

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

MECHATRONICS ENGINEERING

Subject Name: **MICROELECTRO MECHANICAL SYSTEMS AND NANOTECHNOLOGY**

Sr. No.	Course Contents	Total Hrs
1.	Introduction to MEMS and Micro Systems: Microsystems and Microelectronics – Miniaturization – Micro sensors: Chemical Sensors- Optical Sensors- Pressure Sensors- Thermal Sensors – Micro actuators and Micro motors.	08
2.	Microsystem Materials: Molecular Theory and Intermolecular Forces – Silicon Piezo Resistors– Electrochemistry – Substrates and Wafers – Silicon Compounds – Polymers – Packaging Materials.	08
3.	Microsystem Fabrication Process: Photolithography – Ion Implantation – Diffusion –Oxidation – Chemical Vapor Deposition – Etching – Applications of MEMS in Automatic-Telecom and Other Industries.	10
4.	Nanotechnology Basics: Nanobuilding Blocks – Atoms and Molecular Structure – Molecular Recognition – Tools For Measuring Nanostructures – Electron Microscopy – Spectroscopy – Molecular Synthesis and Polymerization – Encapsulation.	06
5.	Science of Nano Materials Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – effect of nanoscale dimensions on biological systems. Fabrication methods – Top down processes – bottom up process.	10
6.	Applications of Nanotechnology In Medicines: Nanobiosensors – Electronic Nose – Photo Dynamic Therapy – Molecular Motors – Protein Engineering.	05

Text Books:

1. Tai,Ran Hsu, “MEMS & Microsystems Design & Manufacture”, Tata Mc Graw Hill,2002.
2. Richard Booker, Earl Boysen, “Nanotechnology”, Wiley Dreamtech (p) Ltd, 2006.

Reference Books:

1. Mart Ratner, Daniel Ratner, “Nanotechnology”, Pearson Education, 2003
2. Charles P. Poole. “Introduction to nanotechnology,” Wiley publications,2003
3. Norio Taniguchi, Nano Technology, Oxford University Press, New York, 2003
4. The MEMS Hand book, Mohamed Gad-el-Hak, CRC Press, New York, London.