

Subject Code:1SC2050406

Subject Title: Analog and Digital Electronics

COURSE OBJECTIVE:

Physics is a science to understand the nature. This course is designed to get basic understanding of the physical world.

LEARNING OUTCOMES:

- To get basic concepts of electronics.

Teaching scheme (hours) per week		Credit		University Examination		Internal Examination		Total
Theory	Practical	Theory	Practical	University Assessment	Practical	Internal Assessment	Practical	
4	--	4	--	60	--	40	--	100

Unit	Content	Lectures	Weight (%)
1	Heterojunction Bipolar Transistors: BJT design limitations: Need for band tailoring & its methods, Heterojunction bipolar transistor - Si based HBTs, GaAs/AlGaAs HBTs, InGaAs/InAlAs and InGaAs/InP HBTs, JFET, MESFET : I-V characteristics in active and saturation regimes. Effects in real devices- Velocity field relations, Channel length modulation,	15	25
2	Advanced Field Effect Devices: Heterojunction FETs-Key motivations. Charge control model for MODFET, Current control in MODFET: Active and saturation regions, High frequency, high speed issues - Small signal characteristics, Equivalent circuit, Large signal analog applications and requirements of semiconductor parameters. Charge coupled devices, Advanced MOS devices- HMOS and SIMOX.	15	25
3	MOSFET: Metal Oxide Semiconductor capacitor, Accumulation, Depletion and Inversion regions, Capacitance-Voltage characteristics of the MOS structure, MOSFET current-Voltage characteristics, Substrate bias effects, Depletion and enhancement MOSFETs, Complementary MOSFETs, Important effects in long channel and short channel MOSFETs, High frequency issues.	15	25
4	Optical detectors and Emitters: Optical absorption in semiconductors, photocurrent in a P-N diode, Photoconductive detector, P-I-N photodetector, Avalanche Photodetector, APD design issues, Materials for light emitting devices, Internal and external quantum efficiency, LED performance issues, Light-current characteristics, Spectral purity, Temporal response, Advanced LED structures, Heterojunction LED, Edge emitting LED, Surface emitting LED.	15	25

Basic Reference book:

- Semiconductor Devices - An introduction, Jasprit Singh, McGraw-Hill Inc.
- Physics of Semiconductors and their Heterostructures, Jasprit Singh, McGraw-Hill Inc.
- Semiconductor Optoelectronic Devices, Pallab Bhattacharya, Prentice Hall of India.
- Electronic Devices and Components, J. Seymore, Longman Scientific and Technical Publication.