PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credit			Theory		
		L	T	P	External (70)	Internal (30)	Total (100)
CMOS VLSI Design	ECT -701	3	1	-			Min: 40 (D Grade)

Duration of theory (External): 3 hours
Theory internal - max marks: 30
Best of two mid semester test – Max. Marks: 20
Assignment / Quiz/ Regularity – Max. Marks: 10

Unit	Contents (Theory)
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.
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.
II	**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.
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.
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.

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credit			Theory		
		L	T	P	External (70)	Internal (30)	Total (100)
Satellite Communication	ECT -7101	3	1	-			Min: 40 (D Grade)

Duration of theory (External): 3 hours
Theory internal - max marks: 30
Best of two mid semester test – Max. Marks: 20
Assignment / Quiz/ Regularity – Max. Marks: 10

Unit	Contents (Theory)
I	**Overview of satellite systems**: Introduction, History of Satellites operations, Frequency allocations for satellite systems. **Orbits and launching methods**: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.
II	**The Geostationary orbit**: Introduction, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits. **Polarization**: Antenna polarization, polarization of satellite signals, cross polarization discrimination. **Depolarization**: Ionospheric, rain, ice.
II	**The Space segment**: Introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem, Morelos and Satmex 5, Anik-satellites, Advanced Tiros-N spacecraft. **The Earth segment**: Introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.
IV	**The space link & link design**: Introduction, Equivalent isotropic radiated power (EIPR), transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, intermodulation noise, inter-satellite links. Interference between satellite circuits.
V	**Satellite services** **VSAT (very small aperture terminal) systems**: overview, network architecture, access control protocols, basic techniques, VSAT earth station, calculation of link margins for a VSAT star network. **Direct broadcast satellite (DBS) Television and radio**: digital DBS TV, BDS TV system design and link budget, error control in digital DBS-TV, installation of DBS-TV antennas, satellite radio broadcasting.

References:

1. D. Roddy: Satellite Communications, 4th Edition, TMH, New Delhi.
2. T. Pratt, C. Bostian and J. Allnut: Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd.
3. W. L. Pritchard, H. G. Suyderhoud and R. A. Nelson: Satellite Communication Systems Engineering, PEd.
4. D.C. Agarwal: Satellite Communications, Khanna Publishers.
5. R. M. Gangliardi: Satellite Communications, CBS Publishers.
6. M. R. Chartrand: Satellite Communication, Cengage Learning.

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credit			Theory		
		L	T	P	External (70)	Internal (30)	Total (100)
Microwave Circuits	**ECT -7102**	3	1	-			Min: 40 (D Grade)

Duration of theory (External): 3 hours
Theory internal - max marks: 30
Best of two mid semester test – Max. Marks: 20
Assignment / Quiz/ Regularity – Max. Marks: 10

Unit	Contents (Theory)
I	**Transmission lines:** 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.
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.
II	**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 Sij parameters.
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.
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.

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credit			Theory		
		L	T	P	External (70)	Internal (30)	Total (100)
Advanced Data Networks	**ECT -7103**	3	1	-			Min: 40 (D Grade)

Duration of theory (External): 3 hours
Theory internal - max marks: 30
Best of two mid semester test – Max. Marks: 20
Assignment / Quiz/ Regularity – Max. Marks: 10

Unit	Contents (Theory)
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.
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.
II	**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.
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.
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.

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credits			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total (50)
Antenna & Wave Propagation	**ECT-703**	3	1	2	**(70)**	**(30)**	Min: 40 (D Grade)	**(35)**	**(15)**	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20

Quiz/Assignment / Attendance – Max. Marks: 10

Practical Internal - Max Marks: 15

Lab Performance, Lab Record & Viva –Max Marks: 10

Assignment / Quiz – Max. Marks: 05

Unit	Contents (Theory)
I	**Introduction to antenna:** Antenna terminology, radiation, retarded potential, radiation field from current element, radiation resistance of short dipole and half wave dipole antenna, network theorems applied to antenna, self and mutual impedance of antenna, effect of earth on vertical pattern and image antenna.
II	**Antenna arrays:** Antenna array of point sources, two element array, end fire and broad side arrays, uniform linear arrays of n-elements, linear arrays with non-uniform amplitude distribution (binomial distribution and Chebyshev optimum distribution), arrays of two-driven half wave length elements (broad side and end fire case), principle of pattern multiplication.
III	**Types of antennas & Designing:** Babinet's principles and complementary antenna, horn antenna, parabolic reflector antenna, slot antenna, log periodic antenna, loop antenna, helical antenna, biconical antenna, folded dipole antenna, Yagi-Uda antenna, VHF & UHF antennas, lens antenna, turnstile antenna. Long wire antenna: resonant and travelling wave antennas for different wave lengths, V-antenna, rhombic antenna, beverage antenna, microstrip antenna.
IV	**Antenna array synthesis: I**ntroduction, continuous sources, methods-Schelknoff polynomial method, Fourier transform method, Woodward- Lawson method, Taylor's method, Laplace transform method, Dolph- Chebychev method, triangular, cosine and cosine squared amplitude distribution, line source, phase distribution, continuous aperture sources.
V	**Propagation of radio wave:** Structure of troposphere, stratosphere and ionosphere, modes of propagation, ground wave propagation, duct propagation. Sky wave propagation: Mechanism of Radio Wave Bending by Ionosphere, critical angle and critical frequency, virtual height, skip distance and LUF, MUF. Single hop and multiple hop transmission, influence of earths magnetic field on radio wave propagation, Fading Space Wave Propagation: LOS, effective earth's radius, field strength of space or tropospheric propagation.

References:

1. J. D. Krauss: Antennas;for all applications
2. C. A. Balanis: Antenna Theory Analysis and Design
3. Jordan and Balmain: Electromagnetic Fields and Radiating System
4. K. D. Prasad: Antennas and Wave Propagation

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

List of Experiments

1. To Plot the radiation pattern of a simple dipole λ/2 antenna.
2. To Plot the radiation pattern of a rhombus antenna.
3. To Plot the radiation pattern of a parabolic reflector antenna.
4. To Plot the radiation pattern of a log periodic antenna.
5. To Plot the radiation pattern of a ground plane antenna.
6. To Plot the radiation pattern of a folded dipole antenna.
7. To Plot the radiation pattern of a yagi antenna.
8. To Plot the radiation pattern of a collinear antenna.
9. To Plot the radiation pattern of a broad side antenna.
10. To Plot the radiation pattern of a square roof antenna.

Procedure for performing the Experiments

All experiments (wherever applicable) should be performed and simulated using Electromagnetic Simulation S/W (CST/HFSS/IE3D etc).

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credits			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total (50)
Optical Communication	ECT- 704	3	1	2	(70)	(30)	Min: 40 (D Grade)	(35)	(15)	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20

Quiz/Assignment / Attendance – Max. Marks: 10

Practical Internal - Max Marks: 15

Lab Performance, Lab Record & Viva –Max Marks: 10

Assignment / Quiz – Max. Marks: 05

Unit	Contents (Theory)
I	**Optical fibers**: Generation and motivation of the Optical technologies, optical spectral bands, key elements of optical fiber systems, 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.
II	**Optical sources: S**tructures, materials, quantum efficiency of Light emitting diodes, 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. 3dB frequency concept. **Power launching and coupling**: Source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, and optical fiber connectors.
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.
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.
V	**Wavelength division multiplexing (WDM) concepts**: Operational principles of WDM, passive optical star coupler, isolators, circulators, and 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.

References:

1. G. Keiser: Optical Fiber Communications, 4th Edition, TMH New Delhi.
2. Subir Kumar Sarkar: Optical Fibers and Fiber Optic Communication System, S. Chand.
3. J. M. Senior: Optical Fiber Communication-Principles and Practices, 2nd Edition, Pearson Edu.
4. G. P. Agarwal: Fiber Optic Communication Systems, 3rd Edition, Wiley India Pvt. Ltd.
5. J. C. Palais: Fiber Optics Communications, 5th Edition, Pearson Education.

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

List of Experiments

1. To study a 650 nm fiber optical analog links. Also study the relationship between input and output signal
2. To study a 650 nm fiber optical digital links. Also study the relationship between input and output signal
3. To the study of intensity modulation technique using analog input signal.
4. To the study of intensity modulation technique using digital input signal.
5. To study frequency modulation.
6. To study pulse width modulation.
7. To measure propagation attenuation loss in optical fiber.
8. To study bending loss.
9. To determine the numerical aperture of optical fiber.
10. To study the effect of optical receiver characteristics on a system performance

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credits			Practical		
		L	T	P	External	Internal	Total (50)
CMOS VLSI Design lab	**ECT- 705**	0	0	2	**(Nil)**	**(50)**	Min: 20 (D Grade)

Practical Internal - Max Marks: 50

Lab Performance, Lab Record & Viva –Max Marks: 45

Assignment / Quiz – Max. Marks: 05

List of Experiments

1 To Design and implement logic inverter using MOSFETs.

2 To Design and implement CMOS NAND and NOR logic gates.

3 To Design basic differential amplifier using current mirror logic.

4 To Design and implement 2 bit parallel adder.

5 To Design Schmitt trigger circuit with UTP=0.8V and LTP=0.2V. plot transfer curve analysis.

6 To Design and simulation of Common source amplifier and common gate amplifier.

7 To Estimate of frequency response of common source amplifier and common gate amplifier.

8 To design and simulation of differential amplifier.

9 To design and simulation of feedback amplifier.

10 To design and simulation of ring oscillator and L-C oscillator.

Procedure for performing the 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.

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credits			Practical		
		L	T	P	External (105)	Internal (45)	Total (150)
Major Project-I	**ECT-706**	-	-	6			Min: 60 (D Grade)

Practical Internal - Max Marks: 45

Lab work & Sessional –Max Marks: 40

Assignment / Quiz – Max. Marks: 05

Contents (Practical)

The Major Project Work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which should be selected from some real life problem as far as possible, which may involve fabrication, design or investigation of a technical problem. The project work involves sufficient work so that students get acquainted with different aspects of manufacturing, design or analysis. The student also have to keep in mind that in final semester they would be required to implement whatever has been planned in the major project in this semester. It is possible that a work, which involves greater efforts and time, may be taken up at this stage and finally completed in final semester, but partial completion report should be submitted in this semester and also evaluated internally. At the end of semester, all students are required to submit a synopsis.

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Programme: **B. Tech. (Electronics and Communication Engineering)** Semester: **VII**

Subject Title	Subject Code	Credits			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)
Industrial Training II	**ECT- 707**	-	-	4			Min: 40 (D Grade)

Practical Internal - Max Marks: 30

Lab work & Sessional – Max Marks: 25

Assignment / Quiz – Max. Marks: 05

Contents (Practical)

OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final Year.

Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment. This will enrich their practical learning and they will be better equipped to integrate the practical experiences with the classroom learning process.