

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Physics)
Semester: IV
Syllabus with Effect from: June - 2014

Paper Code: PS04EPHY04	Total Credit: 4
Title Of Paper: Advanced Solid Electronics Devices	

Unit	Description in detail	Weightage (%)
I	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, Heterojunction FETs-Key motivations.	25%
II	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.	25%
III	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.	25%
IV	Optical absorption in semiconductors, photocurrent in a P-N diode, Photoconductive detector, P-I-N photodetector, Avalanche Photodetector, APD design issues, LED, 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, Operating principle and characteristics semiconductor laser.	25%

Basic Text & Reference Books:-

- 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.

