Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Digital Communication)

SEMESTER I

COURSE CODE	CATE GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTMA101	EC	Advance Mathematics	60	20	20	0	0	3	1	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To introduce the students with the Fundamentals of the Advanced Mathematics.

Course Outcomes:

After the successful completion of this course students will be able to

1. Understand and apply the basics of the numerical and analytic techniques of solution PDE, various transforms which are fundamental of almost every subject of Electrical, Electronics and Telecommunication Engg.
2. Know the fundamental principles of the Modern probability theorems and Statistics, Stochastic or Random Processes, Fuzzy set and logic, Matab programming.
3. Apply the approaches of Reliability engineering, Decision theory and Goal programming which play significant role in the subjects of modern engineering and Technology.

Syllabus:

UNIT I

Partial Differential Equations and various Transforms:

Solution of PDE by separation of variable method, Numerical solution of PDE using finite difference method, Elementary properties of FT, DFT, Wavelet transform, WFT, Haar transform.

UNIT II

Probability & Statistics:

Probability, Compound probability, Discrete Random variable, Binomial and Poisson distribution, Continuous Random variable, Normal distribution, Sampling distribution, Theory of hypothesis.

UNIT III

Stochastic or Random Process:

Introduction of Random or Stochastic processes, Markov Processes, Markov chain, Queuing theory: M/M/1: ∞/FCFS, M/M/N: ∞/FCFS.

UNIT IV

Fuzzy Set and Theorems:

Fuzzy set, Fuzzy relation, Fuzzy arithmetic, Fuzzy logic, Introduction of MATLAB, MATLAB

Programming, functions and applications.

UNIT V

Reliability:

Introduction of Reliability, derivation of reliability functions, Failure rate, mean time to failure and applications, Decision theory, Goal programming.

Text Books:

1. B. S. Grewal, "Higher Engg. Mathematics", Khanna Publishers, Delhi.

Reference Books:

1. Ervin Kreszig, "Advance Engineering Mathematics", John Wiley & Sons (Asia) Pvt. Ltd.
2. S. D. Sharma, Kedar Nath, Ram Nath, "Operation Research", Delhi.
3. Probability, Random variables & Random processes: Schaum's outlines.
4. J. Medhi, "Stochastic processes", New Age International Publishers.
5. Gupta, Malik, "Calculus of finite differences and Numerica Analysis".
6. J. N. Sheddon, "Fourier Transform".
7. T. J. Ross, "Fuzzy logic in Engineering".
8. H. J. Zimmersoms, "Fuzzy set theory and its applications".
9. Pran Nath, "Statistics, Reliability and Decision making for Engineers", Tara Printing works.s

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC101	EC	Data Communication & Computer Networks	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts.

Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Identify the different types of network topologies and protocols.
2. Enumerate the layers of the OSI model and TCP/IP.
3. Identify the different types of network devices and their functions within a network.
4. Understand the various routing mechanisms as well as design new routing algorithm.

Syllabus:

UNIT I

Network and its application, categories of network: LAN, MAN, WAN, Wireless Network, Internetwork, Reference models: OSI, TCP/IP model and their comparison. Line configuration: point to point, multicast, broadcast, Network Topologies: Mesh, Star, Tree, Bus, Ring, Hybrid. Physical Layer: Shannon's maximum data rate of a channel. Transmission media: Guided Media, Magnetic, Twisted Pair, Coaxial cable, Fibre optics. Wireless Media: Radiowave, Microwave, Infrared, RS-232 C and X.21 standards.

UNIT II

Framing techniques, Error detection-correction, Multiplexing-TDM, FDM, WDM; switching circuit, message, packet switching, Repeaters, Hubs, Bridges, switches, routers and gateways, Data link protocols, unrestricted simplex protocol, stop & wait, sliding window, Go-back n, selective repeat, data link layer in internet.

UNIT III

Channel allocation, Multiple access protocols – ALOHA, CSMA, CSMACD, collision-free protocol, Ethernet- frame format, cabling, encoding, performance, fast Ethernet, Gigabit Ethernet Broadband and wireless LAN, Bluetooth.

UNIT IV

Connectionless & connection oriented service, comparison of virtual circuit and datagram subnet, Routing algorithms: shortest path, flooding, distance vector, hierarchical routing, congestion control and prevention, Quality of service, network layer in internet- IP protocol and IP address, IPv6, OSPF, BGP routing protocol.

UNIT V

Elements of Transport Protocol, Internet Transport Protocol-UDP / TCP protocol, performance issues -Network performance measurement, system design for better performance Domain name system, email, world wide web- architecture, HTTP.

Text Books:

1. Andrew S. Tannenbaum, "Computer Networks", 4th Ed., Pearson Education, 2003.
2. William Stallings, "Data and Computer Communications", 8th Ed., Prentice Hall India, 2007.

Reference Books:

1. Behrouz A. Forouzan, "Data Communications and networking", 4th Ed., Tata McGraw-Hill, 2000.

List of Practical's:

1. Implementation of Ring Topology using db9.
2. To plot efficiency of pure aloha and slotted aloha in Matlab.
3. To study different physical equipments used for networking.
4. To implement sliding window protocols.
5. To plot channel efficiency for Ethernet in Matlab.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTDC102	EC	Advanced Digital Communication	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To understand and analyze the signal flow in a digital communication system.
2. To analyze error performance of a digital communication system in presence of noise and other interferences.
3. To understand concept of spread spectrum communication system.
4. To analyze the performance of optimum receiver.

Course Outcomes:

After completion of this course, the student will be able to:

1. Construct time- and frequency-domain models for digital communications systems with linear channels and additive noise.
2. Design the optimal receiver when the noise is Gaussian.
3. Design linear and decision-feedback equalizers.
4. Evaluate and compare the performance of the preceding techniques.

Syllabus:

UNIT I

Introduction to Band Pass Modulation and Demodulation- Digital Band pass Modulation Techniques binary PSK, DPSK, QPSK, M-ary PSK, QAM, M-ary FSK, MSK, GMSK their Generation, Signal Space representation, Band-width requirements, Detection (Coherent, Non-coherent), Peprformance analysis and Comparison in presence of noise and their spectral characteristics.

UNIT II

Estimation of signal parameters, carrier phase and symbol timings. Signal design for band limited channels and their characterization, probability of error in detection of PAM with zero ISI, modulation codes for spectrum shaping.

UNIT III

Optimum receivers for signals corrupted by AWGN and their performance for memoryless channel, optimum receivers for PCM, Re-generative repeaters, Link budget analysis.

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SEMESTER I

UNIT IV

Optimum receiver for channels with ISI and AWGN, linear equalization and decision feedback equalization, adaptive linear and adaptive decision feedback equalizer.

UNIT V

Multi-channel and multi-carrier systems, spread spectrum signals for digital communications, direct sequence spread spectrum signals and frequency-hopped spread spectrum signals and their performances, OFDM.

Text Books:

1. Proakis, "Digital Communication", 5th Edition, McGraw Hill.
2. Sklar B., "Digital Communication", Pearson Education
3. Haykins Simon, "Digital Communication", Wiley Publication.

Reference Books:

1. Glover & Grant, "Digital Communication", Prentice Hall.
2. Apurba Das, "Digital Communication Principles & System Modeling", Springer.
3. Glover & Grant, "Digital Communication", Prentice Hall.

List of Practical's:

1. To plot the wave form for Binary Amplitude Shift Keying (BASK) signal using MATLAB for a stream of bits.
2. To plot the wave form for Binary Frequency Shift Keying (BFSK) signal using MATLAB for a stream of bits.
3. To plot the wave form for Binary Phase Shift Keying signal (BPSK) using MATLAB for a stream of bits.
4. To plot the wave form for Quadrature Phase Shift Keying (QPSK) signal using MATLAB for a stream of bits.
5. To plot the wave form for 8 quadrature amplitude modulated signal (QAM) using MATLAB for a stream of bits.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC113	EC	Probability & Random Processes	60	20	20	0	0	3	1	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in advanced communication systems.
2. To understand the concepts of random sequences and processes.

Course Outcomes:

The student will be able to:

1. Define and apply various concepts of probability theory.
2. Comprehend and use the properties of random processes in real world situations.
3. Create mathematical models for practical design problems and determine theoretical solutions to the created models.

Syllabus:

UNIT I

Introduction to Probability & Random Variables: Misuses, Miscalculations & Paradoxes in Probability, Set, Fields, and Events, Axiomatic Definition of Probability, Bayes' Theorem and its applications, Bernoulli trial, Binomial and Poisson's distribution, Probability distribution function, Discrete and Continuous Random Variable, functions of random variables.

UNIT II

Expectation and Introduction to Estimation: Expected values of random variable, Conditional Expectations, Moments, Chebyshev and Schwartz Inequalities, Moment Generating Function, Chernoff Bound, Central Limit Theorem, Estimators for mean and variance, Random Vectors, Parameter estimation, Multidimensional Gaussian Law, Maximum likelihood estimators.

UNIT III

Random Sequences: Infinite-Length Bernoulli trials, Discrete-time Linear systems, Random Sequences, WSS Random Sequences and Power spectral densities, Markov Random Sequences, ARMA model and Markov Chain, Queuing Systems M/G/1, Birth-Death Process, Networks of Queues.

UNIT IV

Random Processes: Wide Sense and Strict Sense Stationary Processes, Poisson Counting

Process, Random Telegraph Signal, Wiener, Markov Random Process, Continuous time Linear Systems with random inputs, Periodic & Cyclostationary Processes, Vector Processes & State Equations.

UNIT V

Advanced topics in Random Processes: Mean-square Calculas, Stochastic Integrals & Differential Equations, Ergodicity, Karhunen-Loeve Expansion, Representation of bandlimited and Periodic Processes, Applications to Statistical Signal Processing.

Text Books:

1. Henry Stark, John W. Woods, "Probability and Random Processes with Application to Signal Processing" 3rd Edition, Pearson Education.
2. Sheldon M. Ross, "Introduction to Probability" 10th Edition, Elsevier.
3. Peebles, “Probability, Random Variables and Random Signal Principles”, MGH.

Reference Books:

1. Garcia & Garcia, “Network Modelling, Simulation and Analysis”, Marcel Dekker Inc.
2. Papoulis, “Probability, random variables and stochastic processes”, MGH.
3. Trivedi K.S., “Probability and Statistics with reliability, queuing and Computer Science Applications”, II Ed., Wiley.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC123	EC	Embedded System	60	20	20	0	0	3	1	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Introduction of the real time systems.
2. Computing required for the real time embedded systems.
3. Communication required for the real time embedded systems.
4. Present an overview of the real time embedded systems in practice.

Course Outcomes:

Students shall be able:

1. To present the mathematical model of the system.
2. To develop real time algorithm for task scheduling.
3. To understand the working of real time operating systems and real time database.
4. To work on design and development of protocols related to real time communication.

Syllabus:

UNIT I

Review of 8-Bit and 16-bit microprocessor, support chips and interfacing techniques, single chip micro-computers, architecture, program and data memory, ports, input Output interfacing and programming.

UNIT II

Single chip micro controllers- INTEL 8051/ 8751, MOTOROLA 68HC0/68HC11 architecture, instruction set and programming, Memory mapping, addressing modes, Registers, expanded modes. Interrupt handling timing and serial I / O.

UNIT III

Software development Modular approach, integrated software development environment, Object oriented interfacing and programming, Recursion and debugging.

UNIT IV

ATMEL 89C51 / 52 and PIC micro-Controllers: Case studies. Design and Application of MicroController in Data acquisition, Embedded controllers and Process control.

UNIT V

DSP Processor architecture and sample design using TI – DSP.

Text Books:

1. Majidi & Majidi, "Embedded Systems, 8051.

Reference Books:

1. John P. Peatman, "Design with Micro-Controllers",TMH.
2. Jonathan W. Valvano, "Embedded Micro-Computers System. Real time Interfacing", Thomson learning.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC133	EC	Mobile & Satellite Communication	60	20	20	0	0	3	1	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To gain knowledge about the Satellite system and mobile services provided
2. Understand how the various signal processing and coding techniques combat channel uncertainties
3. Understand the techniques of radio spectrum allocation in multi-user systems and their impact on networks capacity

Course Outcomes:

1. To model radio signal propagation issues and analyze their impact on communication system performance
2. Introduce various wireless systems and standards and their basic operation cases
3. To simulate wireless networks and analyze the simulation results

Syllabus:

UNIT I

Review of wireless and cellular radio Communication: The cellular concept, system design fundamentals, frequency reuse, reused distance, cluster size, channel assignment strategies, hand-off strategies, co-channel interference and system capacity, truncking and grade of service. Wideband CDMA concepts/principles.

UNIT II

Speech coding for wireless system applications and broadcast systems, Coding techniques for audio and voice and popular speech codes.

UNIT III

Brief introduction to radio channel characterization, multi-path propagation, co-channel interference, exponential power delay profile, propagation effects, scattering, ground reflection, fading, Log normal shadowing, coherence bandwidth. Modulation techniques for mobile and satellite communication, their generation, detection and performance of spectral and power efficiency.

UNIT IV

Physical layer techniques: diversity, spread spectrum, frequency hopping, direct sequence, adaptive equalization, Orthogonal Frequency Division Multiplexing (OFDM).

UNIT V

MAC protocols: 802.11 and its variants, ETSI-HILERAN type 1 MAC protocol, multiple access with collision avoidance. Introduction to GEO, MEO and LEO satellite systems, Antenna positioning in GEO and link calculations.

Text Books:

1. Rappaport T.S., "Wireless Communications: Principles and Practice", PH
2. A.F.Molish, "Wireless Communication", Pearson edu.
3. Schiller J., "Mobile communication", Addison Wesley.

Reference Books:

1. Wilkis and Garg, "Principles of GSM Technology", PHI
2. Ramji Prasad and Richard Van Nee, "OFDM Wireless Multimedia Communication", ArtechHouse.
3. Fehar K., "Wireless Digital Communication", PHI.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC114	EC	Information Theory & Coding	60	20	20	0	0	3	1	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The students should be able to:

1. Understand the basic classes of compression techniques
2. Be able to determine to best class of compression techniques to use in a particular situation.
3. Know how to apply compression techniques to practical situations.
4. Understand the ideas of entropy and information content.

Course Outcomes:

1. Design the channel performance using Information theory.
2. Comprehend various error control code properties.
3. Apply convolution codes for performance analysis & cyclic codes for error detection and correction.
4. Apply linear block codes for error detection and correction.

Syllabus:

UNIT I

Information Theory: Information, Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit, Lempel-Ziv coding, Source with memory and its entropy.

UNIT II

Discrete 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 a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon's theorem, Fading channel, channels with memory.

UNIT III

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 circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding

circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT IV

Cyclic codes and Introduction to BCH codes: Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, Cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.

UNIT V

Convolutional codes: Convolutional codes, code tree, trellis, state diagram, Encoding & Decoding: Sequential search and Viterbi algorithm, Principle of Turbo coding.

Text Books:

1. Lathi B. P., Modern Analog and Digital Communication Systems, Oxford Univ. Press.
2. Shu Lin and Costello, Error Control Coding: Theory and Application, PHI.
3. Sklar, Digital Communication, Pearson Education Asia.

Reference Books:

1. Haykins Simon, "Digital Communication", Wiley Publication.
2. S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007.
3. Amitabh Bhattacharya, "Digital Communication", TMH 2006.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC124	EC	CMOS VLSI Design	60	20	20	0	0	3	1	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects.
2. Be able to create models of moderately sized CMOS circuits that realize specified digital functions.
3. Be able to apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
4. Have an understanding of the characteristics of CMOS circuit construction

Course Outcomes:

1. Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.
2. To design static CMOS combinational and sequential logic at the transistor level, including mask layout.
3. Use different analysis and verification tools, implementation and synthesis methodologies and testability techniques that will enable them to design high performance and efficient digital systems.
4. Design digital systems for a variety of applications, including microcomputers and special purpose computing systems

Syllabus:

UNIT I

Fundamental of MOS Transistor its Characteristic under Static and Dynamic Conditions, MOS Transistor Secondary Effects, Process Variations, Technology Scaling, CMOS Inverter -Static Characteristic, Dynamic Characteristic, Power, Energy, and Energy Delay parameters.

UNIT II

Stick diagram, Layout diagrams, combinational logic design examples, Dynamic Logic Gates, Pass Transistor Logic, Power Dissipation, Low Power Design principles.

UNIT III

Static Latches and Registers, Dynamic Latches and Registers, Timing Issues, Pipelines, Pulse and sense amplifier based Registers.

UNIT IV

Data path circuits, Architectures for Adders, Accumulators, Multipliers, Barrel Shifters, Speed and Area Tradeoffs, Memory Architectures, and Memory control circuits

UNIT V

CMOS Processing Technology Introduction, Wafer Formation, Photolithography, N-well process, Twin tub process, Stick Diagrams, layout design rules, CMOS process enhancements.

Text Books:

1. Neil H.E. Weste, David Money Harris, "CMOS VLSI Design, A circuits and systems perspective", IV Edition, Pearson, 2010.
2. Neil H.E. Weste, David Money Harris Ayan Banerjee, "CMOS VLSI Design, A circuits and systems perspective", III Edition, Pearson Education, 2004.
3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw-Hill Education, 2002.
4. Peter Van Zant, "Microchip Fabrication, A Practical Guide to Semiconductor Processing", Sixth Edition, McGraw Hill Professional, 2013.

References Books:

1. Randall L. Geiger, Philip E. Allen, Noel R. Strader, "VLSI Design Techniques for analog and digital circuits", Tata McGraw Hill, 1989.
2. Sung Mo Kang, Yusuf Lebliabici, "CMOS Digital Integrated Circuits: Analysis and Design", IV Edition, Tata McGraw Hill, 2015.
3. Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design", III Edition, Prentice Hall, 1994.
4. S M Sze, VLSI Technology, II Edition, Tata McGraw-Hill Education, 2003.
5. Sorab Gandhi: "VLSI Fabrication Principles", Wiley India.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC134	EC	Optical Communication	60	20	20	0	0	3	1	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes.
4. To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM.

Course Outcomes:

1. Recognize and classify the structures of Optical fiber and types.
2. Analyze various coupling losses.
3. To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.
4. Familiar with Design considerations of fiber optic systems.

Syllabus:

UNIT I

Review of optical fiber communications, forms of communication systems, elements of an optical fiber transmission link, optical fiber systems. Optical fibers : Structure & wave guiding fundamentals, basic optical laws, optical fiber modes & configuration mode, theory for circular wave guides, graded index fiber structure.

UNIT II

Signal degradation in Optical fiber: Overview of fiber materials, signal distortion in optical wave guides, pulse broadening due to various types of dispersion mechanisms, mode coupling, optical fiber measurements.

UNIT III

Optical sources and photo detectors: LEDs, LASER diodes, light sources linearity, modal and reflection noise. Physical principles of photo diodes, photo detector noise, detector response time, Avalanche multiplication noise, photo diode materials.

UNIT IV

Power launching & coupling: Source of fiber power launching, lensing scheme for coupling improvement, fiber to fiber joints, splicing techniques, Optical fiber connectors. Introduction to coherent optical communication & applications of optical fibers. Optical modulation & receiver operation: Analog & digital modulation, fundamental receiver operation, digital receiver performance calculation, preamplifier design, analog receivers, heterodyne receiver.

UNIT V

Optical networks: Evolution of optical networks, SONET/SDH, WDM networks: architecture, elements and design.

Text Books:

1. Senior J.M., "Optical Fiber Communications: Principles & Practice", PHI.
2. Keiser G, "Optical Fiber Communication", McGraw Hill.
3. Agrawal Govind P., "Fiber Optic Communication Systems", John Wiley & Sons, students Ed.

Reference Books:

1. Djfar K Mynbaev & Scheiner, "Fiber Optic Communication Technology", Pearson.
2. Ramaswami and Sivrajan, "Optical Networks : A Practical Perspective", Pearson.
3. Black Uyless, "Optical Networks and 3rd Generation Transport Systems", Pearson.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTDC105	EC	LINUX & C Programming	0	0	0	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Build an understanding of the basic set of commands and utilities in Linux system.
2. Familiarize the student with the operating system of choice for computationally-intensive data analysis.
3. Introduce the student to the Linux computing environment.
4. To learn the C language and get experience programming in C.

Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Understand the basic set of commands and utilities in Linux system.
2. Develop software for Linux system.
3. Design extensive programmes in C.
4. Implement the important Linux library function and system calls.

Text Books:

1. David Haskins, "C Programming in Linux".

Reference Books:

1. Jasper Nuyens, "Linux C Programming: Fun and Powerful", Create Space Independent Publishing Platform.

List of Practical's:

1. Program to accept two numbers and print which is greater.
2. Program to accept a number and print if it is positive or negative,
3. Find smallest number in series of 10 numbers.
4. Accept a digit between 0 to 9 and print it in words.
5. Program to accept length and breadth of a rectangle and print its area.

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Master of Technology (Digital Communication)

SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC106	EC	MATLAB for Communication system	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To enable the student to synthesis and analyze wireless communication systems over a stochastic fading channel
2. To provide the student with an understanding of advanced multiple access techniques.
3. To develop understanding of diversity reception techniques.

Course Outcomes:

1. The student will be able to determine the type and appropriate model of wireless fading channel based on the system parameters
2. The student will be able to analyze and design receiver and transmitter diversity techniques.
3. The student will be able to synthesize the wireless systems.

Text Books:

1. Molisch: Wireless Communications, Wiley India.
2. Rappaport T.S., "Wireless communications", Second Edition, Pearson Education, 2010.
3. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.

Reference Books:

1. Proakis, Digital Communication, McGraw Hill.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Zeimer, Peterson and Borth: Introduction to Spread Spectrum Communication, Pearson Education

List of Practical's:

1. Study of Shannon's Capacity Theorem.
2. To study Maximum Likelihood Estimation.
3. To study Raised Cosine Filter and Moving Average Filter.
4. To Study various probability distribution functions.
5. To study Gibbs Phenomena.

6. To mitigate the distortion introduced by the channel on the transmitted signal using Adaptive Linear Equalizer (LE) on the received samples from ADC output.
7. To observe the BER performance of DS-CDMA using mixed codes in multipath channel using RAKE receiver for single user case.
8. To study propagation path loss models: indoor & outdoor.
9. To study Orthogonal Frequency Division Multiplexing (OFDM).