Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Digital Communication)

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*				
MTDC201	EC	WIRELESS 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 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:

The student will be able to:

1. Determine the type and appropriate model of wireless fading channel based on the system parameters
2. Analyze and design receiver and transmitter diversity techniques.
3. Synthesize the wireless systems.

Syllabus:

UNIT I

Large scale path loss, Path loss models: Free Space and Two-Ray models. Link Budget design, Small scale fading. Parameters of mobile multipath channels, Time dispersion parameters, Coherence bandwidth, Doppler spread & Coherence time. Fading due to Multipath time delay spread, flat fading, frequency selective fading, fading due to Doppler spread, fast fading, slow fading.

UNIT II

Multiple Access techniques: FDMA, TDMA, CDMA. Capacity calculations, Cellular concept, Frequency reuse, channel assignment, hand off, interference & system capacity, trunking & grade of service, Coverage and capacity improvement.

UNIT III

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IV

Equalization, Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS algorithms, Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

UNIT V

Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access. Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding, Performance of Spread Spectrum Systems with Forward Error Correction.

Text Books:

1. Molisch: Wireless Communications, Wiley India.
2. T.S. Rappaport, "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. To study SIMULINK and BerTool.
2. To mitigate the distortion introduced by the channel on the transmitted signal using Adaptive Linear Equalizer (LE) on the received samples from ADC output.
3. To observe the BER performance of DS-CDMA using mixed codes in multipath channel using RAKE receiver for single user case.
4. To study propagation path loss models: indoor & outdoor.
5. To study Orthogonal Frequency Division Multiplexing (OFDM).

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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
MTDC202	EC	MODERN DIGITAL SIGNAL PROCESSING	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. Students are expected to demonstrate the ability to design FIR and IIR filters by hand to meet specific magnitude and phase requirements.
2. Perform Z and inverse Z transforms using the definitions, Tables of Standard Transforms and Properties, and Partial Fraction Expansion.
3. Determine if a DT system is linear, time-invariant, causal, and memoryless, determine asymptotic, marginal and BIBO stability of systems given in frequency domain.

Course Outcomes:

1. Students will be able to design and implement digital filters by hand and by using MATLAB.
2. Use computers and MATLAB to create, analyze and process signals, and to simulate and analyze systems sound and image synthesis and analysis.
3. To plot and interpret magnitude and phase of LTI system frequency responses.

Syllabus:

UNIT I

Introduction of DSP and Discrete Fourier transforms: Properties of the DFT Decimation in time and decimation in frequency FFT algorithms, discrete cosine transform. Linear filtering methods based on the DFT.

UNIT II

Design of digital filters: IIR Filter design: Butterworth design, Bilinear Transformation. Low Pass, High Pass, Band Pass and Band Stop digital filters. Spectral transformation of IIR filters.
FIR filter design: Symmetric and Antisymmetric linear phase. FIR filter by rectangular, triangular and Hamming window functions.

UNIT III

Finite word length effects in FIR and IIR digital filters: Quantization, round off errors and overflow errors.
Multi rate digital signal processing: Concepts, design of practical sampling rate converters, Decimators, Interpolators, Polyphase decompositions. Applications of Multirate signal processing, Digital filter banks, two channel quadrature mirror filter banks, M-channel QMF bank.

UNIT IV

Adaptive filter: Applications of Adaptive filters, Adaptive direct form FIR filters, The LMS algorithm, Adaptive direct form filters, RLS algorithm.

UNIT V

Wavelet Transform: Introduction to Wavelets, wavelets and wavelet expansion systems, Discrete Wavelet Transform, multi resolution formulation of wavelet systems, Haar Wavelet and other wavelet representations, scaling function, wavelet functions.

Text Books:

1. John. G Proakis & D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Application", 4th Edition, Pearson Education.
2. S. K. Mitra, "Digital Signal Processing: A Computer Based Approach", 3rd Edition, TMH.
3. S.Salivahanan, A Vallavaraj & C.Gnanapriya, "Digital Signal Processing", TMH.
4. A.V. Oppenheim & R.W. Schaffer, "Digital Signal Processing", PHI.

Reference Books:

1. L. R. Rabiner & B. Gold, "Theory & application of Digital Signal Processing", PHI.
2. E.C. Ifeachor & B. W. Jarvis, " Digital Signal Processing: A Practitioner's approach", 2nd Edition, Pearson Education.
3. Thomas J. Cavicchi, "Digital Signal Processing", John Wiley & Sons.
4. Chi Tsong Chen, "Digital Signal Processing", Oxford.
5. Engelberg, Shlomo, "Digital Signal Processing", Springer.
6. D Antona & Gabriele, "Digital Signal Processing For Measurement", New Age International.
7. Robert. O. Cristi, "Modern Digital Signal Processing", Cengage Publishers.
8. Proakis, Rade & Ling, "Advanced DSP", Macmillan Publication.

List of Practical's:

1. Generation of basic signals with Proper Indexing.
2. Determine the Discrete Fourier Transform of the given sequence.
3. Determine circular convolution of given sequences.
4. Determine the DITFFT of the given sequence.
5. Design of IIR and FIR filters.

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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*				
MTDC203	EC	Advanced Communication System	60	20	20	0	0	3	1	0	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 develop a understanding of OFDM and MIMO systems.
2. To enable the students to differentiate between various type of receiver and fading characteristics.
3. To provide the knowledge of cognitive and cooperative systems.

Course Outcomes:

The student will be able to:

1. Analyze MIMO and OFDM systems and design systems with different fading channels.
2. Design various MIMO receivers.
3. Analyze and design cognitive and cooperative communication systems.

Syllabus:

UNIT I

Introduction, principle of OFDM, implementation of transceivers, frequency-selective channels, channel estimation, peak to average power ratio, inter carrier interference, adaptive modulation and capacity, multiple access, multi carrier code division multiple access, single carrier modulation with frequency-domain equalization.

UNIT II

MIMO systems: spatial multiplexing, System model, Pre-coding, Beam forming, transmitter diversity, receiver diversity, Channel state information, capacity in fading and non-fading channels.

UNIT III

Smart antennas, multiple input multiple output systems, multi user MIMO, MIMO System Model, Zero Forcing Receiver, MMSE receiver, Singular Value Decomposition of MIMO Channel, Asymptotic MIMO Capacity, Alamouti and Space-time codes.

UNIT IV

Cognitive Radios, Problem description, cognitive transceiver architecture, principle of interweaving, spectrum sensing, spectrum management, spectrum sharing, overlay, underlay.

UNIT V

Introduction and motivation for Cooperative Communication, fundamentals of relaying, relaying with multiple parallel relays, routing and resource allocation in multi hop networks, routing and resource allocation in collaborative networks, applications, network coding.

Text Books:

1. Molisch, "Wireless Communications", Wiley India.
2. Aditya K. Jagannatham, "Prinicples of Modern Wireless Communication System", McGraw Hill.
3. Ramji Prasad and Richard Van Nee, "OFDM Wireless Multimedia Communication", Artech House.

Reference Books:

1. Proakis, "Digital Communication", McGraw Hill.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Marvin K. Simon, Mohamed-Slim Alouini, "'Digital Communication over Fading Channels", 2nd Ed., Wiley-IEEE Press 2004.

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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*				
MTDC214	EC	Cryptography & E-Security	60	20	20	0	0	3	1	0	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:

Students are expected to demonstrate the ability to:

1. Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.
2. Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms.
3. Analyze existing authentication and key agreement protocols; identify the weaknesses of these protocols.

Course Outcomes:

1. Students will be able to download and install an e-mail and file security software, PGP, and efficiently use the code to encrypt and sign messages. …
2. Develop SSL or Firewall based solutions against security threats, employ access control techniques to the existing computer platforms such as Unix and Windows NT.
3. Write an extensive analysis report on any existing security product or code, investigate the strong and weak points of the product or code.

Syllabus:

UNIT I

The distributed information systems security problem: Basic definitions, risk analysis, physical security of systems, personnel security of documents and keys, Possible security violations, security attack, mechanism and services, X.800 security services and their categories, Network security models.

UNIT II

Cryptographic Tools: Symmetric key systems, Caesar, Mono-alphabetic, Playfair, Hill cipher etc., Block cipher method, Simplified DES, DES, Feistel algorithm, avalanche effect, block cipher modes of operation (ECB, CBC, CFB, OFB, CTR),

UNIT III

Elements of finite fields, Galois Field GF (p), Euclid's algorithm Cryptography & E-Security of GCD, polynomial arithmetic, AES triple DES, Blowfish.

UNIT IV

Message digest functions, key management, privacy issues (clipper / skipjack.), Confidentiality. Asymmetric key systems, RSA, ECC, hash function and algorithms. Authentication: Authentication requirements, message authentication codes, authentication protocols, kerberos, X.509 certificates. Message Security: Digital signature (RSA, DSS, MD5).

UNIT V

Electronics Mail implementations (PGP, PEM, S/MIME), World Wide Web Transactions. System Security: E-security issues, types of network attacks (e.g. denial of service), firewalls, DeMilitarized Zones (DMZ), Intrusion Detection System (IDS). System Management - IP security, SNMP Version, Database Security.

Text Books:

1. W. Stallings, "Cryptography and network security", Pearson Education.
2. Schiller, "Applied Cryptography", Wiley.
3. Kahate, "Cryptography and Network Security", TMH.

Reference Books:

1. C. Kaufman, R. Perlman, S. Speciner, "Network Security", PH..
2. D. Champman, E. Zwickey, "Building Internet Firewalls", O'Reilly and Associates.
3. Albrecht Beutelspacher, "Cryptology", Cambridge Univ.

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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*				
MTDC224	EC	Antenna Theory and Design	60	20	20	0	0	3	1	0	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. Distinguish (with specifications) appropriate antenna for specific wireless communication system.
2. Devise (with specifications) appropriate antenna for specific wireless communication system.
3. Decide (with specifications) appropriate antenna for specific wireless communication system.

Course Outcomes:

1. An ability to explain the basic concepts of electromagnetic wave theory.
2. Will be able to describe basic radiating antennas.
3. Select antennas and antenna arrays as per their operating frequency ranges and radiation pattern for the specific application & mode of wave propagation.

Syllabus:

UNIT I

Antenna fundamental and definitions: Radiation mechanism - overview, EM fundamentals, Solution of Maxwell's equations for radiation problems, Ideal dipole, Radiation patterns, Directivity and gain, Antenna impedance, Radiation efficiency, Antenna polarization.

UNIT II

Resonant Antennas: Wires and patches, Dipole antenna, Yagi-Uda antennas, Microstrip antenna. Arrays: Array factor for linear arrays, Uniformly excited equally spaced linear arrays, Pattern multiplication, Directivity of linear arrays, Non-uniformly excited equally spaced linear arrays, Mutual coupling, Multidimensional arrays, Phased arrays, Feeding techniques, Perspectives on Arrays.

UNIT III

Broadband antennas: Travelling wave antennas, helical antennas, Biconical antennas Sleeve antennas, and Principles of frequency independent antennas, Spiral antennas, and Log - periodic antennas.

UNIT IV

Aperture antennas: Techniques for evaluating gain, Reflector antennas - Parabolic reflector antenna principles, Ani-symmetric parabolic reflector antenna, Offset parabolic reflectors, Dual reflector antennas, Gain calculations for reflector antennas, Feed antennas for reflectors, FiECS representations, Matching the feed to the reflector, General feed model, Feed antennas used in practice.

UNIT V

Antenna Synthesis: Formulation of the synthesis problem, Synthesis principles, Line sources shaped beam synthesis, Linear array shaped beam synthesis, Fourier series, Woodward - Lawson sampling method, Comparison of shaped beam synthesis methods, low sidelobe narrow main beam synthesis methods, Dolph-Chebyshev linear array, Taylor line source method.

Text Books:

1. Jordan and Balman, “Electromagnetic Waves and Radiating System”, PHI Learning.
2. C. A. Balanis, “Antenna Theory Analysis and Design”, John Wiley, 2nd Edition, 1997.

Reference Books:

1. Stutman and Thiele, "Antenna theory and design", 2nd edition John Wiley and sons Inc.
2. Sachidnanda et al, "Antennas and propagation", Pearson Education.
3. J. D. Kraus, “Antennas”, McGraw Hill TMH, 3rd /4th Edition.

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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*				
MTES203	EC	FPGA - based System Design	60	20	20	0	0	3	1	0	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. Students will implement real-world designs in field programmable gate arrays (FPGAs) as well as test and optimize the FPGA-implemented systems.
2. Students will get exposure to medium-scale digital system design projects.
3. Design and optimize complex combinational and sequential digital circuits.

Course Outcomes:

1. Students will be able to understand the FPGA Architecture.
2. Students will be able to design and model digital circuits with Verilog HDL at behavioral, structural, and RTL Levels
3. To Develop test benches to simulate combinational and sequential circuits.

Syllabus:

UNIT I

Programmable logic devices (PLDs). Programmable gate arrays. Xilinx series FPGAs and CPLDs. Altera series CPLDs and FPGAs. FPGA- based system design. FPGA fabrics. Combinational network delay. Power and energy optimization sequential machine design styles. Rules for clocking. Performance analysis.

UNIT II

Algorithms for fast convolution. Algorithmic strength reduction in filters and transforms. DCT and inverse DCT. Parallel FIR filters. Pipelining of FIR filters. Parallel processing. Pipelining and parallel processing for low power.

UNIT III

Bit level arithmetic structures- parallel multipliers, interleaved floor plan and bit plan based digital filters. Bit serial multipliers. Bit serial filter design and implementation. Canonic signed digit arithmetic, Distributed arithmetic.

UNIT IV

Synthesis and simulation using HDLs-Logic synthesis using verilog and VHDL. Short time Fourier Transform Computation of DWT using filter banks. Implementation and verification on FPGAs.

UNIT V

Computation of special functions using CORDIC. Vector and rotation mode of CORDIC. CORDIC architectures. Implementation and verification on FPGAs.

Text Books:

1. W. Wolf, "FPGA-Based System Design, Pearson, 2004".
2. U. Meyer- Basese, "Digital Signal Processing with Field Programmable Gate Arrays", Springer, 2004.

Reference Books:

1. K. K. Parhi, "VLSI Digital Signal Processing Systems, John Wiley, 1999.

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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*				
MTDC215	EC	Digital Image Processing	60	20	20	0	0	3	1	0	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. Understand image formation and the role human visual system plays in perception of grey and color image data.
2. Learn the signal processing algorithms and techniques in image enhancement and image restoration.
3. Develop understanding of various applications of image processing in industry, medicine, and defense.

Course Outcomes:

1. Acquire an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems.
2. Be able to conduct independent study and analysis of image processing problems and techniques.
3. Be able to apply Image enhancement/ restoration/ compression and Segmentation techniques used in digital image processing.

Syllabus:

UNIT I

Digital Image Fundamentals: A simple image model, Sampling and Quantization, Imaging Geometry, Digital Geometry, Image Acquisition Systems, Different types of digital images. Bi-level Image Processing: Basic concepts of digital distances, distance transform, medial axis transform, component labelling, thinning, morphological processing, extension to grey scale morphology.

UNIT II

Binarization and Segmentation of Grey level images: Histogram of grey level images, optimal thresholding using Bayesian classification, multilevel thresholding, Segmentation of grey level images, Water shade algorithm for segmenting grey level image.

UNIT III

Detection of edges and lines in 2D images: First order and second order edge operators, multi-scale edge detection, Canny's edge detection algorithm, Hough transform for detecting lines and curves, edge linking.

UNIT IV

Images Enhancement: Point processing, Spatial Filtering, Frequency domain filtering, multi-spectral image enhancement, image restoration.

Image compression: Lossy and lossless compression schemes, prediction based compression schemes, vector quantization, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme.

UNIT V

Color Image Processing: Color Representation, Laws of color matching, chromaticity diagram, color enhancement, color image segmentation, color edge detection, color demosaicing Image Registration and depth estimation: Registration Algorithms, Stereo Imaging, Computation of disparity map.

Text Books:

1. Gonzalez and Woods, "Digital Image Processing", Prentice-Hall.
2. Anil K Jain, "Fundamentals of Digital image processing". PHI.

Reference Books:

1. Sonka, Hlavac & Boyle, "Digital image processing and computer vision", Cengage learning, India Edition.
2. B Chanda, D. Dutta Majumder, "Digital image Processing and Analysis", PHI.
3. Annadurai, "Fundamentals of Digital Image Processing", Pearson Education.
4. Jayaraman, Esakkirajan and Veerakumar, "Digital Image Processing", TMH.
5. William K. Pratt, "Digital Image Processing", Wiley India.

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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
MTDC225	EC	Artificial Intelligence	60	20	20	0	0	3	1	0	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. Students will have a broad understanding of the fundamental theories, concepts, and applications of computer science.
2. Students will be prepared for careers in computer science and information technology.
3. Students will communicate effectively, both orally and in writing.

Course Outcomes:

1. Understand different types of AI agents.
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).
3. Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.

Syllabus:

UNIT I

Introduction to AI and AI Techniques: Problems, Problem space and Sate space, Production systems, Search techniques and algorithms.

UNIT II

Knowledge Representation: Issues and Methods, Predicate logic- resolution and unification, Forward and backward Reasoning, Logic programming & Prolog.

UNIT III

Symbolic computation: Uncertainty, Rule based systems, Statistical Reasoning, Fuzzy Logic, Expert systems, Decision support systems.

UNIT IV

Semantic networks: Frames and Scripts, Conceptual Dependency, Game playing, Planning overview, understanding, learning.

UNIT V

Natural language processing: parsing, semantic analysis, ATN and RTNs, Connectionists models- neural networks, Speech and vision processing, Robotic actions.

Text Books:

1. E Rich, K Knight, "Artificial Intelligence", McGraw Hill.
2. S Russell, P Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education (PH).

Reference Books:

1. D W Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI.
2. P Winston, Addison Wesley, "Artificial Intelligence".
3. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", Morgan-Kaufmann.

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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*				
MTDC235	EC	RF And Microwave Circuit Design	60	20	20	0	0	3	1	0	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 the basic theory pertaining to microwaves and other high-frequency devices and subsystems
2. To examine some of its applications to modern communication systems.
3. To Demonstrate fundamental understanding of microwave components and circuits in terms of electrical characteristics of waveguides and transmission lines through electromagnetic field analysis, basics of microwave amplifiers based on stability, bandwidth, gain, and noise figure criteria.

Course Outcomes:

1. Students will gain proficiency in using s-parameters in designing passive and active microwave circuits.
2. Demonstrate fundamental understanding of the various semiconductor devices, amplifiers and fabrication techniques of microwave Integrated circuits.
3. Gain proficiency in using various microwave sources, their principle of operation and measurement of various parameters.

Syllabus:

UNIT I

Wave propagation in network: Introduction, Reasons for using RF and Microwaves, Applications, RF waves.

UNIT II

RF and Microwave circuit design, Introduction to components basics, Analysis of simple circuit phasor domain, RF impedance matching, Properties of waves, transmission media, Micro strip lines, High frequency parameters, Formulation of S-parameters, Properties, Transmission Matrix, Generalized S-parameters.

UNIT III

Passive circuit design: Introduction, Smith chart, Scales, Application of Smith chart, Design of matching networks, definition of impedance matching, Matching using lumped and distributed elements. Basic consideration in active networks, design of amplifiers, oscillators and detector: Stability consideration, Gain consideration, Noise consideration.

UNIT IV

Linear and Nonlinear design: Introduction, Types of amplifier, Design of different types of amplifiers, Multistage small signal amplifiers, Design of transistor oscillators, Detector losses, detector design.

UNIT V

Mixers Phase shifters and RF and Microwave IC design: Mixer types, Conversion loss for SSB mixers, One diode mixer, Phase shifters, Digital phase shifters, Semiconductor phase shifters, RF and microwave IC design, MICs, MIC materials, Types of MICs, Hybrid verses monolithic ICs, Chip materials.

Text Books:

1. Matthew M. Radmanesh, "RF and Microwave Electronics Illustrated", Pearson Education edition.
2. Reinhold Ludwig, and Pavel Bretchko,"RF circuit design theory and applications", Pearson Education edition, 2004.
3. George D. Vendelin, Anthony M. Pavio, Ulrich L. Rohde, “Microwave Circuit Design Using Linear and Nonlinear Techniques”, 2nd Edition.
4. Liao, “Microwave Devices and Circuits”, Pearson Education.

Reference Books:

1. Ali A. Behagi and Stephen D. Turner, “Microwave and RF Engineering An Electronic Design Automation Approach”, Volume 1, BT Microwave LLC State College, PA 16803.
2. Das, “Microwave Engineering”, TMH.
3. Rao, “Microwave Engineering”, PHI Learning.
4. Collins, “Foundations of Microwave Engineering”, Wiley India.
5. Reich, “Microwave Principles”, East West Press.
6. Pozar, “Microwave Engineering”, Wiley India.

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Master of Technology (Digital Communication)

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*				
MTDC206	EC	Simulation Tools for Advance communication system	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. To develop a understanding of OFDM and MIMO systems.
2. To enable the students to differentiate between various type of receiver and fading characteristics.
3. To provide the knowledge of cognitive and cooperative systems.

Course Outcomes:

The student will be able to:

1. Analyze MIMO and OFDM systems and design systems with different fading channels.
2. Design various MIMO receivers.
3. Analyze and design cognitive and cooperative communication systems.

Text Books:

1. Molisch, "Wireless Communications", Wiley India.
2. Aditya K. Jagannatham, "Prinicples of Modern Wireless Communication System", McGraw Hill.
3. Ramji Prasad and Richard Van Nee, "OFDM Wireless Multimedia Communication", Artech House.

Reference Books:

1. Proakis, "Digital Communication", McGraw Hill.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Marvin K. Simon, Mohamed-Slim Alouini, "'Digital Communication over Fading Channels", 2nd Ed., Wiley-IEEE Press 2004.

List of Practical's:

1. To calculate the bit error rate for OFDM system.
2. Channel capacity of MIMO systems in Wireless communication.
3. Energy detection simulation for cognitive radio.
4. Water filling model in a MIMO system.
5. MIMO Rayleigh fading Channel Capacity.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Deputy Registrar
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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*				
MTDC207	EC	MATLAB Simulation & Coding for DIP Applications	0	0	0	30	20	0	0	2	1

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Course Objectives:

1. Understand image formation and the role human visual system plays in perception of grey and color image data.
2. Learn the signal processing algorithms and techniques in image enhancement and image restoration.
3. Develop understanding of various applications of image processing in industry, medicine, and defense.

Course Outcomes:

1. Acquire an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems.
2. Be able to conduct independent study and analysis of image processing problems and techniques.
3. Be able to apply Image enhancement/ restoration/ compression and Segmentation techniques used in digital image processing.

Text Books:

1. Gonzalez and Woods, "Digital Image Processing", Prentice-Hall.
2. Anil K Jain, "Fundamentals of Digital image processing". PHI.

Reference Books:

1. Sonka, Hlavac & Boyle, "Digital image processing and computer vision", Cengage learning, India Edition.
2. B Chanda, D. Dutta Majumder, "Digital image Processing and Analysis", PHI.
3. Annadurai, "Fundamentals of Digital Image Processing", Pearson Education.
4. Jayaraman, Esakkirajan and Veerakumar, "Digital Image Processing", TMH.
5. William K. Pratt, "Digital Image Processing", Wiley India.

List of Practical's:

1. To generate Matrix with various methods and understand Matrix related function.
2. Reading and Display image.
3. Inverting color.
4. Adding boundary frame to the image.
5. Binarization using threshold.

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