Category of course	Course Title	Course code	Credit-6C			Theory paper (ES)
			L	T	P	
DC-22	Advanced Communication Systems	EC-801	3	1	2	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Course Contents

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 ro 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 transreceiver 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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
PROGRAMME: Electronics and Communication Engineering
COURSE: EC-802 CMOS Circuit Design

Category of course	Course Title	Course code	Credit-4C			Theory paper (ES)
DC-23	CMOS Circuit Design	EC-802	L 3	T 1	P 2	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Course Contents

Unit I

Single-Stage Amplifier: Basic Concepts, Common Source Stage, Source Follower, Common-Gate Stage, Cascode Stage.
Frequency Response of Amplifiers: General Consideration, Common-Source Stage, Source Followers, Common-Gate Stage, Cascode Stage, Differential Pair.

Unit II

Differential Amplifier: Single-Ended and Differential Operation, Basic Differential Pair, Common-Mode Response, Differential Pair with MOS Loads, Gilbert Cell.
Feedback Amplifier: General Consideration, Feedback Topologies, Effect of Loading, Effect of Feedback on Noise.
Switched-Capacitor Circuits: General Consideration, Sampling Switches, Switched-Capacitor Amplifier, Switched-Capacitor Integrator, Switched-Capacitor Common-Mode Feedback.

Unit III

Oscillator: General Consideration, Ring Oscillator, Voltage Controlled Oscillator, Mathematical Model of VCOs.
Phase-Locked Loops: Simple PLL, Charge-Pump PLLs, Nonideal Effects in PLLs, Delayed-Locked Loops.

Unit IV

Sequential Circuit Design: Introduction, Sequencing Static Circuit, Circuit Design of Latches and Flip-Flops, Static Sequencing Element Methodology.
Array Subsystem: Introduction, SRAM, DRAM, Read-Only Memory, Serial Access Memories, Content-Addressable Memory, Programmable Logic Arrays.

Unit V

Datapath Subsystems: Introduction, Addition/Subtraction, One/Zero Detector, Comparators, Counters, Boolean Logic Operation, Coding, Shifters, Multiplication, Division, Parallel-Prefix Computations.

References:

1. B. Razavi: Design of Analog CMOS Integrated Circuits, TMH Publication.
2. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson Education
3. J. M. Rabaey, Digital Integrated Circuits, PHI Learning.
4. R. Jacob Baker: CMOS-Circuit Design, Layout and Simulation, Wiley.
5. A. A. Raj and T. Latha: VLSI Design, PHI Learning.

List of Experiments:

Practicals should be performed using any Electronic Design Automation (EDA) - eg. Microwind / Cadence / Sylvaco / Tanner silicon HiPer / Xilinx ISE 9i or any similar software.

1. Design and simulation of: (a) Common source amplifier (b) Source follower amplifier (c) Common gate amplifier (d) Cascode amplifier.
2. Estimation of frequency response of: (a) Common source amplifier (b) Source follower amplifier. (c) Common gate amplifier (d) Cascode amplifier.
3. Design and simulation of differential amplifier.
4. Design and simulation of feedback amplifier.
5. Design and simulation of oscillators: (a) Ring Oscillator (b) L-C Oscillator (c) Voltage controlled Oscillator.
6. Design and simulation of: (a) Adder (b) Subtractor (c) One/zero detector (d) Comparator (e) Counter (f) Multiplier (g) Divider.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
PROGRAMME: Electronics & Communication Engineering
COURSE: EC-803 Nanoelectronics

Category of course	Course Title	Course code	Credit-6C			Theory paper (ES)
			L	T	P	
DC-24	Nanoelectronics	EC-803	3	1	0	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Course Contents

Unit-I

Introduction

The 'Top down' and 'Bottom up' approach, Why Nanoelectronics?, 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 hetrostructure and quantum wells, quantum dots and nanoparticles.

Unit-III

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

Unit-IV

Ballastic 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: Buck minsterfullerence, Nanodiomond, 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 Nanoelectronics, Pearson Education.
2. K. K. Chattopadhyay and A. N. Banerjee: Introduction to Nanoscience and Nanotechnology, PHI Learning.
3. Vlaadiniz U. 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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
PROGRAMME: Electronics & Communication Engineering
COURSE: EC-8101 Advanced Data Networks

Category of course	Course Title	Course code	Credit-6C			Theory paper (ES)
			L	T	P	
DCO(E)-III	Advanced Data Networks	EC-8101	3	1	0	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Course Contents

Unit-I

Principles of Wireless Networks

Network Planning: Introduction, wireless network topologies, cellular topology.

Wireless network operation: introduction, mobility management, radio resources and power management, security in wireless networks

Unit-II

Mobile Data Networks

Introduction, the data-oriented CDPD network, GPRS and higher data rates, short messaging services in GSM, mobile application protocols.

Wireless LANs (WLAN)

Introduction, historical overview of the LAN industry, evolution of the WLAN industry, new interest from military and service providers, a new explosion of market and technology, wireless home networking.

Unit-III

IEEE 802.11 WLANs

Introduction, what is IEEE 802.11? The PHY layer, MAC sublayer, MAC management sublayer.

HIPERLAN

What is HIPERLAN? HIPERLAN-2

Wireless Geolocation Systems

Introduction, what is Wireless Geolocation? Wireless geolocation system architecture, technologies for wireless geolocation, geolocation standards for E-911 services, performance measures for geolocation systems.

Unit-IV

Wireless Personal Area Network (WPAN)

Introduction, what is IEEE 802.15 WPAN? What is HomeRF? What is Bluetooth? Interference between Bluetooth and 802.11.

Satellite Networks

Satellite navigation and global positioning system: Introduction, radio and satellite navigation, GPS position location principles, GPS time, GPS receivers and codes, the C/A code, Satellite signal acquisition, GPS signal levels, timing accuracy, GPS receiver operation, GPS C/A code accuracy, differential GPS.

Unit-V

Optical Networks

Network Concepts: terminology, categories, layers. Network topologies: performance of passive linear buses, performance of star architectures. SONET/SDH : transmission formats and speeds, optical interfaces, SONET/SDH rings, SONET/SDH networks.

High speed light-wave links: links operating at 10, 40 and 160 Gbps. Optical add/drop multiplexing (OADM): OADM configurations, reconfigurable OADM.

Optical switching: optical cross-connect, wavelength conversion, wavelength routing, optical packet switching, optical burst switching.

WDM network examples: wideband long-haul WDM networks, narrowband metro WDM networks, passive optical network.

Mitigation of transmission impairments: chromatic dispersion compensating fiber, bragg grating dispersion compensators, polarization-mode dispersion compensation, optical amplifier gain transients.

References:

1. K. Pahlavan and P. Krishnamurthy: Principles of Wireless Networks, PHI Learning.
2. G. Keiser: Optical Fiber Communications, 4th Edition, TMH New Delhi.
3. T. Pratt, C. Bostian and J. Allnut: Satellite Communications, 2nd Edition, Wiley Indian Pvt. Ltd.
4. Upena Dalal: Wireless Communications, Oxford University Press.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
PROGRAMME: Electronics and Communication Engineering
COURSE: EC-8102 Microwave Circuits

Category of course	Course Title	Course code	Credit-4C			Theory paper (ES)
			L	T	P	
DCO(E)-III	Microwave Circuits	EC-8102	3	1	0	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Course Contents

Unit I
Transmission lines: Impedance matching and transformation
Plane Electromagnetic waves, Transmission Lines: Line Equations and analysis, Smith Chart, Impedance Matching and transformation single stub, double stub matching ,triple –stub tuner, impedance mismatch factor, quarter wave transformer, theory of small reflections, binomial and Chebyshev transformer, tapered transmission lines, triangular, exponential and Klopfenstein taper.

Unit II
Field analysis of transmission lines:
Analysis of general transmission line and terminated transmission line circuits, Planar Transmission lines, Microstrip lines.
Strip lines: Characteristic Impedance, conductor losses, Dielectric losses, Radiation Losses, Higher order modes and dispersion, Microstrip attenuation ,high frequency properties , suspended and inverted microstrip lines, coplanar lines, slot lines, Fin-lines, Coupled Lines. Substrates for microwave printed circuits

Unit III
Microwave (solid state) Amplifiers:
BJT and FET, Power gains: definitions, Stability: stability circles, tests for unconditional stability, Constant Power Gain Circles, Constant Mismatch Circles, Single stage and multi stage transistor Amplifier design, Broadband transistor Amplifier Design, Power amplifiers. Basic Noise theory, Low noise amplifier designs, Microwave amplifier designs using S_{ij} parameters.

Unit IV
Microwave oscillators and mixers:
RF oscillators, Microwave oscillators, Oscillators Phase Noise, Frequency Multipliers, Gunn oscillators and circuits, Transistor oscillators, Oscillator circuits and design.
Mixers: Mixer characteristics, linear and non-linear mixer operation, Mixer noise figure, Balanced mixers, Single ended diode mixer, single ended FET mixer, image reject mixers, other mixers, Mixer analysis using Harmonic Balancing.

Unit V
Microwave Filters:
Periodic structures: analysis, Filter design : image parameter and insertion loss method. specification of power loss ratio,
Filter transformations, Filter Implementations, Stepped-Impedance low –pass filters, coupled line filters, Filters using coupled resonators, Impedance and Admittance inverters, micro strip half-wave filter, Quarter –wave coupled cavity filters, direct –coupled cavity filters, Low-Pass filter designs, Frequency transformations and expansions, Narrowband and wideband microwave filters.

References:

1. R. E. Collin: Foundations for Microwave Engineering, 2nd Edition, Wiley India Pvt. Ltd.
2. D. M. Pozar: Microwave Engineering, 3rd Edition, Wiley India Pvt. Ltd.
3. P. A. Rizzi: Microwave Engineering- Passive Circuits.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
PROGRAMME: Electronics and Communication Engineering
COURSE: EC- 8103 Principles of Management & Managerial Economics

Category of course	Course Title	Course code	Credit-4C			Theory paper (ES)
			L	T	P	
HS-3	Principles of Management & Managerial Economics	EC-8103	3	1	0	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Course Contents

Unit I
Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management.

Unit II
Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.

Unit III
Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty Decision making under uncertainty, Decision Making under risk.

Unit IV
Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

Unit V
Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.

References:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, PHI Learning.
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.
5. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
6. Hirschey: Managerial Economics, Cengage Learning.
7. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers.
8. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
9. Joel Dean: Managerial Economics, PHI learning.
10. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
11. V. L. Mote: Managerial Economics, TMH, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
PROGRAMME: Electronics and Communication Engineering
COURSE: EC-804 Major Project

Category of course	Course Title	Course code	Credit-4C			Practical Exam
DC-25	Major Project	EC-804	L 0	T 0	P 4	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Course Contents

The student should prepare a working system or some design or understanding of a complex system that he has selected in the seventh semester using system analysis tools and submit the same in the form of a write-up i.e. detail project report. The student should maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable. Each student is required to prepare a project report based on the above points and present the same at the final examination with a demonstration of the working system.