Programme: 107 - B Tech (Computer Engineering)

Semester VII									
Course Code	Course Title	Contact hours			Cr	Evaluation Weightage			ESE (Theory) Hours
		L	P / T	Total		TWA	MST	ESE	
307210	Advanced microprocessors	4	2	6	10	15	15	70	3
307220	Intelligent Systems	4	2	6	10	15	15	70	3
307230	Digital Signal Processing	4	2	6	10	15	15	70	3
307240	Software Engineering	4	2	6	10	15	15	70	3
-	Elective-I	4	2	6	10	15	15	70	3
	Total	20	10	30	50				

Elective - I									
Course Code	Course Title	Contact hours				Evaluation weightage			ESE (Theory) Hours
		L	P / T	Total	Cr	TWA	MST	ESE	
407010	Image Processing	4	2	6	10	15	15	70	3
407020	Pattern Recognition	4	2	6	10	15	15	70	3
407030	Mobile Computing	4	2	6	10	15	15	70	3
407040	Embedded Systems	4	2	6	10	15	15	70	3
407050	Computer Simulation and Modeling	4	2	6	10	15	15	70	3
407060	Advanced Computer Networks	4	2	6	10	15	15	70	3

Semester VIII									
307250	System Security	4	2	6	10	15	15	70	3
307260	Distributed Computing	4	2	6	10	15	15	70	3
307270	Multimedia Systems	4	2	6	10	15	15	70	3
-	Elective-II	4	2	6	10	15	15	70	3
	Total	16	8	24	40				

Elective II									
Course Code	Course Title	Contact hours				Evaluation weightage			ESE (Theory) Hours
		L	P / T	Total	Cr	TWA	MST	ESE	
407110	Robotics	4	2	6	10	15	15	70	3
407120	Computer Vision	4	2	6	10	15	15	70	3
407130	Parallel Processing	4	2	6	10	15	15	70	3
407140	Data Warehousing and Mining	4	2	6	10	15	15	70	3
407150	Neural Networks and Fuzzy Systems	4	2	6	10	15	15	70	3
407160	Software Testing	4	2	6	10	15	15	70	3

Project:

Sr. No.	Course Code	Course Title	L	P	T	Cr	TWA	MST	ESE	ESE (Theory) Hrs
1	407900	Project				8	See note below			

- The project is evaluated in two stages. The first stage evaluation shall be done at the end of pre-final semester by a Committee of Institute faculty (at least two faculty members including project guide). The Project Guide along with an external examiner shall do the second stage evaluation at the end of final semester.
- The first stage assessment shall have 25% weightage. Another 25% weightage shall be given for the initiative, interest, effort and sincerity shown by the student during the entire project work. The second stage assessment shall have 50% weightage.
- The first stage evaluation is to be carried out after a minimum of 12 weeks of work.
- The project report should be submitted in the prescribed format at least three weeks prior to the end of final semester or by the prescribed date and second stage assessment can be done in the last week of semester.
- The project shall carry 08 credits. The grade for the project shall be declared only after second stage evaluation.

(307210) ADVANCED MICROPROCESSORS

Objective: To study microprocessor basics and the fundamental principles of architecture related to advanced microprocessors.

Pre-requisite: Microprocessors

DETAILED SYLLABUS

1. **Overview of new generation of modern microprocessors.**

2. **Advanced Intel Microprocessors:** Protected Mode operation of x86 Intel Family; Study of Pentium: Super-Scalar architecture & Pipelining, Register Set & special Instructions, Memory Management, Cache Organizations, Bus operation, Branch Prediction Logic.

3. **Study of Pentium Family of Processors:** Pentium I, Pentium II, Pentium III, Pentium IV, Pentium V: Architectural features, Comparative study.

4. **Advanced RISC Microprocessors:** Overview of RISC Development and current systems, Alpha AXP Architecture, Alpha AXP Implementations & Applications.

5. **Study of Sun SPARC Family**: SPARC Architecture, The Super SPARC, SPARC Implementations & Applications.

6. **Standard for Bus Architecture and Ports:** EISA, VESA, PCI, SCSI, PCMCIA Cards & Slots, ATA, ATAPI, LPT, USB, AGP, RAID

7. **System Architectures for Desktop and Server based systems**: Study of memory subsystems and I/O subsystems. Integration issues

BOOKS

Text Books:

1. Daniel Tabak, "*Advanced Microprocessors*", McGraw-Hill.
2. Barry Brey , "*The Intel Microprocessors, Architecture, Programming and Interfacing*"
3. Tom Shanley, "*Pentium Processor System Architecture*", Addison Wesley Press.

References:

1. Ray and Bhurchandi, "*Advanced Microprocessors and Peripherals*", TMH
2. James Antonakos, "*The Pentium Microprocessor*", Pearson Education.
3. Badri Ram, "*Advanced Microprocessors and Interfacing*", TMH Publication.
4. Intel Manuals.

(307220) INTELLIGENT SYSTEMS

Objectives: To understand and apply principles, methodologies and techniques in design and implementation of intelligent system.

Prerequisite: Data Structures, Programming Languages, and Algorithms

DETAILED SYLLABUS

1. **Artificial Intelligence**: An overview, Intelligent Systems: Evolution of the concept.
2. **Intelligent Agents**: How agent should act, Structure of intelligent agents, Environments
3. **Problem Solving:** Solving problems by searching, Informed search methods, Game playing
4. **Knowledge and Reasoning:** A knowledge based agent, The wumpus world environment, Representation, Reasoning, Logic, Proportional logic, First order logic: Syntax and Semantics, Extensions and Notational variation, Using first order logic
5. **Building a Knowledge Base:** Properties of good and bad knowledge base, Knowledge engineering, General ontology
6. **Interfacing First Order Logic:** Interface rules involving quantifiers, An example proof, Forward and backward chaining, Completeness
7. **Acting Logically:** Planning, Practical planning: Practical planners, Hierarchical decomposition, Conditional planning
8. **Uncertain Knowledge and Reasoning:** Uncertainty, Representing knowledge in an uncertain domain, The semantics of belief networks, Inference in belief networks
9. **Learning:** Learning from observations: General model of learning agents, Inductive learning, learning decision trees, Learning in neural and belief networks: Introduction to neural networks, Perceptrons, Multilayer feed-forward network, Application of ANN, Reinforcement learning: Passive learning in a known environment, Generalization in reinforcement learning, Genetic algorithms
10. **Agents that Communicate:** Communication as action, Types of communicating agents, A formal grammar for a subset of English
11. **Expert system:** Introduction to expert system, Representing and using domain knowledge, Expert system shells, Explanation, Knowledge acquisition
12. **Applications:** Natural language processing, Perception, Robotics

BOOKS

Text Books:

1. Struart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach*"
2. George F.Luger, *"Artificial Intelligence: Structures and Strategies for Complex Problem Solving"*, Pearson Education

References:

1. Nils J. Nillson, *"Artificial Intelligence: A New Synthesis"*, Harcourt Asia
2. Elaine Rich and Kevin Knight, "*Artificial Intelligence"*, TMH
3. Patrick Winston, "*Artificial Intelligence"*, Pearson Education

4. Ivan Brakto, "*Prolog Programming for Artificial Intelligence*", Pearson Education
5. Efraim Turban Jay E.Aronson, "*Decision Support Systems and Intelligent Systems*"
6. Ed. M. Sasikumar and Others, *"Artificial Intelligence : Theory and Practice"* Proceedings of the International Conference KBCS-2002, Vikas Publishing House

(307230) DIGITAL SIGNAL PROCESSING

Objective: Digital Signal Processing continues to play an increasingly important role in the fields that range literally from A (astronomy) to Z (zeugmatography, or magnetic resonance imaging) and encompass applications such as Compact Disc player, Speech Recognition, echo cancellations in communication systems, image Enhancement, geophysical exploration, and noninvasive medical imaging. This course aims to build concepts regarding the fundamental principles and applications of Signals, System Transforms and Filters.

Pre-requisites: Nil

DETAILED SYLLABUS

1. **Discrete Time Signals & System:** Discrete–time signals, Discrete–time systems, Analysis of discrete-time LTI systems, Discrete-time systems described by differential equations, Implementation of discrete-time systems, Correlation of discrete-time systems
2. **Z-Transform:** Definition and Properties of Z-transform, Rational Z-transforms, Inverse Z-transform, one-sided Z-transform, Analysis of LTI systems in Z-domain
3. **Frequency Analysis of Signals and Systems:** Frequency analysis: Continuous time signals and Discrete-time signals, Properties of the Fourier transform for discrete-time signals, Frequency domain characteristics of LTI systems, LTI system as a frequency selective filter, Inverse systems and deconvolution
4. **Discrete Fourier Transform:** Frequency domain sampling, Properties of DFT, Linear filtering method based on DFT, Frequency analysis of signals using DFT, FFT algorithm, Applications of FFT, Goertzel algorithm, Quantisation effects in the computation of DFT
5. **Implementation of Discrete Time Systems:** Structure of FIR systems, Structure of IIR systems, quantization of filter coefficients, round-off effects in digital filters
6. **Design of Digital Filters:** Design of FIR filters, Design of IIR filters from analog filters, frequency transformations, Design of digital filters based on least-squares method digital filters from analogue filters, Properties of FIR digital filters, Design of FIR filters using windows, Comparison of IIR and FIR filters, and Linear phase filters.
7. **Introduction to DSP co**-processors: TMS 320C40/50, Analog Devices.
8. **Applications :** Image processing, Control, Speech, Audio, Telecommunication

BOOKS

Text Books:

1. J.G. Proakis, "*Introduction to Digital Signal Processing*", PHI
2. Oppenhiem and Schaffer, "*Discrete Time Signal Processing*"

References:

1. S.K. Mitra, "*Digital Signal Processing*", TMH.
2. T.J. Cavicchi, "*Digital Signal Processing*", John Wiley.
3. L.C. Ludeman," *Fundamentals Of Digital Signal Processing*", John Wiley.
4. E.C. Ifeachor, B.W. Jervis, "*Digital Signal Processing*", Pearson Education.
5. S Sallivahanan, *"Digital Signal Processing*", TMH.
6. Ashok Ambardar, "*Analog and Digital Signal Processing*", Thompson Learning.

(307240) SOFTWARE ENGINEERING

Objectives: Apply various software Engineering principles and methodologies while dealing with the various phases of software development.

Pre-requisite: Programming concepts.

DETAILED SYLLABUS

1. **Product:** Evolving role of software, Software Characteristics, Software Applications, Software myths.
2. **Process:** Software Process, Process Models, Linear sequential model, Prototyping model, RAD model, Evolutionary software models, Component-based development, Formal methods model, Fourth generation techniques, Process technology, Product and process.
3. **Project Management:** Management spectrum, People, Product, Process, Project, W^5HH principle.
4. **Software Process and Project Metrics:** Measures-Metrics-Indicators, Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software engineering process, Statistical quality control, Metrics for small organizations, Establishing a software metrics program.
5. **Software Project Planning:** Objectives, Software scope, Resources, Software project estimation, Decomposition techniques, Empirical estimation models, Make/Buy decision, Automated estimation tools.
6. **Risk Analysis and Management:** Reactive versus proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, Risk mitigation-monitoring-management, Safety risks and hazards, RMMM plan.
7. **Project Scheduling and Tracking:** Basic concepts, Relationship between people and effort, Defining a task set for the software project, Selecting software Engineering tasks, Refinement of major tasks, Defining a task network, Scheduling, Earned value network, Error tracking, Project plan.
8. **Software Quality Assurance:** Quality concepts, Quality Movement, Software quality assurance, Software reviews, Formal technical reviews, Formal approaches to SQA, Statistical software quality assurance, Software reliability, Mistake-proofing for software, ISO 9000 quality standards, SQA plan.
9. **Software Configuration Management:** Introduction, SCM process, Identification of objects in the software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards.
10. **System Engineering:** Computer-based systems, System engineering hierarchy,

Business process engineering, product engineering, Requirements engineering, System modeling.

11. **Analysis Concepts and Principles:** Requirement Analysis, Requirement elicitation for software, Analysis principles, Software prototyping, Specification.
12. **Analysis Modeling:** Introduction, Elements of analysis model, Data modeling, Functional modeling and information flow, Behavioral modeling, Mechanics of structured analysis, Data dictionary, Other classical analysis methods.
13. **Design Concepts and Principles:** Software design and software engineering, Design process, Design principles, Design concepts, Effective modular design, Design heuristics for effective modularity, Design model, Design documentation.
14. **Architectural Design:** Software architecture, Data design, Architectural styles, Analyzing alternative architectural designs, Mapping requirements into a software architecture, Transform mapping, Transaction mapping, Refining architectural design.
15. **User Interface Design:** The golden rules, User interface design, Task analysis and modeling, Interface design activities, Implementation tools, Design evaluation.
16. **Component-Level Design:** Structured programming, Comparison of design notation.
17. **Software Testing Techniques:** Software testing fundamentals, Test case design, White-box testing, Basis path testing, Control structure testing, Black-box testing, Testing for specialized environments, architectures and applications.
18. **Software Testing Strategies:** Strategic approach to software testing, Strategic issues, Unit testing, Integration testing, Validation testing, System testing, Art of debugging.
19. **Technical Metrics for Software:** Software quality, framework for technical software metrics, Metrics for the analysis model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance.

BOOKS

Text Books:

1. Roger Pressman, "*Software Engineering*", McGraw Hill, Fifth Edition.
2. James Peter, "*Software Engineering An Engineering Approach*", John Wiley
3. Ian Sommerville, "*Software Engineering*", Pearson Education.

References:

1. W.S. Jawadekar, "Software *Engineering*", TMH.
2. Pankaj Jalote, "*An Integrated Approach To Software Engineering* ", Narosa.
3. R. Mall, "*Fundamentals of Software Engineering"*, Prentice Hall of India
4. A. Behferooz & F. J. Hudson, "*Software Engineering Fundamentals"*, Oxford University Press
5. S. L. Pfleeger, "*Software Engineering Theory and Practice*", Pearson Education

(407010) IMAGE PROCESSING
(ELECTIVE-I)

Objective: Digital Image Processing is a rapidly evolving field with growing applications in science and engineering. Image processing holds the possibility of developing the ultimate machine that could perform the visual functions of all living beings. There is an abundance of image processing applications that can serve mankind with the available and anticipated technology in the near future.

Pre-requisites: Digital Signal Processing, & Computer Graphics

DETAILED SYLLABUS

1. **Digital Image Processing Systems:** Introduction, Structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels
2. **Image Transforms (Implementation):** Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.
3. **Image Enhancement in the Spatial Domain:** Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters
4. **Image Enhancement in the Frequency Domain:** Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering
5. **Wavelets and Multiresolution Processing:** Image pyramids, Subband coding, Haar transform, Series expansion, Scaling functions, Wavelet functions, Discrete wavelet transforms in one dimensions, Fast wavelet transform, Wavelet transforms in two dimensions
6. **Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone still image compression standards, Video compression standards.
7. **Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images
8. **Image Segmentation:** Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation
9. **Image Representation and Description:** Representation schemes, Boundary descriptors, Regional descriptors

BOOKS

Text Books:

1. R.C.Gonsales R.E.Woods**, "***Digital Image Processing*", Second Edition, Pearson Education
2. Anil K.Jain, "*Fundamentals of Image Processing*", PHI

References:

1. William Pratt, "*Digital Image Processing*", John Wiley
3. Milan Sonka,Vaclav Hlavac, Roger Boyle, "*Image Processing, Analysis, and Machine Vision*" Thomson Learning
2. N Ahmed & K.R. Rao, "*Orthogonal Transforms for Digital Signal Processing*" Springer
3. B. Chanda, D. Dutta Majumder, "*Digital Image Processing and Analysis*", PHI.

(407020) PATTERN RECOGNITION
(ELECTIVE-I)

Objective: This course teaches the fundamentals of techniques for classifying multi-dimensional data, to be utilized for problem-solving in a wide variety of applications, such as engineering system design, manufacturing, technical and medical diagnostics, image processing, economics, psychology.

Pre-requisite: Linear Algebra, Probability and Statistics

DETAILED SYLLABUS

1. **Introduction:** Machine perception, Pattern recognition systems, Design cycle, Learning and Adaptation
2. **Bayesian Decision Theory:** Bayesian decision theory: Continuous features, Minimum-error rate classification, classification, Classifiers, Discriminant functions and Decision surfaces, Normal density, Discriminant functions for normal density, Bayes Decision theory: discrete features
3. **Maximum-Likelihood and Bayesian Parameter Estimation:** Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian caseand General theory, Prolems of dimentionality, Hidden Markov Model
4. **Nonparametric Techniques:** Density estimation, Parzen windows, k_n-Nearest-Neighbor estimation, Nearest-Neighbor rule, Matrics and Nearest-Neighbor classification
5. **Linear Discriminants Functions:** Linear discriminant functions and decision surfaces, Generalised linear discriminant functions, 2-Category linearly separable case, Minimising the Perceptron criterion function, Relaxation procedure, Non-separable behavior, Minimum squared error procedure, Ho-Kashyap procedures, Multicategory generalizations
6. **Nonmetric Methods:** Decision tree, CART, ID3, C4.5, Gramatical methods, Gramatical interfaces
7. **Algorithm Independent Machine Learning:** Lack of inherent superiority of any

classifier, Bias and Variance, Resampling for estimating statistic, Resampling for classifier design, Estimating and comparing classifiers, Combining classifiers

8. **Unsupervised Learning and Clustering:** Mixture densities and Identifiability, Maximum-Likelihood estimations, Application to normal mixtures, Unsupervised Bayesian learning, Data description and clustering criterion function for clustering, Hierarchical clustering
9. **Applications of Pattern Recognition**

BOOKS

Text Books:

1. Duda, Hart, and Stock, "*Pattern Classification*", John Wiley and Sons.
2. Gose, Johnsonbaugh and Jost, "*Pattern Recognition and Image analysis*", PHI

(407030) MOBILE COMPUTING (ELECTIVE-I)

Objective: Recent developments in portable devices and high-bandwidth, ubiquitous wireless networks has made mobile computing a reality. Indeed, it is widely predicted that within the next few years' access to Internet services will be primarily from wireless devices, with desktop browsing the exception. Such predictions are based on the huge growth in the wireless phone market and the success of wireless data services.This course will help in understanding fundamental concepts, current developments in mobile communication systems and wireless computer networks.

Pre-requisites: Computer Networks.

DETAILED SYLLABUS

1. **Introduction:** Applications, A short history of wireless communication
2. **Wireless Transmission:** Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.
3. **Medium Access Control:** Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.
4. **Telecommunication Systems**: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, Security, New data services; DECT: System architecture, Protocol architecture; TETRA, UMTS and IMT-2000: UMTS Basic architecture, UTRA FDD mode, UTRA TDD mode
5. **Satellite Systems**: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover, Examples
6. **Broadcast Systems**: Overview, Cyclic repetition of data, Digital audio broadcasting: Multimedia object transfer protocol; Digital video broadcasting
7. **Wireless LAN**: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks,

IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control. Sublayer, Medium access control Sublayer, Information bases And Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management.

8. **Wireless ATM**: Motivation for WATM, Wireless ATM working group, WATM services, Reference model: Example configurations, Generic reference model; Functions: Wireless mobile terminal side, Mobility supporting network side; Radio access layer: Requirements, BRAN; Handover: Handover reference model, Handover requirements, Types of handover, Handover scenarios, Backward handover, Forward handover; Location management: Requirements for location management, Procedures and Entities; Addressing, Mobile quality of service, Access point control protocol
9. **Mobile Network Layer**: Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation , Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics
10. **Mobile Transport Layer**: Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP
11. **Support for Mobility**: File systems: Consistency, Examples; World Wide Web: Hypertext transfer protocol, Hypertext markup language, Some approaches that might help wireless access, System architectures; Wireless application protocol: Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language, WML script, Wireless telephony application, Examples Stacks with Wap, Mobile databases, Mobile agents

BOOKS

Text Books:

1. Jochen Schiller, "*Mobile communications",* Addison wisely , Pearson Education
2. Wiiliam Stallings, "*Wireless Communications and Networks*"

References :

1. Rappaort, "*Wireless Communications* P*rincipals and Practices*"
2. YI Bing Lin , "*Wireless and Mobile Network Architectures*", John Wiley
3. P. Nicopolitidis , "*Wireless Networks*", John Wiley
4. K Pahlavan, P. Krishnamurthy , "*Principles of Wireless Networks*"
5. M. Richharia , "*Mobile Satellite Communication: Principles and Trends*", Pearson Education

(407040) EMBEDDED SYSTEMS
(ELECTIVE-I)

Objective: Embedded system tools and products are evolving rapidly. This course deals with various approaches to building embedded systems. It introduces unified view of hardware and software. The aim of this course is to make the students aware of the various applications of embedded systems.

Pre-requisites: Microprocessors and C Programming

DETAILED SYLLABUS

1. **An overview of embedded systems:** Introduction to embedded systems, Categories and requirements of embedded systems, Challenges and issues related to embedded software development, Hardware/Software co-design, Introduction to IC technology, Introduction to design technology
2. **Embedded Software development:** Concepts of concurrency, processes, threads, mutual exclusion and inter-process communication, Models and languages for embedded software, Synchronous approach to embedded system design, Scheduling paradigms, Scheduling algorithms, Introduction to RTOS, Basic design using RTOS
3. **Embedded C Language:** Real time methods, Mixing C and Assembly, Standard I/O functions, Preprocessor directives, Study of C compilers and IDE, Programming the target device
4. **Hardware for embedded systems:** Various interface standards, Various methods of interfacing, Parallel I/O interface, Blind counting synchronization and Gadfly Busy waiting, Parallel port interfacing with switches, keypads and display units, Memory and high speed interfacing, Interfacing of data acquisition systems, Interfacing of controllers, Serial communication interface, Implementation of above concepts using C language
5. **Study of ATMEL RISC Processor:** Architecture, Memory, Reset and interrupt , functions, Parallel I/O ports, Timers/Counters, Serial communication, Analog interfaces, Implementation of above concepts using C language, Implementation of above concepts using C language
6. **Case studies and Applications of embedded systems:** Applications to: Communication, Networking, Database, Process Control, Case Studies of: Digital Camera, Network Router, RTLinux

BOOKS

Text Books:

1. Raj Kamal, "*Embedded Systems*", TMH
2. David E. Simon, "*An Embedded Software Primer* ", Pearson Education
3. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "*The 8051Microcontroller and Embedded Systems",* Pearson Education

References:

1. Frank Vahid, Tony Givargis, "*Embedded System Design: A Unified Hardware/Software Introduction*", John Wiley

2. Craig Hollabaugh, "*Embedded Linux*", Pearson Education
3. Daniel Lewis, "*Fundamentals of Embedded Software*", Pearson Education.
4. Barnett, Cox, O'Cull, "*Embedded C Programming and the Atmel AVR* ", Thomson Learning
5. Myke Predko, "*Programming and Customizing the 8051 Microcontroller*", TMH

(407050) COMPUTER SIMULATION AND MODELING
(ELECTIVE-I)

Objective: In the last five decades digital computer simulation has developed from infancy to a full-fledged discipline. The field of modeling and simulation is as diverse as of man. The application of simulation continues to expand, both in terms of extent to which simulation is used and the range of applications. This course gives a comprehensive and state of art treatment of all the important aspects of a simulation study, including modeling, simulation software, model verification and validation, input modeling.

Pre-Requisite: Probability and Statistics

DETAILED SYLLABUS

1. **Introduction to Simulation:** System and System environment, Components of system, Type of systems, Type of models, Steps in simulation study, Advantages and Disadvantages of simulation.
2. **Simulation Examples:** Simulation of Queueing systems, Other examples of simulation.
3. **General Principles:** Concepts of discrete event simulation, List processing,
4. **Simulation Software:** History of simulation software, Desirable software features, General-purpose simulation packages, Object oriented simulation, Trends in simulation software.
5. **Statistical Models in Simulation:** Useful statistical model, Discrete distribution, Continuous distribution, Poisson process, Empirical distribution.
6. **Queueing Models:** Characteristics of Queueing systems, Queueing notations, Long run measures of performance of Queueing systems, Steady state behavior of infinite population Markovian models, Steady state behavior finite population model, Network of Queues.
7. **Random Number Generation:** Properties of random numbers, Generation of pseudo random numbers, Techniques for generating random numbers, Tests for random numbers.
8. **Random Variate Generation:** Inverse transform technique, Convolution method, Acceptance rejection techniques
9. **Input Modeling:** Data Collection, Identifying the Distribution of data, Parameter estimation, Goodness of fit tests, Selection input model without data, Multivariate and Time series input models.
10. **Verification and Validation of Simulation Model:** Model building, Verification, and Validation, Verification of simulation models, Calibration and Validation of models.
11. **Output Analysis for a Single Model:** Types of simulations with respect to output analysis, Stochastic nature of output data, Measure of performance and their

estimation, Output analysis of terminating simulators, Output analysis for steady state simulation

12. **Comparison and Evaluation of Alternative System Design:** Comparison of two system design, Comparison of several system design, Meta modeling, Optimization via simulation.
13. **Case Studies:** Simulation of manufacturing systems, Simulation of computer systems, Simulation of super market, Simulation of pert network

BOOKS

Text Books:

1. Jerry Banks, John Carson, Barry Nelson, David Nicol, "*Discrete Event System Simulation*"
2. Averill Law, W. David Kelton, "*Simulation Modeling and Analysis",* McGRAW-HILL

References:

1. Geffery Gordon, *"System Simulation"*, PHI
2. Bernard Zeigler, Herbert Praehofer, Tag Gon Kim, "*Theory of Modeling and Simulation*", Academic Press
3. Narsing Deo, *"System Simulation with Digital Computer"*, PHI
4. Donald W. Body, "*System Analysis and Modeling*", Academic Press Harcourt India
5. W David Kelton, Randall Sadowski, Deborah Sadowski, "*Simulation with Arena*", McGRAW-HILL.

(407060) ADVANCED COMPUTER NETWORKS
(ELECTIVE-I)

Objectives: In first part, Advanced technologies like High speed Devices etc. are to be considered. Second part Network programming is to be studied. Not just SOCKETS but also protocols, Drivers, Simulation Programming. In third part we should study Network Design, Protocols designs and analysis considering deterministic and non-deterministic approach. We expect natural thinking from student. For example he should able to consider different constraints and assume suitable data and solve the problems.

Pre-requisites: Computer networks

DETAILED SYLLABUS

1. **Data Communications:** Business Drivers and Networking Directions : Data communication Past and future.
2. **Understanding the standards and their maker:** Creating standards: players and Process, Current forums, Standard protocols, Layered reference models: The OSIRM, Standard computer architectures.
3. **Introduction to Transmission Technologies:** Hardware selection in the design process.
4. **Optical Networking:** SONET/SDH standards, Dense wavelength division multiplexing (DWDM), Performance and Design considerations.

5. **Physical Layer Protocols and Access Technologies:** Physical Layer Protocols and Interfaces, Accessing the Network, Copper access technologies, Cable Access Technologies, Fiber Access Technologies, Air Access Technologies.
6. **Common Protocols and Interfaces in the LAN environment:** Data link layers protocols, LLC and MAC sub layer protocol, Ethernet, Token Ring, Token Bus and FDDI, Bridge protocols, Switching in the LAN environment.
7. **Frame Relay:** FR specification and design, VoFR: Performance and Design considerations, Advantages and disadvantages of FR.
8. **Common WAN Protocol:** ATM: Many faces of ATM, ATM protocol operation (ATM cell and Transmission), ATM networking basics, Theory of operations, B-ISDN protocol reference model, PHY layer, ATM layer (Protocol model), ATM layer and cell (Definition), Traffic descriptors and parameters, Traffic and Congestion control defined, AAL Protocol model, Traffic contract and QoS, User plane overview, Control plane AAL, Management plane, Sub-DS3 ATM, ATM public services.
9. **Common Protocols and Interfaces in the Upper Layers(TCP/IP):** Background (Routing protocols), TCP/IP suite, Network layer (Internetwork layer), Transport layer, Application layer, Addressing and routing design.
10. **Mature Packet Switched Protocol:** ITU Recommendation X.25, User connectivity, Theory of Operation, Network layer functions, X.75 Internetworking protocol, switched multimegabit data service (SMDS), SMDS and IEEE 802.6, Subscriber Interface and Access protocol, Addressing and Traffic control.
11. **Requirements Definition:** User requirements, Traffic sizing, Traffic characteristics, Protocols, Time and Delay considerations, Connectivity, Availability, Reliability and Maintainability, Service aspects, Budget constraints,.
12. **Traffic Engineering and Capacity planning:** Background (Throughput calculations) , Traffic engineering basics (Traffic characteristics), Traditional Traffic engineering, Queued data and packet switched traffic modeling, Designing for peaks, Delay or Latency, Availability and reliability, Network performance modeling, Creating the traffic matrix, Capacity planning and Network vision, Design tool, Categories of tools, Classes of design tool, Components of design projects, Types of design projects.
13. **Technology Comparisons:** Circuits-message-packet and cell switching methods, Packet switching service aspects, Generic packet switching network characteristics, Private verses public networking, Public network service selection, Business aspects of Packet-Frame and cell switching services, High speed LAN protocols comparisons, Application performance needs.
14. **Access Network Design:** Network design layers, Access layer design, Access network capacity, network topology and hardware, completing the access network design.
15. **Backbone Network Design:** Backbone requirements, Network capacities, Topologies, Topologies strategies, Tuning the network.

BOOKS

Text Books:

1. Darren L Spohn, "Data Network Design", TMH
2. D. Bertsekas, R. Gallager, "*Data Networks*", PHI

References:

1. W.R. Stevens, "*Unix Network Programming*", Vol.1, Pearson Education
2. J.Walrand, P. Varaiya, "High Performance Communication Networks", Morgan

Kaufmann
3. Y. Zheng, S. Akhtar, "Networks for Computer Scientists and Engineers", Oxford
4. A.S. Tanenbaum, "Computer Networks"
5. Peterson & Davie, "Computer Networks", Harcourt Asia.
6. James D. McCabe , "Practical Computer Analysis and Design", Harcourt Asia.

(307250) SYSTEM SECURITY

Objectives of the course: Learn about the threats in computer security. Understand what puts you at a risk and how to control it. Controlling a risk is not eliminating the risk but to bring it to a tolerable level.

Pre-requisites: Computer Networks, Operating system.

DETAILED SYLLABUS

1. **Introduction:** Security, Attacks, Computer criminals, Method of defense
2. **Cryptography:** Basic Cryptography: Classical Cryptosystems, Public key Cryptography, Cryptographic checksum, Key Management: Key exchange, Key generation, Cryptographic key infrastructure, Storing and revoking keys, Hash algorithm, Digital signature, Cipher Techniques: Problems, Stream and block ciphers: AES, DES, RC4.
3. **Program Security:** Secure programs, Non-malicious program errors, Viruses and other malicious code, Targeted malicious code, Controls against program threats
4. **Operating System Security:** Protected objects and methods of protection, Memory address protection, Control of access to general objects, File protection mechanism, Authentication: Authentication basics, Password, Challenge-response, Biometrics.
5. **Database Security:** Security requirements, Reliability and integrity, Sensitive data, Interface, Multilevel database, Proposals for multilevel security
6. **Security in Networks:** Threats in networks, Network security control, Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example protocols: PEM, SSL, IPsec
7. **Administrating Security:** Security planning, Risk analysis, Organizational security policies, Physical security.
8. **Legal, Privacy, and Ethical Issues in Computer Security: P**rotecting programs and data, Information and law, Rights of employees and employers, Software failures, Computer crime, Privacy, Ethical issues in computer society, Case studies of ethics

Books

Text Books:

1. Stallings**, "***Cryptography And Network Security: Principles and practice*"
2. C. P. Pfleeger, and S. L. Pfleeger, "*Security in Computing*", Pearson Education.
3. Matt Bishop, "*Computer Security: Art and Science*", Pearson Education.

References :

1. Kaufman, Perlman, Speciner, "*Network Security*"
2. Eric Maiwald, "*Network Security : A Beginner's Guide*", TMH
3. Bruce Schneier, "*Applied Cryptography*", John Wiley.
4. Macro Pistoia, "*Java network security* ", Pearson Education
5. Whitman, Mattord, "*Principles of information security",* Thomson

(307260) DISTRIBUTED COMPUTING

Objective: This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered.

Pre-requisites: Operating Systems and Computer Networks

DETAILED SYLLABUS

1. **Introduction to Distributed System:** Goals, Hardware concepts, Software concepts, and Client-Server model. Examples of distributed systems.
2. **Communication:** Layered protocols, Remote procedures call, Remote object invocation, Message-oriented communication, Stream-oriented communication.
3. **Processes:** Threads, Clients, Servers, Code Migration, Software agent.
4. **Naming:** Naming entities, Locating mobile entities, Removing un-referenced entities.
5. **Synchronization:** Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion, Distributed transactions.
6. **Consistency and Replication:** Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols.
7. **Fault Tolerance:** Introduction, Process resilience, Reliable client server communication, Reliable group communication. Distributed commit, Recovery.
8. **Security:** Introduction, Secure channels, Access control, Security management.
9. **Distributed File System:** Sun network file system, CODA files system.
10. **Case Study:** CORBA, Distributed COM, Globe, Comparison of CORBA, DCOM, and Globe.

BOOKS

Text Books:

1. A. Taunenbaum, **"***Distributed Systems: Principles and Paradigms***"**
2. G. Coulouris, J. Dollimore, and T. Kindberg, "*Distributed Systems: Concepts and Design*", Pearson Education

References:

1. M. Singhal, N. Shivaratri, "*Advanced Concepts in Operating Systems*", TMH

(307270) MULTIMEDIA SYSTEMS

Objectives of the course: This course teaches students to collect, and intelligently integrate multiple media on computers. Students learn the issues involved in capturing, compressing, processing, manipulating, searching, indexing, storing, and retrieving various kinds of continuous media in the text section.

Pre-requisites: Operating Systems, Computer Networks

DETAILED SYLLABUS

1. Multimedia Systems Introduction: Multimedia application, Multimedia system architecture, Evolving technologies for multimedia systems, defining objects for multimedia systems, Multimedia data interface standards
2. Compression and Decompression: Types of compression, Binary image compression schemes, Color, Gray scale, Still video image compression, Video image compression, Audio compression, Fractal compression, Data and File Format Standards: Rich text format, TIFF, RIFF, MIDI, JPEG, AVI, MPEG
3. Multimedia Input/Output Technologies: Key technologies issues, Pen input, Video and Image display system, Printout technology, Image scanners, Digital Voice and Audio, Full motion video
4. Storage and Retrieval Technologies: Magnetic media technology, Optical media, Hierarchical storage management, Cache management for storage system, Image and video databases: Indexing and Retrieval
5. Architectural and Telecommunications Considerations: Specialized computational processors, Memory systems, Multimedia board solutions, LAN/WAN connectivity, Multimedia transport across ATM networks, Multimedia across wireless, Distributed object models
6. Multimedia Networking: Multimedia networking applications, Streaming stored audio and video, RTP, Scheduling and policing mechanisms, Integrated services, RSVP
7. Multimedia Application Design: Multimedia application classes, Types of multimedia systems, Virtual reality design, Components of multimedia systems, Organizing multimedia databases, application workflow design issues, Distributed application design issues, Applications like Interactive, Television, Video Conferencing, Video-on-demand, Educational applications and authoring, Industrial applications, Multimedia archives and digital libraries
8. Multimedia Authoring and User Interface: Multimedia authoring systems, Hyper media application design considerations, User interface design, information access, Object display/playback issues
9. Hyper Media Messaging: Mobile messaging, Hyper media message components, Hypermedia linking and embedding, Creating hypermedia messages, integrated multimedia message standards, Integrated document management, The world-wide web, Open hypermedia systems, Content based navigation.
10. Distributed Multimedia Systems: Components of distributed multimedia systems, Distributed client server operations, Multimedia object servers, Multi-server network topologies, Distributed multimedia database, Managing distributed objects
11. Multimedia System Design: Methodology and considerations, Multimedia systems

design examples.

Books

Text Books:

1. Prabhat K. Andheigh, Kiran Thakrar, "*Multimedia Systems Design*", PHI John F,
2. Koegel Buford, "*Multimedia Systems*", Pearson Education.

References :

1. Free Halshall, "*Multimedia Communications*", Pearson Education.
2. R. Steimnetz, K. Nahrstedt, "*Multimedia Computing, Communications and Applications*", Pearson Education
3. K.R. Rao, D. Milovanovic, "*Multimedia Communication Systems: Techniques, Standards, and Networks*"
4. Subrahmanian, "*Multimedia Database Systems*", M. Kaufman
5. J. D. Gibson, "*Multimedia Communications: Directions and Innovations*", Academic Press, Hardcourt India
6. J.F. Kurose, K.W. Ross, "*Computer Networking*", Pearson Education

(407110) ROBOTICS (ELECTIVE-II)

Objective: The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, chose, and incorporate robots in engineering systems.

Pre-requisite: Exposure to linear algebra and matrix operations. Exposure to programming in a high level language

DETAILED SYLLABUS

1. **Robotic Manipulation**: Automation and Robots, Classification, Application, Specification, Notations.
2. **Direct Kinematics**: Dot and cross products, Co-ordinate frames, Rotations, Homogeneous, Co-ordinates, Link co-ordination arm equation, (Five-axis robot, Four axis robot, Six axis robot).
3. **Inverse Kinematics**: General properties of solutions tool configuration Five axis robots, Three-Four axis, Six axis robot (Inverse kinematics).
4. Workspace analysis and trajectory planning work envelop and examples, workspace fixtures, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.
5. **Robot Vision:** Image representation, Template matching, Polyhedral objects, Shane analysis, Segmentation (Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers, Perspective transformation, Structured Illumination, Camera calibration).
6. **Task Planning:** Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp planning, Fine-motion Planning, Simulation of Planer motion,

Source and goal scenes, Task planner simulation.

7. **Moments of Inertia.**
8. **Principles of NC and CNC Machines.**

BOOKS

Text Books:

1. Robert Shilling, "*Fundamentals of Robotics-Analysis and control",* PHI.
2. Fu, Gonzales and Lee, *"Robotics",* McGraw Hill
3. J.J, Craig, *"Introduction to Robotics"*, Pearson Education

References:

1. Staughard, *"Robotics and AI",* PHI.
2. Grover, Wiess, Nagel, Oderey, "Industrial Robotics", McGraw Hill
3. Walfram Stdder, *"Robotics and Mecatronics"*, TMH.
4. Niku, "*Introduction to Robotics*", Pearson Education
5. Klafter, Chmielewski, Negin, "*Robot Engineering*", PHI
6. Mittal, Nagrath, "*Robotics and Control*", TMH

(407120) COMPUTER VISION (ELECTIVE-II)

Objective: To introduce the student to computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving

Pre-requisite: Introduction to Image Processing.

DETAILED SYLLABUS

9. **Recognition Methodology:** Conditioning, Labeling, Grouping, Extracting, Matching. Edge detection, Gradient based operators, Morphological operators, Spatial operators for edge detection. Thinning, Region growing, region shrinking, Labeling of connected components.
10. **Binary Machine Vision:** Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation.
11. **Area Extraction:** Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).
12. **Region Analysis:** Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.
13. **Facet Model Recognition:** Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consisting labeling problem, Back-tracking, Perspective Projective geometry, Inverse perspective Projection, Photogrammetry – from 2D to 3D, Image matching : Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching.
14. **Object Models And Matching:** 2D representation, Global vs. Local features.

15. **General Frame Works For Matching:** Distance relational approach, Ordered-structural matching, View class matching, Models database organization.
16. **General Frame Works:** Distance –relational approach, Ordered –Structural matching, View class matching, Models database organization.
17. **Knowledge Based Vision:** Knowledge representation, Control-strategies, Information integration.

BOOKS

Text Books:

1. David A. Forsyth, Jean Ponce, *"Computer Vision: A Modern Approach"*
2. R. Jain, R. Kasturi, and B. G. Schunk, *"Machine Vision"*, McGraw-Hill.

References:

1. Milan Sonka,Vaclav Hlavac, Roger Boyle, "*Image Processing, Analysis, and Machine Vision*" Thomson Learning
2. Robert Haralick and Linda Shapiro, *"Computer and Robot Vision"*, Vol I, II, Addison-Wesley, 1993.

(407130) PARALLEL PROCESSING
(ELECTIVE-II)

Objective: Upon completion of this course students will be able to understand and employ the fundamental concepts and mechanisms which form the basis of the design of parallel computation models and algorithms, recognize problems and limitations to parallel systems, as well as possible solutions

Pre-requisite: Computer architecture, Data structures

DETAILED SYLLABUS

1. **Introduction:** Parallel Processing Architectures: Parallelism in sequential machines, Abstract model of parallel computer, Multiprocessor architecture, Pipelining, Array processors.
2. **Programmability Issues:** An overview, Operating system support, Types of operating systems, Parallel programming models, Software tools
3. **Data Dependency Analysis:** Types of dependencies loop and array dependences, Loop dependence analysis, Solving diophantine equations, Program transformations
4. **Shared Memory Programming:** General model of shared memory programming, Process model under UNIX
5. **Algorithms for Parallel Machines:** Speedup, Complexity and cost, Histogram computation, Parallel reduction, Quadrature problem, Matrix multiplication, Parallel sorting algorithms, Solving linear systems, Probabilistic algorithms
6. **Message Passing Programming:** Introduction, Model, Interface, Circuit satisfiability, Introducing collective, Benchmarking parallel performance
7. **Parallel Programming languages:** Fortran90, nCUBE C, Occam, C-Linda
8. **Debugging Parallel Programs:** Debugging techniques, Debugging message passing

parallel programs, Debugging shared memory parallel programs

9. **Memory and I/O Subsystems:** Hierarchical memory structure, Virtual memory system, Memory allocation and management, Cache allocation and management, Cache memories and management, Input output subsystems
10. **Other Parallelism Paradigms:** Data flow computing, Systolic architectures, Functional and logic paradigms, Distributed shared memory
11. **Performance of Parallel Processors:** Speedup and efficiency, Amdahl's law, Gustafson-Barsis's law, Karf-Flatt metric, Isoefficiency metric

BOOKS

Text Books:

1. Hawang Kai and Briggs F. A., "*Computer Architecture and Parallel Processing"*, McGraw Hill
2. Jorden H. F. and Alaghaband G., "*Fundamentals of Parallel Processing*"
3. M.J. Quinn, "*Parallel Programming*", TMH

References:

1. Shasikumar M., "*Introduction to Parallel Processing"*, PHI
2. Wilson G.V., "*Practical Parallel Programming*", PHI
3. D. E. Culler, J.P. Singh, A. Gupta, *"Parallel Computer Architecture*", Morgan Kaufman

(407140) DATA WAREHOUSING AND MINING
(ELECTIVE-II)

Objectives of the course: The data warehousing part of module aims to give students a good overview of the ideas and techniques which are behind recent development in the data warehousing and online analytical processing (OLAP) fields, in terms of data models, query language, conceptual design methodologies, and storage techniques. Data mining part of the model aims to motivate, define and characterize data mining as process; to motivate, define and characterize data mining applications.

Pre-requisites: DBMS

DETAILED SYLLABUS

Data Warehousing:

1. **Overview And Concepts:** Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing.
2. **Planning And Requirements:** Project planning and management, Collecting the requirements.
3. **Architecture And Infrastructure:** Architectural components, Infrastructure and metadata.
4. **Data Design And Data Representation:** Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data quality.

5. **Information Access And Delivery:** Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web.
6. **Implementation And Maintenance:** Physical design process, data warehouse deployment, growth and maintenance.

Data Mining:

1. **Introduction:** Basics of data mining, related concepts, Data mining techniques.
2. **Data Mining Algorithms:** Classification, Clustering, Association rules.
3. **Knowledge Discovery :** KDD Process
4. **Web Mining:** Web Content Mining, Web Structure Mining, Web Usage mining.
5. **Advanced Topics:** Spatial mining, Temporal mining.
6. **Visualisation :** Data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, Mining class comparisons: Discriminating between different classes, Mining descriptive statistical measures in large databases
7. **Data Mining Primitives, Languages, and System Architectures:** Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems
8. **Application and Trends in Data Mining:** Applications, Systems products and research prototypes, Additional themes in data mining, Trends in data mining

BOOKS

Text Books:

1. Paulraj Ponnian, "*Data Warehousing Fundamentals*", John Wiley.
2. M.H. Dunham, "*Data Mining Introductory and Advanced Topics*", Pearson Education.
3. Han, Kamber, "*Data Mining Concepts and Techniques*", Morgan Kaufmann

References:

1. Ralph Kimball, "*The Data Warehouse Lifecycle toolkit*", John Wiley.
2. M Berry and G. Linoff, "*Mastering Data Mining*", John Wiley.
3. W.H. Inmon, "*Building the Data Warehouses*", Wiley Dreamtech.
4. R. Kimpall, "*The Data Warehouse Toolkit*", John Wiley.
5. E.G. Mallach, "*Decision Support and Data Warehouse systems*", TMH.

(407150) NEURAL NETWORKS & FUZZY SYSTEMS (ELECTIVE-II)

Objective: This course covers basic concepts of artificial neural networks, fuzzy logic systems and their applications. Its focus will be on the introduction of basic theory, algorithm formulation and ways to apply these techniques to solve real world problems.

Pre-requisite: Knowledge of calculus, and basic probability and statistics are required. Background in the following subjects desirable: numerical analysis (including optimization). Programming skills in one of the following would be desirable: Matlab, MathCad, C, Java, C++

DETAILED SYLLABUS

1. **Introduction:** Biological neurons, McCulloch and Pitts models of neuron, Types of activation function, Network architectures, Knowledge representation. Learning process: Error-correction learning, Supervised learning, Unsupervised learning, Learning Rules.
2. **Single Layer Perceptron:** Perceptron convergence theorem, Method of steepest descent - least mean square algorithms.
3. **Multilayer Perceptron**: Derivation of the back-propagation algorithm, Learning Factors.
4. **Radial Basis and Recurrent Neural Networks:** RBF network structure, theorem and the reparability of patterns, RBF learning strategies, K-means and LMS algorithms, comparison of RBF and MLP networks, Hopfield networks: energy function, spurious states, error performance .
5. **Simulated Annealing**: The Boltzmann machine, Boltzmann learning rule, Bidirectional Associative Memory.
6. **Fuzzy logic:** Fuzzy sets, Properties, Operations on fuzzy sets, Fuzzy relations, Operations on fuzzy relations, The extension principle, Fuzzy measures, Membership functions, Fuzzification and defuzzification methods, Fuzzy controllers.

BOOKS

Text Books:

1. Simon Haykin, "*Neural Network a - Comprehensive Foundation"*, Pearson Education
2. Zurada J.M., "*Introduction to Artificial Neural Systems,* Jaico publishers
3. Thimothy J. Ross, *"Fuzzy Logic with Engineering Applications"*, McGraw Hill
4. Ahmad Ibrahim, "*Introduction to Applied Fuzzy Electronics*", PHI

References:

1. Yegnanarayana B., "*Artificial Neural Networks"*, PHI
2. Driankov D., Hellendoorn H. & Reinfrank M., "*An Introduction to Fuzzy Control*", Norosa Publishing House
3. Berkan R.C., and Trubatch S.L., "*Fuzzy Systems Design Principles*", IEEE Press

(407160) SOFTWARE TESTING
(ELECTIVE-II)

Objectives To improve your understanding of software testing - its purpose and nature - and raise your awareness of issues and constraints around testing. To provide a professional qualification widely recognized by employers, customers and peers. To learn standard terminology. Discover good sources of information. To provide a complete picture of the test activities and processes from requirements review to system implementation.

Pre-requisites: Software Engineering, OOAD

DETAILED SYLLABUS

1. **Introduction:** Defect, Defect Vs failures, Process problems and defect rates, The business perspective for testing
2. **Building a Software Testing Strategy:** Computer system strategic risk, Economics of testing, Common computer problems, Economics of SDLC testing, Testing- an organizational issue, Establishing a testing policy, Structured approach to testing, Test strategy, Testing methodology
3. **Establishing a Software Testing Methodology:** Introduction, Verification and validation, Functional and structural testing, Workbench concept, Considerations in developing testing methodologies
4. **Determining Software Testing Techniques:** Testing techniques/tool selection process, Selecting techniques/tools, Structural system testing techniques, Functional system testing techniques, Unit testing techniques, Functional testing and analysis
5. **Selecting and Installing Software Testing Tools:** Testing tools-Hammers of testing, Selecting and using the test tools, Appointing managers for testing tools
6. **Software Testing Process:** Cost of computer testing, Life cycle testing concept, Verification and validation in the software development process, Software testing process, Workbench skills
7. **Software Testing Process:** Access Project Management Development Estimate and Status, Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report Test Result, Testing Software Installation, Test Software Change, Evaluate Test Effectiveness
8. **Testing Specialized Systems and Applications:** Client/Server systems, RAD, System documentation, Web based systems, Off-the-self software, Multi platform environment, Security, Data Warehouse
9. **Building Test Document:** Uses, Types, Responsibility, Storage, Test plan documentation, Test analysis report documentation

Books

Text Books:

3. W.E. Perry, "*Effective Methods for Software Testing*", John Wiley.
4. Kaner C., Nguyen H., Falk J., "*Testing Computer Software"*, John Wiley.

References :

1. Boris Beizer, *"Software Testing Techniques",* Dreamtech
2. Louise Tamres, *"Introducing Software Testing"*, Pearson Education.