Faculty of Engineering & Technology
Computer Science & Engineering
M.E. (CSE)
PART – I **W.E.F. 2009-10**

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Marks)			
			L	T	P	Total	Th	TW	Practical	Total
01	MCS01	Advanced Operating Systems	3	1	--	4	100	25	--	125
02	MCS02	Image Processing	3	1	--	4	100	25	--	125
03	MCS03	Advanced Database Management Systems	3	1	--	4	100	25	--	125
04	MCS04	Advanced Algorithms	3	1	--	4	100	25	--	125
05	MCS05	Elective –I	3	1	--	4	100	--	--	100
06	MCS06	Software Laboratory –I	--	--	6	6	--	--	50	50
Total of First semester			**15**	**5**	**6**	**26**	**500**	**100**	**50**	**650**

PART – II

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Marks)			
			L	T	P	Total	Th	TW	Practical	Total
07	MCS07	Knowledge Discovery Techniques	3	1	--	4	100	25	--	125
08	MCS08	Soft Computing	3	1	--	4	100	25	--	125
09	MCS09	Pattern Recognition	3	1	--	4	100	25	--	125
10	MCS10	Advanced Computer Networks	3	1	--	4	100	25	--	125
11	MCS11	Elective –II	3	1	--	4	100	--	--	100
12	MCS12	Software Lab-II	--	--	6	6	--	--	50	50
Total of Second semester			**15**	**5**	**6**	**26**	**500**	**100**	**50**	**650**

Elective I **Elective II**

i)Advanced Computer Architecture i) High Performance Computing ii)Knowledge Based Computer System

ii) Object oriented system design

iii) Embedded System Design iii)Advanced Compiler Technique

PART– III

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Marks)			
			L	T	P	Total	Th	TW	Pract	Total
13	MCS13	Dissertation Part –I	0	0	24	24	0	50	50	100

PART– IV

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Marks)			
			L	T	P	Total	Th	TW	Pract	Total
14	MCS14	Dissertation Part -II	0	0	24	24	0	50	150	200
Grand total (for all 4 semesters)							**1000**	**300**	**300**	**1600**

Subject Title: Advanced Operating Systems

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 marks

Objectives:

- To explore several advanced topics on operating systems
- To cover key design issues in implementing an operating system, such as memory management, scheduling, protection, inter-process communication, device drivers, and file systems

Unit 1: Introduction to all the concepts relating to Operating Systems (8 hrs)

Memory management, Process Management, I/O Management and File system,
Uni-processor and multi-processor systems

Unit 2: Issues for network servers (8 hrs)

System issues for network servers - concurrency management, multi-tier servers, request tracking and workload monitoring, performance modeling of network servers.

Hardware-related issues - operating system utilization of processor hardware counters, memory super- pages, cache resource management on multi-core processors.

Unit 3: I/O and storage systems (8 hrs)

Storage device characterization, data consistency with journaling, data persistence for delayed writes, SAN and NAS storage concepts

Unit 4: Remote Files (8 hrs)

Remote File systems, Distributed computing, File level caching, Directory and its implementation

Virtualization - memory management and I/O processing under virtual machine architecture, migration of virtual machines.

Unit 5: Performance Analysis (8 hrs)

Performance measurement - measurement of concurrent servers (throughput and response time), confidence intervals, Student's t-test.

System dependability - anomaly detection and characterization, error monitoring and analysis

Reference Books:

1. A. Tannenbaum, A. Woodhull, “Modern Operating Systems”, PHI
2. Gary Nutt, “Operating Systems”, Pearson Education
3. Jain, "The Art of Computer Systems Performance Analysis", Wiley.
4. Bovet and Cesati, "Understanding the Linux Kernel", O'Reilly.
5. Love, "Linux Kernel Development", Novell Press.
6. Selected research papers as referred to in class

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Subject Title: Image Processing

Teaching Scheme :

Lectures: 4 Hrs/Week

Examination Scheme :

Theory Paper : 100 Marks (3 Hrs)
Term Work: 25 marks

Objectives:

- To get the knowledge of Digital Image Processing

Contents:

Unit 1 (8 hrs)

Introduction to image processing and image models. Trasforms, their properties and uses fourier trasform, fast fourier transfrom, cosine transforms, Walsh and hadamard transforms, wavelet transforms.

Unit 2 (8 hrs)

image enhancement point processing, processing based on histograms filtering in spatial domain low pass , high pass, high boost, median, and other techniques. Filtering in frequency domain, different techniques image restoration.

Unit 3 (8 hrs)

Image data compression : Lossy and lossless, data compression using wavelet transforms

Unit 4 (8 hrs)

image segmentation point, line and edge detection segmentation based on thresholding region based segmentation other techniques

Unit 5 **(8 hrs)**
Image description and representation

Reference Books:
1. Gonzalez.R & Woods B.E., Digital Image Processing, Iind Ed., Addison Wesley
2. Anil Jain.K, Fundamentals of Digital image Processing, Prentice Hall of Indi,.
3. Sid Ahmed., Image Processing , McGraw Hill , New York.

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Subject Title: Advanced Database Management System

Teaching Scheme :
Lectures: 4 Hrs/Week

Examination Scheme :
Theory Paper : 100 Marks (3 Hrs)
Term Work: 25 marks

Objectives:
- To cover advanced concepts of Database Management System
- It focuses on topics like Object-Oriented Databases, Distributed Databases, Data Models for advanced Database applications

Contents:
Unit 1: Relational Database Management Issues and Data storage and querying (8 hrs)
Transaction Processing, Concurrency, Recovery, Security and Integrity, Storage and file structure, Indexing and hashing, Query processing and optimization.

Unit 2: Database System Architecture (8 hrs)
Centralized client server architecture, Server system architecture, Parallel system and distributed system.

Unit 3: Advanced application development (8 hrs)
Performance Tuning, Performance bench mark, Standardization.

Unit 4: Advanced Transaction Processing (8 hrs)
E-commerce, MMDB, Real time transaction system, long duration transaction, Transaction management in multi databases.

Unit 5: Enhanced Data Models for Advanced Applications (8 hrs)
Active database concepts, Temporal Database concepts, Spatial databases, Deductive databases, Mobile databases, Geographic information systems, Multimedia Data bases. Case studies: Oracle, Microsoft Sql server. IBM db2**.**

Reference Books:
1. Korth, Silberchatz, Sudarshan , Database System Concepts, McGraw-Hill.
2. Elmasri and Navathe, Fundamentals of Database Systems [4e], Pearson Education
3. Peter Rob and Coronel, Database Systems, Design, Implementation and Management Thomson Learning.
4. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems [3e], McGraw-Hill
5. C.J.Date, Longman, Introduction To Database Systems, Pearson Education

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Subject Title: Advanced Algorithms

Teaching Scheme :
Lectures : 4 Hrs/Week

Examination Scheme :
Theory Paper : 100 Marks (3 Hrs)
Term Work: 25 marks

Objectives:
- To use computational complexity to analyze algorithms
- To develop an ability to encode a task into an optimum algorithm

Contents:
Unit 1: Quick Review of basic concepts (8 hrs)
Complexity measures, worst-case, average case Big O,

little O, omega and theta notations, Standard complexity classes. Empirical measurements of performance. Time and space tradeoffs in algorithms. Analyzing recursive algorithms using recurrence relations and amortized complexity functions, model of computation.

Unit 2: Algorithm Design Paradigm and Sorting, Selection Problems (8 hrs)
Divide and Conquer, Recursion, Greedy method, Dynamic programming. Role of Data Structures, Order Statistics, sorting methods, lower bounds.

Unit 3: Searching and Selection Problems, Searching and Set manipulation (8 hrs)
Order Statistics, sorting methods, lower bounds, Searching in Static table - path lengths in Binary trees and applications, optimality of Binary search in worst case and average case, construction of weighted Binary Search tree. Searching in dynamic table - randomly grown binary search trees, AVL trees, (a, b) trees; Union-find problem -tree representation of set, weighted union and path compression, analysis and application.

Unit 4: Hashing and Graph algorithms (8 hrs)
Chaining, open addressing, universal hashing function, Review of topological sort, connected and biconnected components, shortest paths, minimum spanning trees. Maximum matching, maximum-flow (Ford-Fulkerson).

Unit 5: Arithmetic, Algebraic problems and NP-completeness (8 hrs)
Integer multiplication, GCD, Polynomial evaluation, Matrix Multiplication, Lower Bounds. Introductory Stringology. Some geometric algorithms, Determinism and non-determinism, P, NP, NP-complete, Cook's theorem, Some NP-complete problems, Approximation algorithms. Notion of Randomization and Parallelism in algorithms, PRAM Model

Reference Books:

1. T. H. Cormen, C. E. Leiserson and R. L. Rivest: Introduction to Algorithms, MIT Press, 1990.
2. U. Manber: Introduction to Algorithms, Addison-Wesley, 1989.
3. G. Brassard and P. Bartley: Algorithmics: Theory and Practice, PHI Publication 1996.
4. A. V. Aho, J. E. Hopcroft and J. D. Ullman: Design and Analysis of Algorithms, Addison-Wesley, 1974.

Term Work: The term work shall consist of a record of at least 5 programs/assignments. The experiments shall be evenly spread over the syllabus.

Elective-I
Subject Title: Knowledge Based Computer System

Teaching Scheme :
Lectures : 4 Hrs/Week

Examination Scheme :
Theory Paper : 100 Marks (3 Hrs)

Objectives:
- The core aspect of knowledge based systems is their ability to deal with knowledge in various forms.
- To generate new knowledge from existing information. Based on that, decisions must be made for the system.

Contents:

Unit 1 (8 hrs)
Introduction: Scope and Definition - Formal Description, Expert System Component.

Unit 2 (8 hrs)
Facts : Rule Based Reasoning , Databases , Inference Engine, Knowledge Base (rule base), Knowledge Engineering Facts, Case-Based Reasoning.

Unit 3 (8 hrs)
Uncertain Knowledge and Reasoning : Uncertainty , Probabilistic Reasoning , Probabilistic Reasoning Over Time, Making Simple Decisions , Making Complex Decisions.

Unit 4 (8 hrs)
Knowledge Acquisition: Machine Learning Approach for knowledge acquisition,
Acquisition Cycle, Knowledge refinement. Learning: Learning from Observations Knowledge in Learning, Statistical Learning Methods, Reinforcement Learning, Logics for incompleteness management - Non-monotonic Logic, Spatio-temporal Logic.

Unit 5 (8 hrs)
Logic Programming , Advantages and Disadvantages of Expert Systems, Rule-Based Expert Systems ,Criticisms of Expert Systems , Case Studies of Expert Systems.

Reference Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall Publishers
2. Dhar, Vasant, and Stein, Roger, Intelligent Decision Support Methods, Prentice Hall
3. Mallach, Efrem, Understanding Decision Support Systems and Expert Systems, Irwin,
4. Dologite, D.G., Developing Knowledge-Based Systems Using VP-Expert, Macmillan,
5. D. W. Patterson: Introduction to Artificial Intelligence and Expert Systems, PHI

Elective-I
Subject Title: Advanced Computer Architecture

Teaching Scheme : **Examination Scheme :**
Lectures : 4 Hrs/Week Theory Paper : 100 Marks (3 Hrs)
Objectives:
- To understand architecture of computer in detail and factors affecting their performance

Contents:

Unit 1 **(8 hrs)**
Metrics for computer performance: clock rate, MIPS, CPI; Strength and weakness of performance metrics; role of Amdalh's in computer performance; Classification of computer architecture: SIMD, MIMD, SISD and MISD;

Unit 2 **(8 hrs)**
Processing unit design: Data path implementation, Microprogrammed execution. Instruction pipelining and parallel processing, Instruction level parallelism: VLIW, Vector processor

Unit 3 **(8 hrs)**
Multithreaded processor, Superscalar architecture; branch prediction; Prefetching; Speculative execution; Principles of pipelining and vector processing: Pipelining, Instruction and Arithmetic Pipelines

Unit 4 **(8 hrs)**
Principles of Designing Pipelined Processor, Vector Processing Requirements. Structure and Algorithms for array processors: SIMD Array Processors, SIMD Interconnection Networks,
Parallel Algorithms for array Processors, Associative Array Processing.

Unit 5 **(8 hrs)**
Multiprocessor architecture and programming: Inter processor Communication Mechanisms, System Deadlocks and Protection, Multiprocessor Scheduling Strategies

Reference Books:
1. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, Tata McGraw Hill, 2004.
2. K .Hwang and F. A. Briggs, Computer Architecture and Parallel Processing, McGraw Hill, 2001.
3. N. Carter, Computer Architecture, Tata McGraw Hill, 3rd ed. 2008.
4. J. L. Heressy and D. A. Pattersan, Computer Architecture A Quantitative approach, Elsevier, 3rd ed. 2006.

Elective-I
Subject: Embedded System Design

Teaching Scheme : **Examination Scheme :**
Lectures : 4 Hrs/Week Theory Paper : 100 Marks (3 Hrs)

Objectives:
- To understand Embedded system programming with hardware
- To study interfacing with peripheral device and its application

Contents:
Unit 1: Introduction to Embedded Systems **(8 hrs)**
Classification, characteristics, design metrics, requirements, trends. Brief Review of Sensors, signal conditioning and data converters. RAM technology and programming of EPROM.

Unit 2: Embedded Hardware **(8 hrs)**
Dedicated processor and General Purpose Processors. 32 bit ARM architecture, High performance processors- Intel Xscale/IBM PowerPC/MIPS R5000, Development environment.

Unit 3: Interfacing of Microprocessor to Peripherals and Target Devices **(8 hrs)**

Buses & protocols, ISA, EISA, PCI, ARM, I 2C, CAN, FIREWIRE, USB. Wireless protocol:
Bluetooth and IEEE 802.11, 802.15, 802.16.: Introduction, features, area of applications.
Interface for IRDA, SMART card and WEB enabling. Case study of emerging Serial and Parallel
Bus standards (USB 2.0, IEEE1394,PCI, Compact PCI, PCI-X), Different types of ASICS: FPGA, CPLD architectures.

Unit 4: Real Time Operating Systems (RTOS) (8 hrs)
OS Services, goals and structures, features, characteristics, process management, memory management, File system organization and implementation, I/O subsystem, Real time task models and performance metrics, Real time features of Vx works, WIN CE, QNX , Nucleus, RT Linux. Network OS, Inter Process communication of Processes, Tasks and Threads , OS Security Issues, One case study

Unit 5: Programming Concept and Embedded Programming (8 hrs)
Programming in assembly Language and High level language C /C++ and/OR Java. Compilers and Cross Compilers, Source Code Engineering Tools, Programme modeling concept in single and multiprocessor system software, Software Engineering Practices in the Embedded Software Development Process.

Reference Books:
1. Vahid F., Givargies T., "Embedded Systems Design", John WILEY X SONS 2002
2. Raj Kamal, "Embedded Systems- Architecture, Programming and Design", TMH 2003
3. Gupta R., "Co-synthesis of Hardware and Software for Digital embedded systems", Kluwer.
4. Barr M., "RTOS".
5. Smith M., "Application specific Integrated circuits".

Title: Software Laboratory –I

Teaching Scheme :
Practical: 6 hrs/week

Examination Scheme :
Practical: 50 marks

Software Laboratory –I shall be based on the subjects Image Processing, Advanced Database Management System and Advanced Algorithms.

Practical examination will consist of a viva based on the practical work done during the semester.

Part – II

Subject Title:-Knowledge Discovery Techniques

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 marks

Objective:
-To provide the capability to discover new and meaningful information by using existing data.
-To study techniques to retrieve knowledge from large data sets.

Contents:
Unit 1: KDD Techniques and Classification Approach (8 hrs)
Statistical Approach, Probabilistic Approach, Classification Approach, Linear and nonlinear regression, Rule based, The Decision Tree Approach, Tree pruning, Neural networks, Genetic algorithms, Fuzzy set, Hybrid Approach.

Unit 2: Cluster Analysis (8 hrs)
Types of data, partitioning methods: k-Means, Hierarchical clustering: BIRCH, CURE and Chameleon Clustering, Density (DBSCAN, OPTICS, DENCLUE), Grid (CLIQUE) and Model based clustering: Statistical and Neural network approach, Outlier Analysis: Statistical, Distance and Deviation-based Outlier detection.

Unit 3: Association, Mining Stream, Time series and sequence data (8 hrs)
Association rule mining, Market basket analysis, basic concepts, Finding frequent item sets: Apriori algorithm, generating rules, mining Multi-level Association rules Temporal mining, Mining Stream, Time series and Sequence data.

Unit 4: Mining web data, Text, Spatial (8 hrs)
Web mining, Mining Web's link structure, Classification of Web pages, Web Usage Mining, Text mining, Information Retrieval, Spatial Mining.

Unit 5: Multidimensional data model (8 hrs)

OLAP and mining, Multidimensional data model: Data cubes, Stars, Snowflakes and fact constellations, Semi-supervised and active learning, Machine learning, Data mining tools such as OLE DB/DBMiner/WEKA/iDA/ORACLE DM Tools,

References:-

1 Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers

2 T. Mitchell. Machine Learning. McGraw-Hill, 1997

3 Hand, Smyth, Mannila Principles of Data mining

4 S. Chakrabarti, S. Sarawagi, and B. Dom. Mining surprising temporal patterns. In Proc. of the Twenty fourth Int'l conf. on Very Large Databases (VLDB), Aug 1998.

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Subject Title: - Pattern Recognition

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 marks

Objectives:

- To familiarize with the fundamental concepts of statistical and neural pattern recognition
- To learn techniques for analyzing multidimensional data of various types
- To scales along with algorithms for projection, dimensionality reduction, clustering and classification of data
- To work on a few applications of pattern recognition using MATLAB software

CONTENTS

Unit 1: Introduction and Bayes Decision Theory (8 hrs)

Different approaches of Pattern recognition systems can be designed using the following main approaches: (i) template matching, (ii) statistical methods, (iii) syntactic methods and (iv) neural networks.

Unit 2: Bayes Decision Theory (8 hrs)

Bayes Decision Rule, A Bayesian Example, Minimum Error Rate Classification, Multi-category Classifier, Discriminant Functions, and Decision Surfaces- Two-Category Case (Dichotomizer)

Unit 3: Approach using Neural Networks (8 hrs)

Linear Separability, Perceptron, Multi-layer Perceoptrons, Solving XOR problem using Neural Network, Generative Methods.

Unit 4: Maximum-Likelihood and Bayesian Parameter Estimation (8 hrs)

Maximum-Likelihood Estimation , Bayesian Parameter Estimation , Some Common Statistical Distributions, Component analysis and Discriminants (Principle Component Analysis (PCA) – PCA for face Recognition), Fisher Linear Discriminant, Sequential Data and Hidden Markov Models

Unit 5: Discriminative Methods and Applications of PR (8 hrs)

Distance-based Methods - Nearest neighbor Classification, Fuzzy Classification
Linear Discriminant Functions- Gradient Descent and Perceptrons, Minimum Squared Error Procedures, Support Vector Machines, Unsupervised Learning and Clustering, Hierarchical Clustering, Application of Signature Verification, Handwriting Recognition, Biomedical Image Analysis

Reference Books:

1. Duda R.O., P. E. Hart and D. Stork, "Pattern Classification ",(2nd. Edition), Wiley Pub
2. C. Bishop, " Pattern Recognition and Machine Learning", Springer Pub
3. R.J. Schalkoff , "Pattern Recognition : Statistical, Structural, and Neural Approaches",
4. Earl Gose, "Pattern Recognition and Image Analysis", PHI Pub.
   Selected research papers as referred to in class.

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Subject Title: Advanced Computer Networks

Teaching Scheme:

Examination Scheme:

Lectures: 4 Hrs/Week

Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 marks

Objectives:
- To cover different topics of Computer Networks
- To elaborates TCP/IP protocol suit, Wireless Network and Network Security

UNIT 1
Introduction: **(8 hrs)**
OSI and TCP/IP reference model, Internet Protocol -
The OSI Model and the TCP/IP Protocol Suite, IP Addresses, Delivery and Routing of IP Packets, Internetworking IP addressing, IP Multicasting, Unicast and Multicast routing Protocols, IP over ATM,

UNIT 2
Internet Transport Protocols: **(8 hrs)**
TCP, UDP -
Introduction To UDP , Remote Procedure Call , The Real-Time Transport Protocol Introduction to TCP , The TCP Service Model , The TCP Protocol ,The TCP Segment Header, TCP Connection Establishment , TCP Connection Release , Modeling TCP Connection Management , TCP Transmission Policy ,TCP Congestion Control, Configure dynamic and static network settings for both IPv4 and IPv6

UNIT 3 **(8 hrs)**
Network Server Services:
Name servers, File Sharing, Web Services, e-mail -
DNS, Network File Sharing Services –File Transfer Protocol and Network File Sharing, Web server and its Services, SMTP and e-mail services

UNIT 4 **(8 hrs)**
Wireless Network:
Basics, GSM and CDMA Technology, Mobile Network layer and Mobile Transport Layer -
Wireless Transmission Basics, GSM Technology, Handoff Management, CDMA Technology, Mobile IP, Mobile TCP.

UNIT 5 **(8 hrs)**
Network security and Administration:
Firewalls and other Security Standards -
Cryptography, Hashes and Message Digests, Public Key Algorithms, Kerberos, Security at the Transport Layer (SSL and TLS): SSL architecture Security at the Network Layer(IPSec): AH and ESP, PGP, S/MIME
Firewall

Reference Books:

1. Computer Networks: Andrew S. Tanenbaum- Prentice Hall
2. TCP/IP Protocol Suit : B. Forouzan 2nd Edition McGraw-Hill, Inc.
3. Network Security Complete reference: Roberta Bragg, Mark Rhodes, Keith Strassberg – Tata Mcgraw Hill
4. Cryptography and network security: Atul Kahate – Tata Mcgraw Hill
5. Network security – Chaile Kaufman, Radia Perlman Mike speciner Pearson education
6. Mobile Communications J. Schiller, Pearson education publishing
7. W. R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, PEARSON Education.
8. G. R. Wright. TCP/IP Illustrated, Volume 2: The Implementation, PEARSON Education.
9. W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Edition, PEARSON Education.

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project.The experiments shall be evenly spread over the syllabus.

Subject Title: Soft Computing

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 marks

Objectives:
- To study models of ANN, Fuzzy Logic and Genetic algorithm
- To be able to apply these models in practice for solving problems in diverse areas such as pattern recognition, pattern matching
- To study and understand techniques of Feed forward and feedback neural networks

Contents-

Unit 1 **(8 hrs)**

Fuzzy Logic: Basic Concepts of Fuzzy systems, Conventional and fuzzy sets, fuzzy relations, fuzzy operators and operations, fuzzification, defuzzification methods, application of fuzzy logic

Unit 2 **(8 hrs)**

Neurocomputing: Feed forward, Feedback and competitive neural network Models of Neurocomputing: Perceptron Training, Back propagation learning, Hopfield nets,

Unit 3 **(8 hrs)**

Adaptive resonance theory I & II, Self-organizing feature map, ADALINE. Applications in pattern classification and image understanding.

Unit 4 **(8 hrs)**

Genetic Algorithms: The basic operators, Schema theorem, convergence analysis, stochastic models, applications in search and optimization. Learning with GA & NN;

Unit 5 **(8 hrs)**

Composite use of fuzzy logic, neural network and genetic algorithms.Chaos Theory, Fusion of Neuro, Fuzzy, GA & Chaos theory & applications.

Reference Books:

1. David E. Goldberg: Genetic Algorithms in Search, Optimization and Machine Learning, Addision Wesley, MA.
2. S. Haykin: Neural Networks - A Comprehensive Foundation, Macmillan College Publishing Company, New York.
3. H. J. Zimmermann: Fuzzy set theory and its application, 2nd revised edition, Allied Publishers Ltd.
4. G. J. Klir, B. Yuan: Fuzzy sets and Fuzzy logic: Theory and Applications, PHI.
5. R. L. Devaney: An Introduction to Chaotic Dynamical Systems, 2nd Ed. Addision Wesley,
6. B. Yegnanarayana , "Artificial Neural Networks", PHI publications

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Elective-II

Subject Title: Object Oriented System Design

Teaching Scheme : **Examination Scheme :**

Lectures : 4 Hrs/Week Theory Paper : 100 Marks (3 Hrs)

Objectives:

- To cover design part of Object Oriented System

Contents:

Unit 1 **(8 hrs)**

The object Model - Classes and Objects - Complexity - Classifiation - Notation - Process –

Unit 2 **(8 hrs)**

Pragmatics – Binary and entity relationship - object types - object state - OOSD life cycle. Overview of object oriented analysis - Shaler/Mellor, Coad/ Yourdon, Rumbaugh, Booch UML.

Unit 3 **(8 hrs)**

Usecase -Conceptual model - behaviour - class - analysis patterns -overview -diagrams –aggregation.

Unit 4 **(8 hrs)**

UML - diagrams - collaboration - Sequence - Class - design patterns and frameworks – comparison with other design methods. Object Oriented testing, Technical metrics for Object Oriented Systems

Unit 5 **(8 hrs)**

Design of Foundation class libraries - Object Oriented Databases - Client/Server Computing - Middleware. Case studies

Reference Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison - Wesley Longman, 1999, ISBN 0-201-57 168 -4.
2. Ali Bahrami, Object Oriented System Development, Mc Graw Hill International Edition

3. J. Rumbaugh et. al., Object Oriented Modeling and Design, Prentice Hall
4 . R. S. Pressman, Software Engineering - A Practioner"s Approach,3rd Edition, McGrawHill,
5. Baude, Object Oriented Software Engineering, Wiley.

Subject Title: High Performance Computing (HPC)

Teaching Scheme : Lectures : 4 Hrs/Week

Examination Scheme : Theory Paper : 100 Marks (3 Hrs)

Objectives:

- To emphasis on Cluster and Grid Computing

Unit 1 **(8 hrs)**

Introduction, Challenges, Parallel Architectures Classifications, Clusters and Components of a Parallel Machine, Conventional Supercomputers and it's limitations

Unit 2 **(8 hrs)**

Multi processor and Multi Computer based Distributed Systems. Cluster and Grids: Cluster Components Processor/machine, High Speed Interconnections goals, topology, latency, bandwidth, Example Interconnect: Myrinet, Inifiniband, QsNet, Fast Ethernet, Gigabit Ethernet

Unit 3 **(8 hrs)**

Light weight Messaging system/Light weight communication Protocols, Cluster Middleware Job/Resource Management System, Load balancing, Scheduling of parallel processes,

Unit 4 **(8 hrs)**

Programming tools such as PVM, MPI, Cluster Operating Systems Examples: Linux, MOSIX,

Unit 5 **(8 hrs)**

Characteristics of Grid, Computational services, Computational Grids, Data grids/Storage grids, management and applications, Different components of Grid, Grid Applications, Grid Security

Reference Books:

1. D. Janakiram, Grid Computing, Tata Mcgraw Hill, 2005.
2. R. K. Buyya, High Performance Cluster Computing: Programming and Applications, Vol 2, PHI
3. P. Jalote, Fault Tolerance in Distributed Systems, Prentice Hall, 1994.
4. J. J. Jos & R. K. Buyya, High Performance Cluster Computing: Architecture and Systems, Vol 1, PHI
5. R. K. Buyya & C. Szyperski, Cluster Computing, Nova Science, New York, USA,

Subject: Advanced Compiler Techniques

Teaching Scheme: Lectures: 4 Hrs/Week

Examination Scheme: Theory Paper: 100 Marks (3 Hrs)

Objectives-

1. To learn and use tools for construction of a compiler
2. To learn some advanced compiler construction techniques

Unit 1: Basics of Compiler Design and Code Generation **(8 hrs)**

Planning a compiler, approaches to compiler design, compiler development tools – Lex and Yaac, Efficient code generation for expressions, code generator generators, code generation for pipelined machines, register allocation techniques.

Unit 2: Code Optimization **(8 hrs)**

Classical theory of data flow analysis, bi-directional data flows, unified algorithm for data flow analysis, theory of data flow analysis, program representation for optimization – SSA form.

Unit 3: Parallel Compilers **(8 hrs)**

Motivation and overview, Structure of a Parallelizing compiler. Parallelism detection: data dependency, direction vectors, loop carried and loop independent dependences.

Unit 4: Compilation for Distributed Machines **(8 hrs)**

Data partitioning, instruction scheduling, register allocation, machine optimization. Dynamic compilation.

Unit 5: Advanced Topics **(8 hrs)**

Just in time (JIT) compilers, Auto scheduling compilers.

Reference Books:

1 Aho, Ulman, Sethi, "Compiler Principles and Techniques", Addison Wesley
2. Muchnik, "Advanced Compiler Design and Implementation", Kauffman(1998)
3. Wolf M., "Optimizing Super Compiler for Super Computers", Pitman(1989)
4. Banerjee U., kluwer, "Loop Optimization", PHI (1997)

Title: Software Laboratory –II

Teaching Scheme:
Practical: 6hrs/week

Examination Scheme:
Practical: 50 marks

Software Laboratory –II shall be based on the subjects Knowledge Discovery Techniques, Soft Computing and Pattern Recognition.

Practical examination will consist of a viva based on the practical work done during the semester.

Title: Dissertation Part -I

Teaching Scheme:
Practical: 24 hrs/week

Examination Scheme:
Term Work: 50 marks
Practical: 50 marks

1. All are expected to complete details Introduction, Literature Survey, system/problem definition. The stage of implementation needs to be started in this semester. Project report must be submitted in the prescribed format only. Term work marks will be awarded internally based on the dissertation work completed till then.

2. The dissertation -seminar will consist of a typewritten report covering the work completed so far. The work will be judged by two examiners (one internal guide and one external) by taking viva-voce and practical examination marks will be given accordingly.

Title: Dissertation Part -II

Teaching Scheme:
Practical: 24 hrs/week

Examination Scheme:
Term Work: 50 marks
Practical: 150 marks

1. The student should complete the dissertation work taken in Semester-III. It should complete the rest of the work till the conclusion. The performance Analysis chapter should consist of various testing methods used along with sample test cases. It should also include how better the system is performing as compared to other similar systems. Term work marks will be awarded internally based on the dissertation work completed till then.

2. The final examination will consist of the demonstration of work which will be judged by two examiners (one internal and one external) and the practical examination marks will be given accordingly.