



SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))
Syllabus with effect from the Academic Year 2021-2022

Master of Science (Electronics)
M.Sc. (Electronics) Semester II

Course Code	PS02EELE52	Title of the Course	Advanced Electronic Science & Devices
Total Credits of the Course	4	Hours per Week	3 + 1=4 Hours

Course Objective	<ol style="list-style-type: none">1. To teach the physical principles and operational characteristics of advanced semiconductor electronic devices with emphasis on metal-oxide systems, bipolar, high-electron mobility, and field-effect transistors.2. To get aware about quantum point contact and tunneling devices.3. To provide advanced background in solid state electronic devices4. To help students to continue advanced research in the variety of different branches of semiconductor microelectronics.
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Course Content		
UNIT	Description	Weightage* %
1	Review of scattering mechanisms and conduction process in semiconductors, High-field transport and breakdown phenomena, Boltzmann transport equation and Monte Carlo simulation, Field-effect devices and their structures with working mechanisms, Submicron MOSFET.	25
2	Fowler-Nordheim tunneling, SOI MOSFET, MESFET, Permeable base transistor (PBT), Modulation doping, GaAs-MODFET, Band structure and device behavior, Current-Voltage characteristics, Carrier transport in MODFET, Quantum Hall-effect.	25
3	Potential effect devices, BJT limitations, Hetero structures and types, Silicon based HBTs, GaAs based HBTs, Hetero junction LEDs and LASERs, Hot electron transistors, Nanoelectronics and Quantum Hetero structures, Quantum wells, Quantum wires, Quantum dots.	25
4	Super lattices, Lattice mismatched interfaces, strained layer super lattices, Nanoelectronics and Quantum effect devices, Resonant tunneling diode, Resonant tunneling transistor, Optical devices based on quantum and nanostructures.	25





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Teaching-Learning Methodology	Traditional Classroom teaching with use of Multimedia facility in the classroom. Use of Computer Tool for live demonstration and problem / design based approach.
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Evaluation Pattern		
Sr. No	Details of Evaluation	Weightage
1	Internal Written/Practical Examination(As per CBCS R.6.8.3)	15%
2	Internal Continuous Assessment in the form of Practical, Viva Voce, Quizzes, Seminars, Assignments, Attendance (as per CBCS R6.8.3)	15%
3.	University Examination	70%

Course Outcome. Having completed this course, the learner will be able to	
1	Understand the details of operation of the advanced semiconductor electronic devices,
2	Know the parameters of electronic devices that govern their performance and limitations,
3	Familiar with tendency in contemporary microelectronics and principles of the nano-scale electronic devices.

Suggested References:	
Sr. No.	References
1	High Speed Semiconductor Devices S. M. Sze, (John Wiley & Sons Inc., N.Y., USA)
2	Low dimensional Semiconductors: Materials, Physics, Technology & Devices M. J. Kelly, (Clarendon Press, Oxford, USA)
3	Physics of Semiconductors and their Hetero structures J. Singh, (Mc-Graw Hill, N.Y., USA)
4	Fundamentals of Semiconductor Theory and Device Physics Shyh Wang, (Prentice Hall International Inc. N.J., USA)
5	Semiconductor Optoelectronic Devices P. Bhattacharya, (Prentice Hall of India, New Delhi, INDIA)

On-line resources to be used if available as reference material
On line resources.
1. ece.umd.edu/course-schedule/course/ENEE413
2. www.mccormick.northwestern.edu/electrical...
3. On Line Video lectures on Advanced Electronic Devices -NPTEL

