

CC141: FUNDAMENTALS OF ELECTRONICS

CREDITS = 5 (L=3, T=0, P=2)

Course Objective:

1. The goal of this course is to introduce basic principles, operation and applications of the analog building blocks like: Diode, Bipolar Junction transistor, MOSFETs and Op-amp etc for performing various functions.
2. The course aims to make the students familiar with principles of basic electronic components and devices used for different electronic application.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Marks Distribution				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE	CE	ESE	CE	
3	0	2	5	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	<u>Introduction to Electronics:</u> Signals, Frequency Spectrum of Signals, Analog and Digital Signals, Amplifiers, Circuit Model for Amplifiers, Frequency Response of Amplifiers, Digital Logic Inverters. Digital Building Blocks and Number Systems.	08
2	<u>Semiconductors:</u> Intrinsic Semiconductors, Doped Semiconductors, Current Flow in Semiconductors, The pn Junction with Open-Circuit Terminals (Equilibrium), The pn Junction with Applied Voltage, Capacitive Effects in the pn Junction.	06
3	<u>Diodes:</u> The Ideal Diode, Terminal Characteristics of Junction Diode, Modeling the Diode Forward Characteristic, Operation in the Reverse Breakdown Region-Zener Diodes, Diode Applications, Rectifiers Circuits, Limiting and Clamping Circuits, Physical Operation of Diodes, Special Diode Types.	09

4	<u>Bipolar Junction Transistors (BJTs):</u> Device Structure and Physical Operation, Current-Voltage Characteristics, The BJTs as an Amplifier and as a switch, Biasing in BJT Amplifier Circuits, Frequency Response of the Common Emitter Amplifier, The Basic BJT Digital Logic Inverter.	09
5	<u>MOS Field-Effect Transistors (MOSFETs):</u> Introduction, Device Structure and Physical Operation, Current – Voltage Characteristics, MOSFET Circuits at DC, The MOSFET as an Amplifier and as a switch, Biasing in MOS Amplifier Circuits, Small-Signal Operation and Models, Single-Stage MOS Amplifiers.	09
6	<u>Operational Amplifiers:</u> Introduction, The Ideal Op-Amp, The Inverting Configuration, The Non-Inverting Configuration, Op-amp Applications, Difference Amplifier, DC Imperfections, Integrators and Differentiators.	09
	Total:	50

List of References:

1. Sedra/Smith, “Microelectronic Circuits”, Sixth Edition, Oxford University, 2010.
2. Jacob Millman and Christos C. Halkias, “Integrated Electronics”, Ninth Edition, Tata McGraw Hill Publication.
3. Robert Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Tenth Edition, Pearson Publication.
4. Albert Malvino and David J. Bates, “Electronic Principles”, Seventh Edition, Tata McGraw-Hill.

Course Outcomes (COs):

At the end of this course students will be able to:

1. Identify the applications and functions of electronics in Engineering.
2. Acquire knowledge about semiconductor physics for intrinsic and extrinsic materials.
3. Understand the basic of semiconductor diodes, BJTs and their small signal and high frequency analysis.
4. Analyze the performance of BJTs on the basic of their operation and working.
5. Gain idea about CMOS structure and Operation of MOS transistor.
6. Analyze and Design the operational amplifiers circuits.