UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

EIGHTH SEMESTER

OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

EIGHTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
CS04 801	Information Retrieval	3	1	-	50	3	100
CS04 802	Computer Architecture and Parallel processing	3	1	-	50	3	100
CS04 803	Internet Technology	3	1	-	50	3	100
CS04 804	Elective II	3	1	-	50	3	100
CS04 805	Elective III	3	1	-	50	3	100
CS04 806(p)	**Networks Lab**	-	-	3	50	3	100
CS04 807(P)	**Project**	-	-	7	100	-	-
CS04 808(P)	**Viva Voce**	-	-	-	-	-	100
TOTAL Aggregate marks for 8 semesters = 8250		**15**	**5**	**10**	**400 2950**	**-**	**700 5300**

Elective II

CS04 804A – Artificial Intelligence
CS04 804B - Image Processing
CS04 804C – Information Theory and Coding
CS04 804D – Computational Complexity
CS04 804E - Mobile Communication Systems
CS04 804F – Quantum Computing

Elective III

CS04 805A - Neural Networks and Fuzzy Logic
CS04 805B - Pattern Recognition
CS04 805C –Management Information System
CS04 805D – VLSI Design
CS04 805E – Data Mining and Data Warehousing
CS04 805F – Advanced Topics in Algorithm

CS04 801 : INFORMATION RETRIEVAL

3 hours lecture and 1 hour tutorial per week

[Objective: In the current scenario of information explosion, tools and techniques for deriving the right information at the right time will give a competitive edge to an organization. This paper examines this aspect in detail in the context of the World Wide Web. It covers many forms of information, such as text, image, audio and video formats, and presents several research issues related to different IR tasks.]

Module I (10 hours)

Introduction: Information versus Data Retrieval, IR: Past, present, and future. Basic concepts: The retrieval process, logical view of documents. Modeling: A Taxonomy of IR models, ad-hoc retrieval and filtering. Classic IR models: Set theoretic, algebraic, probabilistic IR models, models for browsing.

Module II (12 hours)

Retrieval evaluation: Performance evaluation of IR: Recall and Precision, other measures, Reference Collections, such as TREC, CACM, and ISI data sets. Query Languages: Keyword based queries, single word queries, context queries, Boolean Queries, Query protocols, query operations.

Module III (12 hours)

Text and Multimedia Languages and properties, Metadata, Text formats, Markup languages, Multimedia data formats, Text Operations. Indexing and searching: Inverted files, Suffix trees, Suffix arrays, signature files, sequential searching, Pattern matching.

Module IV (16 hours)

Multimedia IR: Spatial access methods, Generic multimedia Indexing approach, Distance functions, feature extraction, Image features and distance functions. Searching the Web: Characterizing and measuring the Web. Search Engines: Centralized and Distributed architectures, user Interfaces, Ranking, Crawling the Web, Web directories, Dynamic search and Software Agents.

Text book

1.R.Baeza-Yates and B. R. Neto: Modern Information Retrieval:, Pearson Education, 2004.

Reference books

1. C.J. van Rijsbergen: Information Retrieval, Butterworths, 1979.
2. C.D. Manning and H. Schutze: Foundations of Statistical natural Language Processing (Chapters 13, 14, and 15 only), The MIT Press, Cambridge, London.2001.
1. David Hand, Heikki Mannila, Padhraic Smyth, *Data Mining*, Prentice hall of India

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 802 : COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

3 hours lecture and 1 hour tutorial per week

[Objective: This subject is aimed to introduce a concentrated course on parallel computing based computer architectures with a quantitative approach. The students will be able to understand new design paradigms to achieve parallelism, memory hierarchy design and inter-connection networks. **]**

Module I (15 hours)

Fundamentals - task of a computer designer - trends in technology usage and cost - performance measurement - quantitative principles of computer design - *instruction set architectures* - classification - addressing and operations - encoding an instruction set - role of compilers - *case study* - the DLX architecture - *pipelining* - pipeline for DLX - pipeline hazards - data and control hazards - implementation difficulties - pipelining with multicycle operations

Module II (12 hours)

Instruction level parallelism - concepts and challenges - dynamic scheduling - dynamic hardware prediction - multiple issue of instructions - compiler and hardware support for ILP - *vector processing* - vector architecture - vector length and stride - compiler vectorization - enhancing vector performance

Module III (13 hours)

Memory hierarchy design - reducing cache misses and miss penalty, reducing hit time - main memory - virtual memory and its protection - *case study* - protection in the Intel Pentium - crosscutting issues - *I/O systems* - performance measures - reliability and availability - designing an I/O system - case study - Unix file system performance

Module IV (12 hours)

Interconnection networks - simple networks - connecting more than two computers - practical issues - *multiprocessors* - introduction - application domains -

centralised-shared memory and distributed-shared memory architectures - synchronisation - models of memory consistency

Text book

1. Hennesy J.L. & Pattersen D.A., *Computer Architecture: A Quantitative approach,* Harcourt Asia Pte Ltd. (Morgan Kaufman)

Reference books

1. Pattersen D.A. & Hennesy J.L., *Computer Organisation and Design: The Hardware/ Software Interface*, Harcourt Asia Pte Ltd (Morgan Kaufman)
2. Hwang K., *Advanced Computer Architecture: Parallelism, Scalability and . Programmability*, McGraw Hill

Sessional work assessment

Assignments	2x7.5 = 15	
Tests	2x15 = 30	
Regularity	=	05
Total marks		= 50

University examination pattern

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Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 803 INTERNET TECHNOLOGIES

3 hours lecture and 1 hour tutorial per week

[Objective: This course introduces the algorithms and protocols implemented to have human interaction with internet with an emphasis on application layer and multimedia networking. It also introduces the techniques and methods of E-Commerce.**]**

Module I (14 hours)

Network Applications-Client-Server Interaction-Socket Interface-Connection Oriented Service-Simple Client and Server example-Domain Name System-Electronic Mail Representation and Transfer-VoIP-File Transfer and Remote File Access-RPC and Middleware-Initialization

Module II (12 hours)

Multimedia networking-applications-streaming stored audio and video – internet telephony – RTP – scheduling and policing mechanisms – integrated services – RSVP – differentiated services – network management – the internet network management framework – network security – integrity, Access control attacks & control measures

Module III (13 hours)

E-commerce-Difference between E-commerce and E-Business, Unique features, types – Portals – E-distributor. Emerging E-commerce areas. Technology infrastructure – Internet and web features (case study not required). Building an E-commerce website-choosing server software- choosing hardware- E-commerce site tools. Security needs in E-commerce environment.

Module IV (13 hours)

E-commerce payment systems – credit cards, E-commerce transactions – digital payments in B2C arena - B2B payment systems, B2B E-commerce and Supply Chain Management – Evolution – Procurement process & Supply Chain Management – Trends in Supply Chain Management and collaborative commerce, Net Marketers – characteristics, types, e-distributors, e-procurement.

Text books

1. Douglas E. Comer, *Computer Networks and Internets with Internet Applications* – Pearson Education
2. Kurose J.F. & Ross K.W, *Computer Networking: A Top -Down Approach Featuring the Internet*- Pearson Education
3 Kenneth C. Laudon, Carol Guercio Traver, *E-Commerce-Business, Technology, Society*- Pearson Education

Reference books

1. Nalin K. Sharda, *Multimedia Information Networking* – Prentice Hall of India.
2. Stallings, *Computer Networking with Internet Protocols* - Pearson Education Asia.
3. Greenlaw R. & Hepp E.,*In-line / On-line: Fundamentals of the Internet and the World Wide Web*- Tata McGraw Hill
4. Goncalves M., *Firewalls: A Complete Guide* - Tata McGraw Hill
5. Kalakota R. & Whinston A.B., *Frontiers of Electronic Commerce* - Addison Wesley

6. Schneider G.P. & Perry J.T. *Electronic Commerce, Course Technology*

Sessional work assessment		
Assignments	2x7.5 = 15	
Tests	2x15 = 30	
Regularity	=	05
Total marks		= 50

University examination pattern

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Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 804A : ARTIFICIAL INTELLIGENCE

(common with IT04 804A)

3 hours lecture and 1 hour tutorial per week

[Objective: AI is the study of how to make computers do things which, at the moment people do better. This course introduces AI problems and Search techniques, Knowledge Representations, Neural networks, LISP and various approaches of AI problems solving. This leads the students to design their own systems of artificial Intelligence and expert systems.**]**

Module I (16 hours)

Introduction - definition and basic concepts - aims - approaches - problems in AI - AI applications - perception and action - representing and implementing action functions - production systems - networks - problem solving methods - forward versus backward reasoning - search in state spaces - state space graphs - uninformed search - breadth first search - depth first search - heuristic search - using evaluation functions - general graph-searching algorithm - algorithm A* - admissibility of A* - the consistency condition - iterative deepening A* - algorithm AO* - heuristic functions and search efficiency - alternative search formulations and applications - assignment problems - constraint satisfaction - heuristic repair - two agent games - the mini-max search - alpha beta procedure - games of chance

Module II (14 hours)

Knowledge representation - the propositional calculus - using constraints on feature values - the language - rules of inference - definition of proof - semantics - soundness and completeness - the PSAT problem - meta-theorems - associative and distributive laws - resolution in propositional calculus - soundness of resolution - converting arbitrary wffs to conjunctions of clauses - resolution refutations - horn clauses - the predicate calculus - motivation - the language and its syntax - semantics -

quantification - semantics of quantifiers - resolution in predicate calculus - unification - converting arbitrary wffs to clause form - using resolution to prove theorems - answer extraction - knowledge representation by networks - taxonomic knowledge - semantic networks - frames - scripts

Module III (12 hours)

Neural networks - introduction - motivation - notation - the back propagation method - generalization and accuracy - reasoning with uncertain information - review of probability theory - probabilistic inference - bayes networks - genetic programming - program representation in GP - the GP process - communication and integration - interacting agents - a modal logic of knowledge - communication among agents - speech acts - understanding language strings - efficient communication - natural language processing - knowledge based systems - reasoning with horn clauses - rule based expert systems

Module IV (10 hours)

Programming in LISP - basic LISP primitives - definitions - Predicates - conditionals and Binding - recursion and iteration - association lists - properties and data abstraction - lambda expressions - macros - I/O in LISP - examples involving arrays and search

Text book

1. Nilsson N.J., *Artificial Intelligence - A New Synthesis*, Harcourt Asia Pte. Ltd.

Reference books

1. Luger G.F. & Stubblefield W.A., *Artificial Intelligence*, Addison Wesley
2. Elain Rich & Kevin Knight, *Artificial Intelligence*, Tata McGraw Hill
3. Tanimotto S.L., *The Elements of Artificial Intelligence*, Computer Science Press
4. Winston P.H., *LISP*, Addison Wesley
5. George F. Luger, *Artificial Intelligence - Structures and strategies for complex problem solving*, Pearson Education
6. Stuart Russell, Peter Norvig, *Artificial Intelligence - A modern approach*, Pearson Education

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
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Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 804B : IMAGE PROCESSING
(common with IT04 804B)

3 hours lecture and 1 hour tutorial per week

[Objective: The subject deals with techniques of image processing such as enhancement, encoding and compression, which are inevitable in the present networked multimedia scenario. A basic knowledge of information theory and digital signal processing is assumed. The study is very significant in research perspective as well as in the application perspective.]

Module I (20 hours)

Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - *digital image fundamentals* - elements of visual perception - a simple image model - sampling and quantization - basic relationship between pixels - image geometry - image transforms - introduction to Fourier transform - discrete Fourier transform - some properties of 2-fourier transform (DFT) - the FFT - other separable image transforms - hotelling transform

Module II (12 hours)

Image enhancement - point processing - spatial filtering - frequency domain - color image processing - *image restoration* - degradation model - diagonalization of circulant and block circulant matrices - inverse filtering - least mean square filter

Module III (10 hours)

Image compression - image compression models - elements of information theory - error-free compression - lossy compression - image compression standards

Module IV (10 hours)

Image reconstruction from projections - basics of projection - parallel beam and fan beam projection - method of generating projections - Fourier slice theorem - filtered back projection algorithms - testing back projection algorithms

Text book

1. Rafael C., Gonzalez & Woods R.E., *Digital Image Processing*, Addison Wesley

Reference books

1. Rosenfeld A. & Kak A.C., *Digital Picture Processing*, Academic Press
2. Jain A.K, *Fundamentals of Digital Image Processing*, Prentice Hall, Englewood Cliffs
3. Schalkoff R. J., *Digital Image Processing and Computer Vision*, John Wiley
4. Pratt W.K., *Digital Image Processing*, John Wiley

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one

Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 804C : INFORMATION THEORY & CODING

3 hours lecture and 1 hour tutorial per week

[Objective: The subject deals with the fundamentals of information quality, error control in communication process and various systems of coding information for reliable communications. Built on a sound mathematical basis, the methods developed in this field of study are essential in a study of communication systems, information Technology and computing. A background in algebraic structures would prove helpful while learning this subject.]

Module I (14 hours)
Information theory - information and entropy - properties of entropy of a binary memory less source - extension of a discrete memory less source - source coding theorem - Shannon-Fano coding - Huffman coding - Lempel Ziv coding - discrete memory less source - binary symmetric channel - mutual information - properties - channel capacity - channel coding theorem - information capacity theorem

Module II (14 hours)
Coding - linear block codes - generator matrices - parity check matrices - encoder - syndrome and error detection - minimum distance - error correction and error detection capabilities - cyclic codes - coding and decoding

Module III (14 hours)
Introduction to algebra - groups - fields - binary field arithmetic - construction of galois field - basic properties - computations - vector spaces - matrices - BCH codes - description - decoding - reed solomon codes

Module IV (10 hours)
Coding - convolutional codes - encoder - generator matrix - transform domain representation - state diagram - distance properties - maximum likelihood decoding - Viterbi decoding - sequential decoding - interleaved convolutional codes

Text books
1. Simon Haykin, *Communication Systems*, John Wiley
2. Shu Lin & Costello D.J., *Error Control Coding - Fundamentals and Applications*, Prentice Hall Inc. Englewood Cliffs

Reference books
1. Das J., Malik S.K. & Chatterje P.K., *Principles of Digital Communication*, New Age International Limited
2. Sam Shanmugham, *Digital and Analog Communications*, John Wiley
3. Simon Haykin, *Digital Communications*, John
4. Taub & Shilling, *Principles of Communication Systems*, Tata McGraw Hill.

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 5
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 804D : COMPUTATIONAL COMPLEXITY

3 hours lecture and 1 hour tutorial per week

[Objective: This course gives a clear cut idea to the students how to evaluate computational complexities, so that they would be capable of design systems with maximum efficiency.**]**

Module I (13 hours)
Problems and algorithms - classification of problems - decision - search - optimization and enumeration problems - review of unsolvability - rice theorem - fixed point theorem - degrees of unsolvability - complexity classes - P, NP, co-NP, PSPACE - NP hardness - NP completeness - cook's theorem - reductions - NP ¤ co-NP - primality - pratt's theorem - approximability - weak verifiers and non approximability

Module II (13 hours)
Parallel models and complexity - class NC - P-completeness - lograthimic Space - L and NL - NL completeness - randomized computation - randomized complexity classes RP, BPP, PP etc. - relation between classes

Module III 13 hours
Function (search) problems - classes FP and FNP - FNP completeness - optimization problems - DP completeness - relation with P=NP problem - polynomial hierarchy - counting problems - #P completeness - class ¤P relation between ¤P and NP

Module IV 13 hours
One way functions - public key cryptography - class UP - randomized cryptography - alternation and games - AP - completeness - equivalence of AP and PSPACE - PSPACE completeness - games against nature - interactive protocols - classes APP, ABPP and IP - Shamir's theorem (IP=PSPACE) - zero knowledge proofs

Text book
1. Papadimitirou C.H., *Computational Complexity*, Addison Wesley

Reference books
1 Moret, B.M., *The Theory of Computation*, Addison Wesley
2. Bovet D.P. & Crescenzi P., *Introduction to the Theory of Complexity*, Prentice Hall

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 5
Total marks	= 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 804 E : MOBILE COMMUNICATION SYSTEMS

3 hours lecture and 1 hour tutorial per week

[Objective: This course is an introduction to the field of mobile communications and focuses on the aspects of digital data transfer in wireless and mobile environments. The students require a basic understanding of communication and a rough knowledge of the Internet or networking in general.**]**

Module I (12 hours)

Introduction - applications - history of wireless communications - reference model wireless transmission - frequencies for radio transmission - signals - antennas - signal propagation - multiplexing - modulation - spread spectrum - cellular systems - medium access control - specialized MAC - SDMA - FDMA - TDMA - aloha - CSMA - collision avoidance - polling - CDMA - comparison of S/T/F/CDMA

Module II (12 hours)

Telecommunication systems - GSM - mobile services - system architecture - radio interface - protocols - localization and calling - handover - security - new data services - DECT - TETRA - UMTS and IMT-2000 - satellite systems - history - applications - basics - rooting - localization - handover - examples - broadcast systems - overview - cyclic repetition of data - digital audio broadcasting - digital video broadcasting

Module III (12 hours)

Wireless LAN - infrared Vs radio transmissions - infrastructure and ad-hoc networks - IEEE 802.11 - HIPERLAN – blue-tooth - wireless ATM - motivation for WATM working group - WATM services - reference model - functions - radio access layer - handover - location management - addressing - mobile quality of service - access point control protocol

Module IV (16 hours)

Mobile network layer - mobile IP - packet delivery - registration - tunneling and encapsulation - optimizations - reverse tunneling - dynamic host configuration protocol – ad-hoc networks - routing - algorithms - metrics - mobile transport layer - TCP - indirect TCP - snooping TCP - mobile TCP - retransmission - recovery - transaction oriented TACP - support for mobility - file systems - WWW - WAP - architecture - datagram protocol - transport security - transaction protocol - session protocol - application - environment - WML - WML script - wireless telephony application - example stacks with WAP

Text book

1. Schiller J., *Mobile Communications*, Addison Wesley

Reference books

1. Singhal et.al S., *The Wireless Application Protocol*, Addison Wesley
2. Wesel E., *Wireless Multimedia Communications: Networking Video, Voice and Data*, Addison Wesley
3. Gordman D., *Wireless Personal Communications*
4. Martyn Mallick, *Mobile and wireless design essentials,* Dream – tech India Pvt. Ltd.
5. Lee W.C., *Mobile Collection Tele Communications*, McGraw Hill
6. Ojawpera T. & Ranjee Prasad, *Wide Band CDMA for Third Generation Mobile*

Communication

Sessional work assessment

Assignments	2x7.5 = 15	
Tests	2x15 = 30	
Regularity	=	05
Total marks		= 50

University examination pattern

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Q II - 2 questions of 15marks each from module I with choice to answer any one
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Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 804F : QUANTUM COMPUTING
(common with IT04 804F)

3 hours lecture and 1 hour tutorial per week

[Objective Experimental and theoretical research in quantum computation is accelerating world-wide. New technologies for realizing quantum computers are being proposed, and new types of quantum computation with various advantages over classical computation are continually being discovered and analyzed. This course introduces the concepts of quantum computation and its applications]

Module I (13 hours)

Foundations of quantum theory - states - observable - measurement - dynamics quantum measurement - quantum entanglement - bell's theorems

Module II (13 hours)

Classical information theory - entropy - quantum information theory - quantification of entanglement - communication complexity - quantum cryptography

Module III (13 hours)

Turing machines - reversible computation - universal logic gates and circuits - quantum computers and circuits - quantum algorithms - search - FFT - prime factorization

Module IV (13 hours)

Quantum simulations - quantum error correction and codes - fault tolerant quantum computation - physical implementations - ion traps - quantum dots - cavity QED - NMR

Reference Books

1. Preskill J., *Lecture Notes for the Course on Quantum Computation,* http://www.theory.caltech.edu/people.preskill/ph229
2. Berman G. P., Dooten G.D., Mainieri. R. & Tsifrinovich V., *Introduction to Quantum Computers*, World Scientific
3. Lo. H. K., Popescu S. & Spiller T., *Introduction to Quantum Computation and Information*, World Scientific
4. Press A., *Quantum Theory: Concepts and Methods*, Kluwer Academic

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions of 15marks from module I with choice to answer any one
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Q V - 2 questions of 15marks from module IV with choice to answer any

CS04 805A : NEURAL NETWORKS & FUZZY LOGIC
(common with IT04 805A)

3 hours lecture and 1 hour tutorial per week

[Objective: This course is intended to introduce some of the methods and techniques by means of which it is possible to incorporate human like performance in machine. At the end of this course students will be able to design and develop such systems using neural networks and fuzzy logic.**]**

Module I (13 hours)

Introduction to artificial neural networks **-** biological neurons - Mc Culloch and Pitts modals of neuron - types of activation function - network architectures - knowledge representation - learning process - error-correction learning - supervised learning - unsupervised learning - single unit mappings and the perceptron - perceptron convergence theorem (with out proof) - method of steepest descent - least mean square algorithms - adaline/medaline units - multilayer perceptrons - derivation of the back-propagation algorithm

Module II (13 hours)

Radial basis and recurrent neural networks - RBF network structure - covers theorem and the separability of patterns - RBF learning strategies - K-means and LMS algorithms - comparison of RBF and MLP networks - recurrent networks - Hopfield networks - energy function - spurious states - error performance - simulated annealing - the Boltzman machine - Boltzman learning rule - the mean field theory machine - MFT learning algorithm - applications of neural network - the XOR problem - traveling salesman problem - image compression using MLPs - character retrieval using Hopfield networks

Module III (13 hours)

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 - Mamdani and Sugeno types - design parameters - choice of membership functions - fuzzification and defuzzification methods - applications

Module IV (13 hours)

Introduction to genetic algorithm and hybrid systems - genetic algorithms - natural evolution - properties - classification - GA features - coding - selection - reproduction - cross over and mutation operators basic GA and structure. Introduction to Hybrid systems - concept of neuro-fuzzy and neuro-genetic systems

Text books

1. Simon Haykins, "*Neural Network a - Comprehensive Foundation"*, Macmillan College, Proc, Con, Inc
2. Ross T.J., *"Fuzzy Logic with Engineering Applications"*, McGraw Hill

Reference books

1. Zurada J.M., "*Introduction to Artificial Neural Systems,* Jaico publishers
2. Driankov D., Hellendoorn H. & Reinfrank M., "*An Introduction to Fuzzy Control*", Narosa
3. Bart Kosko. *"Neural Network and Fuzzy Systems"*, Prentice Hall, Inc., Englewood Cliffs
4. Goldberg D.E., *"Genetic Algorithms in Search Optimisation and Machine Learning"*, Addison Wesley
5. Suran Goonatilake & Sukhdev Khebbal (Eds.), *"Intelligent Hybrid Systems*", John Wiley

Sessional work assessment

Assignments	2x7.5 = 15
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Regularity	= 05
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University examination pattern

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Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS2K 805B : PATTERN RECOGNITION

(common with IT04 805B)

3 hours lecture and 1 hour tutorial per week

[Objective: The course will impart a basic knowledge on pattern recognition and will give a sound idea on the topics of parameter estimation and supervised learning, linear discriminant functions and syntactic approach to PR. It will provide the strong foundation to students to understand and design pattern recognition systems.**]**

Module I (12 hours)

Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - *Bayes Decision theory* - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces - error probabilities and integrals - normal density - discriminant functions for normal density

Module II (12 hours)

Parameter estimation and supervised learning - maximum likelihood estimation - the Bayes classifier - learning the mean of a normal density - general bayesian learning - *nonparametric technic* - density estimation - parzen windows - k-nearest neighbour estimation - estimation of posterior probabilities - nearest - neighbour rule - k-nearest neighbour rule

Module III (12 hours)

Linear discriminant functions - linear discriminant functions and decision surfaces - generalised linear discriminant functions - 2-category linearly separable case - non-separable behaviour - linear programming procedures - clustering - data description and clustering - similarity measures - criterion functions for clustering

Module IV (16 hours)

Syntactic approach to PR - introduction to pattern grammars and languages - higher dimensional grammars - tree, graph, web, plex, and shape grammars - stochastic grammars - attribute grammars - parsing techniques - grammatical inference

Text books

1. Duda & Hart P.E, *Pattern Classification And Scene Analysis*, John Wiley
2. Gonzalez R.C. & Thomson M.G., *Syntactic Pattern Recognition - An Introduction*, Addison Wesley

Reference book

1. Fu K.S., *Syntactic Pattern Recognition And Applications*, Prentice Hall, Eaglewood cliffs

Sessional work assessment		
Assignments	2x7.5 = 15	
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University examination pattern

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Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 805C : MANAGEMENT INFORMATION SYSTEMS

3 hours lecture and 1 hour tutorial per week

[Objective: This course will introduce the methods and the influence of the information systems in management milieu and use MIS as an effective tool in management and decision making.]

Module I (12 hours)

Information systems - functions of management - levels of management - framework for information systems - systems approach - systems concepts - systems and their environment - effects of system approach in information systems design - using systems approach in problem solving - strategic uses of information technology

Module II (10 hours)

An overview of computer hardware and software components - file and database management systems - introduction to network components - topologies and types - remote access - the reasons for managers to implement networks - distributed systems - the internet and office communications

Module III (14 hours)

Application of information systems to functional - tactical and strategic areas of management, decision support systems and expert systems

Module IV (16 hours)

Information systems planning - critical success factor - business system planning - ends/means analysis - organizing the information systems plan - systems analysis and design - alternative application development approaches - organization of data processing - security and ethical issues of information systems

Text book

1. Schultheis R. & Mary Sumner, *Management Information Systems-The Manager's View,* Tata McGraw Hill

Reference books

1. Laudon K.C. & Laudon J.P., *Management Information Systems - Organization and Technology,* Prentice Hall of India
2. Sadagopan S., *Management Information Systems,* Prentice Hall of India
3. Basandra S.K., *Management Information Systems*, Wheeler Publishing
4. Alter S., *Information Systems: A Management Perspective*, Addison Wesley
5. Effy Oz., *Management Information Systems,* Thomson, Vikas Publishing House

Sessional work assessment

Assignments	2x7.5 = 15	
Tests	2x15 = 30	
Regularity	=	05
Total marks		= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one

Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 805D : VLSI DESIGN

3 hours lecture and 1 hour tutorial per week

[Objective: Design of high-performance, low power and cost effective systems demands knowledge of all aspects digital design from application algorithms to fabrication and packaging. The VLSI design is system design and this course imparts those skills to the students and will be invaluable to every future VLSI design Engineer and Manager.**]**

Module I (14 hours)

Introduction to MOS technology - IC technology - MOS and VLSI - NMOS and CMOS fabrication - thermal aspects - MOS circuits tub ties and latch up - wire parasitic - design rules and layouts - multilayer CMOS process - layout diagrams - stick diagrams - hierarchical stick diagrams - layout design analysis tools

Module II (14 hours)

Logic gates - review of combinational logic circuits - basic gate layouts - delay - power consumption - speed power product - wires and delay - combinational logic networks - layout design methods -network delay - cross talk - power optimization - switch logic networks

Module III (12 hours)

Sequential machines - latches and flip flops - sequential system design - subsystem design - pipelining – data paths - adders - ALU - ROM - RAM - FPGA - PLA - multipliers

Module IV (12 hours)

Floor planning - methods - floor plan of a 4 bit processor - off chip connections - architecture design - register transfer design - architecture for low power - architecture testing - cad systems and algorithms - simulation - layout synthesis

Reference books

1. Puck Nell D.A. & Eshraghm K., *Basic VLSI Design - Systems and Circuits*
2. Mead C., Conway L., *Introduction to VLSI System*, Addison Wesley

3. Wayne Wolf, *Modern VLSI Design*, Phipe

Sessional work assessment		
Assignments	2x7.5 = 15	
Tests	2x15 = 30	
Regularity	=	05
Total marks		= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 805E : DATA MINING AND DATA WAREHOUSING

3 hours lecture and 1 hour tutorial per week

[Objective: This subject has evolved over the last decade to address the problem of decreasing amount of useful information even when the amount of data keeps on increasing. Many new applications including those in business and even security related areas have been developed using the techniques of data mining. The objective of this subject of study is to familiarize the students with the concepts, algorithms, and applications of data mining, data warehousing, and the related areas, emphasizing on real-world examples involving large databases.**]**

Module I (12 hours)
Basic data mining tasks: Classification, Regression, Time Series Analysis, Prediction, Clustering, Summarization, Sequence discovery.

Introduction to data ware housing, OLAP, OLTP, Knowledge discovery in databases.

Module II: (10 Hours)Data Mining Techniques:
Statistical Perspective on Data Mining: Point Estimation, Models based on summarization, Bayes Theorem, Hypothesis testing, similarity measures, Application of Decision trees, Neural Networks and Genetic algorithms in data mining.

Module III(12 hours) Core Topics in Data Mining
Classification: Issues in classification, statistical algorithms, Distance-based algorithms, Decision tree based algorithms, Neural Network-based algorithms, rule-based algorithms.
Clustering: Similarity and distance measures, outliers, partitional and hierarchical algorithms (16 hrs)

Module IV(14 hrs) Association Rules
Large Item sets: Basic algorithms, Comparison of approaches.
Advanced topics: Generalized Association rules, multiple-level association rules, Quantitative rules, web mining, spatial Mining and temporal mining (Introduction only)

Text books: Data mining: Introductory and Advanced Topics-Margaret H.Dunham. 2004 (Pearson Education)

Reference books

1.Data Mining: Concepts & Techniques-Jiawei Han and Micheline Kamber 2002. (Morgan Kauffman Publishers)
2.Principles of Data Mining : David Hand, Heikki Mannila, and Pedhraic Smyth. 2004. (Prentice Hall India).
3.Data ware housing in the real world : A practical Guide for building decision support systems-Sam Anahory and Dennis Thurray , 2000. (Addision Wesley)
4.Modern Information Retrieval : Richardo Baeza-Yates and Berthier Riberio-Neto. 1999, Addison Wesley.

Sessional Work Assessment

Assignments	2x7.5 = 15	
Tests	2x15 = 30	
Regularity	=	05
Total marks		= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 805F : ADVANCED TOPICS IN ALGORITHMS

3 hours lecture and 1 hour tutorial per week

[Objective of this paper is to acquaint the student with the advanced algorithmic techniques for manipulating complex data structures in order to solve nontrivial problems. Wide ranging applications of these techniques can be found in areas such as database management, distributed systems, parallel processing, signal processing, etc. Study of the topics covered in this paper is essential for anyone involved in the design of complex applications in the above areas.]

Module I: Advanced data structures (13 hours)

Balanced binary search trees - AVL trees - red black trees - B/B+ trees - priority queues - binomial heaps - Fibonacci heaps - mergeable heap operations - disjoint set representation - path compression algorithm - hashing - chaining - open addressing - hash functions - probing - double hashing - universal hashing - graph algorithms - review - DFS - BFS - connected Components - topological sorting - strong connectivity - minimal spanning tree - kruskal and prim algorithms - shortest path problem - Dijkstra's and bellman - ford algorithms - Johnson's algorithm for sparse graphs - flow networks - ford fukerson algorithm - maximum bipartite matching - preflow push and lift to front algorithms

Module II (13 hours)

Introduction to parallel algorithms - PRAM models - EREW, ERCW, CREW and CRCW - relation between various models - handling read and write conflicts - work efficiency - Brent's theorem - parallel merging, sorting, and connected components - list rank - Euler tour technique - parallel prefix computation - deterministic symmetry breaking

Module III: Distributed algorithms (13 hours)

Distributed models - synchronous algorithms - leader election - BFS - shortest path - maximal independent set - minimal spanning tree - consensus algorithms with link and process failures - byzantine agreement problem - asynchronous algorithms - Dijkstra's mutual exclusion algorithm - bakery algorithm - randomized algorithm for dining philosophers' problem.

Module IV Selected topics (13 hours)

Polynomials and FFT - representation of polynomials - DFT and FFT - divide and conquer FFT algorithm - efficient parallel FFT implementations - pattern matching - finite automata based methods - Rabin Karp algorithm - Knuth Morris Pratt algorithm - Boyer Moore heuristic - computational geometry - two dimensional problems - line segment intersection convex hull - Graham's scan - Jarvis's march technique - closest pair of points in a set

Text book

1. Cormen T.H., Leiserson C.E., Rivest R.L., *Introduction to Algorithms*, Prentice Hall of India

Reference books

1. Brassad G. & Bratley P., *Fundamentals of Algorithmics*, Prentice Hall of India
2. Basse S., *Computer Algorithms - Introduction to Design and Analysis*, Addison Wesley
3. Lynch N.A., *Distributed Algorithms*, Harcourt Asia (Morgan Kaufman)

Sessional work assessment		
Assignments	2x7.5 =15	
Tests	2x15 = 30	
Regularity		= 05
Total marks		= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

CS04 806(P): NETWORKS LAB

3 hours practical per week

[Objective: This practical course includes experiments in computer networking using basic network components and systems there by allowing the students to gain an intuitive feel for network protocols. This course is very much significant both from research perspective and from application perspective.**]**

Lab 1 : Implementation of PC to PC file transfer using serial port and MODEM.

Lab 2,3: Software Simulation of IEEE 802.3, 802.4 and 802.5 protocols.

Lab 4,5: Software Simulation of Medium Access Control protocols – 1) Go Back N,

2) Selective Repeat and 3) Sliding Window.

Lab 6 : Implementation of a subset of Simple Mail Transfer Protocol using UDP

Lab 7,8: Implementation of a subset of File Transfer Protocol using TCP/IP

Lab 9 : Implementation of "finger" utility using Remote Procedure Call (RPC)

Lab 10: Generation and processing of HTML forms using CGI.

Reference books

1. Richard S.W., *Unix Network Programming*, PHI
2. Comer D.E., *Internetworking with TCP/IP*, Vol.1, 2 & 3, PHI

3. Campione et. al M., *The Java Tutorial Continued*, Addison Wesley

Sessional work assessment	
Lab practical and record	= 25
Tests	= 20
Regularity	= 05
Total marks	= 50

CS04 807(P) : PROJECT

7 hours per week

[Objective: The project is aimed at improving the professional competency by touching the areas which otherwise is not covered in theory or laboratory classes. There is a grater realization of the importance of the application of ideas to build a solution to complement the learning process. The work practice will help the students to develop ability to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.]

This project is the continuation of the seventh semester project - the eighth semester is for the development - testing and installation of the product - the product should have user manuals - a detailed report is to be submitted at the end of the semester - the internal assessment may be made individually and in groups

Sessional work assessment	
Design & development	= 40
Testing and installation	= 30
Regularity	= 10
Report	= 20
Total marks	= 100

CS 04 808(P) : VIVA VOCE

There is only university examination for Viva-voce - University will appoint examiners for conducting the viva voce examination - the examiners will ask questions from subjects studied for the B. Tech course, project, mini project and seminar reports of the student - the relative mark distribution should be as follows

Marks distribution for Viva- Voce	
Subject	= 40
Project	= 30
Mini project	= 20
Seminar	= 10
Total marks	= 100