

BE VIII SEMESTER ELECTRONICS & COMMUNICATION ENGG.

COURSE CONTENTS

EC-8021	Nano electronics	L	T	P	C	Max. Marks	Min. Marks
Duration	3 Hours	3	1	0	4	100	35

Unit-I

Introduction: The 'Top down' and 'Bottom up' approach, Nanotechnology potential. Band structure and density of states at Nanoscale: energy bands, density of states at low dimensional structure.

Electrical transport in Nanostructure: Electrical conduction in metals, insulator/ionic crystals and semiconductors. Conduction mechanism in bulk, thin film and low dimensional system. Introductory quantum mechanics for Nanoscience: size effect in smaller systems, quantum behavior of nanometric world.

Unit-II

Tunnel junction and application of tunneling: Tunneling through a potential barrier, potential energy profiles of material interfaces, applications of tunneling.

Quantum wells, wires and dots: Semiconductor heterostructure and quantum wells, quantum dots and nanoparticles.

Unit-III

Single electron transistor: Coulomb Blockade, single electron transistor, other SET and FET structures.

Unit-IV

Ballistic and spin transport: Classical and semi-classical transport, ballistic transport, carbon nanotubes and nanowires, transport of spin and spintronics.

The era of new Nanostructures of carbon: Buckminsterfullerene, Nanodiamond, BN Nanotubes, Molecular Machine, Nanobiometrics.

Unit V

Fabrication technology: Top-down vs bottom-up technology.

Lithographic process: Lithography, Nanolithography, split gate technology, self assembly, limitation of lithographic process.

Non-lithographic techniques: Plasma arc discharge, sputtering, evaporation, chemical vapour deposition, pulsed laser deposition, molecular beam epitaxy, sol-gel technique, electrodeposition and other process.

References:

1. G. W. Hanson: Fundamentals of Nano electronics, Pearson Education.
2. K. K. Chattopadhyay and A. N. Banerjee: Introduction to Nanoscience and Nanotechnology, PHI Learning.
3. Vladimir J. Mitin: Introduction to Nanoelectronics, Cambridge University Press.
4. M. Dragman and D. Dragman: Nanoelectronics- Principles and devices, Artech House.
5. Karl Goser: Nanoelectronics and Nanosystems, Springer.
6. Daniel Minoli: Nanotechnology application to telecommunication and networking, Wiley Interscience.
7. John H. Davis: Physics of low dimension semiconductor, Cambridge Press.
8. Carl C. Cosh: Nanostructure materials processing property and applications, Noyes Publications.

✓ Elective - IV

EC - VIII

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COURSE CONTENTS							
EC-8001	Advance Communication System	L	T	P	C	Max. Marks	Min. Marks
Duration	3 Hours	3	1	2	6	100	35

Unit-I

Channel coding: Introduction, Block codes, Convolutional codes, Trellis-coded modulation, Turbo-codes, Low density parity check codes, coding for the fading channels. **Speech coding:** Introduction, the sound of speech, stochastic models for speech, quantization and coding, from speech transmission to acoustic telepresence.

Unit-II

Orthogonal Frequency Division Multiplexing (OFDM) : Introduction, principle of OFDM, implementation of transceivers, frequency-selective channels, channel estimation, peak to average power ratio, intercarrier interference, adaptive modulation and capacity, multiple access, multicarrier code division multiple access, single carrier modulation with frequency-domain equalization. **Multiantenna system:** smart antennas, multiple input multiple output systems.

Unit-III

Global System for Mobile Communications (GSM) : Historical overview, system overview, the air interface, logical and physical channels, synchronization, coding, equalizer, circuit switched data transmission, establishing a connection and handover, services and billing. **Interim Standard 95 (IS-95) and Code Division Multiple Access (CDMA 2000)** Historical overview, system overview, the air interface, coding, spreading and modulation, logical and physical channels, handover.

Unit-IV

Wideband Code Division Multiple Access (WCDMA) : Historical overview, system overview, the air interface, logical and physical channels, speech coding, multiplexing and channel coding, spreading and modulation, physical-layer procedures. **Statistics of Cellular systems:** Time delay spread, Noise figure, power limited and bandwidth-limited system, mobile and portable coverage, Ray-tracking and building block approach, coding scheme and variable burst-error intervals, antenna down-tilt, Inter-modulation, mobile location, angle spread with antenna height and its application.

Unit V

New Concepts : Channel capacity in a Rayleigh fading environment, real-time running average, link capacities versus call drops between GSM and CDMA, data transmission via cellular systems, multiuser detection for CDMA, spectrum and technology of a WLL system, wavelet representation.

References:

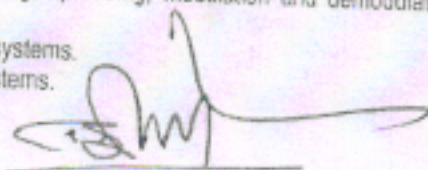
1. A. F. Molisch: Wireless Communications, Wiley India Pvt. Ltd.
2. W. C. Y. Lee: Mobile Communications Engineering- theory and practices, TMH.
3. Upena Dalal: Wireless Communications, Oxford University Press.
4. Kamilo Feher: Wireless Digital Communications, PHI Learning.
5. Mullet: Introduction to Wireless Telecommunication Systems and Networks: Cengage Learning.

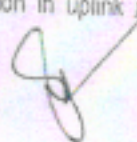
List of Experiments:

Practical should be performed using Scilab / Matlab simulation software based on the above contents some may be as follows:

1. Simulation of block codes, convolutional codes, parity check codes etc.
 2. Simulation of transceiver in OFDM and plotting of BER vs SNR graphs for coded and uncoded OFDM.
 3. Simulation of transmission through a rayleigh fading channel.
- Other practical may include study of:
1. Coding, multiplexing, interleaving, spreading, modulation and demodulation in uplink and downlink for GSM and CDMA.
 2. Data transmission via cellular systems.
 3. Smart antennas and MIMO systems.

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8351 - Fiber Optics Comm

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COURSE CONTENTS

EC-8002	Optical Communication	L	T	P	C	Max. Marks	Min. Marks
Duration	3 Hours	3	1	2	6	100	35

Unit-I

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems. **Optical fibers:** basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, single mode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables.

Unit-II

Optical sources: Light emitting diodes (LEDs): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes. **Power launching and coupling:** source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, optical fiber connectors.

Unit-III

Photo detectors: pin photo detector, avalanche photodiodes, photo detector noise, detector response time, avalanche multiplication noise. **Signal degradation in optical fibers:** Attenuation: units, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion, waveguide dispersion, polarization-mode dispersion. Characteristics of single mode fibers: refractive index profiles, cutoff wavelength, dispersion calculations, mode field diameter, bending loss calculation. Specialty fibers.

Unit-IV

Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers. **Digital links:** point to point links, link power budget, rise time budget, power penalties. **Analog links:** overview of analog links, carrier to noise ratio, multichannel transmission techniques.

Unit-V

Optical technologies

Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators, circulators, Active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators.

Optical amplifiers: basic applications and types of optical amplifiers, Erbium Doped Fiber Amplifiers (EDFA): amplification mechanism, architecture, power conversion efficiency and gain. Amplifier noise, optical SNR, system applications. **Performance Measurement and monitoring:** measurement standards, basic test equipment, optical power measurements, optical fiber characterization, eye diagram tests, optical time-domain reflectometer, optical performance monitoring.