iii .

Annexure – I

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

Scheme of Instruction
and
Syllabi of

ME (DIGITAL SYSTEMS)

(With effect from 2009-2010)

MUFFAKAHAM JAH COLLEGE OF ENGINEERING & TECH

Mount pleasant , Banjarahills Rd. # 3, Hyderabad - 34

M.Tech. (DIGITAL SYSTEMS)

Scheme of Instruction & Examination
M.Tech. Four Semester Course (Regular)2009-2010

S.No.	Subject	Periods per Week L/T	*D/P*	Duration (Hours)	Max. Marks Univ. Exam	Sessional
			SEMESTER – I			
1.	Core	3	--	3	80	20
2.	Core	3	--	3	80	20
3.	Core / Elective	3	--	3	80	20
4.	Core / Elective	3	--	3	80	20
5.	Core / Elective	3	--	3	80	20
6.	Elective	3	--	3	80	20
7.	Lab – I	--	3	--	--	50
8.	Seminar – I	--	3	--	--	. 50
	Total	18	6	--	480	220
			SEMESTER – II			
1.	Core	3	--	3	80	20
2.	Core / Elective	3	--	3	80	20
3.	Core / Elective	3	--	3	80	20
4.	Core / Elective	3	--	3	80	20
5.	Core / Elective	3	--	3	80	20
6.	Elective	3	--	3	80	20
7.	Lab-II	--	3	--	--	50
8.	Seminar - II	--	3	--	--	50
	Total	18	6	--	480	220
			SEMESTER – III			
1.	Dissertation + Project Seminar*	--	6	--	--	100**
			SEMESTER – IV			
1.	Dissertation	--	--	Viva-Voce	Grade***	--

Note: Six Core Subjects and Six Elective subjects should be completed by the end of Semester - II.

* One Project Seminar presentation.
** 50 marks to be awarded by guide and 50 marks to be awarded by Viva committee with guide and two internal faculty members.
*** Excellent / Good / Satisfactory / Unsatisfactory.
(i) Theory question paper have total 7 questions out of which candidate has to answer 5 questions including one compulsory question of 20"marks. This compulsory question, consisting of 6 to 10 questions, which will cover the entire syllabus. Other questions shall be of

15 marks each.
(ii) Sessional marks 20 are based on 2 class tests (each weightage 10 marks). Performance of both the tests will be taken into account.

DEPT. OF ELECTRONICS & COMMUNICATI ON ENGINEERING
MuffakhamJah College Of Engineering and Technology
Banjara Hills Road No.3 Hyderabad

List of Subjects for ME (ECE) Course (Regular) with specialization in
DIGITAL SYSTEMS W.E.R 2009-2010

S.No No	Syllabus Ref. No.	Subject	Periods per week
		CORE SUBJECTS	
1	EC 501	Digital Design and PLDS	3
2	EC 502	Advanced Microprocessors and Microcontrollers	3
3	EC 503	Data and Computer Communication Networks	3
4	EC 504	Data Structures Using C	3
5	EC 505	VHDL	3
6	EC 563	Modem Digital Signal Processing	3
7	EC 507-1	Digital Systems Laboratory - I	3
8	EC 507-2	Digital Systems Laboratory - II	3
9	EC 508-1	Seminar - I	3
10	EC 508-2	Seminar - II	3
11	EC 508-3	Project Seminar	3
12	EC 509	Dissertation	9
		ELECTIVE SUBJECTS	
13	EC 510	VLSI Design	3
14	EC 511	Fault Diagnosis of Digital Systems	3
15	EC 512	Systems Programming	3
16	EC 513	Multimedia Information Systems	3
17	EC 514	Digital Communication Systems	3
18	EC 515	Algebraic Coding Theory	3
19	EC 516	Computer Graphics	3
20	EC 517	Computer Vision	3
21	EC 518	Neural Networks	3
22	EC 519	Speech Signal Processing	3
23	EC 520	Information Theory	3
24	EC 521	Operating Systems	3
25	EC 522	Internet and Java Programming	3
26	EC 523	Numerical Methods in Engineering	3
27	EC 524	VLSI Array Processing- I	3
28	EC 525	VLSI Array Processing-II	3
29	EC 526	Parallel Processing	3
30	EC 527	Advanced Computer Organization	3
31	EC 528	Management Information Systems	3
32	EC 529	Image Processing	3
33	EC 540	Electromagnetic Interference and Compatibility	3
34	EC 542	Optical Communication Systems	3
35	EC 572	Optimization Techniques	3
36	EC 573	Digital Filter Design	3
37	EC 574	Systems Simulation and Modeling	3
38	EC 579	Fuzzy Logic	3
39	EC 581	Wireless Communication Systems	3
40	MT 501	Engineering Mathematics	3

Note: Core of one specialization can be elective for other specialization provided condition for prerequisite is satisfied. This is also applicable to electives.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 501

DIGITAL DESIGN AND PLDS

Instruction:	3 Periods per week 3 Hours
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Digital system Design Hierarchy. Top-Down Modular combinational Logic Design, combinational circuit Design with Programmable Logic Devices (PLDs)

UNIT II
Introduction to sequential circuits, sequential circuit model & classification state table and state diagram. Memory devices: Latches, Flip Flops, excitation. Table characteristic equation, state diagram, synchronous sequential circuit Mealy and Moore models.

UNIT III
Analysis and synthesis of synchronous sequential circuits. Finite-state controllers. Algorithmic State Machine (ASM) diagram. One hot Finite state Machine Design Method.

UNIT IV
Analysis and synthesis of Asynchronous sequential circuits and critical and non critical races, essential hazards.

UNIT V
Sequential circuits with Programmable Logic Devices. Introduction to computer aided design of Digital Circuits.

Suggested Reading

1. CD Victor P. Nelson, H Troy Nagle. Bill D. Carrol and] David Irwin. Digital Circuit -Analysis and Design, PHI, 1996.
2. Nagle H. T., Introduction to Computer Logic, PHI, 1975.
3. Zavi Kohavi. Switching and Finite Automata Theory, TMH, 1976.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 502

ADVANCED MICRO PROCESSOR & MICRO CONTROLLERS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT -I
Architectural Advances of INTEL XX86 microprocessor family from 8086/8088 to Pentium & Pentium pro, Addressing Modes, Instruction set, ALP, Assembler Directives, String processing, Procedures & stack, Interrupt structure, Interrupt Vector table.

UNIT-II
Minimum Mode & Maximum Mode operations, Control signal interface under Maximum & minimum Modes, Interfacing with SRAM, EPROM. Interfacing with 8255, 8254, 8259, 8237 & 8251 Programmable interface chips.

UNIT-III
Introduction to O.S and Virtual Memory Management, Pentium Micro Processor, RISC concepts, Bus operations, Super scalar Architecture, Pipelining, Branch Prediction, Instruction & Data caches, Floating Point Unit, Protected Mode of operation.

UNIT-IV
Micro controller: Architecture of 8051, Instruction Set, Peripheral Interface programming, Interface programming, Interface with DAC, ADC Stepper Motor, PID Controller and RTOS with 8051.

UNIT - V
PIC Micro controller, Instruction Set, Timer & Interrupts, External Interrupts & Timers, I/O port expansion, 12C BUS, Special features of PIC 16F8XX, interface with L VDT & digital Thermometer.

References:

1. DV Hall Microprocessors and Interfacing, Programming & Hardware, 2nd edition,TMH, 1999.
2. Uften beck, The 80X86 family Design, Programming & Interfacing, 3rd edition, Pearson, 2004.
3. James L Antonokos, The INTEL Pentium Microprocessor, PHI, 1997.
4. Mazidi M A & Mazidi. The 8051 microcontroller & embedded system, Pearson, 2000.
5. A Deshmukh Microcontroller Theory & Applications, 1st edition, TMH, 2005.
6. John B Peat men, designing with PIC Microcontroller, Pearson, 2000.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 503

DATA AND COMPUTER COMMUNICATION NETWORKS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I

Introduction: Data communication networking. Computer communication architecture. Data link control line configuration. Flow control, Error control, Bit-oriented link control (HLDC). Modems and Data Multiplexers. Modem; Standard Modem: Data Multiplexers. Telephone Network; long distance network.

UNIT II

Communication networking techniques: Circuit, message and packet switching. Broadcast networks. Packet switching: Virtual circuits and datagrams. Routing, Traffic control. Error Control.

Radio and satellite networks: Packet radio architecture. Access protocols. Satellite network architecture. Channel access protocols. Local networks: Technology Bus/Trco topology. Ring topology. Medium access control protocols. Protocol performance.

UNIT III

Computer communication architecture: Protocols, Layered approach. Hierarchical. approach. Network access protocol. Interface X.21, X.25 and logical link control. Internetworking: Bridge, X.75. Internet protocol.

UNIT IV

Transport protocols: Transport services. Protocol mechanisms. Network services. Session' protocols: Session characteristics. Service definition. Protocol definition. Presentation/ application
protocols: Virtual terminal protocols. File transfer protocols. Electronic mail.

UNIT V

Integrated services network: Overview. Transmission structure. User access protocols. ATM Networks - Introduction.

Suggested Reading

1. Stallings W., *Data and Computer Communications,* Maxwell Macmillan, 2nd Edn.,1988.
2. Andrew S Tanenbaum, *Computer Networks,* PHI, 3rd Edn., 1997.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 504

DATA STRUCTURES USING 'C'

Instruction:	3 Periods Per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Programming in 'C' : Data types & memory size, expressions, Statements, Arrays, Pointers. Structures, Functions, Recursive functions, String functions. Files in C and Files I/O. Dynamic memory allocation.

UNIT II
Sorting And Searching: Sorting algorithms. Selection sort. Quick sort. Searching algorithms. Linear search. Binary search. Application programs.

UNIT III
LISTS: Stacks. Queues; definitions. Operations. Array implementation of stacks and Queues. Circular Queues and Applications. .

UNIT IV
Linked Lists: Linked lists, detinitions. Linked implementation of stacks and queues.

UNIT V
Trees: Binary Trees. Operations on binary trees and applications of Binary trees.

Suggested Reading

1. Aaron M. Tenenbaum. Yadidyah Langsam and Moshe J. Augesteain., *Data Structures Using* C) PHI, 1996. .
2. Herbert Schildt, *Advanced* C, Osborne McGraw Hill, 1998.
3. Robert Lafore, *The Waite Group's* C *programming using Turbo* C+ +, Macmillan Computer Publishing, 1990.
4. Kruse RL. Bruce RL. Cloris Lt, *Data Structures and Program Design in* C, PHI, 1991.
5. Johnson B1m ht and Kalil} *Application Programming in* C, Maxwell Macmillan, 1990.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 505

VHDL

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT - I
Behavioral Modeling, Transport Vs Inertial delay, Simulation deltas, Drivers, Generics, sequential Processing, Process statement, Signal assignment V s Variable assignment, sequential statements.

UNIT-II
Data types, Object types, Subprograms and packages, Function, procedures, packages, Predefined attributes, Configurations.

UNIT -III
Synthesis, RTL description, Constraints, attributes, Technology Libraries, VHDL Synthesis, State machine example,

UNIT-IV
High Level design flow, Place & Route, Post layout simulation; Top level System design, CPU design.

UNIT - V
CPU: Synthesis description, RTL simulation, Test benches, Kinds of test benches, CPU simulation and Case studies: USB Controller, Reference Controller, Bus Controller. *'-1.IJV/-'t.*

Suggested Readings:
1. J. Douglas L. Perry, VHDL : *Programming by Example,* 4th edition, TMH, 2003.
2. J,.. Charles HRoth, Jr. *Digital System using VHDL,* 1st edition, Thomson Learning, 2001.
3. S. Brown, Z. Vranesic, *Fundamentals of Digital Logic with VHDL design,* 1st edition, TMH, 2004.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 507-1

DIGITAL SYSTEMS LABORATORY

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals;	20 Marks

Section - 1 C

1 - C & Data Structure

Section - 2: VHDL

Including case studies. Synthesis on FPGA/CPLDs

Section - 3: **VLSI Design**

Layout Design Practice of INV, NAND, NOR, XOR, Transmission Gate.
*Fullcustom IC design of Both's Multiplier, Parallel Prefix Adders.
Layout Design of OPAMP, P.LL, ADC

Section - 4: Micro Processor &. Micro Controller

a) Microprocessor
Assembly Language Program of 8086 Microprocessor TASM/MASM. Simple Programs using Dos calls.

b) Micro Controller 8051. .
   i) Introduction to Keil Software IDE. .
   A.LP. of 8051 : Basic Instruction, I/O Port, Timer, Serial & Interrupt Program.
   ii) Experiment using 8051 Micro Controller Developer ADM based Kit: Keyboard, Display, etc.,

c) Microcontroller Motorala
Introduction to Code Warrior IDE
Editing, Debugging, Processor Expert & Data Visualization.

d) Debugging software and hardware with logic state analyzer.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 510

VLSI DESIGN

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks20
Sessionals:	Marks

Unit - **I**
Overview of CMOS & BiCMOS Technologies, Implementation Strategies for Digital ICs, MOS Transistor Models-Manual & SPICE Models, Technology Scaling, CMOS inverter -DC Characteristics, Static and dynamic behavior, power, Energy & Energy - Delay, BiCMOS Inverter.

Unit - II
MOS & BiCMOS circuit design, Basic circuit concepts - Sheet Resistance, Area capacitance of layers, Delay units, Layout design of basic Gates, Transmission Gate.

Unit - III
Design of combinational logic Gates in CMOS - static & dynamic logic, design of sequential logic circuits - static, Dynamic & Pipelining.

Unit - IV
Subsystem Design - Arithmetic Building Blocks, memory & Array Structures.

Unit - V
Test & Testability, Ultra fast VLSI circuits & system, Introduction to GaAs Tectinology.

References:
1. Pucknell Douglas A and Kameran Eshraghian, *Basic VLSI design,* 3rd edition, PHI, 1995.
2. Neil HE Weste & Eshraghian, *Principles of CMOS VLSI Design,* 2nd edition, Addison - Wesley, 1998.
3. JM Rabby, A Chandra Kasan & Borivoj Nokolic, *Digital Integrated Circuits,* 2nd edition, PHI, 2003.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 511

FAULT DIAGOSIS OF DIGITAL SYSTEMS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

Unit - I
Combinational Circuits: Hazards, Fault detection and Fault Locational Classical methods. Fault detection by path sensitization.

Unit-II
Construction of fault detection experiments. Equivalent Normal-Form method, Boolean difference method, Spoof method.

Unit - III
Detection of multiple faults, D-Algorithm, Singular covers, d-intersection. "Detection of multiple faults. Failure-tolerant design, Quadded Logic.

Unit -IV
Sequential circuits: State identification and fault-detection experiments, Homing and distinguishing experiments.

Unit -V
Machine identification, Design of fault detection experiments. Design of diagnosable machines.

Suggested Reading:
1. Melvin A. Bruer & Arthur D. Friedman, *Diagnois & Reliable of Digital Systems,* Computer Science Press, 1976.
2. Kohavi Z, *Switching and finite automata theory,* TMH, 1978.
3. Samuel, C.Lee, *Digital and Logic Design,* PHI, 1976.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 512

SYSTEMS PROGRAMMING

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Introduction: Machine structure. Evolution of the components of a programming systems. Operating system functions, Assemblers, Loaders, Compilers, Operating Systems.

UNIT II
Machine Language and Assembly Language: Machine Language. Addressing schemes. use of Index Registers, Looping, Assembly Language simple programs in Assembly Language.

UNIT III
Assemblers: Techniques for the design of assemblers. Data Structure. Table processing. Searching and sorting, Random entry searching, Macro Language and the Macro Processor: Macro Instructors. Macro facility Implementation.

UNIT IV
Loaders: Loader schemes. 'Compile-and-go' loaders. Absolute loaders. Subroutine linkages. Linkage Editors, Relocating loaders, Direct-linking loaders, Design aspects.

UNIT V
Compilers: Recognizing Basic elements, Syntactic units, Storage allocation. Code generation. General model of a compiler. Phase of compiler - Lexical phase, Syntax phase. Assmbly phase. Passes of compiler. Introduction to operating systems.

Suggested Reading
I. Donovan JJ., *Systems Programming,* MGH, 1975.
2. Gear C. W., *Computer Organization and Programming,* MGH
3. Leland L. Beck. *System Software,* Addison Wesley, 1985.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010.

EC 513

MULTIMEDIA INFORMATION SYSTEMS

Instruction:	3 Periods per week
Duration of University Examination	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

I

UNIT I
Definition of Multimedia, Multimedia System Description. Applications of Multimedia. Types of Multimedia: a .non-interactive, interactive. hypertext.

UNIT II
Multimedia Networking: ATM. ISDN. WAN and their comparisons, Multimedia synchronization. Serial and Parallel.

UNIT III
Motion estimation techniques: Bruteforce, algorithm three step, search algorithm. 2-D algorithm and conjugate direction search algorithm.
Image compression standards: Review on loss less and lossy compression models. JPEG. H261 MPEG1, MPEG2 and MPEG4. .

UNIT IV
Audio coding: Introduction to multi rate signals. MPEGI and MPEG2 audio encoder and decoder. .

UNIT V
Multimedia Information indexing and Retrieval: General information Retrieval (IR) model. Differences between between IR and DBMS Basic IR models. Filestructure, Audio Indexing and Retrieval methods. Image Retrieval Based on shape and moments and watemarking Techniques.

Suggested Reading

1. Guojun Lu. *Communication and Computing for distributed multimedia systems,* Artech House, Boston, London, 1995.
2. Bhaskar. V and Konstantindes K, *Image and Video Compression Standards algorithms and Architecture* Kluwer Academic, Sept, 1997.
3. Judith Jeffcoate, *Printmedia in practice (Theory and Applications),* PHI, 1998.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 514

DIGITAL COMMUNICATION SYSTEMS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Representation of bandpass signals. Stationary. Stochastic processes. Linear band bass system. Spectral characteristics of digitally modulated signals.

UNIT II
Baseband data transmission: Duo-binary systems. M-ary signalling schemes, equalization.

UNIT III
Coherent and non-coherent detection of binary signals. MSK and QPSK signalling scheme-generation and detection.

UNIT IV
Linear Block codes and cyclic codes: Soft decision decoding and hard decision decoding, Convolutional codes- Viterbi algorithm.

UNIT V
Digital signalling over fading multi path channels. Characterization of fading multi path channels. Binary signalling over frequency non-selective fading channel.

Suggested Reading

1. John G. Proakis, *Digital Communication,* MGH, 2nd Edn., 1984.
2. Shanmugam. KS., *Digital and Analog Communication Systems,* Willey, 1980.
3. Das.J., Mullick. SK. Chatterjee. PK., *Principles of Digital Communication,* Wiley Eastern, 1992.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 515

ALGEBRAIC CODING THEORY

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Elements of Digital Communication Systems. Channel Encoder and Channel Decoder. - Channel Models. Discrete Memoryless Channel Binary Symmetric Erasu re Channel Burst Channel Types of Errors and Error-Control Codes.

UNIT II
Groups Rings. Polynomial Rings. Polynomials over (GF(2). Construction of Extension Field GF(2**). Implementation of Galois Field. Vector Spaces Matrices.

UNIT III
Linear Block Codes: Basic Concepts and Definitions. Examples of Binary Linear Block Codes. Modifications of Linear Block Codes. Decoding of Linear Block Codes, Correction of Errors and Erasures. Performance of Binary Block Codes.

UNIT IV
Cyclic Codes: Polynomial Description of Cyclic Codes. Decoding of Cyclic Codes, Syndrome Decoding, Bose-Chauduri-Hocquenghem Codes, Reed-Solomon codes, Multilevel Block Coded Modulation.

UNIT V
Application of Block Codes: Voyager Missions. Galileo Mission. Applications to Mobile Communications, GSM Digital Radio System. Applications and decoding to Compact Discs encoding.

Suggested Reading

1. Shu Lin, *An Introduction to error Correcting codes,* Prentice Hall, 1961.
2. Peterson WW., *Error Correcting Codes,* John Wiley, 1961.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 516

COMPUTER GRAPHICS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I

Overview of Graphics Systems - Video display devices. Raster scan Systems. Random Scan Systems. Graphics monitors and workstations. Input devices. Hard copy devices.

UNIT II

2 Dimensional Geometric Transformations: Basic transformations. Homogeneous co-ordinates. Composite transformations. Transformation between co-ordinate systems. Affinite transformations. Transformation functions. Segment tables. Segment Display files, Operation on Segment data structures for display files, Raster methods for transformations.

UNIT III

Two dimensional viewing: Window, View-port. Viewing pipelining. viewing transformation. viewing functions.

Clipping: Line clipping - Cochen Sutherland line clipping. Hang Barsky line clipping; interior and exterior clipping; Polygon clipping; Sutherland - Hodgman recentrant polygon clipping. Weller - Atheron concave clipping regions. .

UNIT IV

Three dimensional primitives. 3-D transformations. Projections - Parallel. Isometric. Perspective: viewing parameters, viewing transformations, 3-D clipping.

UNIT V

Three dimensional object representations: Polygon surfaces. curved lines and surfaces. spline representations. Bezeir curves and surfaces. B-Spine curves and surfaces. CSG methods: Octrees. BSP trees. Hidden lines and surfaces: Visible surface detection methods - Warnock algorithm. Z-Buffer algorithm scan line algorithm, Arc sub division algorithm.

Suggested Reading

1. David F. Rogers. *Procedural Elements for Computer Graphics.* McGraw Hill International Edition. 1987.
2. Hearn Donald and Pauline Baker M. *Computer Graphics,* PHI, 2nd Edn., 1995 Newmann WM, and Sproull, RF., *Principles of Computer Graphics.*
3. Steven Harrington. *Computer Graphics, A Programming Approach,* MGH, 2nd Edn., 1987.
4. Newmann WM, and sproull, RF., *Principles of Computer Graphics.*

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 517

COMPUTER VISION

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Image Segmentation: Edge detection methods. Laplacian, gradient, LOG, Canny Operators. Line and Point detection methods. Region Based Segmentation methods.

UNIT II
2D Image representation: Chaincode, Polygonal approximation, Fourier descriptors. BSpline and moment methods.

UNIT III
Texture Segmentation: Statistical and syntactic texture description methods. Co.occurence matrices. Edge frequency. Law texture measures. Syntactic texture description method: Shape chain grammars and Grapgrammars.

UNIT IV
Motion analysis: Optical flow Computation: Global and local optical flow estimation. Detection of interest points, Object tracking, and Correspondance of interest points and Object bracking.

UNIT V
3D Vision: Basics of Projective geometry stereo correspondence algorithms. Radiometric considerations in determining gray level. Surface reflectances, Shape from shading and photometric stereo.

Suggested Reading

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, *Image Processing, Analysis and Machine Vision.* PWS Publishing. (In International Thomson Publishing Co.,), 1999.
2. Bolye. RD and Thomas. RC, *Computer Vision a first course.* Black well Scientific publication.
3. Robert J. Schalk Off, *Digital Image Processing and Computer Vision,* John Willey. 1989.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 518

NEURAL NETWORKS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Modeling the simple neuron: Learning by Hebb's rule, Widrow-Hoff rule. Perception learning rule and its convergence theorem.

UNIT II
Adaline and Madaline neural networks. Multilayered Perception - Solution of the XOR problem. Learning by error back propagation rule. Radial Basis functions and learning rule.

UNIT III
Bidirectional associative memory; Hetro associative memory. Interpolative associative memory. Auto associative memory. Hopefield Memory. Bidirectional associative energy function. Discrete and continuous Hopfiel memory. Hopfield network for AID and Travelling salesman problems.

UN IT IV
Recurrent Neural Network: Stochastic networks and simulated annealing, Architecture of a Boltzman Machine, Learning rule, issues in implementation of Boltzman Machine.

UNIT V
Competitive learning network: Components of competitive learning network. Basic learning rules. Description of Kohonen's neural network, Learning rule and parametric selection. Adaptive resonance theory: ARTI, ART2 network description and learning rules.

Suggested Reading

I. Freemann *JA.* and Skapura DM, *Neural Networks Algorithm, Applications and Programming Techniques,* Addison Wesley, 1991.
2. Muller B. Rienhardt, *J., Neural Networks and Introduction,* Springer-Verlag, 1991.
3. Simon Haykin. *Neural Networks (A Comprehensive Foundations),* McMillan college Pub. Company, New York, 1994.
4. Yegnanarayana. B., *Artificial Neural Networks.* PHI.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 519

SPEECH SIGNAL PROCESSING

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Mechanism of speech production, Source-filter model, Lossless tube model, Speech sounds, Digital speech: PCM, Adaptive differential PCM, Delta modulation.

UNIT II
Short-time spectral analysis: Windowing, Short-time energy, magnitude, zero crossing, Autocorrelation function, Cepstral analysis, Filter banks, Formant estimation and tracking, Pitch extraction.

UNIT III
Linear predictive coding (LPC) analysis: Computation of LP coefficients, Frequency domain interpretation of LPC, LPC applications, CELP.

UNIT IV
Subband coding, Formant Vocoder, Cepstral vocoder, Vector quantizer coder, Speech enhancement techniques, Spectral subtraction, Enhancement by resynthesis.

UNIT V
Automatic speech recognition: Basic pattern recognition approaches, Evaluating the similarity of speech patterns, Hidden Markov model (HMM) for speech recognition, Viterbi algorithm, Speaker recognition, Features that distinguish speakers.

Suggested Readings:
1. Rabiner and Schafer, *Digital Processing of Speech Signals,* Pearson Education, 2004.
2. Douglas O'Shaughnessy, *Speech Communication: Human and Machine,* 2nd ed.,University Press, Hyderabad, 2001.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 520

INFORMATION THEORY

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I

Introduction: Model of communication system. Discrete and continuous schemes with and without memory. Discrete Schemes without memory: Entropy as a measure *of* uncertainty: Requirements of entropy function. Markov sources. Joint and conditional entropies. Redundancy. Efficiency. Channel capacity.

UNIT II

Capacity *of* noisy and noise less channels without memory. Channels with symmetric noise structure. BSE and BEC. Extension *of* channel source. Continuous system without Memory: Measure of information in continuous system.

UNIT III

Entropy maximization problems. Gaussian noise channels. Transmission *of information* in the presence of additive noise, channel capacity in the presence *of* Gaussian addition noise and specified transmitter and- noise average powers.

UNIT IV

Band - limited Signals: Sampling theorem in time and frequency domain_ Shannon Hartley channel capacity formula.

UNIT V

Coding: Separable binary codes. Shannon-Fano coding. Necessary and sufficient conditions for noiseless coding. McMillan's in-equality for Shannon's binary coding. Huffmann's minimum redundancy code. Shannon's Fundamental theorems for noiseless and noisy channels. Hamming's error detecting and correcting codes.

Suggested" Reading

1. Gallager. *Information theory*- John Wiley.
2. Reza, *An Introduction to Information theory*- McGraw Hill, 1961.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 521

OPERATING SYSTEMS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Basic operating system functions: Types of operating systems. User interface. Run time environment.

UNIT II
Machine-Dependant operating systems: Interrupt processing. Process scheduling. I/O Supervision. Management of real memory and virtual memory.

UNIT III
Machine-Independent Operating System Features: File-processing. Job Scheduling. Resource allocation. Protection.

UNIT IV
Operating System Design Options: Hierarchical structure. Virtual machines, Multiprocessor systems.
Implementation Examples: UCSD Pascal system. Unix, NOS, VAX/VMS, VM/370.

UNIT V
System software: Data base Management system (DBMS). Basic concepts. Levels, Users, Text Editors - User.interface_ Editor structure. Interactive Debugging systems-Debugging functions and capabilities. Relationship with other parts of the system. User-interface criteria.

Suggested Reading .

1. Leland L. Beck, *Systems Software, Addison* Wesley, 1985.
2. Madnick, SE and Donvan. JJ" *Operating Systems.* MH (ISE), 1978.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 522

INTERNET AND JAVA PROGRAMMING

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Introduction to Internet and Intranet, HTTP protocol. TCP/IP - concepts, addressing, routing. Web application building blocks, HTML, CGI, Integrating ODBC and CGI. .

UNIT II
Java programming - Overview of Java. Data types. Variables, arrays, operators, control structures, classes, inheritance, packages and interface.

UNIT III
Java programming - Exception handling, multithreading programming, I/O, Applets Networking. AWT, AWT control.

UNIT IV
Internet concepts - cross-platform client Browser setup, corporate information models, structuring company information resources document management, workflow software. Group ware, case studies.

UNIT V
Information servers - DNS, Mail Servers, News Servers. Chat.ftp servers, proxy servers. security and firewalls, search engines.

Suggested Reading
1. Desborough John, *Intranet Web Development,* New Rides, 1996
2. Patrik Naughton, Robert Schrildt, *The Complete Reference Java,* TMH, 1997.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 523

NUMERICAL METHODS IN ENGINEERING

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Errors and Approximations in Digital computers - solution of Transcedental and polynomial equations.

UNIT II
Interpolation. Single and two variable functions.

UNIT III
Eigen values and Eigen vectors of Matrix, Solution of linear equations.

UNIT IV
Numerical integration and differentiation.

UNIT V
Solution of ordinary differential, Partial differential and integral equation.

Sugested Reading

. 1. Rajaraman, Numerical Methods in Computer; PHI, 3rd Edn., 1995.
2. Mc Crackew, Daniel. D and Dorn WS., Numerical Methods and Fortran Programming, John Wiley, 1964.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 524

VLSI ARRAY PROCESOR-I

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Introduction: Array Processors for Signal and Image Processing, VLSI Architecture Design Principles, VLSI Array Algorithm.

UNITII
Mapping Algorithms onto Array Structures: ParalleL Algorithm Expression, Canonical Mapping Methodology, Generalized Mapping Methodology from DG to SFG.

UNIT III
Systolic Array Processors: Systolic Array processors, Mapping DGs and SFGs to Systolic

arrays. Performance Analysis and Design Optimization.
. .

UNIT IV
Wavefront Array Processors: Wavefront array processors; Mapping Algorithms to Wavefront Arrays: Timing Analysis and Optimal Queue Assignment:

UNIT V
Programming Languages for Wavefront arrays: Hardware Design.

Suggested Reading
1. Kung. SY. VLSI Array Processor*;* PHI, 1988.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 525

VLSI ARRAY PROCESSOR-II

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I
Signal and Image Processing Algorithms: Matrix Algorithms; Digital Signal Processing Algorithms; Image Processing Algorithms.

UNIT II
System and Software Design: System Organization; Matching Algorithms to arrays; Fault Tolerance on VLSI array processors;

UNIT III
Programming Languages for array processors; CAD for array processors.

UNIT IV
Implementation of array processors: Processor level implementation; Design of arithmetic units; System level implementation; Examples of array processor system.

UNIT V ,
Application to Signal and & Image processing: Spectral estimation; Beam forming and Kalman filtering; Speech processing; Image processing.

Suggested reading
1. Kung, SY. VLSI Array Processors, PHI, 1988.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 526

PARALLEL PROCESSING

Instruction:	3 Periods per week
Duration of University Examination	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I
Programming and Parallelism: Conditions of Parallelism; Program partitioning and scheduling; program flow mechanisms.
System Inter connect Architectures: Network properties and routing; Static connection. Networks: Dynamic connection Network. .

UNIT II
Processors and Memory Hierarchy: Advanced Processor Technology; Superscalar and Vector Processors; Memory Hierarchy technology; Virtual memory technology. Cache and shared memory; Cache Memory Organisations; Shared memory organisations.

UNIT III .
Pipelining and Superscalar Techniques: Linear pipeline processors; Nonlinear pipeline processor: Instruction pipeline design; Arithmetic pipeline design; Superscalar and Super pipeline design.

UNIT IV
Multiprocessors and Multicomputers; Multiprocessor system interconnects; cache coherence and synchronisation mechanisms; Message passing mechanisms. Multivector, and SIMD computers: Vector processing principles; Multivector Multiprocessors; Compound vector processing; SIMD computer organizations.

UNIT V
Scalable Multithreaded and Dataflow Architectures: Latency-hiding techniques; principles of Multithreading; Fine-Grain Multicomputers; scalable and Multithreaded architectures; Dataflow and hybrid architectures: I/O channels. CPU design; Bus architecture.

Suggested Reading

1. Kai Hwang, *Advanced Computer Architecture,* McGraw Hill, 1993.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 527

ADVANCES COMPUTER ORGANISATION

Instruction:	3 Periods per week
Duration of University Examination	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I

Processor Design: Processor organisation. Information representation. Instruction sets. ALU design for fixed point addition, subtraction, multiplication and division. Floating point arithmetic. Parallel processing. Pipeline processors. Multinunit processors.

UNIT II

Control Unit Design: Instruction sequencing. Hardware control unit design, Microprogrammed control unit design. Microprogrammed controls.

UNIT III

Memory organization: Random access memories. serial access memories. Virtual memory. Interleaved memories. Cache memories. Associate memories.

UNIT IV

I-0 Organization: Local communication, long distance communication. Interconnection structure. Bus control, Programmed 1-0. DMA & Interrupts. I-O processors.

UNIT V

CPU and 1-0 interaction. Multiple CPU systems, and Recent developments.

Suggested Reading

1. Hayes John. P., *Computer Architecture and Organization,* McGraw Hill.
2. William Stallings

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 528

MANAGEMENT INFORMATION SYSTEMS

Instruction:	3 Periods per week
Duration of University Examination	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I

An overview of MIS. Structure of MIS. Information System Technology, Storage and Retreival of data. transaction processing, office automation, information processing control functions.

UNIT II

Conceptual Foundations: The decision making process, concepts of information system concepts. concepts of planning and control, organizational structure and management: concepts. .

UNIT III

Information system requirements: Developing a long range informations, database requirements, user interface requirements.

UNIT IV

Implememation: Developing and implementing application systems, quality assurance and evaluation.

UNIT V

Organization and management of information resources function.

Suggested Reading

1. Gordon Davis B., Margrethe Oslon, H., *Management Information Systems: Conceptual foundations, structures and development,* MCGraw-Hill.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 529

IMAGE PROCESSING

Instruction:	3 Periods per week
Duration of University Examination	3 Hours
University Examination:	80 Marks
Sessionals:	20 Marks

UNIT I

Digital Image Fundamentals: Image geometry. Perspective, orthographic and stereo, imaging; geometry. Image Sampling and Quantization. Elements of a Digital Image Processing System. .

UNIT II

Image transforms: FFT, WHT, Haar transform, slant Transform, DCT and Wavelet transform

UNIT III

Image enhancement: Spatial domain techniques - Histogram equalization, direct histogram, contrast stretching multiple, averaging. Frequency domain techniques Highpass, lowpass. Homomorphic, and alpharooting technique.

UNIT IV

Image Restoration: Degradation model, Inverse filter, wiener filter. Interactive restoration and Geometric Transformation.

UNIT V

Image Compression: Data Redu.ndancies, Coding, Interpixel and Psychovisual redundancy Lossless and Lossy compression models.

Suggested Reading

1. Gonzalex, RC and Woods, RE., *Digital Image Processing,* Addison-Wesley, 1992.
2. Jain, AK, *Digital Image Processing,* PHI, 1995. .
3. Pratt. W. *Digital Image Processing,* Wiley, 2nd Edn.. 1991.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 540

ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I

Sources and effects of EMI - Intersystem and Intrasystem : EMI predictions and modelling; Cross talk: Cable wiring and coupling: Shielding and Shielding materials. Grounding and bounding.

UNIT II

(a) Transmitter models for EMI prediction: Types of emissions: Amptitude culling, Frequency culling. Detail prediction and Perfonnance prediction of various emissions.

(b) Receiver models for EMI prediction: Receiver EMI functions. Receiver models for amplitude Clling, frequency culling, Detail predictions and perfonnance prediction.

UNIT III

(a) Antenna models for EMI prediction:

Antenna EMI prediction considerations. Antenna models for amplitude culling, frequency culling and detail prediction

(b) Propagation models for EMI prediction

Propagation considerations. Propagation models for amplitude culling, Propagation models and detail Predictions.

UNIT IV

EMI measrements - Open area test site measurements. Measurement precautions: Radiated and Conducted interference measurements; Control requirements and test methods.

UNIT V

EMI filters characters of LPF, HPF, BEF, EMI standards - Military and Industrial standards. FCC regulations.

Suggested Reading

I. Wi/iam Duff G., and Donald RJ., *Series on Electromagnetic Interference and Compatibility Vol.* 5, *EMI Prediction and Analysis Technique,* 1972.

2. Dr. Prasad Kodali V., *Engineering Electromagnetic Compatibility,* IEEE Press, 1996.

3. Weston David. A., *Electromagnetic Compatibility Principles and Applications,* 1991.

4. Kaiser BE., *Principles of Electromagnetic Compatibility,* Artech House, 1987.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC542

OPTICAL COMMUNICATION SYSTEMS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

U NIT I

Wave propagation through cylindrical waveguides, Optical fibers and dielectric waveguides, Orthogonality relations, Effects of Imperfections of dielectric wave guides on propagation, Ray optics.

UNIT II

Fiber Characterisation: Attenuation due to material imperfections, Rayleigh scattering and mode coupling, dispersion due to wave guide, Material and mode coupling, Effects of refractive index profiles on mode coupling and attenuation, numerical aperture.

UNIT III

Optical Sources: LEDs, Far field and near field radiation patterns, Laser diodes, Light source linearity, Single hetro-junctions and double hetro junction structures.
Power Launching and Coupling: Sources to fiber, fiber to detector, fiber to fiber couplers, Splicing techniques, optical fiber connectors.

UNIT IV

Detectors: Characterisation of PIN and avalanche photo detectors, Equivalent circuits, Noise models and Noise equivalent power characteristics.

UNIT V

Optical Receiver Operation: Fundamental receiver operation, Preamplifier design, Analog receivers, Transmission line analysis.

Suggested Reading

1. Baraeski, MK.. *Fundamentals of Optical fibre communication,* Academic Press.
2. Howes MJ, Morgen DV, *Optical fibre communication,* John Wiely.
3. Marcuse, D., *Light transmission optics*
4. Keiser Gerd, *Optical fiber communication,* McGraw Hill, 1983
5. John Growar, *Optical Communication Systems,* PHI.
6. Agarwal, DC., *Fibre Optic Communication,* Wheeler.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 572

OPTIMIZATION TECHNIQUES

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I

Use of optimization methods. Introduction to classical optimization techniques, motivation to simplex method. simplex algorithm, sensitivity analysis.

UNIT II

Search methods. Unrestricted search, exhaustive search, Fibonacci method, Golden section method. Direct search methods. Random search methods, Univariate method, simplex method.

UNIT III

Descent methods. Gradient of a function, Steepest descent method, Conjugate gradient method. Pattern Search methods.

UNIT IV

Characteristics of a constrained problem. Direct methods. The complex method. cutting plane method. Review of global optimization" techniques such as Monte Carlo method. Simulated annealing and Tunnelling algorithm.

UNIT V

Genetic algorithm Selection process, Crossover, Mutation, Schema theorem, comparison between binary and floating point implementation.

Suggested Reading

1. Rao SS. *Optimization Techniques/* PHI. 1989.
2. Zhigmiew Michelewicz, *Genetic algorithms + data structures* Evolution programms. Springer Verlag, 1992.
3. Merrium. CW., *Optimization theory and the design of feedback control systems.* MGH, 1964.
4. Weldo. OJ. *Optimum seeking methods.* PHI, 1964.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 573

DIGITAL FILTER DESIGN

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I

Infinite impulse response digital filter design-IIR filter design via Bilinear transformation. Numerical integration method. Frequency transformation. Time domain design of IIR filters. Realization, Computer aided methods.

UNIT II

Design of finite impulse response filters-Design by windowing and truncation, Design by frequency sampling method, FIR Equiripple filters. Realization, Computer aided design.

UNIT III

Ladder filters. Gray-Markar filter, Filter properties. State space realization, Realization of IIR and FIR filters.

UNIT IV

Digital Filters based on least squares method - Pade approximation. least squares design methods, FIR least squares inverse filters.

UNIT V

Error analysis-Quantization error, Output noise power due to input quantization error, -Effect of inaccuracy representation of coefficient. Multiplication round-off error, Limit cycle oscillation.

Suggested Reading

1. Bose, MK, Digital filters, *Theory and App/ications/* Elsevir Science Pub., 1985
2. Taylor. FJ, *Digital Filter Design Hand Book/* Marral Dekkar, 1983. .
3. Chen. CT, *Introduction to One dimensional digital Signal Processing.*
4. John G Proakis, Manolakis. DG, *Digital Signal Processing/* 1977.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 574

SYSTEM SIMULATION AND MODELLING

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I

System and its model. Nature of simulation. Continuous system. Numerical integration. Erection of integration method. Example systems.

UNIT II

Discrete systems. Fixed time step. event-to-event models. Random Process simulation. Monte-carlo computation and stochastic simulation.

UNIT III

Queuing systems : Single and two serve queues. More general queues. Activity networks. Network model of project Analysis.

UNIT IV

Critical path. Uncertainties. Resource allocation and costs. Inventory and forecasting Models. Poisson and Erlang variates.

UNIT V

Forecasting and regression analysis. Evaluation. Length of runs. Variance reduction. Validation. Factors in selecting of simulation language.

Suggested Reading

1. Deo N, *System simulation with digital computer,* PHI, 1979.
2. Geoffrey Gordon, *System simulation,* PHI, 1978.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 579

FUZZY LOGIC

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

UNIT I

Basics of Fuzzy Sets - Fuzzy sets, Operation on Fuzzy sets, Extensions of Fuzzy set concepts, Extension principles and its applications, Geometry of Fuzzy sets, Sets as points, Paradox at the midpoints, Counting with Fuzzy sets, The fuzzy entropy theorem.

UNIT II

Fuzzy relations - Basics of Fuzzy relations, Operations on Fuzzy relations, Various types of Binary Fuzzy relations, Fuzzy relation equations.

UNIT III

Fuzzy design - Fuzzy logic as human logic, Fuzzy logic vs probability theory, Linguistic variables, Creation of fuzzy logic rule base, Defuzzification methods, Neural realization of basic fuzzy logic operations, basic concepts of integrating fuzzy systems and neural networks.

UNIT IV

Fuzzy associative memories - Fuzzy systems as between - Cube mappings, Fuzzy and neural function estimators, Neural vs Fuzzy representation of structured knowledge, FAMS as mappings, Fuzzy Hebb F AMS, The bi-directional F AM theorem for correlation minimum encoding, Correlation-product encoding, Superimposing F AM rules, Recalled outputs and defuzzification, F AM structure architecture.

UNIT V

Applications - Binary input-output F AMS, Inverted - pendulum example, Fuzzy truck Backer - upper system, Fuzzy container crane control.

Suggested Readings:

1. C.T. Lin and c.s. George Lee, *Neural Fuzzy Systems,* PHI, 1996.
2. Bart Kosko, *Neural Networks and Fuzzy Systems,* PHI, 1994.
3. Altrock, CV, *Fuzzy Logic and Neuro Fuzzy Applications Explained,* PHI, 1995.

EC 581

WIRELESS COMMUNICATION SYSTEMS

Instruction:	3 Periods per week
Duration of University Examination:	3 Hours
University Examination:	80 Marks
Sessionals :	20 Marks

N SY

UNIT I

The cellular concept - System design fundamentals - Frequency reuse, Channel assignment strategies, Handoff strategies, Power control, Interference and system capacity, Improving coverage and capacity in cellular systems, Basic cellular mobile communication system.

UNIT II

Mobile radio propagation - Large scale path loss - Introduction to radio wave, Free space propagation model, Three basic propagation mechanisms, 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.

UNIT III

Mobile radio propagation - Small scale fading and multi path, Small scale multipath propagation, impulse response model of a multipath channel, Small scale multi path measurements, Parameters of mobile multipath channels, Types of small scale fading, Rayleigh and Ricean distributions, Statistical models for multipath fading channels.

UNIT IV

Equalization, Diversity, Speech Coding - Equalization in a communication receiver, Linear equalization, Non linear equalization, algorithms for adaptive equalization, Diversity techniques, Rake receiver, Vocoders, Linear predictive coders, Choosing speech coders for mobile communications.

UNIT V

Wireless systems and standards - Multiple access techniques for wireless communications - FDMA, TDMA, Spread spectrum multiple access. SDMA, Packet radio, CSMA, Reservation protocols, Evolution of wireless systems, Study of AMPS, IS - 54, 15-136, GSM, 15-95, CDMA-2000, WCDMA, Introduction to multi user detection, 4th generation systems.

Suggested Readings:

1. Theodores Rappaport, *Wireless Communications,* Pearson Education, 2002.
2. V.K. Garg, 15-95 *COMA* & *COMA 2000,* Pearson Education, 2002.
3. William Stallings, *Wireless Communications and Networks,* Pearson Education, 2002.
4. William C.Y Lee, *Mobile Cellular Telecommunications,* McGraw-Hill, 2nd ed., 1995.

ENGINEERING MATHEMATICS

Instruction :
No. of Lectures : 3 Periods / weeks No. of credits: 3
Examination : 3 Hours

Complex Variable:

Power series in the complex plane. Tyalor's series in the complex plans, Laurent series, Poles and residues, Logarithmic residues. Evaluation of real internals, Definite integrals, Representation of function by integrals, Liouvile's theorem, Jordan's Lemma, Conformal mapping, Application of conformal mapping.

The Schwarz.. Christofel transformation.

Partial Differential Equations:

The wave-equation, Laplaces equation in polar co ordinate and in three dimensions, Time dependent problems, Uniqueness of solution, The equation of heat conduction, Flow in semi-infinite solid. Two dimensional heat conduction.

Special functions:-

The Gamma, Beta functions, Elliptic functions, Elliptic integrals, Orthogonal functions and polynomials, Legendre Laguerre and Bessel functions.

Linear Algebra:- Cayley- Hamiltion theorem, Eigen values, Eigen vectors of matrices.

Suggested Reading :

1. Fuchs and Shabat, "Function of a complex variable and some of their applications."
2. Growder and Meeuskey, "To pies in higher analysis"
3. Churchill, "Functions of complex variables".

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