CURRICULUM AND SYLLABI

for

Minor Programme

(Applicable to 2022 admission onwards)

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राष्ट्रीय प्रौधोगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

कुंकोलिम, जिला दक्षिण गोवा, गोवा, पिन – ४०३७०३, इंडिया

Cuncolim, South Goa District, Goa, Pin – 403703, India

Minor Specialization

in

Electronics and Communication Engineering

Offered by the

Department of Electronics and Communication Engineering

Semester Offered	Course Code	Course Name	Type	L-T-P	Credits
IV	EC250M	Analog Electronics	MR	3-0-2	4
V	EC300M	Digital Electronics	MR	3-0-2	4
VI	EC350M	Communication Engineering	MR	3-0-0	3
VII	EC400M	Sensors Technology	MR	3-0-0	3
VIII	EC450M	Microcontroller	MR	3-0-2	4
Total Credits					**18**

Detailed Syllabi of courses

Course Code	Course Name	L	T	P	Credits
EC250M	Analog Electronics	3	0	2	4

Course Objective

1. Exploring the behaviour of the diodes and BJTs in analogue and digital environment.
2. Analysis of the various circuits using MOSFETs and study of the amplifiers.
3. Understand the high frequency model of the bipolar junction transistors (BJTs) for the different configurations.
4. Understanding and analysis of the different types of the feedback amplifiers.

Course Outcomes

CO1. Applying the device characteristics in different circuits and studying the related impact.
CO2. Acquire the basic understanding of the Field effect transistor (FET) and its small signal model, analyses the low frequency configurations of the amplifier using FET.
CO3. Understand the high frequency model of the BJTs & MOSFETs for the different configurations.
CO4. Exploration of the feedback concepts in different BJT and MOSFET amplifiers.

Relationship of Course Outcomes to Program Outcomes
H = High correlation; M = Medium correlation; L = Low correlation

POs → COs ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	L	M	L	H	M	H	H
CO2	H	H	H	H	M	L	L	L	H	M	H	H
CO3	H	H	H	H	M	L	L	L	H	M	H	H
CO4	H	H	H	H	M	L	L	L	M	M	H	H

Syllabus

Module 1: Diode & Bipolar Transistors (12 hours)

Diode circuits: clipping, clamping and rectifiers.

Small and Large Signal Model, DC & Small Signal Analysis, Operating Point Analysis and Design: Simple Biasing and Resistive Divider Biasing, Ebers-Moll and Gummel-Poon Model, Common Emitter and Common Base Bipolar Amplifiers with Active Load, BJT Differential Pair

Module 2: MOSFETs (10 hours)

Small & Large Signal Model, Current Source, Current Mirror Circuits, MOS Differential Amplifiers, Differential and Common Mode Gain, CMRR, MOS Differential Amplifiers with Active Load-Qualitative & Quantitative Analysis.

Module 3: Frequency Response (12 hours)

Miller's Theorem, High Frequency Models of Transistors, Use of Miller's Theorem,

Frequency Response of Followers, Cascode Stage and Differential Pairs. Voltage Amplifiers, Current Amplifiers.

Module 4: Feedback Amplifiers (10 hours)

Series-Shunt Feedback Amplifiers, Series-Series Feedback Amplifiers, Shunt-Shunt Feedback Amplifiers, Shunt Series Feedback Amplifiers, Loop Gain Stability.

List of Experiments (Any Five)

Experiment No. 1: Set-up and extract the input and output characteristics of the P-N junction diode.
Experiment No. 2: Realization of the different clipping and clamping circuits and observe the waveforms.
Experiment No. 3: To study input and output characteristics of a NPN Bipolar Junction Transistor (BJT) in Common-emitter configuration.
Experiment No. 4: To study transfer and output characteristics of an n-channel MOSFET in common-source configuration.
Experiment No. 5: Determine the Q-point stability of base bias.
Experiment No. 6: Construct the dc load line and plot the Q-point of voltage divider bias circuit.
Experiment No. 7: Study and simulate the frequency response of the common emitter amplifier.

Textbooks:

1. Behzad Razavi, "Fundamentals of Microelectronics", John Wiley & Sons .2008.
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.
3. B.G. Streetman and S. K. Banerjee, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.
4. T. C. Carusone, D. Johns, and K. Martin, Analog Integrated Circuit Design, 2nd edition. Wiley-India, 2013.
5. P. R. Gray, P. J. Hurst, S. H. Lewis, and R. G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th edition. Wiley-India, 2009.

Reference Books:

6. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th edition. Pearson, 2013.
7. D. A. Neamen, Electronic Circuits: Analysis and Design, 3rd edition. Tata McGraw-Hill, 2008.