L: 3	**CS 871 Digital System Design**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Synthesis of clock mode (synchronous) sequential circuits

Analysis of sequential circuits. Design procedure With synthesis of state diagrams Mealy and Moore machines. Partitioning and state assignment. Finite state machine model.

Synthesis of asynchronous sequential system design

Pulse mode circuits and fundamental mode circuits with synthesis.

Design Convention

Register transfer, biasing and sequencing of control. Electronic realization of hardwired control unit. Conditional transfer.

Introduction to HDL

Operand convention of AHPL, APL and AHPL operators. AHPL conventions for combinational logic and memory arrays.

RIC

Basic organization, register transfer and AHPL control programmes. Multiple cycle instructions.

Microprogramming

Introduction to microprogramming. Microprogramming the RIC. Microprogramming of bus oriented machines in assembly language for microprogrammes.

High speed addition, Multiplication, division and floating point arithmetic

Text Books/references:

1. J. Frederic and G. R. Peterson - Digital Systems: Hardware Organization and Design, John Wiley and Sons, 3/e.

2. F. J. Hill and G. R. Peterson - Switching Theory and Logical Design. John Wiley and Sons, 3/e.

L: 3	**CS 872 Modeling & Simulation**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

1. Introduction:

Concepts of Systems - System Environment - Stochastic activities - Continuous and discrete systems - Modeling and types - Principles of modeling.

2. System Studies:

Types of systems study -System analysis, system design, system postulation

3. System Simulation:

Techniques - Monte Carlo method - comparison of simulation and analytical methods - Experimental nature simulation - types of simulation - lag models - Cobweb models - progress of simulation study

4. Continuous System Simulation:

Continuous system model - Different equations. Analog methods - analog and hybrid computers - Digital analog simulators - CSSLS. Feedback systems _ Interactive systems - Real time simulation.

5. System Dynamics:

Exponential models - Systems dynamics diagram - World model.

6. Discrete Systems Simulation:

Discrete events - Time representation - Oathering statistics - Discrete simulation languages - Models of telephone system - study of GPSS, SIMSCRIPT languages.

7. Model of multi-user and multitasking computer system, Review of probability concepts - Arrival pattern & service times - Analysis of simulation output.

Text & References:

1. Geoffrey Gordon - System Simulation, PHI

2. Narsingh Deo - System Simulation and Digital Computer, PHI.

3. T. M. D. Donavan - GPSS simulation made simple, John Wiley Sons

L: 3	**CS 873 Principles Of Compiler Design**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Lexical analysis:

Finite automata, DFA construction and minimization and automatic tools.

Syntax analysis:

Context free grammars, top down and top bottom up parsing techniques. Construction of effcient parser. Syntax directed translation and automatic tools.

Semantic analysis:

Declaration processing. type checking, symbol tables and error recovery.

Intermediate code generation:

Run-time environments and translation of language constructs.

Code Generation:

Flow graphs, register allocation and code generation algorithms. Introduction to code optimization techniques.

Textbooks / References:

1. AAho, R. Sethi & Ullman - Compilers Principles, Techniques & Tools - Addison-Wesley 1995.

2. A. I. Holub - Compiler Design in C - PHI 1993.

3 A. S. Tremblay and P S Sorenson - The Theory and Practice of Compiler Writing - McGraw Hill 1985.

L: 3	**CS 874 Robotics**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Overview of Robotics.

Mechanical Design of robots, sensors, actuators, gearboxes, robot end-effectors, resolution, accuracy, precision.

Describing the position and orientation of objects in 3D space. Coordinate frames, position, orientation and velocity vectors in 3D, coordinate transformations. Applies directly to Computer Graphics.

How to mathematically define a path in space. How to control the robot to follow that path
Contact tasks, force sensing and control. Also: Haptic interfaces paralllel kinematics

Overview of computer vision and robotic applications of vision. Elements of a vision system, lighting, sensors, optics. Geometry of imaging, projections, distortions, depth of field. Digitization, brightness, color space, color depth, image formats. Camera calibration.

Binary images, thresholding, histograms. Area/moment statistics, morphological operations. Segmentation, blob analysis, labeling. Spatial operations and transformations: Pixel neighborhoods, convolution. Mean, Gaussian, Laplacian, gradient filters. Edge detection, Canny, Hough transform.

Overview of mobile robotics, applications. Sensors and estimation. Distributed robotics.

Overview of MEMS, scaling effects, micromanipulation. Microscope optics, depth from defocus, focus measures. Examples from current research

L: 3	**CS 874 Reliability Engineering**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Fundamentals of reliability engineering:

Definition of reliability, types of failures, failure mechanism and failure modes. Component co-units, bathtub curves, measures of reliability, failure rates, MTBF (Mean Time Between Failures), MTTF (Mean Time To Failure), reliability functions and hazard rate.

Reliability mathematics:

Basic probability theorems, conditional probability, Baye's theorem, basic statistical parameters such as mean, mode, median, variance, standard deviation, high order moments, types of probability distribution and their mean and variance. Binomial, Poisson, normal, log normal, exponential, Raleigh, Weibull and Gamma distributions.

Reliability modeling and assessment:

Reliability Logic Diagram (RLD), types of systems - repairable and non-repairable. System configuration – series, parallel, m out of n, standby systems, redundancy. Types and influence on reliability of subsystems. System reliability and evaluation methods - inspection methods, event space method, path tracing method, decomposition method and cut-set and tie-set method. Upper and lower bounds on system reliability.

Reliability data analysis:

Data acquisition, documentation and storage problem. Derivation of various reliability parameters from data. Anbalysis of constant hazard, data and estimation of reliability parameters.

Basic reliability design consideration:

Simple creative designs. Reliability consideration, reliability optimization with reference to some given constraints. Reliability and redundancy apportionment procedures.

Fault tree analysis:

Fault tree construction, direct evaluation of fault trees, fault tree evaluation by cut-sets.

Maintenance models:

Definition of maintainability and availability, preventive maintenance and assessment of influence on reliability/availability of a system.

Books/references:

1. M. L. Shooman - Probabilistic Reliability: An Engineering Approach, McGraw-Hill, 1968.

2. E. E. Lewis - Introduction to Reliability Engineering, John Wiley and Sons.

3. K. C. Kapur and L. R. Lamberson - Reliability Engineering Design, PHI, 1985.

4. W G. Ireson - Reliability Handbook, McGraw-Hill, 1966.

5. K. B. Misra - Reliability Analysis and Prediction: A Method Oriented Treatment, Elvester Sc. Publication, Netherlands, 1992.

6. A. K. Govil - Reliability Engineering, TMH, 1994.

L: 3	**CS 874 Mobile Computing**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Course Outline:

Recent Advances in Mobile Networks
Performance Analysis and Enhancement for IEEE 802.11 MAC protocol
A Novel Analytical Modeling for Optimal Channel Partitioning in the Next Generation Integrated Wireless and Mobile Networks
Multicast in Wireless Environment
Strategies for Enhancing Routing Security in Protocols for Mobile Ad Hoc Networks
Generic and Scalable Security Schemes for Ad Hoc Networks
Energy Efficient Routing Protocols with Comprehensive Information Retrieval for Wireless Sensor Networks: Wireless LANs and PANs

Topics in Bluetooth

Books/references:

L: 3	**CS874 Parallel Processeing**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Introduction to Parallel Processing
Flynn's classification, SIMD and MIMD operations, Shared Memory vs. message passing multiprocessors, distributed shared memory.

Shared Memory Multiprocessors
SMP and CC-NUMA architectures, Cache coherence protocols, Consistency protocols, Data Pre fetching, CC-NUMA Memory Management.

Interconnection Networks
Static and Dynamic networks, Switching Techniques, Internet Techniques, Network Processors.

Message passing Architectures
Message passing paradigms, Grid Architecture, Workstation clusters, User-level software.

Multiprocessor Scheduling
Scheduling and Mapping, Internet wave servers, Multimedia servers, Content aware load balancing.

Books and References:

John Hennessy and David Patterson, Computer Architecture: A quantitative Approach, Morgan Kauffman Publisher.

L: 3	**CS 874 Image Processing**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Introduction :
Scope and application of digital image processing. Image acquisition and display. Mathematical preliminaries. Human visual perception. Image Transforms: 2D-Fourier Transforms. 2D DFT. KLT, 2D DCT, Haar transform

Image Enhancement:
Histogram processing. Spatial Filtering. Frequency Domain Filtering. Image Restoration Degradation Model. Inverse Filtering. Wiener Filtering.

Edge Detection and Segmentation:
Edge detection. Line detection. Segmentation. Texture Analysis and Classification

Image Compression:
Lossy Compression. Loss-less compression. Run-length and Huffman Coding. Transform Coding. Image Compression Standards.

Color Image Processing:
Color model. Color Image Processing

Text Books/references :

1. R. C. Gonzalez & R. E. Woods - Digital Image Processing, Addison Wesley, 1993.
2. A. K. Jain - Fundamentals of Digital Image Processing, PHI
3. K. R. Castleman - Digital Image Processing, PHI 1996
4. W. K. Pratt - Digital Image Processing, John Wiley Interscience, 1991

L: 3	**CS 875 Distributed Systems**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Characterization of Distributed Systems, Design issues and user requirements. Interprocess Communication-Synchronous and Asynchronous, Client-server communication, Group communication.
Remote rocedure Call-Design issues & Implementation. Distributed S-Design issues & Implementation. File Services Design issues, Implementations and case studies. Name Service-Design issues and case studies. Time and Co-ordination Physical & Logical Clocks, Distibuted Co-ordination. Replicaton issues and implementations. Shared data and Trransactions, Distibuted tansactions, concurrency control. Recovery and Fault Tolerance. Security-Design issues and case studies.

Books/References:

Coulouris, Dollimore and Kindberg, Distributed Systems-Concepts and Design, Pearson Education Asia
P K Sinha, Distibuted Operating System, PHI, IEEE Press
Singhal and Shivaratri, Advanced Concepts in Operating Systems, TMH
Tanenbaum, Distributed Systems: Principles and Paradigms, Pearson Education

L: 3	**CS 875 Expert Systems**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Abduction and causation. Architecture of expert systems. Rule based systems - forward and backward chaining, matching match measures, partial fuzzy matching, the Rate algorithm. Structured representation systems - frames, semantic nets, object based, scripts, indexing, retrieval techniques. Handling uncertainty and errors. Bayesian methods, uncertainty factors, Dempster-Shafer theory. Probabilistic and fuzzy reasoning, defeasible reasoning, truth maintenance. Knowledge engineering and acquisition - expert system development cycle, capturing and representing knowledge of experts through interaction, debugging knowledge bases. Explanation based learning. Expert system tools.

Text books / references:

1. P. Jakson - Introduction to Expert Systems, Addison Wesley

2. D. W. Ralston - Principles of Artificial Intelligence and Expert Systems, McGraw Hill

3. B. Buchanen and E. Shorteiffe - Rule Based Expert Systems

4. L. Brownston - Programming Expert Systems in OPSS, Addison Wesley

L: 3	**CS 875 Neural Network and Fuzzy Control**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Introduction.

Early Adaptive Networks.

Hopfield Networks.

Back-error propagation.

Back propagation applications and examples .

The brain and its neurons.

The Kohonen feature map.

Basic elements of fuzzy and fuzzy system:

The idea of a fuzzy set. Basic definition and properties related to fuzzy sets. Decision making in a fuzzy environment. Control process with a fixed and specified termination time.

Text books/references:

1. Judith Dayhoff - Neural Network Architecture: An Introduction, International Thomson Computer Press.

2. Janusa Kacprzyk - Multistage Fuzzy Control, John Wiley and Sons.

L: 3	**CS 875 Switching and Routing in Communication Systems**
T: 1	**Theory: 100 marks**
P: 0	***Sessional: 75marks***
	Time: 3 hours

Communication Network: Routing: routing algorithms, essence of problem, features of telephone network routing. Transmission: multiplexing, link technologies, analogue to digital conversion, voice coding. Switching: motivation, space division switching, time division switching. Signalling: signalling network, switch controller, Signalling System 7 (SS7), state transition diagram.

Voice over Internet Protocol: Enabling technologies; Real Time Transport protocol (RTP), RTP Control Protocol (RTCP). Signaling protocol: Session Initiation Protocol (SIP), SIP's call establishment procedure

Circuit Switching: Link systems: concentrator, route switch, expander, multi-stage switching network. Grades of service of link systems. Strict-sense nonblocking networks. Time-division switching, grades of service of time-division switching networks.

Routing in the telephone network: Telephone network topology. Features of telephone network routing. Alternate/dynamic routing, Trunk reservation. Random routing, Least loaded routing, Real world examples: DNHR, RTNR. Erlang fixed point approximation

IP routing and label switching in Multi-Protocol Label Switching (MPLS): Label switching routers, label switched path. IP packet forwarding, IP routing, label switching. Label assignment, label allocation, label distribution.

Books / references :

1. John E. Flood, Telecommunications Switching, Traffic and Networks, Prentice Hall, 1995.
2. Keshav S : An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network, Addison Wesley , 1997.
3. D. E. Comer, Computer Networks and Internets, with Internet Applications, Prentice Hall, 2001.
4. G. R. Ash, Dynamic Routing in Telecommunications Networks, McGraw-Hill, 1997.
5. Uyless Black, MPLS and Label Switching Networks, Prentice Hall, 2001.

L: 0 **T: 0** ***P: 0***	**CS 877 Viva** **Total marks: 75**

Viva on the whole course and 8th semester project by an external Examiner.

L: 0	**CS 878 Project II**
T: 0	**Total marks: 150**
P: 12	

Project on any of the following topics:

1. Database Management system
2. Networking
3. Microprocessor
4. Microcontroller
5. Neural Network and Fuzzy logic
6. Network security