CURRICULUM 2018 Regulation

SEMESTER I

Sl. No.	Core/Elective	Code	Subject	Contact Hours/ Week				
				L	T	P	Total	Credit points
1	Core 1	MCE101	COMPULSORY: WIRELESS AND MOBILE COMMUNICATION	3	0	0	3	3
2	Core 2	MCE102	COMPULSORY: ADVANCED DIGITAL COMMUNICATION	3	0	0	3	3
3	PE 1	MCE103	PROGRAM SPECIFIC ELECTIVE-I (a) WIRELESS SENSOR NETWORKS (b) ADVANCED RADIO PROPAGATION AND REMOTE SENSING (c) VOICE AND DATA NETWORKS	3	0	0	3	3
4	PE 2	MCE104	PROGRAM SPECIFIC ELECTIVE-II (a) COMPUTER COMMUNICATION & NETWORKING (b) ADVANCED MICROWAVE ENGINEERING (c) COMPUTER VISION	3	0	0	3	3
5	MLC	MLC 101	RESEARCH METHODOLOGY AND IPR	2	0	0	2	2
	PRACTICAL							
6	Lab 1	MCE191	WIRELESS AND MOBILE COMMUNICATION LAB	0	0	3	3	2
7	Lab 2	MCE192	ADVANCED COMMUNICATION LAB	0	0	3	3	2
	SESSIONAL							
8	Audit	MC101A	A) Stress Management by Yoga B) Pedagogy Studies C) Constitution of India D) Personality Development through Enlightenment skills	2	0	0	2	0
				Total			22	18

** MLC – Mandatory Learning Course*

SEMESTER II

Sl. No.	Core/Elective	Code	Subject	Contact Hours/ Week				
				L	T	P	Total	Credit points
1	Core 3	MCE201	COMPULSORY: MOBILE COMPUTING	3	0	0	3	3
2	Core 4	MCE202	COMPULSORY: ADVANCED DIGITAL SIGNAL PROCESSING	3	0	0	3	3
3	PE3	MCE203	PROGRAM SPECIFIC ELECTIVE-III (a) CRYPTOGRAPHY & NETWORK SECURITY (b) J2ME FOR MOBILE PROGRAMMING (c) SATELLITE COMMUNICATION (d) Microwave measurement Techniques	3	0	0	3	3
4	PE4	MCE204	PROGRAM SPECIFIC ELECTIVE-IV: (a) Baseband Processor (b) Multimedia for Mobile Devices (c) Image processing & pattern recognition (d) Advanced Antenna Engineering	3	0	0	3	3
5	Minor Project	MCE281	Mini Project with Seminar	0	0	4	4	2
	PRACTICAL							
6	Lab 3	MCE291	MOBILE COMPUTING LAB	0	0	3	3	2
7	Lab 4	MCE292	ADVANCED DIGITAL SIGNAL PROCESSING LAB	0	0	3	3	2
	SESSIONAL							
8	Audit	MC201A	A) English for Research Paper Writing B) Disaster Management C) Sanskrit for Technical Knowledge	2	0	0	2	0
				Total			24	18

SEMESTER III

Sl. No.	Core/ Elective	Code	Subject	Contact Hours/ Week				
				L	T	P	Total	Credit points
1	PE5	MCE301	PROGRAM SPECIFIC ELECTIVE-V: (a) MOBILE ADHOC NETWORKING (b) ARTIFICIAL INTELLIGENCE (c) Digital Wireless Communications System Design	3	0	0	3	3
2	OE	MCE302	(a) Business Analytics (b) Industrial Safety (c) Operations Research	3	0	0	3	3
3	Major Project	MCE381	DISSERTATION (PART-1)	0	0	20	20	10
				Total			26	16

SEMESTER IV

Sl. No.	Core/ Elective	Code	Subject	Contact Hours/Week				
				L	T	P	Total	Credit points
	SESSIONAL							
1	Major Project	MCE481	DISSERTATION (COMPLETION)	0	0	32	32	16
				Total			32	16

Total Credit = 68

SEMESTER I

WIRELESS AND MOBILE COMMUNICATION
Code: MCE101
Contact hours: 4-0-0
Credits: 4
Prerequisite: Communication Systems
Module 1: Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co channel and adjacent channel interference, interference reduction. techniques and methods to improve cell coverage, Frequency management and channel assignment. GSM architecture and interfaces, GSM architecture details, GSM subsystems, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM.2.5 G Standards: High speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), 2.75 G Standards: EDGE,
Module 2: Spectral efficiency analysis based on calculations for Multiple access technologist, FDMA and CDMA, Comparison of these technologies based on their signal separation techniques, advantages, disadvantages and application areas. Wireless network planning (Link budget and power spectrum calculations)
Module 3: Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath channels, Types of Small-Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading.
Module 4: Equalization, Diversity: Equalizers in a communications receiver, Algorithms for adaptive equalization, diversity techniques, space, polarization, frequency diversity, Interleaving.
Module 5: Code Division Multiple Access: Introduction to CDMA technology, IS 95 system Architecture, Air Interface, Physical and logical channels of IS 95, Forward Link and Reverse link operation, Physical and Logical channels of IS 95 CDMA, IS 95 CDMA Call Processing, soft Handoff, Evolution of IS 95 (CDMA One) to CDMA 2000, CDMA 2000 layering structure and channels.
Module 6: Higher Generation Cellular Standards:3G Standards: evolved EDGE, enhancements in 4G standard, Architecture and representative protocols, call flow for LTE, VoLTE, UMTS, introduction to 5G.

Course Outcomes:
At the end of this course, students will be able to
CO1: Design appropriate mobile communication systems.
CO2: Apply frequency-reuse concept in mobile communications, and to analyze its effects on interference, system capacity, handoff techniques
CO3: Distinguish various multiple-access techniques for mobile communications e.g. FDMA, TDMA, CDMA, and their advantages and disadvantages.
CO4: Analyze path loss and interference for wireless telephony and their influences on a mobile communication system's performance.
CO5: Analyze and design CDMA system functioning with knowledge of forward and reverse channel details, advantages and disadvantages of using the technology

CO6: Understanding upcoming technologies like 3G, 4G etc.
Reference Books:

V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition, 2008.
- V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th edition, 2009.
- T.S.Rappaport, "Wireless Communications Principles and Practice", 2nd edition, PHI,2002.
- William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2nd edition, TMH, 1995.
- Asha Mehrotra, "A GSM system Engineering" Artech House Publishers Bosten, London,1997

Advanced digital communication
Code: MCE 102
Contact hours: 4-0-0
Credits: 4

Prerequisite: Digital Communication, Field Theory, Signal and Systems
Objective
1. Understanding of the main concepts and techniques used in the analysis and design of digital communication systems.

2. Help students to design complex circuits in digital communication.

Outcome

On completing this subject the student should be able to:

CO1: Qualitatively and quantitatively analyse and evaluate digital communication systems;
CO2: Use software tools to analyse, design and evaluate digital communication systems
CO3: Compare different digital commnuication techniques and judge their applicability and performance in different application scenarios.
CO4: Formulate advanced mathematical models which are applicable and relevant in the case of a given problem.
CO5: Use efficiently mathematical model to solve a given demanding engineering problem in the field, and analyze the result and its validity.

Module 1:
Fourier Expansion, Fourier transform, Normalized power spectrum, Power spectral density, Effect of transfer function on output power spectral density, Perseval's theorem. Autocorrelation & cross correlation between periodic signals, cross correlation power. Relation between power spectral density of a signal, its autocorrelation function and its spectrum. Distinction between a random variable and a random process. Probability, sample space, Venn diagram, joint probability, bay's theorem, cumulative probability distribution function, probability density function, joint cumulative probability distribution function, joint probability density function. Mean/average/expectation of a random variable and of sum of random variables. Standard deviation, variance, moments of random variables, explanation with reference to common signals. Tchebycheff's inequality. Gaussian probability density function – error function & Q function Central limit theorem.

Spectral analysis of signals:
Orthogonal & orthonormal signals. Gram-Schmidt procedure to represent a set of arbitrary signalsby a set of orthonormal components; - numerical examples. The concept of signal-space coordinate system, representing a signal vector by its ortho-normal components, measure of distinguishability of signals.

Line codes: UPNRZ, PNRZ, UPRZ, PRZ, AMI, Manchester etc. Calculation of their power spectral densities. Bandwidths and probabilities of error (P_e) for different line codes.
Revision of digital modulation: Principle, transmitter, receiver, signal vectors, their distinguish ability (d) and signal band width for BPSK, QPSK, M-ARY PSK, QASK, MSK, BFSK, M-ARY FSK.

Module 2

Spread spectrum modulation: Principle of DSSS, processing gain, jamming margin, single tone interference, principle of CDMA.
Multiplexing & multiple access: TDM/TDMA, FDM/FDMA, Space DMA, Polarization DMA, OFDM, ALOHA, Slotted ALOHA, Reservation ALOHA, CSMA-CD, CSMA-CA – basic techniques and comparative performances e.g. signal bandwidth, delay, probability of error etc.
Module 3
Base band signal receiver and probabilities of bit error: Peak signal to RMS noise output ration, probability of error. Optimum filter, it's transfer function. Matched filter, it's probability of error. Probability of error in PSK, effect of imperfect phase synchronization or imperfect bit synchronization. Probability of error in FSK, QPSK. Signal space vector approach to calculate probability of error in BPSK, BFSK, QPSK. Relation between bit error rate and symbol error rate. Comparison of various digital modulation techniques vis-Ã -vis band width requirement and probabilities of bit error.

Characteristics of random variables and random processes:
Common probability density functions, - Gaussian, Rayleigh, Poisson, binomial, Rice, Laplacian, log-normal, etc. Probability of error in Gaussian Binary symmetric channel. Random processes – time average, ensemble average, covariance, autocorrelation, cross correlation, stationary process, ergodic process, wide sense stationary process. Power spectral density and autocorrelation, power spectral density of a random binary signal. Linear mean square estimation methods.

Revision of source coding: Sampling theorem, instantaneous/ flat top/ natural sampling, band width of PAM signal, quantization, quantization noise, principle of pulse code modulation, delta modulation & adaptive delta modulation. Parametric coding/ hybrid coding/ sub band coding: APC, LPC, Pitch predictive, ADPCM, voice excited vocoder, vocal synthesizer.

Module 4

Noise: Representation of noise in frequency domain. Effect of filtering on the power spectral density of noise – Low pass filter, band pass filter, differentiating filter, integrating filter. Quadrature component of noise, their power spectral densities and probability density functions. Representation of noise in orthogonal components.

Text Books:
1. Digital communication, 4th ed. - J. G. Proakis, MGH International edition.

2. Principle of Communication Systems – Taub, Schilling, TMH
3. Digital and Analog Communication Systems, 7th ed. – Leon W. Couch, PHI.
4. Principles of Digital Communication – Haykin
5. Digital Communication – Zeimer, Tranter.
6. Principle of Digital communication - J. Das, S. K. Mallick, P. K Chakraborty, New Age Int.
7. Communication Systems, 4th ed. – A. Bruce Carlson, Paul B. Crilly, Janet C. Rutledge, MGH International edition.
8. Digital Communications, 2nd ed. – Bernard Sklar, Pearson Education.
9. Electronic Communications, 4th ed. – Dennis Roddy, John Coolen, PHI

PEO Mapping

a	b	c	d	e	f	g	h	i	j	k	l
√	√	√									

Engineering knowledge: Apply knowledge of circuit and field theory

Problem analysis: Analyse performance of a large communication system

Design/development of solutions: Conducting experiments in communication systems

Program Specific Elective – I

WIRELESS SENSOR NETWORKS
MCE103A
Contact hours: 3-0-0
Credits: 3
Prerequisites: Signals and systems

Program Objectives:
The purpose of this course is to provide in-depth treatment on methods and techniques in discrete-time signal transforms, digital filter design, optimal filtering, power spectrum estimation, multi-rate digital signal processing, DSP architectures, which are of importance in the areas of signal processing, and communications. Applications of these methods and techniques are also presented. The intended audiences are research students and industry professionals working in the above-mentioned areas and related technical fields.

Course Content:

Syllabus Contents:
Module 1: Introduction and overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.
Module 2: Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): tinyOS, MANTIS, Contiki, and RetOS.

Module 3: Programming tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet)
Module 4: Overview of sensor network protocols (details of at least 2 important protocol per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi-hop and cluster-based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.
Module 5: Data dissemination and processing; differences compared with another database management systems, data storage; query processing.
Module 6: Specialized features: Energy preservation and efficiency; security challenges; fault tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in wireless sensor network.

Course Outcomes:
At the end of this course, students will be able to
CO1: Design wireless sensor network system for different applications under consideration.
CO2: Understand the hardware details of different types of sensors and select right type of sensor
CO3: Understand radio standards and communication protocols to be used for wireless sensor network-based systems and application.
CO4: Use operating systems and programming languages for wireless sensor nodes, performance of wireless sensor networks systems and platforms.
CO5: Handle special issues related to sensors like energy conservation and security challenges.

Text and Reference Books:

・ H. Karl and A. Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, India, 2012.
・ C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, “Wireless Sensor Networks”, Springer Verlag, 1st Indian reprint, 2010.
・ F. Zhao and L. Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Morgan Kaufmann, 1st Indian reprint, 2013.
・ YingshuLi, MyT. Thai, Weili Wu, “Wireless sensor Network and Applications”, Springer series on signals and communication technology, 2008.

ADVANCED RADIO PROPAGATION AND REMOTE SENSING
MCE103B
Contact hours: 3-0-0
Credits: 3
Prerequisite: Microwave Engineering

Prerequisites: EM Theory

Program Objectives:
1. To know fundamental mechanism of Radio propagation Advancement in Remote Sensing.
2. To understand model analysis in the subject area.

Module I
Basic Radio propagation mechanism: Short distance & long distance propagation cases. Free space

propagation models. Diffraction, Reflection and Scattering. 4L

Module II

Radio propagation models: Two ray reflection model, Fresnel zones, knife edge model; 6L

Module III

Link budget analysis, Outdoor propagation models. 6L

Module IV

Multipath & Small-Scale Fading, Types Large scale fading, small scale fading, delay speed effect doppler shift, doppler power spectrum. Flat fading channel modelling, frequency selective fading, Fading effects on device. 6L

Module V

Concept of Remote Sensing: Remote Sensing, Data, Sources of Energy, Interaction with Atmosphere and Target, Recording of Energy, Application of Remote Sensing, Types of Remote Sensing, Sensor Resolution. 6L

Module VI

Digital Imaging: Digital Image, Sensors, Detectors, Imaging by Scanning, Active Remote Sensors. Microwave Remote Sensing 5L

Module VII

Radar Imaging GPS: Requirement of Ground Truth Data, Parameters of Ground Truthing-Atmospheric Condition, Suface Water, Factors of Special Measurement—Sun Angle, Aerosol, Haze Water Vapour. 6L

Text and Reference Books:

1. Wireless Communication, Upena Dalal
2. Wireless Communication, Basudeb Acharya
3. Satellite Communication, D. C. Agarwal, Khanna publisher

Course Outcome: Student should be able to

CO1: Gain knowledge and understanding of radio propagation.
CO2: Have knowledge of remote sensing mechanism.
CO3: Demonstrate concepts, methodologies and applications of Remote Sensing Technology.
CO4: Prepare the candidates for National and Global Employability
CO5: Exhibit skills in handling instruments, tools, techniques and modeling while using Remote Sensing Technology

PO Table

Paper Code	A	B	C	d	e	F	G	H	i	j	k	L
MCE104	√	√	√									√

PO Statement

1. Engineering knowledge: Apply the knowledge of basic microwave engineering, and an engineering specialization to the solution of various related measurements.
2. Problem analysis: Analyze and synthesize performance of various channel characteristics.
3. Design/development of solutions: be able to design low loss path in radio propagation.
4. Lifelong learning: proceed to further research work according to the need-based analysis.

VOICE AND DATA NETWORKS
MCE103C
Contact hours: 3-0-0
Credits: 3

Prerequisite: Communication Systems

Module 1

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

Module 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.

Module 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.

Module 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,

Module 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.

Module 6

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

Course Outcomes:

At the end of this course, students will be able to

CO1: Protocol, algorithms, trade-offs rationale.

CO2: Routing, transport, DNS resolutions

CO3: Network extensions and next generation architectures

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

Program Specific Elective – II

COMPUTER COMMUNICATION & NETWORKING
Code: MCE 105A
Contact hours: 3-0-0
Credits: 3

Prerequisite: Digital Communication

Objective:
1. An understanding of how devices like Hub, Switch, Router and Bridge are used in network.
2. An understanding of how securely data can be transmitted from one place to remotely place using various protocols.

Outcome:

After the course, student will be able to
CO1: Analyze various protocols used in data communication
CO2: Design networking structure in data communication.
CO3: Transmit data securely from one place to another.
CO4: Analyze the performance of various protocols.

Module no.	Topic	No. of Lectures
1	Introduction - Motivation, goals, applications and classification of computer networks, common networks and standard organizations Network Structure and Architecture- Network structure-concept of subnet, backbone and local access, Channel sharing techniques- FDM, TDM. Circuit and packet switching. Topological Design of a network. Network architecture layering concept, OSI Reference Model, OSI Services and protocols Physical layer - bit communication between DTE and DCE, RS232, transmission media, modems.	10
2	Data link layer - error detection and correction, retransmission strategies, stop and wait protocol, sliding window protocols, pure Aloha protocols, slotted Aloha protocol, CSMA protocols, CSMA / CD and CSMA / CA protocol, HDLC. LANs and their Interconnection - Basic concepts and IEEE standards,	10

	Architecture, protocol, management and performance of Ethernet, token ring and token bus LANs, WLAN, Bluetooth, LAN interconnection - repeaters and bridges, Transparent and source routing bridges and their relative advantages and disadvantages.	
3	Network layer - basic design issues, network layer services, connection oriented and connection less services, routing – static, dynamic, stochastic, flow-based routing, optimal routing, Quality of service, congestion control, Leaky Bucket Algorithm Transport layer- process to process delivery, TCP, UDP. Internetworking- motivation, goals and strategies, Routers and gateways, TCP / IP model, IP addressing, important features of Ipv6.	10
4	Application layer – DNS, SMTP, FTP, HTTP, WWW Network security -Cryptographic principle, DES, AES, RSA, Digital signature, Security in internet, VPN, Firewalls. Network management system – SNMP. Advance Protocol-RTP, SIP.	10

Text and Reference Books :

1. B. A. Forouzan, Data Communication and Networking, Tata Mc-Graw Hill.
2. W. Stallings, Data and Computer Communication, 5th Ed. PHI, 1998.
3. A. S. Tanenbaum, Computer Networks, Prentice-Hall India.
4. Miller, Data Communication and Networks, Vikas.
5. A. Leon-Garcia, Communication networks, Tata Mc-Graw Hill.
6. G. E. Keiser: Local Area Network, McGraw Hill. 1989.
7. D. Bertsekas and R. Gallagher: Data Networks, 2nd Ed. PHI, 1992.

PEO Mapping

a	b	c	d	e	f	g	h	i	j	k	l
√	√	√	√	√							

Engineering knowledge: Apply knowledge of digital communication
Problem analysis: Analyse performance of a large network system, checking no of packets transmitted and received
Design/development of solutions: Conducting experiments in network setup
Individual and team work: Setup network among different departments and provides security
Modern tool usage: Share knowledge regarding up gradation of computer network.

ADVANCED MICROWAVE ENGINEERING

Code: MCE 105B
Contact hours: 3-0-0
Credits: 3

Prerequisite: Microwave Engineering, Propagation of Microwave.
Program Objectives:
1.Advance Microwave Engineering introduces the student to microwave and millimetre wave solid state devices.
2.Scattering parameters are defined and used to characterize devices and system behaviour.
3.Describe the principles and working of various antennas.
4. Passive and active devices commonly utilized in microwave subsystems are analyzed and studied.
5.Design procedures are presented along with methods to evaluate device performance.
6.Basic radio waves propagation mechanism will be dealt with.

Microwave and millimetre wave devices: 10L

• Overview of microwave and millimetre wave vacuum tube devices, limitations of microwave vacuum tubes, gyrotron vacuum tube devices.
• Advances in microwave and millimetre wave solid state devices, Gunn devices, oscillator using Gunn diode, and injection locked oscillators, IMPATT devices, and microwave and mm wave performance of IMPATT.
• Other solid-state devices like Tunnel diode, BARITT and TRAPAT.

Microwave and mm wave circuits: 10L
• Review of scattering matrix concept in the light of vector network analyzer, impedance matching network, couplers, power dividers, resonators and filters.
• Detectors, mixers, attenuators, phase shifters, amplifier and oscillator
• Ferrite based circuits.
Antennas: 10L
• Hertzian dipole, loop antenna, helical antenna, frequency independent antenna: Du0Hamel principle, log spiral and log periodic dipole antenna array.
• Babinet principle, waveguide slot antenna, microstrip antenna, horn antenna, parabolic reflector.
• Antenna arrays and phased array antenna. Antenna measurement.
Microwave and mm wave propagation. 10L
Overview of basic radio wave propagation mechanisms, Friis transmission formula, plane earth propagation model, troposcatter systems, ionosphere propagation, duct propagation, microwave radio link and calculation of link budget.
• Effect on radio wave propagation due to rain, fog, snow, ice, atmospheric gases, Earth's magnetic field.

Outcome: Student should be able to
CO1: Gain knowledge and understanding of microwave and millimetre wave solid state devices.
CO2: Be able to apply analysis methods to determine circuit properties of microwave devices.
CO3: Know how to model and determine the performance characteristics of a microwave circuit or system.
CO4: Have knowledge of radio waves propagation mechanism.
CO5: Have knowledge of few basic antennas and principles.

PO Table

Paper Code	a	B	c	d	e	F	G	H	i	j	k	l
MCE104	√	√	√									√

PO Statement

1. Engineering knowledge: Apply the knowledge of basic microwave engineering s, and an engineering specialization to the solution of various microwave and millimetre wave related measurements and problems.

2. Problem analysis: Analyze and synthesize performance of various GUNN and IMPATT devices.

3. Design/development of solutions: be able to design antennas.

12. Lifelong learning: Performance measure of solid-state devices of millimetre wave and microwave
and how to design antennas can be applied to further research work.

Books

• P Bhartia & I J Bahl, Millimeter wave engineering and Applications, John Wiley & Sons
• David M Pozar, Microwave Engineering, John Wiley & Sons
• R E Collin, Antenna & Radio wave Propagation, McGraw Hill Book Co.
• Jordan & Balman, Electromagnetic waves & Radiating System
• R E Collin, Microwave Engineering, McGraw Hill CO.

Computer Vision
Code: MCE 105C
Contact hours: 3-0-0
Credits: 3

Module 1

Image Formation Models

• Monocular imaging system • Orthographic & Perspective Projection • Camera model and Camera calibration • Binocular imaging systems, Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Stereo vision

Module 2

Feature Extraction

• Image representations (continuous and discrete) • Edge detection, Edge linking, corner detection, texture, binary shape analysis, boundary pattern analysis, circle and ellipse detection, Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

Module 3

Shape Representation and Segmentation • Deformable curves and surfaces • Snakes and active contours • Level set representations • Fourier and wavelet descriptors • Medial representations Multi-resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation

Module 4

Motion Detection and Estimation • Regularization theory • Optical computation • Stereo Vision • Motion estimation, Background Subtraction and Modelling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation • Structure from motion, Motion Tracking in Video

Module 5

Object recognition • Hough transforms and other simple object recognition methods • Shape correspondence and shape matching • Principal component analysis • Shape priors for recognition

Module 6

Applications of Computer Vision

Automated Visual Inspection, Inspection of Cereal Grains, Surveillance, In-Vehicle Vision Systems, CBIR, CBVR, Activity Recognition, computational photography, Biometrics, stitching and document processing

Course Outcomes:

At the end of this course, students will be able to

CO1: Study the image formation models and feature extraction for computer vision.

CO2: Identify the segmentation and motion detection and estimation techniques.

CO3: Develop small applications and detect the objects in various applications.

References:

- D. Forsyth and J. Ponce, "Computer Vision - A modern approach", 2nd Edition, Pearson Prentice Hall, 2012
- Szeliski, Richard, "Computer Vision: Algorithms and Applications", 1st Edition, Springer-Verlag London Limited, 2011.
- Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", 2nd Edition, Cambridge University Press, 2004.
- K. Fukunaga, "Introduction to Statistical Pattern Recognition",2ndEdition, Morgan Kaufmann, 1990.
- Rafael C. Gonzalez and Richard E. Woods," Digital Image Processing", 3rd Edition, Prentice Hall, 2008.
- B. K. P. Horn, "Robot Vision", 1st Edition, McGraw-Hill, 1986.
- E. R. Davies "Computer and Machine Vision: Theory, Algorithms, Practicalities", 4th Edition, Elsevier Inc,2012.

RESEARCH METHODOLOGY AND IPR
Code: MLC 101
Contact hours: 2-0-0
Credits: 2

Module 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Module 2: Effective literature studies approaches, analysis Plagiarism, Research ethics,

Module 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Module 4: Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Module 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Module 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Course Outcomes:

At the end of this course, students will be able to

CO1: Solve research problem formulation.

CO2: Analyze research related information

CO3: Maintain research ethics

CO4: Convince new incumbents that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

CO5: Realize that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

CO6: Demonstrate that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- Mayall , "Industrial Design", McGraw Hill, 1992.
- Niebel , "Product Design", McGraw Hill, 1974.
- Asimov , "Introduction to Design", Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
- T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

WIRELESS AND MOBILE COMMUNICATION LAB

Code: MCE 191

Contact hours: 0-0-3

Credits: 1.5

List of Assignments:

1. Understanding Cellular Fundamentals like Frequency Reuse, Interference, cell splitting,

multi path environment, Coverage and Capacity issues using communication software.
2. Knowing GSM and CDMA architecture, network concepts, call management, call setup, call release,Security and Power Control, Handoff Process and types, Rake Receiver etc.
3. Study of GSM handset for various signalling and fault insertion techniques (Major GSM handset sections: clock, SIM card, charging, LCD module, Keyboard, User interface).
4. To study transmitters and receiver section in mobile handset and measure frequency band signal and GMSK modulating signal.
5. To study various GSM AT Commands their use and developing new application using it. Understating of 3G Communication System with features like; transmission of voice and videocalls, SMS, MMS, TCP/IP, HTTP, GPS and File system by AT Commands in 3G network.
6. Study of DSSS technique for CDMA, observe effect of variation of types of PN codes, chip rate, spreading factor, processing gain on performance.
7. To learn and develop concepts of Software Radio in real time environment by studying the building blocks like Base band and RF section, convolution encoder, Interleaver and De-Interleaver.
8. To study and analyze different modulation techniques in time and frequency domain using SDR kit.

Course Outcomes:

At the end of this course, students will be able to
CO1: Demonstrate Cellular concepts, GSM and CDMA networks
CO2: Explain GSM handset by experimentation and fault insertion techniques
CO3: Explore 3G communication system by means of various AT commands usage in GSM
CO4: Analyze experimental results on CDMA concept using DSSS kit
CO5: Develop concepts of Software Radio in real time environment

Advanced communication Lab
Code: MCE192
Contact hours: 0-0-3
Credits: 1.5

Purpose:
Experiments on hardware/ kits in order to acquire sufficient knowledge and understand practical limitations/ implications of various communication techniques.
Program Objectives:

- To introduce the basic principles, methods, and applications of various advanced communication systems.
- To learn measurement and synchronization with ambient changes.

Outcomes:

CO1: represent real world signals in digital format to representation of the signals;
CO2: apply the knowledge for proper data recovery.
CO3: Demonstrate the basic blocks of communication systems.

Experiments:

1. QPSK – signal bandwidth, distinguish ability, effect of noise etc.
2. Sampling, quantization, coding – sampling rate, quantization error, signal bandwidth etc.

3. Bit synchronization technique
4. Error control coding techniques
5. Sampling and reconstruction data transmission scheme for
   a. External sampling signal
   b. Audio signal
6. Modulation (Spreading) of DSSS signal.
7. De-modulation (De-spreading) of DSSS signal.

AUDIT COURSE – I
Code: MC 101A
Contact hours: 2-0-0
Credits: 0

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

Mobile Computing
MCE201
Contact hours: 3-0-0
Credits: 3

Aim of the course:

Aim of the course is to provide students advanced level of theoretical knowledge on mobile computing. The knowledge from the mobile computing architecture to database for mobile computing and data synchronization analysis will make students enrich enough to work in mobile computing area either in research field or in industry.

Course Objective:

After completion of this course students will be able to
CO1: State advantages and limitations of mobile computing.
CO2: Describe Mobile Computing architecture and environment.
CO3: Describe Mobile Computing application architecture.
CO4: Explain Mobile computing databases.
CO5: Describe synchronization techniques for mobile data.

Introduction to mobile computing, Novel applications of mobile computing, Limitations of mobile computing.
Mobile computing architecture and environment:
Programming languages, Operating system functions, Functions of middleware for mobile systems, Mobile computing architectural layers.

Mobile computing application architecture:
Reconfigurable Access module for mobile computing applications (RAMON). Functional architecture of RAMON, Algorithm description, control parameters and user plane interaction, mobility management algorithm, handover decision and execution, session control and error control algorithm, Radio resource control algorithm, radio resource sharing, simulative approach, performance issues.
Databases for mobile computing: Data organization, Database transaction models, Query processing, Data recovery process, Data caching.

Data synchronization:
Synchronization in mobile computing systems, conflict resolution strategies, overview of synchronization software for mobile devices. Synchronization protocols, SyncML programming model for mobile computing, SyncML protocol, SMIL.

Text and Reference Books:

1. Architectures and protocols for mobile
computing applications: a reconfigurable approach

Carla-Fabiana Chiasserini a, Francesca Cuomo b,*, Leonardo Piacentini c,

Michele Rossi d, Ilenia Tinirello e, Francesco Vacirca b-- b a
Polytechnic of Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy
Dip. INFOCOM, University of Roma ‘‘La Sapienza’’, Via Eudossiana 18, 00184 Roma, Italy
University of Perugia, Via G. Duranti 93, 06125 Perugia, Italy d
University of Ferrara, Via Saragat 1, 44100 Ferrara, Italye
University of Palermo, Viale delle Scienze, 90128 Palermo, Italy
2. HANDBOOK OF
WIRELESS NETWORKS
AND MOBILE COMPUTING
A WILEY-INTERSCIENCE PUBLICATION--
JOHN WILEY & SONS, INC.

ADVANCED DIGITAL SIGNAL PROCESSING
MCE202
Contact hours: 3-0-0
Credits: 3

Course Outcomes:

At the end of this course, students will be able to
CO1: Demonstrate the theory of different filters and algorithms.
CO2: Explain the multirate DSP, solve numerical problems and write algorithms.
CO3: Elaborate the prediction and solution of normal equations.
CO4: Explore the applications of DSP at block level.

Syllabus Contents:

Module 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.

Module 2

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

Module 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.

Module 4

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

Module 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, Eigen analysis 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.

CRYPTOGRAPHY & NETWORK SECURITY
MCE203A
Contact hours: 3-0-0
Credits: 3

Course Outcomes:

At the end of the course, students will be able to:
CO1: Identify and utilize different forms of cryptography techniques.
CO2: Incorporate authentication and security in the network applications.
CO3: Distinguish among different types of threats to the system and handle the same.

Module 1: Security
- Need, security services, Attacks, OSI Security Architecture, one-time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

Module 2: Number Theory
- Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

Module 3: Private-Key (Symmetric) Cryptography
- Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

Module 4: Public-Key (Asymmetric) Cryptography
- RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

Module 5: Authentication
- IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

Module 6: System Security
- Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Firewall Design Principles, Trusted Systems.

References:

・ William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, 3rd Edition.
・ Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security, Private Communication in a Public World", Prentice Hall, 2nd Edition
・ Christopher M. King, ErtemOsmanoglu, Curtis Dalton, "Security Architecture, Design Deployment and Operations", RSA Pres,
・ Stephen Northcutt, LenyZeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey, "Inside Network Perimeter Security", Pearson Education, 2nd Edition
・ Richard Bejtlich, "The Practice of Network Security Monitoring: Understanding Incident Detection and Response", William Pollock Publisher, 2013.

J2ME FOR MOBILE PROGRAMMING
MCE203B
Contact hours: 3-0-0
Credits: 3

Program Objectives: Mobile phones have been so popular and found a fated market inarguably because of its software features. Java Platform, Micro Edition (Java ME) provides a robust, flexible environment for applications running on embedded and mobile devices in the Internet of Things: micro-controllers, sensors, gateways, mobile phones, personal digital assistants (PDAs), TV set-top boxes, printers and more. Java ME includes flexible user interfaces, robust security, built-in network protocols, and support for networked and offline applications that can be downloaded dynamically. Applications based on Java ME are portable across many devices, yet leverage each device's native capabilities. The Java ME Software Development Kit (SDK) provides device emulation, a standalone development environment and a set of utilities for rapid development of Java ME applications.

Module 1

Introduction to Java ME: Getting Started with Wireless Tool Kit, writing your first J2ME Application, setting up *WTK* with Eclipse and using Netbeans Mobility pack. **3L**

Module 2

MIDlet and UI Elements: MIDlet as a Module of a JME Application, MID let life cycle concepts and simulation, *Display* class; Command Buttons, *Alert* Class, Form, *Choice Group, Date Field, Gauge, String Item, Text Field , Image Item, List, Textbox, Ticker*; Event handling concepts and listener **5L**

Module 3Application data, persistence and RMS: Concept & Need of Persistent Storage with detailed coverage, JME Record Management Store (RMS), Record Store, how to use it for saving application data, Reading from and Writing to a record store, Writing and reading: String, primitive data type, *Serializable* type, any object, use of java.io. Byte Array Output Stream, java. io. Byte Array Input Stream, java.io. Object Output Stream, java.io. Object Input Stream., Iterating over a record set data. **5L**

Module 4 Generic Connection Framework (GCF):

Connecting to a Server over TCP/IP, UDP/IP and HTTP, *Connector* class, *HTTP Connection, Stream Connection, File Connection*, Writing request to and reading response from a HTTP server. Uploading a dummy Form to the Web. Concept of multi-threading in Network and IO operations and replication of Network and IO blockage. Using GCF in a non-UI thread. **4L**

Module 5 Mobile Media API (JSR-135): Capturing Video, Audio, Different formats:

Using Multimedia devices on your phone, to render or play stored media (images, audio, and video). Taking still snap using phone camera, recording audio and video and saving it on phone file system, including SD card. *Canavs* class, Video Control elements. Troubleshooting and overcoming non-JSR-135 compliant native device dependencies. **4L**

Module 6 Wireless Messaging API (JSR-205): Sending and receiving SMS and MMS from your program. **2L**

Module 7 Bluetooth API-JSR 82: Programming Java ME devices and Windows OS Java apps to communicate over Bluetooth. Getting device information, Finding devices, services, *Local Device, Remote Device, Discovery Agent, Discovey Listener, UUID, Stream Connection.* Bluetooth Serial Port Profile, Connecting to standard Bluetooth (IEEE 802.15.x) profiles: DUN, HEADSET, OBEX, concept of AT commands in GSM devices. Using Bluetooth to programmatically connect to a GSM phone and extract information, auto-answer, dial a number. **6L**

Course Outcomes:

CO1: Develop Java ME software and make and distribute essential applications for themselves and their friends which grows interest in engineering as a whole.

CO2: Integrate prototype into product from different application Stores, maybe, for free initially, but they can earn good revenue by incorporating AdSense to even their free applications.

CO3: Explore Mobile Application Development and can pick up other technologies like Android, iOS, RIM etc. very fast.

CO4: Integrates mobile application principles with the real-world experience.

CO5: Demonstrate technical expertise and mobile application development experience.

CO6: Fetch valuable industry inputs and introduce invaluable insight into the process of developing cutting edge mobile applications.

Text & Reference Books:

1. **J2ME Complete Reference by J. Keogh (TMG)**
2. **J2ME from Novice to Professional by Sing Li , Knudsen (Apress)**
3. **Oracle Developers Network**
4. **IBM dW**
5. http://sohamsironline.weebly.com

SATELLITE COMMUNICATION
MCE203C
Contact hours: 3-0-0
Credits: 3

Course Outcomes:

At the end of this course, students will be able to

CO1: Visualize the architecture of satellite systems as a means of high speed, high range communication system.

CO2: State various aspects related to satellite systems such as orbital equations, sub-systems in a

satellite, link budget, modulation and multiple access schemes.
CO3: Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions.
CO4: Demonstrate the communication satellite design, use of analog and digital technologies for satellite communication networks.
CO5: Explore the design of satellite links, the design of Earth station and tracking of the satellites

Module 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.
Module 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.
Module 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.
Module 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.
Module 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.
Module 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.

Microwave measurement Techniques
MCE203D
Contact hours: 3-0-0
Credits: 3

Prerequisite: RF & Microwave Engineering

Program Educational Objectives:
1. To understand the various concepts of Microwave measurement techniques.
2. To understand how to achieve optimization with minute variations.
3. To understand the merits of various measurement devices.
4. To understand the domain-based measurements and comparisons.

Outcome:
CO1: Solve measurement related problems.
CO2: Calculate the parametric value to achieve better measurement.
CO3: Explain different types of waveguides and their respective modes of propagation.
CO4: Analyze typical microwave networks using impedance, admittance, transmission and scattering matrix representations.

Module-I
Introduction to Radio Frequency & Microwave Measurements- Introduction Radio Frequency Band, microwave and millimeter wave. Power Measurement- High Power Measurement, calorimeter technique, Low power Measurement, bolometer technique, Very Low Power Measurement.
Module-II
Frequency Measurement - Different Technique to measure frequency, Slotted Line Technique, maxima & minima, wavelength & frequency measurement. Impedance Measurement- Measurement of unknown load impedance of a transmission line, Slotted Line Technique to measure unknown impedance.
Module-III
Distortion & Frequency Translation Measurement- Different types of distortion occurred at microwave frequencies, Procedures for frequency translation. Detectors& Sensors: Definition of Detectors; Different type of microwave detectors functions and applications, Sensors Definition & working principle, applications.
Module-IV
Vector Network Analyzer (VNA): Concept of vector network analyzer, measurement of scattering parameters, Basic block diagram of vector network analyzer (VNA), Application of vector network analyzers. Scalar Network Analyzer (SNA): Definition of network analyzer, Difference between SNA&VNA, Basic block diagram Scalar Network Analyzer.
Module-V
Spectrum Analyzer: Basic block diagram of a spectrum analyzer, functions & applications of a spectrum analyzer. Time Domain Electrometer (TDR) & IC Technology: Introduction to Electrometer, Measurement of reflection coefficient using electrometer technique, Basic block diagram of a time domain electrometer.

Recommended Books:
1. G.H.Bryant- Principles of Microwave Measurements- Peter Peregrinus Ltd.
2. D.Pozar- Microwave Engineering, 2nd Ed, John Wiley
3. T.S.Laverghetta- Hand book on Microwave Testing
4. S.F.Adam- Microwave Theory & Application- Prentice Hall, Inc
5. HP Application Notes
6. A.E. Bailey, Ed. Microwave Measurements- Peter Peregrinus Ltd
7. M. Engelson-Moder Spectrum Analyser: Theory & Applications Artech Hous

Baseband Processor
MCE204A

Contact hours: 3-0-0
Credits: 3

Prerequisites: Signals and systems, Microprocessor

Aim of the course:

Aim of the course is to provide students advanced level of theoretical knowledge on baseband processor. The knowledge from the baseband processor architecture to power & throughput analysis will make students enrich enough to design and debug baseband processor related areas either in reaserch filed or in industry.

Course Objective:

After completion of this course students will be able to

- ✓ Identify digital baseband operations
- ✓ State characteristics of Parallelizable computation kernels
- ✓ State SIMD and scalar architecture
- ✓ Write macro instruction.
- ✓ Describe macro piping
- ✓ State main processing element and computation units in baseband processor
- ✓ Describe programming model for baseband processor

Outcome of this course are:
CO1: Students will be able to apply the knowledge of baseband processor to design, new baseband architecture and to configure and write programs for the baseband processor. Having a strong foundation on the theoretical knowledge of baseband processor will help then to analyze, synthesize and design baseband processors & also to configure and propose new baseband architecture which may have good social impact in form of products in recent communication era.
CO2: Demonstrate baseband processor to design, new baseband architecture
CO3: Configure and write programs for the baseband processor.
CO4: Analyze, synthesize and design baseband processors & also to configure and propose new baseband architecture
CO5: Build social impact in form of products in recent communication era.

Module-1: Introduction
Digital baseband operations, major computation kernels, workload, characteristic of parallelizable computation kernels.

Module-2: Architecture of baseband processor:
Chip multi-processor, coarse gain PE, Homogeneous PE, Low speech bus, Memory hierarchy, SIMD & scalar architecture.

Module-3:Processing element archtecture:
SODA architecture,macro instruction,macro pipeling,staggered execution of computation units, high level architecture of main processing element,computaion units,vector reduction unit, address generators, programming model.

Module-4:Power and throughput analysis:
Component level evaluation environment,Kernel levlel evaluation environment,system level evaluation environment,kernel level analysis,system level analysis,optimal active mode operation frequency,idle mode,comparison with SODA.

Text and Reference Books :
1. A Low Area and Low Power Programmable Baseband Processor Architecture .-- Eric Tell, Anders Nilsson, and Dake Liu Dept. of Electrical Engineering Linköping University S-581 83 Linköping, Sweden {erite,andni,dake}@isy.liu.se

2. Design of Programmable Baseband Processors -- Department of Electrical Engineering Linköping University SE-581 83 Linköping, Sweden Linköping 2005 ISBN 91-85457-20-ISSN 0345-7524

3. A BASEBAND PROCESSOR FOR SOFTWARE DEFINED RADIO TERMINALS
-- A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Electrical Engineering and Computer Science) in The University of Michigan 2007 Doctoral Committee: Professor Trevor N. Mudge, Chair Professor Chaitali Chakrabarti, Arizona State University Associate Professor Scott Mahlke Professor Marios C. Papaefthymiou Professor Wayne E. Stark.

Multimedia for Mobile Devices
MCE204B
Contact hours: 3-0-0
Credits: 3

Course Outcomes
At the end of the course, students should be able to:
CO1: Describe the importance of multimedia in mobile.
CO2: Demonstrate the process of video telephony.
CO3: Explore the concept of MP3, AAC, WMA audio codecs.
CO4: Identify issues related to bandwidth, error rates, delivery order, call control.
CO5: Featurise some trafficking as speech and video streaming.

Module 1:
Introduction to multimedia for mobile :
Mobile multimedia application properties, Mobile multimedia telephony, mobile multimedia streaming. **4L**
The PSS standrad, media traffic characteristics,content,creation and distribution Media content and rate controls, speach streaming traffic,video streaming traffic. **8L**
Module 2:
Audio for mobile and standrad : 6L
Brief introduction of audio codecs. MP3,AAC,WMA formats Synthetic polyphonic sound format, DLS Voice codecs.

Videos for mobile and standrad : **6L**

Video telephony, video straming, MMS, video compression (H.263,MPEG – 4, H. 264, 3gp) brief inoduction of video codecs.

Module 3: 8L

Multimedia services :

Multimedia messaging service, voice mail, video caller ID, video portal for mobile, mobile TV,components for delevering multimedia service, gateways, media service, multimedia end points.

Module 4:

Qos issues fir mobile multimedia : **8L**

Bandwidth, error rates, delivery order,delay, jitter, segmentation issues,frame based Qos issues,PSNR based Qos metrics, Delay based Qos metrics,call control based Qos metrics.

Text and Reference Books:

1. Tampereen teknillinen yliopisto. Julkaisu 973 tampere University of Technology. Publication 973 igor danilo diego curcio QoS Aspects of mobile multimedia Application.

2. Multimedia in mobile phones – the ongoing revolution jim rasmussion, fredrik dahlgren, harald gustafsson and tord nilsson

3. Quality of Experiance in digital mobile multimedia service shendrik Ole knoche A dissertation submitted in partial fulfillment of the requirements for the degree of doctor of philosophy of university college london.

Image processing & pattern recognition

MCE204C

Contact hours: 3-0-0

Credits: 3

Course Outcomes

At the end of the course, students should be able to:

CO1: Compare human and computer vision system.

CO2: Explain camera geometry fundamentals and image formation.

CO3: Explain the process of Pattern Recognition.

CO4: Apply probability theory to estimate classifier performance.

CO5: Describe the principles of parametric and non parametric classification methods.

CO6: Compare pattern classifications and pattern recognition techniques.

Prerequisite: Basic concept of vectors and matrices (relation between a column matrix and vector), inner product of two vectors, matrix multiplication, inversion, extracting Eigenvectors and Eigen values of a matrix, covariance matrix. Perception of dimensionality and hyper plane. Distance measures in Euclidean space between two points (e.g. Euclidean distance) and a point with a group of points (Mahalanobis distance). Knowledge about statistical distributions (e.g. Normal/ Gaussian), statistical independence, probability distribution function, condition probability, the law of total probability and Bayes rule.

Part – A:

Image Processing Basics: Image definition, a simple image formation model, basic concepts of image sampling and quantization, representing a digital image, concept of pixel/ pel, spatial and gray level resolution, some basic relationships between pixels : Neighbors of a pixel, Adjacency,

Connectivity, Path, Connected component, Connected component labeling. Distance measures: the three essential properties, Euclidean, City-Block and Chess-Board distance, concept of image operations on a pixel basis. 6 L

Popular image processing methodologies: Spatial domain technique : contrast stretching, basic point processing, thresholding function, concept of mask/ sub image, mask processing/ filtering, gray-level slicing, bit-plane slicing. Basics of spatial filtering : convolution mask/kernel, concept of sliding mask throughout the image-space, smoothing(averaging) filter/ low pass filter. Image segmentation by global and local gray level thresholding, region growing, region splitting and merging techniques. Morphological algorithms: thinning, thickening, skeletons. 8 L

Color image processing: Perception of color: color fundamentals. Two popular color models: RGB & HSI, concept of RGB & HSI space and their conceptual relationships, mathematical conversion from RGB to HSI space and vice versa. 2 L

Part – B :

Pattern Recognition Basics of pattern recognition: Concept of a pattern: feature, feature vectors and classifiers. Importance of pattern recognition. Basic concept of fuzzy pattern recognition, linearly separable and inseparable classes, classes with some overlapping regions, convex and non-convex paradigm in this aspect. 2 L

Clustering: Basic concept of cluster analysis.Similarity (Proximity) metrics (indices) and clustering criteria.Partitional clustering: Extraction of natural groups that are inherent in some data set by hard c-means (k-means), fuzzy cmeans. Concept of getting stuck to a local optimum (in objective functional space) by k-means and fuzzy c-means due to their initiation/ starting point. Fuzzy cluster validity index: Xie-Beni index. 8 L

Classification and prediction: Definition of classification and prediction. Basic task of a classifier.Concept of training & testing data and overfitting. Bayes classification: Bayes' Theorem, Naïve Bayesian classification. Classification by Backpropagation: Multilayer Perceptron (MLP) neural network and Backpropagation algorithm. 6 L

Global optimization techniques: Genetic Algorithms (Gas): Cycle of genetic algorithms, selection (Roulette wheel and Tourment) crossover, mutation, evaluation of fitness function, incorporation of elitism in GAs. Multi-objective optimization using GAs. Simulated Annealing (SA): Analogy with physical annealing process, concept of energy and mechanism of energy minimization using SA, Necessity of an uphill movement during the process. Hybridization with partitional clustering techniques. 4 L

Part – C : Image analysis

Image clustering applications: Mechanism of extracting pixel-patterns from a gray-scale image in various ways: e.g. forming feature space (like a two column matrix) treating the gray-value of center-pixel (of a local window) as the first feature and averaged value over a square-shaped local window (3x3 or 5x5 or like that) as the second feature, construction of high-dimensional feature space: e.g. treating all the pixel-gray-values of a local window as features (i.e. for 3x3 window 9-dimensional feature space will result). Application of partitionalclusterings in the above mentioned feature-space to recognize the objects in the concerned image. 2 L

Applications in multispectral and multitemporal remotely sensed imagery: Identification of different land cover types from multispectral remote image data using supervised/ unsupervised classification: Clustering by Histogram peak selection & and its limitation in this context (i.e. remote image analysis). Unsupervised Change Detection using squared-error clustering

methodologies: The algorithm, process, key challenges, error estimations like missed alarms,false alarms and overall error, need of ground truth. 2 L
Image mining: Need, Image search and retrieval. Bottleneck of Text based image mining/ retrieval, Visual feature based image mining: Content-based image retrieval (CBIR). 2 L
Image based face recognition: Basic technique for Eigen face generation & recognition. Intended outcomes: After completion of the course students will be able to analyze about the spatial image processing (in image space) and superiority of image pattern recognition. They will also get the idea about how to deal in an environment with high vagueness and/or ill-fashioned classes (or objects in some image) using fuzzy concept (fuzzy pattern recognition), function of basic and multilayer perceptron model to classify a data set. Some optimization processes (e.g. GA) to enhance the chance to reach a global optimum. Research and development kind of analyses should be realized by them concerning the recent trends in this aspect. 2 L

Text and Reference Books:
1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, Pearson Education Asia, 2004
2. S.K. Pal, A.Ghosh, and M.K. Kundu, Soft Computing for Image Processing, Physica
3. Verlag, (Springer), Heidelberg,1999.
4. R. O. Duda, P.E. Hart and D. G. Stork, Pattern Classification, John Wiley & Sons (Low Priced Edition).
5. Anil K. Jain and R.C.Dubes, Algorithms for Clustering Data, Prentice Hall.
6. S. Theodoridis and K. Koutroumbus, Pattern Recognition, Elsevier.
7. A. Ghosh, S. Dehuri, and S. Ghosh (editors). Multi-Objective Evolutionary
8. Algorithms for Knowledge Discovery from Databases. Springer, Berlin,
9. 2008.
10. Anil K. Jain, Fundamentals of Digital Picture Processing, Prentice Hall.
11. D. E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning, Pearson
12. Education.
13. 9. Remote Sensing Digital Image Analysis : An Introduction by J.A Richards and X. Jia. Springer.
14. Data Clustering: A Review by Anil K. Jain, ACM Comput. Surv., Vol. 31, No. 3. (September 1999), pp. 264-323.
15. Pattern Recognition: The Journal of the Pattern Recognition Society.
16. IEEE Transactions on (i) Pattern Analysis and Machine Intelligence (TPAMI), (ii) on Neural Networks, (iii) on Fuzzy Systems.

Advanced Antenna Engineering
MCE204D
Contact hours: 3-0-0
Credits: 3

Prerequisite: Engineering Electromagnetic
Program Educational Objectives:
1. To understand the fundamental concepts of radiation mechanisms.
2. To understand how to measure various antenna parameters
3. To understand the various possible configurations of antennas and their comparative merits.
4. To understand the working principles of various Antennas.

Module-I

Fundamental Concepts.

Physical concept of radiation, Radiation pattern, near-and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.

Module-II

Radiation from Wires and Loops.

Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

Module-III

Aperture and Reflector Antennas.

Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.

Module-IV

Broadband Antennas.

Log-periodic and Yagi antennas, frequency independent antennas, broadcast antennas.

Module-V

Microstrip Antennas.

Basic characteristics of microstrip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.

Module-VI

Antenna Arrays.

Analysis of uniformly spaced arrays with uniform and non uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkunoff polynomial method, Woodward-Lawson method.

Module-VII

Basic Concepts of Smart Antenns. Concept and benefits of smart antennas, Fixed weight beamforming basics, Adaptive beamforming.

Outcome:

CO1: Solve antenna related problems.

CO2: Calculate the parametric value to design an antenna.

CO3: Explore concepts on antenna related research article discussion.

CO4: Demonstrate the fundamental principles, antenna properties that have impact on the choice of antenna solution in given situations.

CO5: Explore sufficient insight in numerical methods for reasonable and critical use of modern numerical design tool for antennas.

CO6: Design, implement and use avanced antennas in radio systems.

Text:

1. C. A. Balanis, "Antenna Theory and Design", 3rd Ed., John Wiley & Sons., 2005.

2. W. L. Stutzman, and G. A. Thiele, "Antenna Theory and Design", 2nd Ed., John Wiley & Sons., 1998.

3. R. S. Elliot, "Antenna Theory and Design", Revised edition, Wiley-IEEE Press., 2003.

Reference
1. R. E. Collin, "Antennas and Radio Wave Propagation", McGraw-Hill., 1985.
2. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005.

Mini Project with Seminar
MCE281
Contact hours: 0-0-4
Credits: 2

Format

1. Title Page
2. Certificates
3. Declaration by student
4. Acknowledgement
5. Table of Contents
6. Abstract
7. Chapters (Introduction, Literature Survey, System Analysis(if applicable), System Design(if applicable), Coding, Testing(if applicable), Conclusion , Future Scope of work)
8. References (Students should follow IEEE format of papers and books)

Word Processor	Microsoft Word
Page Size	A4 (8.27" x 11.69") with page number
Page Margin for all pages)	Top = 1 inch Bottom=1 inch Left =1.5 inch, Right=1 inch
Font	Times New Roman
CHAPTER TITLE	16 pt. Bold & CAPITAL CASE

Font Size for Sub-Headings	12 pt. Bold & Title Case
Font size for Text	12 pt.
Line Space for Text	1.5 line space
Paragraph	6 pt. Space before and after paragraph & Alignment=Justify
Reference	Align= justify Line Space= single and 6 pt. space before the next reference.

TITLE OF PROJECT

<Font Size 18>

Submitted by

NAME OF THE CANDIDATE

with roll &

reg. no.

<Font Size 16>

Under the guidance of

GUIDE NAME,

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in partial fulfillment for the award of the degree of

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NAME OF THE DEGREE

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BRANCH OF STUDY

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COLLEGE NAME

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MONTH & YEAR <Font Size 14>

MOBILE COMPUTING LAB
Code: MCE 291
Contact hours: 0-0-3
Credits: 1.5

Outcomes:
CO1: Identify the CDMA, J2ME software model for mobile computing.
CO2: Develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.
CO3: Explore the characteristics and limitations of mobile hardware devices including their user-interface modalities
CO4: Analyze QoS over wire and wireless channels
CO5: Promote the awareness of the life-long learning,business ethics, professional ethics and current marketing scenarios.

List of Assignment

1. To implement Code Division Multiple Access (CDMA).
2 To study frequency reuse concept.
3 To study basic concept og J2ME.
4 To study various classes (such as TextBox, ChoiceGroup , Drop Down menus etc.) and their implementation in J2ME.
5 To design a simple WML page using various WML tags.

6 To implement mobile network using NS2.
7 Study Assignment 1: Detailed study of Bluetooth
8 Study Assignment 2: Detailed study of Wireless Application Protocol.
9 Set up and configuration of access point
10 Study Assignment 3:To study network security software

ADVANCED DIGITAL SIGNAL PROCESSING LAB
Code: MCE 292
Contact hours: 0-0-3
Credits: 1.5

Course Outcomes:
At the end of this course, students will be able to
CO1: Design different digital filters in software.
CO2: Apply various transforms in time and frequency.
CO3: Perform decimation and interpolation.

List of Assignments:
1. Basic Signal Representation
2. Correlation Auto and Cross
3. Stability Using Hurwitz Routh Criteria
4. Sampling FFT Of Input Sequence
5. Butterworth Low pass And High pass Filter Design
6. Chebyshev Type I, II Filter
7. State Space Matrix from Differential Equation
8. Normal Equation Using Levinson Durbin
9. Decimation and Interpolation Using Rationale Factors
10. Maximally Decimated Analysis DFT Filter
11. Cascade Digital IIR Filter Realization
12. Convolution and M Fold Decimation &PSD Estimator
13. Estimation Of PSD
14. Inverse Z Transform
15. Group Delay Calculation
16. Separation Of T/F
17. Parallel Realization of IIR filter

AUDIT COURSE – II
Code: MC 201A
Contact hours: 2-0-0
Credits: 0

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies

7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

MOBILE ADHOC NETWORKING
Code: MCE 301A
Contact hours: 3-0-0
Credits: 3

Prerequisites:
Idea of basic networking and wireless networks.

Course Outcomes
At the end of the course, students should be able to:
CO1: Describe the principles of mobile ad hoc networks and what distinguishes them from infrastructure-based networks.
CO2: Identify the layers of the WiFi standard and their functions
CO3: Explore the layers Bluetooth and their functions
CO4: Demonstrate nodes within a piconet for communication, characteristics of sensor networks
CO5: Describe the limitations of wireless sensor networks, especially energy constraints, and the devised solutions.
CO6: Describe the mechanisms employed in clock synchronizing

Module 1
O Ad hoc wireless Network: Introduction, Basic concept on ad hoc network, static and mobile ad hoc network, transmitter-receiver constraints, Applications. 4L
O MAC protocol: Hidden terminal, Exposed terminal, IEEE802.11 in ad hoc mode. 6L
Module 2:
O Routing protocols: Proactive, Reactive and hybrid routing protocol, Destination sequenced distance vector algorithm, Dynamic source routing, Ad hoc on-demand routing, Location aided routing, Link reversal routing. 8L
O Analysis of TCP performance in wireless ad hoc network: TCP window management and problems, different solution schemes, QoS in wireless ad hoc network 6L
Module 3:
O Achieving energy efficiency in wireless ad hoc network: Different schemes to increase the lifetime of the node in ad hoc network – MAC layer protocol, Routing protocol. 6L
O Localization Management: Location acquisition technique, location sensing technique, location aware routing protocol. 4L
Module 4:
O Security for wireless ad hoc network: Security goals, threats and challenges, Different schemes of security in ad hoc network, routing security. 3L
O Case study: Sensor Network, Wi – Max. 3L

Text Books :
1. Ad-hoc networking – Charlse E perkins,Addision–Wesley Professional ; 1 edition (January 8,2001)

2. Ad-hoc networking : Fundamental propertics and network topologies – **Hekmat,** Ramin, Springer
3. Guide to Wireless Ad Hoc Networks – Misra, Sudip ; Woungang, Isaac ; Misra, Subhas Chandra (Eds.) 2009, Springer
4. Ad-hoc networking : Technologies and Protocols – Prasant Mohapatra (Editor), Srikanth Krishnamurthy (Editor)

Reference Books:

1.AdHoc Wireless Networks:Architectures and Protocols,C.Siva Ram Murthy and B.S.Manoj,Pearson Education
2. Wireless and Mobile Networks: Concepts and Protocols, Sunilkumar S. Manvi ,Mahabaleshwar S.Kakkasageri,Wiley India

3)Ad Hoc Mobile Wireless Networks: Protocols and Systems,C.K.Toh,Pearson

4) Mobile Ad Hoc Networking,Stefano Basagni , Marco Conti , Silvia Giordano , Ivan Stojmenovic,WILEY.

ARTIFICIAL INTELLIGENCE
Code: MCE 301B
Contact hours: 3-0-0
Credits: 3

Course Outcomes:

At the end of this course, students will be able to
CO1: Solve basic AI based problems.
CO2: Define the concept of Artificial Intelligence.
CO3: Apply AI techniques to real-world problems to develop intelligent systems.
CO4: Demonstrate the concept of Artificial Intelligence, search techniques and knowledge representation issues.
CO5: Explore the reasoning and fuzzy logic for artificial intelligence.
CO6: Describe game playing and natural language processing.

Module 1
What is AI (Artificial Intelligence)? : The AI Problems, The Underlying Assumption, What are AI Techniques, The Level Of The Model, Criteria For Success, Some General References, One Final WordProblems, State Space Search & Heuristic Search Techniques: Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

Module 2
Knowledge Representation Issues: Representations And Mappings, Approaches To Knowledge Representation. Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing Knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.

Module 3
Symbolic Reasoning Under Uncertainty: Introduction To No monotonic Reasoning, Logics For Non-monotonic Reasoning. Statistical Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, DempsterShafer Theory

Module 4

Fuzzy Logic. Weak Slot-and-Filler Structures: Semantic Nets, Frames. Strong Slot-and-Filler Structures: Conceptual Dependency, Scripts, CYC

Module 5

Game Playing: Overview, And Example Domain: Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. Understanding: What is understanding? What makes it hard? As constraint satisfaction

Module 6

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.

References:

- Elaine Rich and Kevin Knight "Artificial Intelligence", 2nd Edition, Tata Mcgraw-Hill, 2005.
- Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2009.

Digital Wireless Communications System Design

Code: MCE 301C

Contact hours: 3-0-0

Credits: 3

Prerequisites:

Prior idea of communication system and Digital signal processing

Course Outcomes

At the end of the course, students should be able to:

CO1: Describe the concept of digital wireless system communication and issues like interference,noise.

CO2: Distinguish the concept of Wideband transmission and reception happen.

CO3: Explore channel coding, interleaving, spreading function, carrier recovery and timing recovery.

CO4: Explain the method of pulse shape filtering, D/A and RF up conversion method, A/D conversion and filtering.

CO5: Analyze the SNR and Eb/No Modeling of random variables and process,

CO6: Derive mathematically wideband code-division multiple-access system Design, transmitter and receiver architecture.

Module 1:

Introduction to digital communications system modelling, simulation, & design. Elements of a digital communication system, Multiple access schemes, Wideband transmission and reception, Finding Channels, interference, noise. 6L

Module 2:

Top-down design process of a digital communication system

General system architecture and specifications, components modelling and Design, Transmitter Architecutre, Chnnel coding (convolutional), inter-leaving, Spreading, Baseband modulation, pulse shaping filtering (Square-root raised cosine) & design, D/A and RF up-conversion methods & design, 6L

Channel and receiver archiecture, Flat time varying rayleigh (focus) and frequency-selective fading,Low -noise amplification & noise figure, Carrier recovery and RF demodulation,Timing recovery,A/D conversion and recive filtering & design,Despreading, deinterleaving,and decoding. 8L

Module 3:

Performance Simulation and design tradeoff :

Simulation techniques, Baseband filtering ,calibration of noise variance, energy per Symbol,SNR and Eb/No Modeling of random variables and process, A method to generate time-varying fading channel coefficients, 10L

Performance simulation (BER vs.Eb/No),examples,Diversity reception in timevarying frequency-nonselective Rayleigh fading chanels, A wideband code-division multiple-access system Design tradeoff, simulation of a diversity reception system over time -varying Rayleigh fading channels 10L

Text Reference Books :

1. Wireless & Mobile Communications. Edited by jack m. Holtzman and David J.Goodman.Kluwer Academic Publishers, 1994 ,304p.
2. The mobile Communications Handbook. Edited by Jerry D. Gibson,C RC Press,1995,592p ISBN 0-8493-8573-3
3. Mobile Data & wireless LAN Technologies, Prentice Hall,1997. ISBN 0- 13- 839051-7
4. Mobile & Wireless networks, Ulysses black, Prentice Hall,1996, ISBN 0- 13- 440546-3
5. Digital Communications -E Lee & D. Messerschmitt, Kluwer Academic Publishers

Business Analytics
Code: MCE 302A
Contact hours: 3-0-0
Credits: 3

Course Outcomes

CO1: Explain the foundation knowledge of data analytics.
CO2: Demonstrate the ability of think critically in making decisions based on data and deep analytics.
CO3: Describe the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
CO4: Elaborate the ability to translate data into clear, actionable insights.

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.
Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.
9

Module 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.
8
Module 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.
9
Module 4:
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. 10
Module 5:
Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. 8
Module 6:
Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism. 4

Industrial Safety
Code: MCE 302B
Contact hours: 3-0-0
Credits: 3

Course Outcomes
CO1: Analyze the effect of release of toxic substances
CO2: Demonstrate the industrial laws, regulations and source models.
CO3: Apply the methods of prevention of fire and explosions.
CO4: Explain the relief and its sizing methods.

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering,
Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.
Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.
Unit-IV: Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,
vi. Electrical motors, Types of faults in machine tools and their general causes.
Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance
Reference:
1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Operations Research
Code: MCE 302C
Contact hours: 3-0-0
Credits: 3

Course Outcomes: At the end of the course, the student should be able to
CO1: Apply the dynamic programming to solve problems of discreet and continuous variables.
CO2: Explain the concept of non-linear programming.
CO3: Investigate sensitivity analysis
CO4: Explore the real world problem and simulate it.

Syllabus Contents:
Module 1:
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models
Module 2
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

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

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

Module 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