SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

Scheme of examination as per AICTE model Curriculum w.e.f July 2020

Grading System

Course Name –Master of Technology (MWM)

Semester I / Year : I **Scheme for 2020 Admitted Students onwards**

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Hours/ Week			Credit	Total Marks
				Theory			Practical						
				End Sem.	Mid Sem	Quiz, Assignment	End Sem	Term Work	L	T	P		
1	MTMW 11	CORE	ADVANCED DIGITAL SIGNAL PROCESSING	100	30	30	50	50	3	1	4	6	260
2	MTMW 12	CORE	ANTENNA AND RADIATING SYSTEMS	100	30	30	50	50	3	1	4	6	260
3	MTMW 13	CORE	REASEARCH METHODOLOGY AND IPR	100	30	30	-	-	3	1	-	4	160
4	MTMW 14	PE	ELECTIVE-1	100	30	30	-	-	4	1	-	4	160
5	MTMW 15	PE	ELECTIVE-1I	100	30	30	-	-	4	1	-	4	160
6	MTMW 16	AUDIT	AUDIT I	-	-	-	-	-	2		-	-	-
TOTAL				**500**	**150**	**150**	**100**	**100**	**17**	**5**	**8**	**24**	**1000**

L: Lecture **T:Tutorial** **P:Practical**

ELECTIVE -I	ELECTIVE -II	
MTMW 141.MIMO SYSTEM	**MTMW 151. MICROCONTROLLER SYSTEM DESIGN**	
MTMW 142.REMOTE SENSING	MTMW 152.COGNITIVE RADIO	
MTMW 143.VOICE AND DATA NETWORK	MTMW 153.DSP ARCHITECTURE	

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Scheme of examination as per AICTE model Curriculum w.e.f July 2020

Grading System

Course Name –Master of Technology (MWM)

Semester II / Year : I **Scheme for 2020 Admitted Students onwards**

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Hours/ Week			Credit	Total Marks
				Theory			Practical						
				End Sem.	Mid Sem	Quiz, Assignment	End Sem	Term Work	L	T	P		
1	MTMW 21	CORE	ADVANCED MICROWAVE DEVICES	100	30	30	50	50	4	1	2	6	260
3	MTMW 22	CORE	EMT THEORY	100	30	30	50	50	4	1	2	6	260
4	MTMW 23	PROG SPECIFIC ELECTIVE	ELECTIVE III	100	30	30	-	-	4	1	-	5	160
5	MTMW 24	PROG SPECIFIC ELECTIVE	ELECTIVE IV	100	30	30	-	-	4	1	-	5	160
6	MTMW 25	CORE	MINI PROJECT	-	-	-	100	60	-	-	4	2	160
7	MTMW 26	AUDIT	AUDIT - II	-	-	-	-		2	-	-	-	-
TOTAL				**400**	**120**	**120**	**200**	**160**	**18**	**4**	**8**	**24**	**1000**

L: Lecture **T:Tutorial** **P:Practical**

ELECTIVE -III	**ELECTIVE -IV**	
MTMW 231.SATELLITE COMMUNICATION	MTMW 241. COGNITIVE RADIO	
MTMW 232. MICROWAVE MESURMENT	MTMW 242.MIMO SYSTEM	
MTMW 233.VOICE ABD DATA NETWORKS	**MTMW 243.ADVANCED COMMUNICATION SYSYTEM**	

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Scheme of examination as per AICTE model Curriculum w.e.f July 2020

Grading System

Course Name –Master of Technology (MWM)

Semester III / Year : II **Scheme for 2020 Admitted Students onwards**

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Hours/ Week			Credit	Total Marks
				Theory			Practical						
				End Sem.	Mid Sem	Quiz, Assignment	End Sem	Term Work	L	T	P		
1	**MTMW31**	PE	ELECTIVE V	**100**	**30**	**30**	-	-	**4**	**1**	-	**5**	**160**
2	**MTMW32**	**OE**	**OE**	**100**	**30**	**30**	-	-	**4**	**1**	-	**5**	**160**
3	MTMW DP(1)	DESSERTATION	DESSERTATION (PHASE-I)	-	-	-	400	280	-	-	20	10	680
TOTAL				200	60	60	400	280	8	2	20	**20**	**1000**

L: Lecture **T:Tutori** **P:Practical**

ELECTIVE -V	OPEN ELECTIVE
MTMW311.INFORMATION THEROY & CODING	**MTMW321.Business Analytics**
MTMW312.SELECTED TOPICS IN	MTMW322.OPERATIONS
MTMW313.NANO MATERIAL AND	MTMW23 COST MANAGEMENT OF

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Scheme of examination as per AICTE model Curriculum w.e.f July 2020

Grading System

Course Name –Master of Technology (MWM)

Semester IV / Year : II **Scheme for 2020 Admitted Students on**

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Hours/ Week			Credit	Total Marks
				Theory			Practical						
				End Sem.	Mid Sem	Quiz, Assignment	End Sem	Term Work	L	T	P		
1	MTMW DP (II)	DESSERTATION	DESSERTATION (PHASE-II)	-	-	-	500	500	-	-	30	15	1000
TOTAL				-	-	-	500	500	-	-	30	**15**	**1000**

L: Lecture **T:Tutori** **P:Practical**

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 11 ADVANCED DIGITAL SIGNAL PROCESSING

Unit 1

Overview of DSP,Characterization in time and frequency, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design &structures, design techniques of linear phase FIR filters,IIR filters by impulse invariance, bilinear transformation,FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.

Unit 2

Multi rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in subband coding.

Unit 3

Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction.

Unit 4

Adaptive Filters, Applications, Gradient Adaptive Lattice,Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm

Unit 5

Estimation of Spectra from Finite-Duration Observations of Signals. Nonparametric Methods for Power Spectrum Estimation,Parametric Methods for Power Spectrum Estimation, Minimum-Variance Spectral Estimation, Eigenanalysis Algorithms for Spectrum Estimation.

Unit6

Application of DSP & Multi rate DSP, Application to Radar, introduction to wavelets, application
to image processing, design of phase shifters, DSP in speech processing & other applications

References:

- J.G.Proakis and D.G.Manolakis"Digital signal processing: Principles, Algorithm and Applications", 4th Edition, Prentice Hall, 2007.
- N. J. Fliege, "Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets", 1st Edition, John Wiley and Sons Ltd, 1999.
- Bruce W. Suter, "Multirate and Wavelet Signal Processing",1st Edition, Academic Press, 1997.
- M. H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley & Sons

Inc., 2002.
 S.Haykin, “Adaptive Filter Theory”, 4th Edition, Prentice Hall, 2001.
 D.G.Manolakis, V.K. Ingle and S.M.Kogon, “Statistical and Adaptive Signal Processing”, McGraw Hill, 2000.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 12 ANTENNA AND RADIATING SYSTEMS

Unit 1:

Types of Antennas: Wire antennas, Aperture antennas, Micro strip antennas, Array antennas Reflector antennas, Lens antennas, Radiation Mechanism, Current distribution on thin wire antenna. Fundamental Parameters of Antennas: Radiation Pattern, Radiation Power Density, Radiation Intensity, Directivity, Gain, Antenna efficiency, Beam efficiency, Bandwidth, Polarization, Input Impedance, radiation efficiency, Antenna Vector effective length, Friis Transmission equation, Antenna Temperature.

Unit 2:

Linear Wire Antennas: Infinitesimal dipole, Small dipole, Region separation, Finite length dipole, half wave dipole, Ground effects. Loop Antennas: Small Circular loop, Circular Loop of constant current, Circular loop with non uniform current.

Unit 3:

LinearArrays: Two element array, N Element array: Uniform Amplitude and spacing,Broadside and End fire array, Super directivity, Planar array, Design consideration.

Unit 4:

Aperture Antennas: Huygen’s Field Equivalence principle, radiation equations, Rectangular Aperture, Circular Aperture. Horn Antennas: E-Plane, H-plane Sectoral horns, Pyramidal and Conical horns.

Unit 5:

Micro strip Antennas: Basic Characteristics, Feeding mechanisms, Method of analysis, Rectangular Patch, Circular Patch.

Unit 6:

Reflector Antennas: Plane reflector, parabolic reflector, Cassegrain reflectors, Introduction to MIMO.

References:

- Constantine A. Balanis, “Antenna Theory Analysis and Design”, John Wiley & Sons, 4th edition, 2016.
- John D Kraus, Ronald J Marhefka, Ahmad S Khan, “Antennas for All Applications”, Tata McGraw-Hill, 2002.
- R.C.Johnson and H.Jasik, “Antenna Engineering hand book”, Mc-Graw Hill, 1984.
- I.J.Bhal and P.Bhartia, “Micro-strip antennas”, Artech house, 1980.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW13 REASEARCH METHODOLOGY AND IPR

Unit 1

Foundations of Research: Meaning, Objectives, Motivation, Utility. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable, Research process, Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance

Assignment 1: Identify Research Problem based on Trends

Unit 2

Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

Assignment 2: Identify Research methodology for Research Problem identified

Unit 3

Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.

Assignment3: Propose a method for Data Analysis on Research problem identified

Unit 4

Importance of Literature Review. Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.

Assignment 4: Write paper on Literature Review of your research Problem

Unit 5

Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like Latex/MS Office, Software for detection of Plagiarism. Documentation of Research work, Synopsis, Presentations, Writing Research papers on experimentation results, proposed methods, thesis formats

Assignment 5: Write Synopsis for proposed Research Problem

Reference Books:

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
3. Research Methodology – C.R.Kothari
4. Select references from the Internet.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 141.MIMO SYSTEM

Unit 1:

Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems.

Unit 2:

Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation

Unit 3:

The generic MIMO problem, Singular Value Decomposition, Eigenvalues and eigenvectors, Equalising MIMO systems, Disadvantages of equalising MIMO systems, Predistortion in MIMO systems, Disadvantages of pre-distortion in MIMO systems, Pre-coding and combining in MIMO systems, Advantages of pre-coding and combining, Disadvantages of precoding and combining, Channel state information.

Unit 4:

Codebooks for MIMO, Beamforming, Beamforming principles, Increased spectrum efficiency, Interference cancellation, Switched beamformer, Adaptive beamformer, Narrowband beamformer, Wideband beamformer

Unit 5:

Case study: MIMO in LTE, Codewords to layers mapping, Pre-coding for spatial multiplexing, Pre-coding for transmit diversity, Beamforming in LTE, Cyclic delay diversity based pre-coding, Pre-coding codebooks, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environments, Complex baseband multipath channels, Narrowband and wideband channels, MIMO channel models

Unit 6:

Channel Estimation, Channel estimation techniques, Estimation and tracking, Training based channel estimation, Blind channel estimation, Channel estimation architectures, Iterative channel

estimation, MMSE channel estimation, Correlative channel sounding, Channel estimation in single carrier systems, Channel estimation for CDMA, Channel estimation for OFDM.

References:

- Claude Oestges, Bruno Clerckx, "MIMO Wireless Communications : From Real-world Propagation to Space-time Code Design",Academic Press, 1st edition, 2010.
- Mohinder Janakiraman, “Space - Time Codes and MIMO Systems”, Artech House Publishers, 2004.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 142.REMOTE SENSING

Unit 1:

Physics Of Remote Sensing: Electro Magnetic Spectrum, Physics of Remote Sensing- Effects of Atmosphere-Scattering - Different types - Absorption-Atmospheric window-Energy interaction with surface features -Spectral reflectance of vegetation, soil and water atmospheric influence on spectral response patterns-multi concept in Remote sensing.

Unit 2:

Data Acquisition: Types of Platforms - different types of aircrafts-Manned and Unmanned spacecrafts - sun synchronous and geo synchronous satellites - Types and characteristics of different platforms -LANDSAT,SPOT,IRS,INSAT,IKONOS,QUICKBIRD etc

Unit 3:

Photographic products, B/W, color, color IR film and their characteristics -resolving power of lens and film -Opto mechanical electro optical sensors -across track and along track scanners-multispectral scanners and thermal scanners - geometric characteristics of scanner imagery - calibration of thermal scanners.

Unit 4:

Scattering System: Microwave scatterometry, types of RADAR -SLAR -resolution - range and azimuth -real aperture and synthetic aperture RADAR. Characteristics of Microwave images topographic effect-different types of Remote Sensing platforms - airborne and space borne sensors -ERS, JERS, RADARSAT, RISAT -Scatterometer, Altimeter-LiDAR remote sensing, principles, applications.

Unit 5:

Thermal And Hyper Spectral Remote Sensing: Sensors characteristics-principle of spectroscopy-imaging spectroscopy - field conditions, compound spectral curve, Spectral library, radiative models, processing procedures, derivative spectrometry, thermal remote sensing - thermal sensors, principles, thermal data processing, applications.

Unit 6:

Data Analysis: Resolution‑Spatial, Spectral, Radiometric and temporal resolution-signal to noise ratio-data products and their characteristics-visual and digital interpretation‑Basic principles of data processing ‑Radiometric correction‑Image enhancement‑Image classification‑ Principles of LiDAR, Aerial Laser Terrain Mapping.

References:

- Lillesand T.M., and Kiefer,R.W. Remote Sensing and Image interpretation, John Wiley & Sons-2000, 6thEdition
- John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 2nd Edition, 1995.
- John A.Richards, Springer ‑Verlag, Remote Sensing Digital Image Analysis,1999.
- Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995.
- Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006.
- Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman& Co, 1978

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 143.VOICE AND DATA NETWORK

Unit 1

Network Design Issues, Network Performance Issues, Network Terminology, centralized and distributed approaches for networks design, Issues in design of voice and data networks.

Unit 2

Layered and Layer less Communication, Cross layer design of Networks, Voice Networks (wired and wireless) and Switching, Circuit Switching and Packet Switching, Statistical Multiplexing.

Unit 3

Data Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms (ARQ), Hybrid ARQ (HARQ), Go Back N, Selective Repeat protocols and their analysis.

Unit 4

Queuing Models of Networks , Traffic Models , Little's Theorem, Markov chains, M/M/1 and other Markov systems, Multiple Access Protocols , Aloha System , Carrier Sensing , Examples of Local area networks,

Unit 5

Inter-networking , Bridging, Global Internet , IP protocol and addressing , Sub netting , Classless Inter domain Routing (CIDR) , IP address lookup , Routing in Internet. End to End Protocols, TCP

and UDP. Congestion Control , Additive Increase/Multiplicative Decrease , Slow Start, Fast Retransmit/ Fast Recovery,

Unit 6

Congestion avoidance, RED TCP Throughput Analysis, Quality of Service in Packet Networks. Network Calculus, Packet Scheduling Algorithms.

References:

- D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, Prentice Hall, 1992.
- L. Peterson and B. S. Davie, “Computer Networks: A Systems Approach”,5th Edition, Morgan Kaufman, 2011.
- Kumar, D. Manjunath and J. Kuri, “Communication Networking: An analytical approach”, 1st Edition, Morgan Kaufman, 2004.

- Walrand, "Communications Network: A First Course", 2nd Edition, McGraw Hill, 2002.
- Leonard Kleinrock, "Queueing Systems,Volume I: Theory", 1st Edition, John Wiley and Sons, 1975.
- Aaron Kershenbaum, "Telecommunication Network Design Algorithms", McGraw Hill, 1993.
- Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGraw Hill, 1987

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MTMW 151. MICROCONTROLLER SYSTEM DESIGN

Unit 1

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.

Unit2

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.

Unit3

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

Unit 4

ATMEL 89C51 / 52 and PIC micro-Controllers- Case studies. Design and application of Micro-Controller in Data acquisition, embedded controllers, Process control etc.

Unit 5

DSP Processor architecture and sample design using TI – DSP.

Reference Books:

1. Embedded Systems 8051 by Majidi & Majidi
2. Design with Micro-Controllers by John P. Peatman TMH
3. Embedded Micro-Computers System by Jonathan W. Valvano
4. Data Manuals – Intel Motorola.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 152.COGNITIVE RADIO

Unit 1:

Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.

Unit 2:

Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).

Unit 3:

Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.

Unit 4:

Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.

Unit 5:

Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).

Unit 6:

Research Challenges in Cognitive Radio: Network layer and transport layer issues, crosslayer design for cognitive radio networks.

References:

- Ekram Hossain, Dusit Niyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge University Press, 2009.
- Kwang-Cheng Chen, Ramjee Prasad, “Cognitive radio networks”, John Wiley & Sons Ltd., 2009.

- Bruce Fette, "Cognitive radio technology", Elsevier, 2nd edition, 2009.
- Huseyin Arslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems", Springer, 2007.
- Francisco Rodrigo Porto Cavalcanti, Soren Andersson, "Optimizing Wireless Communication Systems" Springer, 2009.
- Linda Doyle, "Essentials of Cognitive Radio", Cambridge University Press, 2009.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 153.DSP ARCHITECTURE

Unit 1 :

Programmable DSP Hardware: Processing Architectures (von Neumann, Harvard), DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT), IEEE standard for Fixed and Floating Point Computations, Special Architectures Modules used in Digital Signal Processors (like MAC unit, Barrel shifters), On-Chip peripherals, DSP benchmarking.

Unit 2:

Structural and Architectural Considerations: Parallelism in DSP processing, Texas Instruments TMS320 Digital Signal Processor Families, Fixed Point TI DSP Processors: TMS320C1X and TMS320C2X Family,TMS320C25 ‐Internal Architecture, Arithmetic and Logic Unit, Auxiliary Registers, Addressing Modes (Immediate, Direct and Indirect, Bit-reverse Addressing), Basics of TMS320C54x and C55x Families in respect of Architecture improvements and new applications fields, TMS320C5416 DSP Architecture, Memory Map, Interrupt System, Peripheral Devices, Illustrative Examples for assembly coding.

Unit 3:

VLIW Architecture: Current DSP Architectures, GPUs as an alternative to DSP Processors, TMS320C6X Family, Addressing Modes, Replacement of MAC unit by ILP, Detailed study of ISA, Assembly Language Programming, Code Composer Studio, Mixed Cand Assembly Language programming, On-chip peripherals, Simple applications developments as an embedded environment.

Unit 4:

Multi-core DSPs: Introduction to Multi-core computing and applicability for DSP hardware, Concept of threads, introduction to P-thread, mutex and similar concepts, heterogeneous and homogenous multi-core systems, Shared Memory parallel programming ‐ OpenMP approach of parallel programming, PRAGMA directives, OpenMP Constructs for work sharing like for loop, sections, TI TMS320C6678 (Eight Core subsystem).

Unit 5:

FPGA based DSP Systems: Limitations of P-DSPs, Requirements of Signal processing for Cognitive Radio (SDR), FPGA based signal processing design-case study of a complete design of DSP processor.

Unit 6:

High Performance Computing using P-DSP: Preliminaries of HPC, MPI, OpenMP, multicore DSP as HPC infrastructure.

References:

- M. Sasikumar, D. Shikhare, Ravi Prakash, "Introduction to Parallel Processing", 1st Edition, PHI, 2006.
- Fayez Gebali, "Algorithms and Parallel Computing",1st Edition, John Wiley & Sons, 2011
- Rohit Chandra, Ramesh Menon, Leo Dagum, David Kohr, DrorMaydan, Jeff McDonald, "Parallel Programming in OpenMP", 1st Edition, Morgan Kaufman,2000.
- Ann Melnichuk,Long Talk, "Multicore Embedded systems", 1st Edition, CRC Press,2010.
- Wayne Wolf, "High Performance Embedded Computing: Architectures, Applications and Methodologies", 1st Edition, Morgan Kaufman, 2006.
- E.S.Gopi, "Algorithmic Collections for Digital Signal Processing Applications Using MATLAB", 1st Edition, Springer Netherlands,2007.

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AUDIT COURSE-I

1. ENGLISH FOR RESEARCH PAPER WRITING

UNIT I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT IV

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

UNIT V

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

2. DISASTER MANAGEMENT

UNIT I

Introduction

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.U**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem.Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And ConflictsNIT II

UNIT III

Disaster Prone Areas In India

Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

UNIT IV

Disaster Preparedness And Management

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT V

Risk Assessment

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

UNIT VI

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies” ,Deep &Deep Publication Pvt. Ltd., New Delhi.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

3. SANSKRIT FOR TECHNICAL KNOWLEDGE

UNIT I

- Alphabets in Sanskrit,
- Past/Present/Future Tense,
- Simple Sentences

UNIT II

- Order
- Introduction of roots
- Technical information about Sanskrit Literature

UNIT III

- Technical concepts of Engineering-Electrical, Mechanical,
- Architecture, Mathematics

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW21 RF AND MICROWAVE CIRCUIT DESIGN

Unit 1:

Transmission Line Theory:Lumped element circuit model for transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matching and tuning.

Unit 2:

Microwave Network Analysis:Impedance and equivalent voltage and current, Impedance and admittance matrix, The scattering matrix, transmission matrix, Signal flow graph.

Unit 3:

Microwave Components: Microwave resonators, Microwave filters, power dividers and directional couplers, Ferromagnetic devices and components.

Unit 4:

Nonlinearity And Time VarianceInter-symbol interference, random process & noise, definition of sensitivity and dynamic range, conversion gain and distortion.

Unit 5:

Microwave Semiconductor Devices And Modeling: PIN diode, Tunnel diodes, Varactor diode, Schottky diode, IMPATT and TRAPATT devices, transferred electron devices, Microwave BJTs, GaAs FETs, low noise and power GaAs FETs, MESFET, MOSFET, HEMT.

Unit 6:

Amplifiers Design: Power gain equations, stability, impedance matching, constant gain and noise figure circles, small signal, low noise, high power and broadband amplifier, oscillators, Mixers design.

References:

- Matthew M. Radmanesh, “Advanced RF & Microwave Circuit Design: The Ultimate
- Guide to Superior Design”, AuthorHouse, 2009.
- D.M.Pozar, “ Microwave engineering” ,Wiley, 4th edition, 2011.
- R.Ludwig and P.Bretchko, “R. F. Circuit Design”, Pearson Education Inc, 2009.
- G.D. Vendelin, A.M. Pavoi, U. L. Rohde, “Microwave Circuit Design Using Linear And

- Non Linear Techniques", John Wiley 1990.
- S.Y. Liao, "Microwave circuit Analysis and Amplifier Design", Prentice Hall 1987.
- Radmanesh, "RF and Microwave Electronics Illustrated" , Pearson Education, 2004.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 22 EMT THEORY

Unit 1

Introduction & review of Electromagnetic Field theory, boundary value problems.

Unit 2

Time varying fields, Maxwell's equation, source concepts, Duality equivalence principle, induction theorem, reciprocity theorem, Green's function & applications.

Unit 3

Plane wave function, Plane waves, Rectangular waveguides Models, Cylindrical wave function, circular guide modes, Coaxial Line modes.

Unit 4

Spherical wave function; Wave transformation.

Reference Books:

- Plonsey & Collin; Principle & Application of EM Fields
- R. F. Harrington; Time Harmonic EM Fields
- Collins; Fields Theory of Guided Waves 4. Ramo & Whinnery; Fields & Waves in Modren Radio.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 23(A) SATELLITE COMMUNICATION

Unit 1:

Architecture of Satellite Communication System: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications, and frequency bands used for satellite communication and their advantages/drawbacks.

Unit 2:

Orbital Analysis: Orbital equations, Kepler's laws of planetary motion, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc of a satellite, concepts of Solar day and Sidereal day.

Unit 3:

Satellite sub-systems: Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems, antenna sub-system.

Unit 4:

Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

Unit 5:

Satellite link budget: Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions, Case study of Personal Communication system (satellite telephony) using LEO.

Unit 6:

Modulation and Multiple Access Schemes used in satellite communication.Typical case studies of VSAT, DBS-TV satellites and few recent communication satellites launched by NASA/ ISRO. GPS.

References:

- Timothy Pratt and Others, "Satellite Communications", Wiley India, 2nd edition,2010.
- S. K. Raman, "Fundamentals of Satellite Communication", PearsonEducation India, 2011.
- Tri T. Ha, "Digital Satellite Communications", Tata McGraw Hill, 2009.
- Dennis Roddy, "Satellite Communication", McGraw Hill, 4th Edition, 2008.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 23(B) MICROWAVE MESURMENT

Unit 1

Microwave detectors, detector characteristics, law of detection, detector mounts, tuning arrangements of probes. Slotted line, effect of penetration of probe, measurement of VSWR and transmission line impedance, measurement of detection law, effect of detection law on VSWR measurement, techniques of high VSWR measurement, VSWR meter.

Unit 2

Measurement of impedance, S – parameter of networks, Smith chart, reflecto meter and network analysis. Measurement of high, medium and low microwave power, Bolometers, Power bridges and calorie meters.

Unit 3

Measurement of microwave frequency, standard resonating cavities, electronic method of measurement, Microwave counters, comparison of various methods.

Unit 4

Microwave components – attenuator, Phase shifters wave-guide joints, directional couplers, matching screw wave-guide excitation connectors and cables.

Unit 5

Antenna measurement – antenna pattern, antenna impedance, near field and far field errors, anechoic chambers, Antenna Range.

Reference Books:

1. A.K. Maini – Microwave & Radar, Khanna Publisher

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 23(C) VOICE AND DATA NETWORKS

Unit 1:

Network Design Issues, Network Performance Issues, Network Terminology, centralized and distributed approaches for networks design, Issues in design of voice and data networks.

Unit 2:

Layered and Layer less Communication, Cross layer design of Networks, Voice Networks (wired and wireless) and Switching, Circuit Switching and Packet Switching, Statistical Multiplexing.

Unit 3:

Data Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms (ARQ), Hybrid ARQ (HARQ), Go Back N, Selective Repeat protocols and their analysis.

Unit 4:

Queuing Models of Networks , Traffic Models , Little's Theorem, Markov chains, M/M/1 and other Markov systems, Multiple Access Protocols , Aloha System , Carrier Sensing , Examples of Local area networks,

Unit 5:

Inter-networking, Bridging, Global Internet , IP protocol and addressing , Sub netting , Classless Inter domain Routing (CIDR) , IP address lookup , Routing in Internet. End to End Protocols, TCP and UDP. Congestion Control , Additive Increase/Multiplicative Decrease , Slow Start, Fast Retransmit/ Fast Recovery,

Unit 6:

Congestion avoidance, RED TCP Throughput Analysis, Quality of Service in Packet Networks. Network Calculus, Packet Scheduling Algorithms.

References:

- D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, Prentice Hall, 1992.
- L. Peterson and B. S. Davie, “Computer Networks: A Systems Approach”,5th Edition,Morgan Kaufman, 2011.

- Kumar, D. Manjunath and J. Kuri, "Communication Networking: An analytical approach",1st Edition, Morgan Kaufman, 2004.
- Walrand, "Communications Network: A First Course", 2nd Edition, McGraw Hill, 2002.
- Leonard Kleinrock, "Queueing Systems, Volume I: Theory", 1st Edition, John Wiley andSons, 1975.
- Aaron Kershenbaum, "Telecommunication Network Design Algorithms", McGraw Hill,1993.
- Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGrawHill, 1987

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 24(A). COGNITIVE RADIO

Unit 1:

Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.

Unit 2:

Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).

Unit 3:

Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.

Unit 4:

Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.

Unit 5:

Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).

Unit 6:

Research Challenges in Cognitive Radio: Network layer and transport layer issues, crosslayer design for cognitive radio networks.

References:

- Ekram Hossain, Dusit Niyato, Zhu Han, “Dynamic Spectrum Access and Management in

Cognitive Radio Networks", Cambridge University Press, 2009.

- Kwang-Cheng Chen, Ramjee Prasad, "Cognitive radio networks", John Wiley & Sons Ltd., 2009.
- Bruce Fette, "Cognitive radio technology", Elsevier, 2nd edition, 2009.
- Huseyin Arslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems", Springer, 2007.
- Francisco Rodrigo Porto Cavalcanti, Soren Andersson, "Optimizing Wireless Communication Systems" Springer, 2009.
- Linda Doyle, "Essentials of Cognitive Radio", Cambridge University Press, 2009.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 24(B).MIMO SYSTEM

Unit 1:

Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems.

Unit 2:

Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation

Unit 3:

The generic MIMO problem, Singular Value Decomposition, Eigenvalues and eigenvectors, Equalising MIMO systems, Disadvantages of equalising MIMO systems, Predistortion in MIMO systems, Disadvantages of pre-distortion in MIMO systems, Pre-coding and combining in MIMO systems, Advantages of pre-coding and combining, Disadvantages of precoding and combining, Channel state information.

Unit 4:

Codebooks for MIMO, Beamforming, Beamforming principles, Increased spectrum efficiency, Interference cancellation, Switched beamformer, Adaptive beamformer, Narrowband beamformer, Wideband beamformer

Unit 5:

Case study: MIMO in LTE, Codewords to layers mapping, Pre-coding for spatial multiplexing, Pre-coding for transmit diversity, Beamforming in LTE, Cyclic delay diversity based pre-coding, Pre-coding codebooks, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environments, Complex baseband multipath channels, Narrowband and wideband channels, MIMO channel models

Unit 6:

Channel Estimation, Channel estimation techniques, Estimation and tracking, Training based channel estimation, Blind channel estimation, Channel estimation architectures, Iterative channel estimation, MMSE channel estimation, Correlative channel sounding,

Channel estimation in single carrier systems, Channel estimation for CDMA, Channel estimation for OFDM.

References:

- Claude Oestges, Bruno Clerckx, "MIMO Wireless Communications : From Real-world Propagation to Space-time Code Design",Academic Press, 1st edition, 2010.
- Mohinder Janakiraman, “Space - Time Codes and MIMO Systems”, Artech House Publishers, 2004.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW 24(C).ADVANCED COMMUNICATION SYSYTEM

UNIT -1

Review of basic communication theoretical concept, Digital Modulation Techniques, On-Off Keying: Frequency shift keying, Phase shift keying, Quadrature Phase shift keying,. Frequency Multiple access; Demand assigned multiple access, Code Division Multiple access.

UNIT -2

Noise & Communication System, Error Rate in Binary Transmission, Optimum decision levels information capacity of PCM systems; Noise, Power & Spectral representation of noise Random signals & noise through linear systems, Matched Filter Detection, Narrow band noise representation, Signal-to-noise ratio in FM & AM, AM detector spectral analysis, Thermal noise consideration & other types of the noise encountered in communication.

UNIT-3

Statistical communication theory in digital communication, Statistical decision theory signal vectors, Multiple sample detector optimum, Binary transmission, M-array transmission additive white Gaussian noise channel, Matched filter detection signal constellation and probability of error calculation, Binary signals M-array orthogonal signals.

UNIT -4

Mobile communication, Introduction, Spread spectrum, Direct sequence spread spectrum, Cellular systems, Access contracts SDMA, FDMA, TDMA, CDMA systems architecture, Radio interface, Protocols, Wireless LAN, Wireless ATM, Mobile Network Layer, Mobile transport layer.

Reference Books:

- Mobile Communication By Jochen Schiller
- Digital Communication By Taub & Schiller
- Modulation, Coding By Swartz & Noise.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

AUDIT COURSE-II

1. CONSTITUTION OF INDIA

UNIT I

Introduction and Methodology:

- Aims and rationale, Policy background, Conceptual framework and terminology
- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions**.**
- Overview of methodology and Searching.

UNIT II

. Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.

- Curriculum, Teacher education

UNIT III

. Evidence on the effectiveness of pedagogical practices

- Methodology for the in depth stage: quality assessment of included studies.
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
- Theory of change.
- Strength and nature of the body of evidence for effective pedagogical practices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV

. Professional development: alignment with classroom practices and follow-up support

- Peer support
- Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

UNIT V

Research gaps and future directions

- Research design
- Contexts
- Pedagogy

- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, ‘learning to read’ campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

2. STRESS MANAGEMENT BY YOGA

UNIT I

Definitions of Eight parts of yog. (Ashtanga)

UNIT II

Yam and Niyam.
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III

Asan and Pranayam
i) Various yog poses and their benefits for mind & body
ii)Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTVD 31(A).COMMUNICATION NETWORK

Unit 1:

Introduction: - Network Architecture, Performance

Unit 2:

Connecting nodes: - Connecting links, Encoding, framing, Reliable transmission, Ethernet and Multiple access networks, Wireless networks

Unit 3:

Queuing models - For a) one or more servers b) with infinite and finite queue size c) Infinite population Internetworking:-Switching and bridging, IPv4, Addressing, Routing Protocols, Scale issues, Routers - Architecture, IPv6

Unit 4:

End-to-End Protocols: - Services, Multiplexing, De-multiplexing, UDP, TCP, RPC, RTP

Unit 5:

Congestion control and Resource Allocation - Issues, Queuing disciplines, TCP congestion control, Congestion Avoidance, QoS Applications: - Domain Name Resolution, File Transfer, Electronic Mail, WWW, Multimedia Applications

Unit 6:

Network monitoring – Packet sniffing tools such as Wireshark Simulations using NS2/OPNET

References:

- Larry L. Peterson, Bruce S, Devie, “Computer Networks” , MK, 5th Edition
- Aaron Kershenbaum, “Telecommunication Network Design Algorithms”, MGH,
- International Edition 1993.
- Vijay Ahuja, “Communications Network Design and Analysis of Computer
- Communication Networks”, MGH, International Editions.
- Douglas E. Comer, “Internetworking with TCP/IP”, Pearson Education, 6th Edition

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW31(A) INFORMATION THEROY & CODING

Unit 1

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

Unit 2

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.

Unit 3

Group and field of Binary system Galois field and its construction in GF (2) 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.

Unit 4

Cyclic codes and its basic properties, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation & error detection, cyclic Hamming codes.

Unit 5

Introduction to BCH codes, its encoding & decoding, error location & correction. Introduction to convolution codes, its construction & viterbi algorithm for maximum likelihood decoding.

Reference Books:

- Digital Communication by Haykins Simon Wiley Publ.
- Error control Coding: Theory and Application, by Shu Lin and Cosstlello,PHI
- Modern analog and Digital Communication system, by B.P. Lathi
- Digital Communication by Sklar, Pearson Education
- Principal of Communication system by Taub & Schilling, TMH
- Error Correcting Codes by Peterson W., MIT Press
- Digital Communication by Carson,MGH 9 Digital Communication by Proakis,TMH

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW312. SELECTED TOPICS IN MATHEMATICAL

Unit 1:

Probability and Statistics:

- Definitions, conditional probability, Bayes Theorem and independence.

- Random Variables: Discrete, continuous and mixed random variables, probability mass, Probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function, Chebyshev inequality.

Unit 2:

Special Distributions: Discrete uniform, Binomial, Geometric, Poisson, Exponential, Gamma, Normal distributions.

- Pseudo random sequence generation with given distribution, Functions of a Random Variable

Unit 3:

Joint Distributions: Joint, marginal and conditional distributions, product moments, correlation, independence of random variables, bi-variate normal distribution.

- Stochastic Processes: Definition and classification of stochastic processes, Poisson process

- Norms, Statistical methods for ranking data

Unit 4:

Multivariate Data Analysis

- Linear and non-linear models, Regression, Prediction and Estimation

- Design of Experiments – factorial method

- Response surface method

Unit 5:

Graphs and Trees:

- Graphs: Basic terminology, multi graphs and weighted graphs, paths and circuits, shortest path Problems, Euler and Hamiltonian paths and circuits, factors of a graph, planar graph and Kuratowski's graph and theorem, independent sets, graph colouring

Unit 6:

Trees: Rooted trees, path length in rooted trees, binary search trees, spanning trees and cut set,theorems on spanning trees, cut sets , circuits, minimal spanning trees, Kruskal's and Prim's algorithms for minimal spanning tree

References:

- Henry Stark, John W. Woods, "Probability and Random Process with Applications to Signal Processing", Pearson Education, 3rd Edition
- C. L. Liu, "Elements of Discrete Mathematics", Tata McGraw-Hill, 2nd Edition
- Douglas C. Montgomery, E.A. Peck and G. G. Vining, "Introduction to Linear Regression Analysis", John Wiley and Sons, 2001.
- Douglas C. Montgomery, "Design and Analysis of Experiments", John Wiley and Sons, 2001.
- B. A. Ogunnaike, "Random Phenomena: Fundamentals of Probability and Statistics for Engineers", CRC Press, 2010.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW321.Business Analytics

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of BusinessAnalytics Process and organisation, competitive advantages ofBusiness Analytics.Statistical Tools: Statistical Notation, Descriptive Statistical methods,Review of probability distribution and data modelling, sampling andestimation methods overview.

Unit 2:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology

Unit 3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization. Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 4:

Decision Analysis: Formulating Decision Problems, Decision
Strategies with the without Outcome Probabilities, Decision Trees, The
Value of Information, Utility and Decision Making

Unit 5:

Recent Trends in : Embedded and collaborative business intelligence,

Visual data recovery, Data Storytelling and Data journalism.

Reference:

- Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
- Business Analytics by James Evans, persons Education.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW322.OPERATIONS RESEARCH

Unit 1:
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex
method - sensitivity analysis - parametric programming

Unit 3:
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5
Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:
1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW23 COST MANAGEMENT OF ENGINEERING PROJECTS

UNIT–I:

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II:

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III:

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV:

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V:

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

MTMW DP (I) Dissertation (PHASE I)

Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution. Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.

MTMW DP(II) Dissertation (PHASE II)

Dissertation – II will be extension of the to work on the topic identified in Dissertation – I.

Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc.There will be presubmission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

Guidelines for Dissertation Phase – I and II at M. Tech.

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of

Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.

- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.
- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work