

Nano Electronics (EC-707)

LTP
210

Unit 1

The development of microelectronics, region of nano structure, challenge initiated by nano electronics, Band diagram of semiconductor technological process for micro miniaturization. Estimated optoelectronics, Basis of Nano electronics: Electromagnetic fields & photons, Quantization of Aciton, charge and flux, electron behaving waves(Schrodinger Equation), Electrons in Potential wells, photons interacting with Electrons in solids, diffusion process, Data and bits, data processing. (7)

Unit 2

Biochemical and quantum- mechanical computers, DNA computer, parallel processing , quantum computer
Parallel Architectures for Nanosystems, Mono and multiprocessor systems, Architecture of parallel processing in Nanosystems,, Processors with large Memories , SIMD and PUP Architecture
Soft computing and Nanoelectronics, Fuzzy systems , Evolutionary Algorithms, Computational intelligence systems, Neural Network in Nanoelectronics, Local Processing (7)

Unit 3

Integrated switches and basic circuits: Ideal and real switches. Threshold Gates, Fredkin Gate, Quantu, Electronics Devices, short channel MOSTransistors, Split Gate Transistors, Quantum Cellular Automata, Quantum DoArray, Switches based on Fullerenes and Nanotubes, Polymer Electrons, Optical Molecular Memories. Tunneling diode, Resonant Tunneling Diode(RTD), Digital Circuits based on RTDT,RTDT mobile, RTDT Threshold gate, RTDT Multiplexer, Single Electron Transistor(SET): Performance of single electron transistor technology, logic and memory circuits, SET Adder, Comparison between FET and SET (7)

Unit 4

Nanoelectronics with super conducting devices, The Macroscopic model, Cryotron, the Josephson Tunneling device, Memory cell, super conducting quantum interferometer device. Flux quantum device: LC gate, single flux quantum device.
Limits of integrated electronics: Energy supply and heat dissipation, the limits due to thermal particale motion, thermal noise, reliability as limiting factor, physical limits, equal failure rates by tunneling and thermal noise.
Uncertainties in development of nano electronics (7)

Reference:

Karl Goser, Peter Glosekotter, Jan Dienstuhel : Nanoelectronics & NanoSystems
(Pub: Springer)