Department of Electrical and Electronics Engineering

COURSE MODULES OF THE SUBJECT TAUGHT FOR THE SESSION AUGUST-DECEMBER, ODD SEMESTER, AY 2024-2025

Course Syllabi with CO's

Faculty Name : **Praveen Kumar M**				Academic Year: 2024-25			
Department: **Electrical & Electronics Engineering**							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BEE303	**Analog Electronic Circuits**	**IPCC**	Basic Electrical Engineering	**3**		**2**	40 hours Theory + 10 Lab slots
Objectives	1. To provide the knowledge for the analysis of transistor biasing and thermal stability circuits. 2. To develop skills to design the electronic circuits like amplifiers, power amplifiers and oscillators. 3. To understand the importance of FET and MOSFET and FET/MOSFET amplifiers						

Topics Covered as per Syllabus		**Teaching Hours**
Diode Circuits: Diode clipping and clamping circuits. **Transistor Biasing and Stabilization:** The operating point, load line analysis, DC analysis and design of fixed bias circuit, emitter stabilized bias circuit, collector to base bias circuit, voltage divider bias circuit, modified DC bias with voltage feedback. Bias stabilization and stability factors for fixed bias circuit, collector to base bias circuit and voltage divider bias circuit, bias compensation, Transistor switching circuits		**8**
Revised Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding	
Module-2: Transistor at Low Frequencies: Hybrid model, h-parameters for CE, CC and CB modes, mid-band analysis of single stage amplifier, simplified hybrid model, analysis for CE, CB and CC(emitter voltage follower circuit) modes, Millers Theorem and its dual, analysis for collector to base bias circuit and CE with un bypassed emitter resistance. **Transistor frequency response:** General frequency considerations, effect of various capacitors on frequency response, Miller effect capacitance, high frequency response, hybrid - pi model, CE short circuit current gain using hybrid-pi model, multistage frequency effects		**8**
Revised Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding	
Module-3: **Multistage amplifiers:** Cascade connection, analysis for CE-CC mode, CE-CE mode, CASCODE stage-unbypassed and bypassed emitter resistance modes, Darlington connection using h-parameter model. **Feedback Amplifiers:** Classification of feedback amplifiers, concept of feedback, general characteristics of negative feedback amplifiers, Input and output resistance with feedback of various feedback amplifiers, analysis of different practical feedback amplifier circuits		**8**
Revised Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding	
Module-4: Power Amplifiers: Classification of power amplifiers, Analysis of class A, Class B, class C and Class AB		**8**

amplifiers, Distortion in power amplifiers, second harmonic distortion, harmonic distortion in Class B amplifiers, cross over distortion and elimination of cross over distortion. **Oscillators:** Concept of positive feedback, frequency of oscillation for RC phase oscillator, Wien Bridge oscillator, Tuned oscillator circuits, Hartley oscillator, Colpitt's oscillator , crystal oscillator and its types		
Revised Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding	
Module-5: Construction, working and characteristics of JFET and MOSFET(enhance and Depletion type) Biasing of JFET and MOSFET. Fixed bias configuration, self bias configuration, voltage divider biasing. Analysis and design of JFET (only common source configuration with fixed bias) and MOSFET amplifiers.		**8**
Revised Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding	

Practice (Laboratory) Part

(PRACTICAL COMPONENT OF IPCC)

Cycle-1

1) Experiments on series, shunt and double ended clippers and clampers.
2) Design, simulation and Testing of Full wave – centre tapped transformer type and Bridge type rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency.
3) Static Transistor characteristics for CE, CB and CC modes and determination of h parameters.
4) Frequency response of single stage BJT and FET RC coupled amplifier and determination of half power points, bandwidth, input and output impedances.
5) Design and testing of BJT -RC phase shift oscillator for given frequency of oscillation.

Cycle-2

6) Design and testing of Hartley and Colpitt's oscillator for given frequency of oscillation.
7) Determination of gain, input and output impedance of BJT Darlington emitter follower with and without bootstrapping.
8) Design and testing of Class A and Class B power amplifier and to determine conversion efficiency.
9) Design, simulation (MATLAB) and testing of Wien bridge oscillator for given frequency of oscillation.
10) Design and simulation of Full wave – centre tapped transformer type and Bridge type rectifier circuits with and without Capacitor filter using MATLAB. Determination of ripple factor, regulation and efficiency.

List of Text Books

TEXT BOOKS:

1. Electronic Devices and Circuit Theory, Robert L Boylestad Louis Nashelsky, Pearson, 11th Edition, 2015
2. Electronic Devices and Circuits, Millman and Halkias, Mc Graw Hill, 4th Edition, 2015
3. Electronic Devices and Circuits, David A Bell, Oxford University Press, 5th Edition, 2008

List of Reference Books

1. Microelectronics Circuits Analysis and Design, Muhammad Rashid, Cengage Learning, 2nd Edition, 2014
2. A Text Book of Electrical Technology, Electronic Devices and Circuits, B.L. Theraja, A.K. Theraja, S. Chand, Reprint, 2013
3. Electronic Devices and Circuits, Anil K. Maini, ,VashaAgarval, Wiley, 1st Edition, 2009
4. Electronic Devices and Circuits, S. Salivahanan, Suresh, Mc Graw Hill, 3rd Edition, 2013
5. Fundamentals of Analog Circuits, Thomas L Floyd, Pearson, 2nd Edition, 2012

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List of URLs, Text Books, Notes, Multimedia Content, etc	
www.nptel.ac.in **https://onlinecourses.nptel.ac.in/noc20_ee45/preview** **https://youtube.com/playlist?list=PLp6ek2hDcoNDAw1BehPFazZ5ogPV8UlQa** **https://nptel.ac.in/courses/117107094** **https://www.ti.com/design-resources/design-tools-simulation/analog-circuits/overview.html** **https://www.analog.com/en/education/education-library/tutorials/analog-electronics.html**	
Course Outcomes	**At the end of the course the student will be able to:** CO1: Produce the preliminary design of the transistor biasing circuits, switching circuits and also to predict the output response of clipper and clamper circuits. [L4] CO2: Analyse and produce the preliminary design of the Transistor at Low Frequencies [L4] CO3: Analyse and produce the preliminary design of the multistage and feedback amplifiers[L4] CO4: Analyse and produce the preliminary design of power amplifier circuits and oscillators. [L4] CO5: Analyse and produce the preliminary design of the FET and MOSFET amplifiers. [L4]
CIE: Theory component are 25 marks and that for the practical component is 25 marks **Theory component (25)**: Internal Assessment Marks (15) + other assessment (10) The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC **Practical component (25):** 15 marks for the conduction of the experiment and preparation of laboratory record, and 10 marks for the test to be conducted after the completion of all the laboratory sessions. The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC. **Note:** 2 Session Tests are conducted during the semester and marks allotted based on average of 2 IAs.	

CO - PO - PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2
CO1	3	3	-	-	3	-	-	-	3	2	-	2	-	3	
CO2	3	3	-	-	3	-	-	-	3	2	-	2	-	3	
CO3	3	3	-	-	3	-	-	-	3	2	-	2	-	3	
CO4	3	3	-	-	3	-	-	-	3	2	-	2	-	3	
CO5	3	3	-	-	3	-	-	-	3	2	-	2		3	