SYLLABUS PRESCRIBED FOR TWO YEAR P.G.DEGREE COURSE IN ME (DIGITAL ELECTRONICS) (Part Time/ Full Time)

1UMEF1/1UMEP1 DIGITAL INSTRUMENTATION

Unit :I Digital Time & Frequency Measurement Technique:

1. Vernier technique for small time interval measurement, Measurement of Periodic time, Measurement of Phase, Capacitance, Quality factor, Time constant and dB.
2. Measurement of ratio, product and difference between two frequencies, High frequency measurement, Maximum and Minimum frequency measurement, Peak frequency measurement, Fast low frequency measurement.

Unit :II Electronic Instruments for Signal Analysis & Signal Analyzer: Spectrum analyzer, wave analyzer, distortion analyzer, Network analyzer, logic analyzer, protocol analyzer.

Unit:III- Automated Measurement Systems:Need and requirement of automatic test equipment (ATE),Computer based and computer Controlled ATE, Switches in ADTEW, ATE for PCB and component testing,IEEE-488 electronic bus standard, field bus application, Instrumentation in hazardous area.

Unit :IV Microcontroller and PC Based Data Acquisition Systems: Introduction to Smart /Intelligent sensors and Digital sensors, Data Acquisition systems, Types of Data Acquisition systems, Case studies of real time PC based instrumentation systems, Virtual instruments, Intelligent instruments**.**

Unit :V Computer Control-I Microprocessor interfacing and computer based instrumentation, Hierarchy of computer control for industry, Direct Digital Control, Digital PID control algorithms, Distributed computer control, System

architecture and implementation concepts, buses and communication network of DCCS, SCADA systems.

Unit:VI 1. **Computer Control-II**Intelligent Controllers: Discrete state process control, Relay sequencer and ladder diagram, Programmable Logic Controllers(PLC), PLC programming techniques, Introduction to Fuzzy logic and Neutral Network Controllers.

2. **Medical Instrumentation Systems:**Real time digital conditioning of monitored bio-medical signals such as EEG, ECG, EMG.

Text Books:

1. “Digital Measurement Techniques”, T. S. Rathore, Narosa Publishers
2. ”Process Control and Instrumentation Technology”, C. Johnson, 5th Edition , PHI
3. ”Computer Based Industrial Control”, Krishna Kant, 2nd Edition PHI

Reference Books:

1. “Electronics Instruments Handbook,”, C.E.Coombs, McGraw Hill international
2. ”Applied Electronic Instrumentation and Measurements”, McLachalan& Buchla , PHI
3. ”Hand Book of Biomedical Instrumentation”, RSKhandpur, PHI
4. “Sensors and signal conditioning”, Webster, John,Wiley & sons
5. “Digital Signal Processing”, Cavicchi, John Wiley & sons

1UMEF2/1UMEP2 ADVANCED DIGITAL SIGNAL PROCESSING

Unit I: Overview of discrete time signal and systems: Convolution, correlation, Time bandwidth relationship, Different transforms and their properties, use of DFT in linear filtering, filtering of long data sequences, Algorithm for convolution and DIT-FFT and DIF-FFT algorithm.

Unit II: Filter Design : Analog filter design, Discrete time IIR filter from analog filter, IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives, HPF, BPF, BRF filter design using frequency translation, Structures of FIR, Linear phase, FIR filter, Filter design using windowing techniques and Frequency sampling techniques.

Implementation of Filter using filter structure.

Unit III: Introduction to Multi-rate Digital Signal Processing: Sample rate reduction, decimation by integer factors-sampling rate increase, interpolation by integer facto, Design of practical sampling rate converters, Filter Specification-filter requirement for individual stages, Determining the number of stages and decimation factors, Sampling rate conversion using poly-phase filter structure, poly-phase implementation of interpreters.

Unit IV: Adaptive Signal Processing : Adaptive filters, Concepts-Adaptive filter as a Noise Canceller, Other configurations of the adaptive filter, Main components of the adaptive filter, Basic Wiener filter theory, The basic LMS adaptive algorithm, Practical limitations of the basic LMS algorithm, Recursive Least Square Algorithm, Limitations, Factorization Algorithm.

Unit V: Introduction to two dimensional signal and Systems: 2D, Discrete Fourier Transforms, Properties and applications, Discrete Hilbert Transform and Discrete Cosine Transform, Properties and Applications, Short term Fourier Transform, Gabor Transform, Properties and Applications.

Unit VI: General and special purpose DSP Processors: Computer Architecture for signal processing, Havard Architecture, Pipelining, Hardware Multiply and Accumulate, Special Instructions, Replication, On-chip

Memory Cache, Extended Parallelism, SIMD, Architecture and programming of TMS320 C67XX, Application of DSP to biomedical Signal Processing.

References Books :

1. "Digital Signal Processing" Emmanuel C Ifeachor, Barrie W Jrevis, Pearson Education.
2. "Theory and Applications of DSP", L.R Rabiner and B. Gold
3. "Electronic Filter Design", Hand Book A .B Williams and FT Taylor, McGraw Hill
4. "Wavelets and Subband Coding", Valterli & Kovaceric, PHI.
5. "Analog Devices & Texas Instruments", Users Manuel of TMS320C4X and ADSP 2106x.
6. "Digital Signal Processing": Principles, Algorithms & Applications", John G. Proakis & Dimitris G.Manolakis, Fourth edition, Pearson education / Prentice Hall, 2007.
7. "Digital Signal Processing – A Computer Based Approach" , Sanjit K. Mitra, Tata McGraw Hill, Third Edition, 2007 .
8. "Discrete Time Signal Processing", Alan V. Oppenheim, Ronald W. Jchafer & Hohn. R. Back, PHI / Pearson Education, Second Edition, 2001.
9. "Digital Signal Processing", Andreas Antoniou, Tata McGraw Hill.
10. "Digital Signal Processing using Matlab and wavelets", Michael weeks Infinity Science Press

1UMEF3/1UMEP3 ELECTIVE –I

(1) MODERN ELECTRONICS DESIGN TECHNIQUES

Unit: I Amplifiers Design : Digital isolation techniques, High speed clamping amplifiers, Programmable gain amplifiers, Auto-zero amplifiers, Lock-in amplifiers.

Unit:II Power Regulator Design: Switch Mode Regulator topologies like buck, boost, buck-boost their control techniques and selection of passive, active and magnetic components for these regulators

Unit:III Communication and Control System Design: Electronic navigation systems, Underwater sound systems, Phase lock loop design, Direct digital synthesis.

Unit:IV Electronic Systems for Aircrafts Radio systems and Autopilot systems in aircraft, Digital engine control and motion control systems for automobiles.

Unit:V Portable Electronic System Design: Types and characteristics of modern batteries, Portable devices like Mobile TV, VoIP phones, Glucose meter, Pulse Oximetry, Cardio Pulmonary Resuscitation systems, Ultrasound systems, Barcode readers, Payment terminals. Smart battery management systems

Unit:VI Electronic System Design for Production: Layout and grounding for analog and digital systems, Safety, Testability, Reliability and Thermal management in electronic systems, Quality, reliability, testing and environmental aspects in printed circuit board design, Design of enclosures for electronic products, EMC of electronic products

Text Books:

1. "Linear Circuit Design Handbook", Analog Devices Corporation (Editor: Zumbahlen), Elsevier 2008
2. "Demystifying Switching Power Supplies" Mach, Elsevier, 2005
3. "Circuit Design – Knowit All", Ashby, Baker, Elsevier, 2008
4. "Standard Handbook of Electronics Engineering" Chritiansen & Alexander, 5th ed McGraw Hill, 2008

Reference Books:

1. "Digital Frequency Synthesis Demystified", Goldberg, LLH Publishers
2. "Aircraft Digital Electronic and Computer Systems", Tooley, Elsevier 2007
3. "Aircraft Electricity and Electronics", Bent
4. "Battery Operated Devices and Systems", Pistoia, Elsevier, 2008
5. "Understanding Automotive Electronics", 6th ed Ribbens, Elsevier, 2003

6. "Grounding and Shielding Circuits and Interference", 5th ed Morrison, Wiley, 2007
7. "Printed Circuit Boards" Khandpur, McGraw Hill, 2008

1UMEF3/1UMEP3 ELECTIVE –I

(2) RF SYSTEM DESIGN

Unit: I Active RF Components: Semiconductor Basics: Physical properties of semiconductors, PN-Junction, Schottky contact.**Bipolar-Junction Transistors:** Construction, Functionality, Temperature behavior, Limiting values. **RF Field Effect Transistors:** Construction, Functionality, Frequency response, Limiting values.

Unit:II High Electron Mobility Transistors: Construction, Functionality, Frequency response. **Active RF Component Modeling:** Transistor Models: Large-signal BJT Models, Small-signal BJT Models, Large-signal FET Models, Small-signal FET Models.

Unit:III RF filter Design methods: Image Parameter Method, Insertion Loss Method, Microstrip Filter Design **Filter Implementation:** Unit Elements, Richard's Transformation, Kuroda's Identities and Examples of Microstrip.

Unit:IV High frequency amplifier design: Bandwidth enhancement, neutralization and unilateralisation, cascaded amplifiers. **RF power amplifier design:** Class A to Class F amplifiers and modulation characteristics.

Unit:V LNA, Mixers and oscillators design LNA topologies and their design, linearity and large signal performances, multipliers and sub sampling mixers, High Frequency Oscillator Configuration: Fixed Frequency Oscillator, Voltage Controller Oscillator and Dielectric Resonator Oscillator

Unit:VI PLL design Linearized PLL models, Noise properties of PLLs, Phase detectors, Sequential phase detectors, Loop filters and charge pumps, design examples.

Text Books :

1. "Microwave Transistor Amplifiers, Analysis and Design", G. Gonzalez; Prentice Hall
2. "RF Circuit Design-Theory and Applications", Reinhold Ludwig and Pavel Bretchko; Pearson Education

Reference Books :

1. " The Design of CMOS RF ICs", Thomas Lee, Cambridge second edition
2. "Microwave Engineering", David M. Pozar; Wiley & Sons (ASIA) Pvt. Ltd.
3. "Radio Frequency and Microwave Electronics", Matthew M Radmanesh
4. "Microwave Circuit analysis and Amplifier Design", S. Y. Liao; Prentice Hall

1UMEF3 /1UMEP3 ELECTIVE –I

(3) COMPUTER COMMUNICATION NETWORKS

Unit: I Review of computer networking: ISO-OSI reference model, Point to point Protocol, ARQ techniques, Data network switching techniques.

Unit:II TCP/IP: TCP/IP architecture, TCP Segments, TCP flow control, IPv4 versus IPv6, UDP, Fragmentation, ARP & RARP , ICMP,IGMP, DHCP, UnIcast and Multicast Routing protocols.

Unit:III Network management: Delay models in data networks, Performance measures & architecturalIssues, Queuing Model (M/M/1, M/M/C, and M/G/1), Network management and congestion control algorithm.

Unit:IV Multiple access technique: Aloha and Slotted Aloha, CSMA/CD, CSMA/CA, CDMA, OFDM, Delay throughput characteristics,

Unit:V Wireless network: WAP architecture, Wireless LAN, Zig-Bee functional architecture and specifications, Ad-hoc Network

Unit:VI Network security: Ciphers, DES, public key cryptography, RSA algorithm, Digital water marking, Attack and counter measure.

Text Books :

1. "Communication Networks", Leon Garcia & Wadeja, Tata McGraw Hill Publication.
2. "Computer Networks and Internetworking", D.E.Comer, Pearson Education

Reference Books :

1. "Data Networks" Dimitri Bertisekas & Robert Gallager, PHI
2. "Local Area Networks", Gerd E Kieser – Mc-Graw-Hill
3. "Cryptography and Network Security: Principles and Practice", William Stallings, Pearson Education
4. "GSM, CDMA and 3G Systems" , Steele,, Wiely Students Edition

1UMEF4 /2UMEP1 DIGITAL COMMUNICATION TECHNIQUES

Unit:I Characterization of Communication Signal and Optimum Receiver for AWGN Channel:- Signal Space representation, Memory less Modulation methods, Linear Modulation with memory, Non- linear Modulation methods with memory, CPFSK & CPM, Power Spectra of Linear Modulated signal, Power Spectra of CPFSK & CPM Signals, Correlation Demodulator, Match Filter Demodulator, Optimum Detector, Probability of Error for Binary & M-array signals

Unit:II **Source Coding:-** Average mutual information & Entropy, Coding of discrete memory-less sources, Discrete Stationary Sources, Lempel-Ziv algorithm; Coding of analog sources, Rate distortion function, Scalar Quantization & Vector Quantization,

Unit:III **Channel Coding:-** Temporal and Spectral Waveform Coding, BCH codes, Reed Soloman codes, Reed Muller Codes, Convolution Codes, Transfer function of convolution codes, Viterbi decoding algorithm, stack algorithm(No problems expected)., trellis coded modulation.

Unit:IV **Signal Design for Band Limited Channel:**-Design of band limited signal for zero ISI, Nyquist Criterion, Design of band limited signal for controlled ISI, partial response signaling, Data detection for controlled ISI

Unit:V **Linear Equalization Techniques :** Peak Distortion Criterion, Mean Square Error (MSE) criterion, Decision Feedback Equalization, Coefficient Optimization, Adaptive Linear Equalizer, Zero Forcing Algorithm, LMS Algorithm.

Unit:VI **Spread Spectrum Techniques:-**Generation of PN sequence, direct sequence spread spectrum system, processing gain, jamming margin, application of direct sequence spread spectrum signal, frequency hopped spread spectrum signal, time hopping spread spectrum signal, synchronization of spread spectrum signal – acquisition & tracking.

Text Books:

1. "Digital Communication Fundamentals and Applications", Bernard Sklar, 2nd Ed, Pearson Education Asia
2. "Digital Communication", J.G. Proakis, Fourth Ed, Mc Graw Hill
3. " Error Control Coding – Fundamentals & Applications," Shu Lin & Costell , Addison Wessley Pub.

Reference Books:

1. "Digital Communication Techniques", Simon Haykin, John Wiley & Sons.

2. "Advanced Digital Communication System and Signal Processing Techniques", Dr.Kemilo Feher Prentice Hall International.

1UMEF5/2UMEP2 EMBEDDED SYSTEM DESIGN

Unit:I **Embedded System hardware :** Embedded systems overview, Hardware components like microcontroller, GPP, ASSP, AISP, SOC, Details of 32 bit ARM**7** core based SoC architecture, Organisation, analog, digital & high speed I/O for embedded systems, interfacing SRAM, DRAM, flash memories with microcontroller, memory management

Unit:II **Embedded System Software :** Techniques of writing efficient C code for microcontroller C data types for ARM, Signed & unsigned data types, limitation of char & char & data types, storage class – static & extern, volatile keyword, operation on bits, functions, ARM / Thumb procedural call standard, pointers & arrays, conditional statements – if-else, switch, structure, conditional loops – for & while, preprocessing, compiling, cross compiling, compiler driver, startup code and board support packages, calling assembly routines in C, interrupt handling in C, interrupt latency.

Unit:III **ARM Philips NXP LPC2148 microcontroller - *Programming & Interfacing:*** Programming on – chip components like ADC, UART, Timers, External Interrupts and interfacing external peripherals like keyboard, LCD, Stepper motor.

Unit:IV **Uniprocessor Real Time Operating Systems – I:** Real time systems, goals and services, tasks and its states, task assignment & scheduling, Task Control Blocks, Context & Context Switching, ISRs, Security Issues, inter- task communication, semaphore.

Unit:V **Uniprocessor Real Time Operating Systems – II:** Task Scheduling models**,** scheduling algorithms – rate monotonic and earliest deadline first, priority inheritance

protocol, priority ceiling protocol, real time operating system features, features of micro COS – II RTOS.

Unit:VI Embedded System Architecture & Design : Architecture styles, implementation aspects, estimation modeling, embedded system architecture, validation and debugging of embedded systems, hardware – software co-design in an embedded system.

Text Books :

1. "Embedded Systems", Rajkamal 2nd Edi Tata McGraw Hill.
2. "Embedded Real-time Systems Programming", Lyer & Gupta Tata McGraw Hill

Reference Books :

1. "ARM System on Chip Architecture", 2nd Ed Furber, Pearson India
2. "Introduction To Embedded Systems", K.V. Shibu, MGH.
3. Philips NXP LPC 2148 User Manual
4. "Scheduling in Real Time Systems", Cottet, Delacroix & Mammeri, John Wiley & Sons.

SEMESTER - II

2UMEF1/3UMEP1 DIGITAL IMAGE PROCESSING

Unit:I Image processing fundamental: Basic image processing Steps, Digital image representation, Image acquisition ,sampling and quantization, basic relationship between pixels, distance measures ,point operations ,Human visual system, Image types, zooming operation ,

Unit:II Image enhancement in spatial domain : Basic gray level transformations, Histrogram processing, Arithmatic and logic operations, ,spatial domain filtering ,bit-plane slicing, median filter, color image processing fundamentals and color models.

Unit:III Image Transforms: 2D DFT, Walsh transform ,Hadamard transform,Slant transform, Discrete transform, KL transform, Radon transform and Multiresolution wavelet transform.

Unit:IV Image enhancement in the frequency domain:Filtering in frequency domain, Homomorphic filter, Image Restoration and Denoising ,Image degradation models, Types of image blur, image restoration model, linear image restoration, nonlinear image restoration techniques, blind deconvolution and classification technique ,image denoising, noise in image.

Unit:V Image segmentation: Detection of discontinuities, edge-based segmentation , edge detection,edge linking, Hough transform , Thresholding ,region based segmentation, watershed transformation, shape representation and classification,Morphological techniques, Object & pattern recognition & interpretation method.

Unit:VI Image Compression : Lossy block truncation & vector quantization , lossless Huffman coding, run length coding & block coding , transform coding. Image processing standards

Text Books :

1. “Digital Image Processing", R.C Gonzales & Woods –Addison Wesley IIIrd Ed.
2. “Digital Image Processing”, S Jayaraman, S Esakkirajan,T Veerakumar- Tata Mc Graw Hill.

Reference Books :

1. “ Fundamental Digital Image Processing “by A.K.Jain –Prentics Hall Inc.
2. “Digital Image Processing”, W.K Pratt IIIrd ed John Wiley
3. “Digital Image Processing and Analysis”, B Chanda and D. Mujumdar-PHI new Delhi

2UMEF2/3UMEP2 CMOS VLSI DESIGN

Unit I: CMOS design methods & Testing: Basic Physical Design of Simple Logic Gates, Design Strategies, CMOS chip design - Sea-of-Gate and Gate Array, standard cell design, CMOS Testing: Functionality Tests, Manufacturing Test, Fault models, Observability, Controllability, Fault Coverage, Design for Testability - Scan based Techniques

Unit: II: CMOS subsystem design: Addition/Substration, Parity Generator, Comparators, Counters, Shifters, Multipliers, Memories - SRAM, DRAM,

Unit III: CMOS Analog Integrated Circuits: Components of analog CMOS ICs, Parametric estimation of R,L & C of CMOS transistors, High-frequency behavior of basic ampliûer, High speed comparators, Switch capacitor filters,

Unit IV: CMOS RF Integrated Circuits : Design of LNA, Mixer, RF Power Amplifiers, Linearization, Oscillator, PLL

Unit V: ASIC Construction: Physical design, CAD tools, system partitioning, ASIC size estimation, Power dissipation issues, FPGA partitioning methods

UnitVI: Floor planning, Placement, physical design flow, information formats, global routing, detailed routing, special routing, circuit extraction and DRC , Deep-Submicron to Nanoscale Technologies, Design of a Simple Microprocessor & Configurable Logic Circuits.

Text Books :

1. "Application Specific IC" Michael John Sebastin, Smith Addison, Wesley Publication
2. "The Design of CMOS Radio-Frequency Integrated Circuits" Thomas H. Lee, Cambridge University press
3. "Advanced CMOS Cell Design", Etienne Sicard, Sonia Delmas Bendhia Mc Graw Hill publication.

Reference Books :

1. "Principles of CMOS VLSI Design" Neil Weste and Eshraghian, Person Education
2. "CMOS Analog Circuit Design" Phillip F. Allen, Douglas R. Holberg, Oxford University Press
3. "VLSI Design" M. Michael Vai, CRC press

2UMEF3/4UMEP1 PARALLEL COMPUTING

Unit I: Parallel Computer models: Flynn's classification, system attributes to Performance, multiprocessor and multicomputer, shared memory multiprocessors, Distributed – Memory Multicomputer, A Taxonomy of MIMD Computers, conditions of parallelism, Data and Resource Dependence, Hardware and Software Parallelism, Roll of Compilers and speed up performance laws.

Unit II: Program partitioning and scheduling: grain size and latency, grain packaging and scheduling. Static multiprocessor scheduling, program flow mechanisms, control flow versus dataflow, demand driven mechanism, comparison of flow mechanism, Static connection network and Dynamic connection network.

Unit III: Linear pipeline processors: Asynchronous and synchronous models, clocking and timing control, speed up, efficiency and throughput. Non-Linear pipeline processors: reservation and latency analysis, collision free scheduling, pipeline scheduling optimization, instruction pipeline design, arithmetic pipeline design, super scalar and super pipeline design.

Unit IV: Parallel and scalable architectures Multiprocessor system interconnects: Network characteristics, hierarchical bus systems, crossbar switch and multiport memory, multistage and combining networks, cache coherence and synchronization mechanisms, snoopy bus protocols, directory bus protocols, hardware synchronization

mechanism, massage routing scheme and deadlock and virtual channels.

Unit V : Scalable, multithread and dataflow architecture: latency hiding techniques: shared virtual memory, prefetching techniques, distributed coherent cache, scalable coherence interface, relaxed memory consistency, Principles of multithreading, multithreading issues and solutions, multi-context processors, multi-dimensional architectures, fine grain parallelism, the scalable multi-threading architectures, the stand ford dash multiprocessor, tera-multiprocessor systems and data flow and hybrid architectures.

Unit:VI Parallel Program Development and Environment: Parallel Programming Computers, Parallel Programming environments, Synchronization and multiprocessing modes, multitasking, Microtasking , autotasking, shared variable program structure, semaphores and applications, message passing program development, control decomposition techniques, heterogeneous processing.

Text Book :

1. "Advanced Computer Architecture, Parallelism, Scalability, Programmability". Kai Hwang, McGraw Hill Inc. second Edition, 2011.

Reference Books :

1. "Elements of Parallel Computing", V. Rajaraman , PHI, 1990
2. "Computer Architecture and Parallel Processing", Kai Hwang. F. A. Briggs, McGraw Hill, 1985.
3. "Computer organization & Architecture ", William Stallings, PHI, New Delhi. 6th Edition.
4. "Kalsuk' Advanced Computer Architectures", Dezso'Sima. Terence Fountain & Peter, Pearson's Edition, 2nd Edition.
5. "Parallel Processing for Supercomputers and AI", Hwang and Degroot (Eds) McGraw Hill.

6. "Computer Architecture: A Quantitative Approach". John L. Hennessy , David A. Patterson, Morgan Haufmann, Elsevier. 4th edition, 2007.
7. ''Computer Architecture: Hardware & Software Approach", John L. Hennessy, David A. Patterson. Elsevier, 3rd Edition, 2005.
8. "Advanced Computer Architecture: A Design Space Approach", Sima, Fauntain, Kscucle. Pearson 7th edition. 2009.

2UMEF4/4UMEP2 ARTIFICIAL INTELLIGENT SYSTEM

Unit I: Introduction to Fuzzy Set Theory: Fuzzy set theory, classical set theory, properties of fuzzy sets, operations on fuzzy sets, fuzzy relations, operation on fuzzy relations, extension principle, fuzzy arithmetic membership functions, fuzzification & defuzzification.

Unit II: Fuzzy Rules, Reasoning & Decision Making:**Fuzzy reasoning:** introduction, linguistic variables, fuzzy propositions.**Fuzzy rules**: fuzzy rule based system, fuzzy if-then rules, fuzzy inference system. **Fuzzy decision making**: individual, multiperson, multicriterion and multistage decision making fuzzy ranking methods.

Unit III:Hybrid Systems:**Fuzzy controller:** construction of FLC, fuzzy PD controller, fuzzy PI controller. **Neuro-fuzzy control:** introduction, inverse learning, specialized learning.**Fuzzy pattern recognition:** introduction, single sample identification, multi-feature recognition.

UnitIV: Artificial Neural Networks Introduction, biological neuron, Artificial neural models, Perceptron Learning rule, Single layer perception, multilayer perceptron network, error back propagation algorithm.

Unit V: Unsupervised Learning: Winner-Take-All learning algorithm, hamming net and Maxnet , self organization feature map, Adaptive Resonance Theory (ART) network,

Counter propagation network,**Associative Memories**: Linear associator, Hopfield recurrent associative memory, storage and retrieval algorithm, basic concept of bidirectional associative memory (BAM).

Unit VI: **Support vector machines (SVM):** Optimal hyperplane for linearly separable and non-separable patterns, SVM as a Kernel machine, design of SVM **Genetic algorithm:** Introduction, encoding, fitness function, reproduction, crossover, mutation. Simulated annealing Applications of neural network in character recognition, forecasting, robot kinematics, biomedical signals. Optical neural network

Text Books:

1. "Neural Networks", S. Hykin, Pearson Education.
2. "Fuzzy Sets and Fuzzy Logic Theory and Applications", George J. Klir, Bo Yuan, PHI
3. "Fuzzy Logic With Engineering Applications", Timothy Ross, McGraw Hill international

Reference Books:

1. "Artificial Neural Networks", Zurada.
2. "Neuro Fuzzy and Soft Computing", Jang, Sun, Mezutani.
3. "Introduction to Neural Networks using MATLAB 6.0", S.N.Sivanandan, S. Sumathi, S.N. Deepa, McGraw Hill.
4. "Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications", S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI
5. "Intelligent Systems & Controls", Laxmidhar Behera, Indrani kar , Oxford

2UMEF5/4UMEP3 ELECTIVE–II

(1) BIOINFORMATICS

Unit I: Introduction to bioinformatics, Bio informatics: Applications and research, Present Bioinformatics scenario in India, characterization in bioinformatics databases, categories of

bioinformatics databases, navigating databases, information retrieval systems

Unit II: Biological sequence database: Nucleotide sequence database, Secondary Nucleotide sequence database, literature database, protein sequence databases, secondary and specialised protein sequence databases, Gene expressing database.

Unit III: Structure databases, structure file formats, , protein Structure databases collaboration, PDB, MMDB, CATH, FSSP, DALI, SCOP, other databases, enzyme databases, MEROPS, BRENDA, pathway databases, CAZy, disease databases, literature databases, other specialised databases

Unit IV: Tools: Need for tools, knowledge discovery Industry trends, data-mining tools, Data submission tools, nucleotide sequence submission tools, protein submission tools, command line tool for GenBank, data analysis tools, prediction tools: phylogenetic trees and phylogeneti analysis, gene prediction, protein structure function prediction

Unit V: Classification of Algorithms, Implementing Algorithms, Biological Algorithms, bioinformatics tasks and corresponding Algorithms, Algorithms and bioinformatics software

UnitVI: **Data Analysis Algorithms:** Sequence comparison algorithms, substitution matrices, sequence alignment optimal algorithms **Prediction Algorithms:** Gene prediction algorithms, phyrogenetic prediction algorithms, protein structure prediction.

Text Books :

1. "Bioinformatics Databases, Tools and Algorithm", Orpita Bosu & Simminder Kaur Thukral, Oxford Uni. Press
2. "Bioinformatics Principles & Application", Zhumur Ghosh & Bikekanand Mallick, Oxford Uni. Press.

Reference Book:

1. "Introduction to Bioinformatics", Artur M. Lesk, Oxford Uni. Press.

2UMEF5/ 4UMEP3 ELECTIVE – II

(2) MICRO ELECTRO MECHANICAL SYSTEMS

Unit I: Overview of MEMS: The development of MEMS Technology, MEMS challenges, MEMS and Microsystems definitions and examples, Difference between Microsystems and Microelectronics, Benefits of miniaturization

Unit II: MEMS Applications in Industrial/automotives sensors, Medical systems, aircraft sensors, Structural health monitoring, Telecommunication etc, Materials for MEMS.

Unit III: Scaling Laws in Miniaturization: Introduction to Scaling, Scaling in Geometry, Scaling in Electrostatic forces. MEMS Design Considerations

Unit IV: Micro Fabrication –I: Introduction, Photolithography, Photoresists and Application, Light Sources, Photoresist Removal, Ion Implantation, Diffusion, Oxidation, Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD), Sputtering, Deposition by Epitaxy, Etching.

Unit V: Micro Fabrication – II: Bulk Micromachining: Etching-Isotropic and Anisotropic, Wet Etching and Dry Etching (Plasma, Deep reactive ion) Comparison. Surface Micromachining: Process, associated Mechanical problems (Adhesion, Interfacial stresses, Stiction), LIGA process, MEMS Packaging

Unit VI: MEMS devices and Structures Microsensors: Biomedical Sensors, Chemical sensors, Optical Sensors, Pressure Sensors, Thermal Sensors. Microactuation: Actuation using thermal forces, Piezoelectric crystals,

Electrostatic forces, MEMS with microactuators: Microgrippers, Micromotors, Microgears, Micropumps

Text Book:

1. "MEMS & Microsystems Design and Manufacture", Tai-Ran Hsu, Tata McGraw Hill.

Reference Books:

1. "Micro Electro Mechanical System Design", James J.Allen, CRC Press, 2005
2. "Fundamentals of Micro Fabrication", Marc Madou, CRC Press.
3. "The MEMS Handbook", Mohamed Gad-el-Hak, CRC Press
4. "Micro and Smart Systems", G.K.Anantha Suresh, Wiley, India.
5. "Foundations of MEMS", Chang Liu, Pearson Education Inc., 2006.
5. “An Introduction to Micro Electro Mechanical System Design”, Nadim Maluf, Artech House, 2000.
7. “MEMS & Micro systems Design and Manufacture”, Tai Ran Hsu, Tata McGraw Hill, New Delhi.
8. "Micro Sensors MEMS Smart Devices", Julian W. Gardner, Vijay K. Varadan, Osana O. Awadelkarim, John Wiley & Sons Ltd, 2002.

2UMEF5/4UMEP3 ELECTIVE – II

(3) HIGH SPEED DIGITAL SYSTEM DESIGN

Unit I: The Importance of Interconnect Design, Ideal Transmission Line Fundamentals,Crosstalk, Crosstalk Estimation.

Unit II: Non ideal Interconnect Issues, Concentric-Ring Skin-Effect Model, Connectors, Packages, and Vias.

Unit III: Nonideal Return Paths, Simultaneous Switching Noise, Power Delivery

Unit IV: Buffer Modeling, Digital Timing Analysis, Clock Repeaters, Zero-Delay Clock Repeaters, Clock Jitter.

Unit V: Design Methodologies, Radiated Emissions Compliance and System Noise Minimization.

Unit VI: High-Speed Measurement Techniques, Digital Oscilloscope, Time Domain Reflectometry, Vector Network Analyzer.

Text Books :

1. "High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices" Stephen H. Hall Garrett W. Hall, James A. McCall, John Wiley & Sons, Inc.
2. "High-Speed Digital Design: A Handbook of Black Magic" Howard Johnson, Prentice Hall publication

Reference Books:

1. "High Speed Signal Propagation: Advanced Black Magic" Howard W. Johnson, Prentice Hall
2. " Signal Integrity Issues and Printed Circuit Board Design" Douglas Brooks, Prentice Hall
3. "Signal Integrity, Simplified" Eric Bogatin, Prentice Hall
4. " Noise Reduction Techniques in Electronic Systems" Henry Ott -John Wiley & Sons.

SYLLABUS PRESCRIBED FOR TWO YEAR P.G.DEGREE COURSE IN

ME (ELECTRONICS & TELECOMMUNICATION ENGG.)

(Full Time) (Credit Grade System)

SEMESTER - I

1 ENTC1 ADVANCED OPTICAL COMMUNICATION

Unit I: Introduction to guided optical communication. Optical Fibers, types of fibers & optical Cables, Study of losses during transmission through viz. Attenuation by Absorption &Scattering, Consideration of losses in designing of High Speed / High bandwidth optical communication systems, Selection of fiber for such systems

Unit II: Optical Sources: Types of LEDs used in optical communication, their construction & operating principle, Types of Lasers. Principle of working of Lasers, solid state & injection Lasers.

Unit III: Optical amplifiers, EDFA, Soliton Systems & design of system required in LAN & WAN type of applications. Calculations of Power budgets and feasibility of system design for above optical sources.

Unit IV: Optical Detectors: Introduction & study of type of detectors characteristics. Spectral spread and availability of detectors for 980 nm, 1.3 ìm & 1.55 ìm _ systems. Calculation of detector sensitivity and design considerations of suitable receivers for LAN, WAN applications

Unit V: Multiplexing Components & Techniques : Concepts of WDM, DWDM system design parameters, Optical multiplex / Demultiplex design considerations- Angular dispersive devices, Dielectric thin film filter type devices

Unit VI: Optical fiber measurements:Fiber attenuation measurements, Fiber dispersion measurements, Fiber refractive index profile measurements, fiber cutoff