 timer	Te3	GGB, Chalk & Duster	Lecturing, Assignment,
38	L29		Monostable, Bistablemultivibrator using 555 timer	Te1,Re1	GGB, Chalk & Duster	Lecturing, discussion
39	L30		VCO, PLL, CMOS and its applications*	Te1,Re1	GGB, Chalk & Duster	Lecturing, Discussion, Assignment
40	T10		Tutorial on Multivibrator	Te1,Re1	GGB, LMS Chalk & Duster	Numericals, Quiz, moodle

L= Lecture T= Tutorial GGB= Green Glass Board *Gap

Text / Reference Books:

Te 1. D. Chattopadhyay, P.C. Rakshit — Electronics Fundamental & application

Te 2.Boylestad&Nashelsky — Electronic Devices & Circuit Theory

Te 3. A.S. Sedra and K.C. Smith — Microelectronic Circuits

Re 1. D Roychoudhury — Linear Integrated Circuits

Re 2. J.B. Gupta — Electronic devices and circuits