PEOPLE'S UNIVERSITY, BHOPAL

PROGRAMME: M Tech (Digital Communication) SEM: III

Subject Title	Subject Code
FIBER OPTICS COMMUNICATION	MTDC-301

Unit	Contents *(Theory)*
I	Introduction, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal Analysis of a step index fiber.
II	**Optical channel Modeling:** Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers measurement techniques like OTDR
III	**Optical sources:** LEDs and Lasers, Photo-detectors – Pin-detectors, detector responsively noise, Optical link design – BER calculation, quantum limit, power panelities
IV	**Optical switches:**coupled mode analysis of directional couplers, electro-optic switches.
V	Nonlinear effect in fiber optic links. Concept of self-phase modulation, group velocity dispersion and soliton based communication. Optical amplifiers – EDFA, Raman amplifier and WDM systems

References

1. J. Keiser, Fiber Optic Communication, McGraw-Hill
2. J. Gower, Optical Communication systems, Prentice Hall, India.
3. G. Agrawal, Nonlinear fiber optics, Academic Press.
4. G. Agrawal, Fiber optic Communication systems, John Wiley and sons.
5. J. Senior, Optical Fiber Communication.

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PROGRAMME: M Tech (Digital Communication) SEM: III

Subject Title	Subject Code
INFORMATION THEORY & CODING	MTDC-302

Unit	Contents *(Theory)*
I	Introduction to uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, coding theorem, data compression, prefix coding, HUFFMAN coding, Lempel-Ziv Coding
II	Discrete memory less channels, Binary symmetric channel, mutual information & its properties, channel capacity, channel coding theorem, and its application to BSC, Shannon's theorem on channel capacity, capacity of channel of infinite bandwidth, Bandwidth signal to noise Trade off, Practical communication system in light of shannon's theorem, Fading Channel.
III	Group and field of Binary system Galois field and its construction in GF (2m) and its basic properties, vector spaces and matrices in GF(2), Linear Block Codes, Systematic codes, and its encoding circuits, syndrome and error detection ,minimum distance, error detecting and correcting capabilities of block code, Decoding circuits, Probability of undetected error for linear block code in BSC, Hamming code and their applications.
IV	Cyclic codes and its basic properties, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation & error detection, cyclic Hamming codes.
V	Introduction to BCH codes, its encoding & decoding, error location & correction. Introduction to convolution codes, its construction & viterbi algorithm for maximum likelihood decoding

Reference Books:

1. Digital Communication by Haykins Simon Wiley Publ.
2. Error control Coding: Theory and Application, by Shu Lin and Cosstlello,PHI
3. Modern analog and Digital Communication system, by B.P. Lathi
4. Digital Communication by Sklar, Pearson Education
5. Principal of Communication system by Taub & Schilling, TMH
6. Error Correcting Codes by Peterson W., MIT Press
7. Digital Communication by Carson,MGH
8. Digital Communication by Proakis,TMH

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PROGRAMME: M Tech (Digital Communication) SEM: III

Subject Title	Subject Code
SYSTEM PROGRAMMING	MTDC-303

Unit	Contents *(Theory)*
I	Fundamental of programming, steps in problem solving with digital computer algorithm, flow chart and textual representation, primitive actions, control construct like conditional, iteration, conditional repetition, recursion, programming with Pascal of C
II	Data & Data types, data representation, data structure array-various operations with array, concept of pointers and pointers manipulations, pointers for data structures and functions, static and dynamic allocations, implementations with arrays and pointers, various operations like searching, appending, insertion & deletion in lists, doubly linked list and their implementations, stack, PUSH/POP &amp.
III	TOP of stack operation, applications of stacks, queues & various operations on queues, tree, binary and K-ary trees, tree traversal, insertion and deletion in tree, B-tree and AVL tree, operations on those tree applications
IV	Searching and sorting, linear, binary and Hash search, minimum and maximum selection, divide and conquer, sorting, insertion sort, bubble sort, quick sort & heap sort, matrix operations, dynamic programming
V	Overview of system programs, Assembler, interpreter, compiler, Editor and operating system.

Reference books:

1.Data structure & Program design by Kruza, PHI

2.Algorithms,Data structure & programs by Wirth N., PHI

3.The programming language by Kernighan &amp ; Ritchi, PHI

4.Introductory problem solving by pascal by Schicder,John Wiley

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PROGRAMME: M Tech (Digital Communication) **SEM: III**

Subject Title	Subject Code
ARTIFICIAL INTELLIGENCE	MTDC-3103

Unit	Contents *(Theory)*
I	Introduction, problem characteristics, issues in design of search algorithms. Searching: Uninformed search techniques, alterative deepening. Heuristics search techniques, Constraint Satisfaction; Means Ends Analysis; Alternative search techniques, Evolutionary search techniques-working of Genetic Algorithm and simulated annealing
II	Game-playing: Single player game, Two player game, The Minmax procedure, Minmax Procedure with alpha-beta cutoffs, Quiescent search, search efficiency
III	Knowledge representation: The propositional Calculus – resolution in propositional calculus, entailment, PSAT problem, The Predicate calculus – resolution in predicate calculus, quantification, unification, horn clauses.
IV	Expert System: introduction, knowledge representation in ES, reasoning with uncertain information, Bayes network, D-separation, probabilistic interfacing, inexact reasoning, representing common sense knowledge, non-monotonic and monotonic reasoning, forward and backward chaining.
V	Introduction to ANN, feed forward and feedback networks, perceptions linearly separable and non-separable problems, supervised and unsupervised learning, back propagation algorithm, introduction to fuzzy logic and fuzzy sets, membership fuction, defuzzification methods, fuzzy arithmetic.

References:

1. Nils J Nilson, Artificial intelligence: A new synthesis, Morgan Kaufmann Publishers.
2. E Rich and K Knight, Artificial intelligence, Tata MacGraw Hill Publishing.
3. Giarratano and Tiley, Expert Systems – Principal and programming, Thomson Publishing.

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PROGRAMME: M Tech (Digital Communication) **SEM: III**

Subject Title	Subject Code
SATELLITE COMMUNICATION	MTDC-3101

Unit	Contents *(Theory)*
I	Introduction, Kepler's First, second and third Law, Definitions of Terms for Earth-orbiting Satellites, Orbital Elements, Apogee and Perigee Heights, Orbital Perturbations, Effects of a Non spherical Earth, Atmospheric Drag, Inclined Orbits, Calendars, Universal Time, Julian Dates, Sidereal Time, The Orbital Plane,
II	Antenna Look Angels, The Polar Mount Antenna, Limits of Visibility, Near Geostationary Orbits, Earth Eclipse of Satellite, Sun Transit Outage, Launching Orbits, Attitude Control, Spinning Satellite Stabilization, Momentum Wheel Stabilization, Station Keeping, Thermal Control, TT&C Subsystem, Transponders, Demultiplexer Power Amplifier, Antenna Subsystem.
III	Receive-Only Home TV Systems, Master Antenna TV System Community Antenna TV System, Transmit-Receive Earth Stations, Equivalent Isotropic Radiated Power, Transmission Losses, Free-Space Transmission, Feeder Losses, Antenna Misalignment Losses, Fixed Atmospheric and Ionospheric Losses, Link Power Budget Equation, Overall System Noise Temperature,
IV	Carrier-to-Noise Ratio, Input Back Off, Combined C/N . Pre assigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis. TDMA : Reference Burst;.
V	Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Onboard signal Processing, Satellite switched TDMA. Introduction, Orbital Spacings, Power Rating and Number of Transponders, Frequencies and Polarization, Transponder Capacity, Bit Rates for Digital Television

References:

1. Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Comm. , John Willy & Sons (Asia) Pvt. Ltd. 2004.
2. Dennis Roddy, Satellite Communications, McGraw-Hill Publication Third edition 2001.
3. Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson, Satellite Comm. Systems Engg. Pearson Edu.Ltd., 2nd edition 2003.
4. Richharia : Satellite Communication Systems (Design Principles Macmillan Press Ltd. Second Edition 2003.

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PROGRAMME: M Tech (Digital Communication) **SEM: III**

Subject Title	Subject Code
SPEECH PROCESSING	MTDC-3102

Unit	Contents *(Theory)*
I	**Introduction:** Speech production and acoustic phonetics, speech perception. Speech analysis: time and frequency domain techniques for pitch and formant estimation, cepstral and LPC analysis.
II	**Speech Enhancement:** Microform Codes, Source coders, and Hybrid coders. Speech Enhancement; Microphone Array processing, Noise Suppression, and Echo Canceller.
III	**Speech Recognition:** Basic pattern recognition, preprocessing, Parametric representation, Evaluating the similarity of speech patter, Accommodating both spectral and temporal variability, Network for speech recognition, Language model, Artificial neural networks.
IV	**Summary of current speech recognition design Speech synthesis:** articulatory, formant, and LPC synthesis, voice response and text-to speech systems.
V	**Applications:** data compression, vocoders, speech enhancement, speech recognition speaker recognition, aids for the speech and hearing impairments

Reference Books:

1. D O'shaughnessy, Speech Communication: Human and Machine, Addison Wesley.
2. L R Rabiner and R W Schafern, Digital Processing of Speech Signals, Prentice Hall.
3. J Flanagan, Speech Analysis, Synthesis, and Perception, Springer Verlag. W. Rappaport, Wireless Communication.

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PROGRAMME: M Tech (Digital Communication) **SEM: III**

Subject Title	Subject Code
MICROWAVE CIRCUITS	MTDC-3201

Unit	Contents *(Theory)*
I	Conceptual understanding of wave propagation in the guided media such as transmission lines, rectangular and circular waveguides; Various characteristics and parameters such as wave velocity, dispersion, mismatch effects; voltage - current - field distributions.
II	Pointing Power / Vectors Theorem and Uniqueness Theorems, Maxwell time varying equations, Smith chart applications to RF and Microwave Engineering,
III	**RF and MICROWAVE ANALYSIS:** Impedance and Admittance Matrix, Hybrid matrix, Scattering matrix, ABCD Matrix, Discontinuities and Modal analysis, Signal flow graph representation, Various excitation and coupling methods to the waveguides.
IV	MICROWAVE COMPONENTS: Understanding the in-depth principle, working, analysis and design of ferromagnetic: Passive components such as microwave resonators, power dividers and couplers, filters and impedance transformers – Chebyshev, Binomial and Tapered. Ferromagnetic components such as isolators, phase shifters, circulators
V	**MICROWAVE DEVICES AND CIRCUITS:** Conceptual understanding the principle, working and applications of microwave circuits and active devices such as: Mixers, Detectors, Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Amplifiers, Oscillators and Synthesizers.

Reference Books:

1. Pozar D M, Microwave Engineering, Wiley.
2. Mishra Ravindra, RF and Microwave Communication, Wiley.
3. Gupta K C, Microwaves, New Age International Publn.
4. Collin R E, Foundations for Microwave Engineering, McGrawHill International.
5. M. Golio & J. Golio, RF and microwave Technologies:Vol I,II,III,CRC Press.

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PROGRAMME: M Tech (Digital Communication)

SEM: III

Subject Title	Subject Code
EMBEDDED SYSTEM DESIGN	MTDC-3202

Unit	Contents *(Theory)*
I	Embedded Micro controller Cores. Embedded Memories, SRAM, DRAM Controllers.
II	**Embedded System Design Aspects:** Interfacing between analog and digital sections, signal conditioning, Interfacing with external systems, User interfacing.
III	**Software aspects of Embedded Systems:** Real time programming languages & operating systems for Embedded Systems, Embedded progrmmming in C/C++, Scheduler, Multitasking, Threading concepts and implementation,
IV	**Serial Communication Interface:** UART, SCI applications, Modern Serial Interface Standards, Modems, SPI, I2C. USB, Introduction to JTAG Port
V	Case study of Embedded Applications.

Reference Books:

1. J. W. Valvo, Embedded Micro computer system, Brooks/Cole.
2. K. J. Ayala, The 8051 Microcontroller, Pernam Intl.
3. Jack Ganssle. The art of designing Embedded Systems.
4. Daniel W. Lewis, Fundamentals of Embedded Software.

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PROGRAMME: M Tech (Digital Communication) **SEM: III**

Subject Title	Subject Code
MICROELECTRONICS CHIP FABRICATION	MTDC-3203

Unit	Contents *(Theory)*
I	**Environment for VLSI Technology:** Clean room and safety requirements. Wafer cleaning processes and wet chemical etching techniques.
II	**Impurity incorporation:** Solid State diffusion modeling and technology; Ion Implantation modeling, technology and damage annealing; characterization of Impurity profiles.
III	**Oxidation:** Kinetics of Silicon dioxide growth both for thick, thin and ultra-thin films. Oxidation technologies in VLSI and ULSI; Characterization of oxide films; High k and low k dielectrics for ULSI.
IV	**Lithography:** Photolithography, E-beam lithography and newer lithography techniques for VLSI/ULSI; Mask generation. Chemical Vapour Deposition techniques: CVD techniques for deposition of poly-silicon, silicon dioxide, silicon nitride and metal films; Epitaxial growth of silicon; modeling and technology, In process measurements.
V	**Metal film deposition:** Evaporation and sputtering techniques. Failure mechanisms in metal interconnects; Multi-level metallization schemes. Plasma and Rapid Thermal Processing: PECVD, Plasma etching and RIE techniques; RTP techniques for annealing, growth and deposition of various films for use in ULSI. Carrier lifetime measurement techniques, Process integration for NMOS, CMOS and Bipolar circuits; Advanced MOS technologies.

Reference Books:

1. C.Y. Chang and S.M.Sze (Ed), ULSI Technology, McGraw Hill Companies Inc, 1996.
2. S.K. Ghandhi, VLSI Fabrication Principles, John Wiley Inc., New York, 1983.
3. S.M. Sze (Ed), VLSI Technology, 2nd Edition, McGraw Hill, 1988.

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Programme: **M. Tech. (Digital Communication)** **Semester -III**

Subject Title	Subject Code	Credit			Practical		
		L	T	P	External (105)	Internal (45)	Total (150)
Minor Project	MTDC - 307	-	-	6			Min: 60 (D Grade)

Practical Internal - Max Marks: 45

Lab work & Sessional – Max. Marks: 40

Assignment / Quiz/ Regularity – Max. Marks: 05

Contents (Practical)
The Minor 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 dissertation 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: **M. Tech. (Digital Communication)** **Semester -III**

Subject Title	Subject Code	Credit			Practical		
		L	T	P	External (105)	Internal (45)	Total (150)
Seminar	MTDC - 306	-	-	6			Min: 60 (D Grade)

Practical internal - max marks: 45

Lab work & sessional – Max. Marks: 40

Assignment / Quiz/ Regularity – Max. Marks: 05

Contents
Elements of Effective Presentation: Body Language and use of voice during presentation; Dress, Posture, Gestures, Eye contact and facial expression, Connecting with the audience during presentation; Projecting a positive image while speaking; Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech. **Stage fright, Voice and language:** Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. **Use of aids** –OHP, LCD Projector, white board.

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