RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

Elective-II EC- 6005 (1) Nano Electronics

Unit 1: Introduction Nanoscale technology: Consequences of the nanoscale for technology and society. Molecular building blocks for nanostructure systems, Nano-scale 1D to 3D structures, Band structure and density of states at low dimensional structure. Size dependent properties (Elelctrical, mechanical, optical, thermal etc).top down and bottom up technique, lithographic, nanolithographic and nonlithographictechniques:plused laser depositon,plasma arc discharge, e-beam sputtering, ball milling , solgel, electrodeposition, chemical vapour deposition.

Unit 2: Characterization technique Scanning probe microscopy: (Principle, construction and working;) Scanning tunnelling microscope, Atomic force microscope, scanning electron microscope, Transmission electron microscope, Carbon materials :Allotropes of carbon, Structure of Carbon Nanotubes, types of CNTs-, Electronic properties of CNTs, Band structure of Graphene ,Band structure of SWNT from grapbene ,electron transport properties of SWNTs ,

Unit -3:Introduction to magnetism and superconductivity Basic magnetic phenomena: paramagnetism, ferromagnetism, ferrimagnetism, anti-ferromagnetism;nano-magnetism; giant and colossal magnetoresistance; ferrofluids. Basic superconductivity phenomena; flux quantisation and Josephsoneffects.

Unit 4: Fundamental of nanoeletronics Charging of quantum dots, Coulomb blockade, Quantum mechanical treatment of quantum wells, wires and dots, Widening of bandgap in quantum dots, Strong and weak confinement, spin field effect transistor. single electron transistors, other SET and FET structure.

Unit 5: Silicon MOSFETs Silicon MOSFET: fundamental of MOSFET devices, scaling rules, silicon dioxide based gate dielectrics, metal gates , junction and contacts, advanced MOSFET concepts

References:

1.G. W. Hanson: Fundamentals of Nanoelectronics, Pearson Education.

2. K. K. Chattopadhyay and A. N. Banerjee: Introduction to Nanoscience and Nanotechnology, PHI Learning.

3. John H. Davis: Physics of low dimension semiconductor, Cambridge Press.

4.KTu, JW Mayer, LC Feldman, "Electronic Thin Film Science", Macmillan, New York, 1992.

5. Z Cui , "Mico-Nanofabrication", Higher Education press, Springer, 2005.

6.Brian Cantor, "Novel Nanocrystalline Alloys and Magnetic Nanomaterials," Institute of Physics Publications, 2005.

7. S.Chikazumi and S.H. Charap," Physics of Magnetism", Springer-verlag berlin Heideberg, 2005

8.CaoGuozhong, "Nanostructures and Nanomaterials - Synthesis, Properties and Applications", Imperial College Press, 2004.

9. SadamichiMaekawa, "Concepts in Spintronics", Oxford University Press, 2006