GOA UNIVERSITY
FINAL YEAR OF BACHELOR'S DEGREE COURSE IN COMPUTER ENGINEERING
(Revised in 2007-08)
SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER VIII

Sub Code	Subjects	Scheme of Instruction Hrs/Week			Scheme of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				
						Th.	S	P	O	Total
CE 8.1ADSA	Advanced Data Structures and Algorithms	3	1	2	3	100	25	-	50	175
CE 8.2CCNS	Computer Cryptography and Network Security	3	1	2	3	100	25	-	50	175
CE 8.3	Elective III	3	1	2	3	100	25	-	50	175
CE 8.4	Elective IV	3	1	2	3	100	25	-	50	175
CE 8.5	Project	-	-	8	-	-	50	-	100*	150
	TOTAL	12	04	16	-	400	150	-	300	850

25 Sessional marks will be split as follows:

20 marks are for the Internal Test

5 marks are for continuous evaluation of Practicals/Assignments

*Seminar, demonstration & Oral

Electives: A student must take One Elective from each Group.

Group III: Subjects for CE 8.3

a) Embedded System Design
b) Multimedia Systems
c) Distributed Operating Systems
d) Data Mining
e) Web Services

Group VI: Subjects for CE 8.4

a) Genetic Algorithms
b) Image Processing
c) Mobile Computing
d) Machine Vision and Learning

CE8.1ADSA ADVANCED DATA STRUCTURES & ALGORITHMS

Course objectives:

Advanced Data structures and algorithms are the building blocks in computer programming. This course will give students a comprehensive introduction of advanced data structures, and algorithms design.

In this course we aim to provide students with a deeper understanding of Advanced data Structure and algorithms. In particular we focus on the principles, techniques, and practices relevant to the design and implementation of advanced data structures and algorithms

Concretely the course has the following objectives:
Study in depth and implement different advanced data structure concepts and also learn, efficient parallel and probabilistic algorithms, and learn techniques for designing algorithms using appropriate data structures.

Instructional Objectives

After completing this course students will be able to:

- Have understanding of advanced data structure concepts in depth
- Understand various implementations and operations on advanced data structure concepts like trees, heaps, tries, digital trees etc.
- Understand different types of parallel and probabilistic algorithms.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Dynamic Hashing (02 Hrs)

Motivation for Dynamic Hashing
Dynamic Hashing Using Directories
Analysis of Directory-Based Dynamic Hashing
Directoryless Dynamic Hashing

Min-Max Heaps (03 Hrs)

Definitions
Insertion into Min-Max heap
Deletion of Min element

Deaps (03 Hrs)

Definition
Insertion into Deap
Deletion of the Min element
Leftist Trees

Binomial Heaps (03 Hrs)
- Cost Amortization
- Definition
- Insertion into binomial heap
- Combining two binomial heap
- Deletion of Min Element
- Analysis

MODULE 2

Fibonacci Heaps (03 Hrs)
- Definitions
- Deletions
- Decreasing key
- Cascading cut
- Analysis

Search structures (04 Hrs)
- Optimal Binary Search Trees
- AVL trees
- 2-3 Trees
- 2-3-4 Trees

Red –Black Trees (04 Hrs)
- Definition and properties
- Searching
- Insertion
- Deletions
- Joining and splitting

MODULE 3

B-Trees (04 Hrs)
- Definitions of m-way search trees
- Searching an m-way search trees
- Definitions and properties of B-tree
- Insertion into B-tree
- Deletion from b-tree

Splay Trees (01 Hr)

Digital search trees (03 Hrs)
- Definition
- Binary tries
- Patricia

Tries (03 Hrs)
- Definitions
- Searching
- Insertions
- Deletions
- Node structure

Differential files (01Hr)

The concept
Bloom Filters

MODULE 4

Introduction to parallelism models (04 Hrs)

Simple algorithms for parallel computers.
CRCW and EREW algorithms
Brent's theorem and work efficiency

Probabilistic Algorithms: (04 Hrs)

Introduction
Expected versus average time
Pseudorandom generation,
Buffon's needle numerical integration,
Probabilistic counting,
Monte Carlo algorithms

TEXT BOOKS:

1. Fundamentals of data structures in c++ by Ellis Horowitz,Sartaj Sahni, Dinesh Mehta, Galgotia Publication, ISBN: 817515-278-8
2. Computer Algorithms – Saar Baase. PHI , ISBN: 0201612445

REFERENCES BOOKS:

1. Graph Theory with application to engineering and computer science by Deo Narsingh, Charles E Millican. MGh, PHI, ISBN: 978-81-203-0145-0
2. Fundamentals of Algorithms by Gilles Brassard and Paul Bratly. PHI, ISBN: 9780133350685.
3. Computer Algorithms by Horowitz, Sartaj Sahni. Rajasekharan – Galgotia, ISBN: 9788175152571
4. Introduction to algorithms by Thomas H cormen, Charles E Leiserson, Ronald L Rivest. PHI, ISBN: 81-203-1353-4

CE8.2CCNS COMPUTER CRYPTOGRAPHY AND NETWORK SECURITY

Course Objective:
To understand the principles of encryption algorithms, conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

Instructional Objectives:

- To know the methods of conventional encryption
- To understand the concepts of public key encryption and number theory
- To understand authentication and hash functions
- To know network security tools and applications
- To understand system level security issues.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Symmetric Ciphers

Introduction (01 Hr)
- Services, mechanisms and attacks
- The OSI Security Architecture
- Model for Network Security

Classical Encryption Techniques (2.5 Hrs)
- Symmetric Cipher Model
- Substitution Techniques
- Transposition Techniques
- Rotor Machine
- Steganography

Block Ciphers and Data Encryption Standard (03 Hrs)
- Simplified DES
- Block Cipher Principles
- The Data Encryption Standard
- Block Cipher Design Principles
- Block Cipher Modes of Operation

Contemporary Symmetric Ciphers (1.5 Hrs)
- Triple DES
- Blow fish

Confidentiality Using Symmetric Encryption (02 Hrs)
- Placement of Encryption Function
- Traffic Confidentiality
- Key Distribution
- Random Number Generators

MODULE 2

Public Key Encryption and Hash Functions

Introduction to Number Theory (1.5 Hrs)
- Prime Numbers
- Fermat's and Euler's Theorems
- Testing for Primality
- Euclid's Algorithm.

Public Key Cryptography and RSA (2.5 Hrs)
- Principles of Public Key Cryptosystems
- The RSA Algorithm

Key Management (02 Hrs)
- Key Management
- Deffie-Hellman Key Exchange.

Message Authentication and Hash Functions (2.5 Hrs)
- Authentication Requirements.
- Authentication Functions
- Message Authentication Codes
- Hash Functions

Hash Algorithms (1.5 Hrs)
- MD5- Message Digest Algorithm
- Secure Hash Algorithm

MODULE 3

Public Key Encryption and Hash Functions (Continued)

Digital Signatures and Authentication Protocols (2.5 Hrs)
- Digital Signatures
- Authentication protocols
- Digital Signature Standard

Network Security

Authentication Applications (2.5 Hrs)
- Kerberos
- X.509 Authentication Service

Electronic Mail Security (2.5 Hrs)
- Pretty Good Privacy
- S/MIME

IP Security (2.5 Hrs)

IP Security Overview
IP Security Architecture
Authentication Header
Encapsulating Security Payload
Combining Security Associations
Key Management

MODULE 4

Network Security (Continued)

Web Security (03 Hrs)

Web Security Considerations
Secure Sockets Layer and Transport Layer Security
Secure Electronic Transaction.

System Security

Intruders (03 Hrs)

Intruders
Intrusion Detection
Password Management

Malicious Software (02 Hrs)

Viruses and related threats
Virus counter measures

Firewalls (02 Hrs)

Firewall Design Principles
Trusted Systems.

TEXT BOOKS:

1. Cryptography and Network security 4th ed. William Stallings PEA, ISBN:978-81-7758-774-6

REFERENCE BOOKS:

1. Internet Cryptography by Richard E Smith, Pearson Education Asia, ISBN:81-297-0351-3
2. Building Internet Firewalls by Chapman D., E. Zwicky, O'Reilly 1995, ISBN:81-7366-101-4
3. Network Security Essential: Applications and Standards by William Stallings, PEA, ISBN:81-7808-307-8
4. Network Security, Private Communication in a Public World by Charlie Kaufman, Radia Perlman, Mike Speciner PTR Prentice Hall, 1995, ISBN:978-81-203-2213-4

CE8.3.a.ESD EMBEDDED SYSTEM DESIGN (Elective III)

Course Objectives:

The main objective of this course is to provide the student with the basic understanding of embedded systems design. This includes system requirements specifications, architectural and detailed design, and implementation, focusing on real-time applications.

Instructional Objectives:

At the end of this course student will be exposed to microcontroller-based embedded systems design, development and implementation. It includes embedded systems and its hardware organization, microcontroller architecture, programming, I/O interfacing and Real Time operating System

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Embedded System (05 Hrs)

An Embedded system
Processor in the system
Other hardware Units
Software Embedded into a System
Exemplary Embedded Systems
Embedded System-on-Chip (SOC) and in VLSI Circuit

Processor and Memory Organization (05 Hrs)

Structural Units in a Processor
Processor selection for an Embedded System
Memory Devices
Memory Selection for an Embedded System
Allocation of Memory to Program segments and Blocks and Memory map of a System
Direct Memory Access
Interfacing Processor, Memories and I/O Devices

MODULE 2

8051 Microcontroller (10 Hrs)

Introduction to Microcontrollers
Architecture and Pin Description of 8051
8051 ALP
I/O Port Programming
Addressing Modes
Arithmetic Logic Instructions and Programs
8051 Programming in C

MODULE 3

8051 Programming (10 Hrs)

8051 Timer Programming in Assembly and C
8051 Serial Port Programming in Assembly and C
Interrupt Programming in Assembly and C
LCD and Keyboard Interfacing using 8051

MODULE 4

Real Time Operating System (10 Hrs)

Operating System services
I/O subsystems
Network Operating Systems
Real Time and Embedded System Operating systems
Interrupt Routines in RTOS environment : Handling of Interrupt source call by the RTOSs
RTOS Task scheduling Models, Interrupt Latency and Response Times of the Tasks as Performance Metrics
Performance Metric in Scheduling Models for Periodic, Sporadic and Aperiodic Tasks.
IEEE standard POSIX 1003.1B Functions for standardization of RTOS and Inter-Task Communication functions
List of basic Actions in a preemptive Scheduler and Expected times taken at a processor
Fifteen Point Strategy for Synchronisation between the Processes, ISRs, OS Functions and Tasks and for Resource Management
Embedded Linux Internals: Linux Kernel for the Device Drivers and Embedded System
OS Security Issues
Mobile OS

TEXTBOOKS

1. Embedded Systems –Architecture, Programming and design by Raj kamal, Tata Mcgraw Hill Publishing Company Limited, ISBN:0-07-049470-3
2. The 8051 Microcontroller and Embedded Systems by Muhammad Ali Mazidi and Janice Mazidi, Pearson Education, ISBN:81-7808-574-7

REFERENCE BOOKS:

1. The 8051 Microcontroller, Architecture, Programming & Applications-Second edition by Kenneth J. Ayala, Penram International, ISBN:81-900828-4-1
2. Programming and Customizing the 8051 Microcontroller by Myke Predko, TMH, ISBN:0-07-042140-4

CE8.3.b.MS MULTIMEDIA SYSTEMS (Elective III)

Course Objective:

Multimedia has become an indispensable part of modern computer technology. In this course, students will be introduced to principles and current technologies of multimedia systems. Issues in effectively representing, processing, and retrieving multimedia data such as sound and music, graphics, image and video will be addressed. The aim of this course is to help students develop an understanding of the fundamental principles of multimedia systems and how they are being developed and applied and also to gain an intuitive understanding of multimedia concepts.

Instructional Objectives:

At the end of the course , the student will be familiar with properties of multimedia systems, video and animation, data compression techniques and the various multimedia applications.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to Multimedia (02 Hrs)

Branching-overlapping aspects of Multimedia
Global Structure

Multimedia : Media and Data Streams (03 Hrs)

Medium
Main properties of a Multimedia System
Multimedia
Data Stream Characteristics for Continuous Media

Sound/Audio (02 Hrs)

Basic Sound Concepts
Music
Speech

Video and Animation (03 Hrs)

Basic concepts
Television
Computer-based Animation

MODULE 2

Data Compression (04 Hrs)

Some Basic Compression Techniques
JPEG
H.261
MPEG
DVI

Computer Technology (03 Hrs)

Communication Architecture
Multimedia Workstation

Multimedia Operating Systems (03 Hrs)

Introduction
Real time systems
File Systems

MODULE 3

Multimedia Communication Systems (03 Hrs)

Application Subsystem
Transport Subsystem
Quality of Service and Resource Management

Database Systems (04 Hrs)

Multimedia Database Management Systems
Characteristics of an MDBMS
Data Analysis
Data Structure
Operations on Data
Integration in a Database Model

Documents Hypertext and MHEG (03 Hrs)

Documents
Hypertext and Hypermedia
Document Architecture SGML
Document Architecture ODA
MHEG

MODULE 4

User Interfaces (03 Hrs)

General Design Issues
Video at the User Interface
Audio at the User Interface
User-friendliness as the Primary Goal.

Synchronization (03 Hrs)

Introduction
Notion of synchronization
Presentation Requirements
A Reference Model for Multimedia Synchronization
Synchronization Specification

Multimedia Applications (04 Hrs)

Introduction
Media Preparation
Media Composition
Media Integration
Media Communication
Media Consumption
Media Entertainment

TEXT BOOKS:

1. Multimedia: Computing, Communications and Applications by Ralf Steinmetz and Klara Nahrstedt, Pearson Education, ISBN:81-7808-319-1

REFERENCE BOOKS:

1. Multimedia Systems, by John F. Koegel Buford, Pearson Education, ISBN: 81-7808-162-8
2. Multimedia: Making it Work, by Tay Vaughan, TMH, ISBN: 0-07-047276-9
3. Principles of Interactive Multimedia, by Mark Elsom-Cook, TMH, ISBN: 978-0-07-058833-2

CE8.3.c.DOS DISTRIBUTED OPERATING SYSTEMS (Elective III)

Course Objectives:

This course has as a first objective to introduce the basic concepts upon which distributed systems at large and distributed operating systems in particular rely. The overall architecture of distributed systems along with their different components is then studied in depth, with a focus on design issues, design problems, solutions and performance issues.

Concretely the course has the following objectives:

- Present the principles underlying the functioning of distributed systems.
- Create an awareness of the major technical challenges in distributed systems design and implementation.
- Expose students to past and current research issues in the field of distributed systems.
- Provide experience in the implementation of typical algorithms used in distributed systems.

Instructional Objectives:

After completing this course students will be able to:

- Explain what a distributed system is, why you would design a system as a distributed system, and what the desired properties of such systems are.
- List the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions.
- Recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design, and be able to identify features and design decisions that may cause problems.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction to distributed operating systems: (05 hrs)

What is a distributed operating system?
Goals
Hardware Concepts
Software Concepts
Design Issues

Communication in distributed systems (06 Hrs)

Layered Protocols
Asynchronous Transfer Mode Networks
The Client-Server Model
Remote Procedure Call
Group Communication

MODULE 2

Synchronization in Distributed Systems (06 Hrs)

Clock Synchronization
Mutual Exclusion
Election Algorithms
Atomic Transactions
Deadlocks in Distributed Systems

Processes and Processors in Distributed Systems (03 Hrs)

Threads
System Models

MODULE 3

Processes and Processors in Distributed Systems (contd.) (05 Hrs)

Processor Allocation
Scheduling in Distributed Systems

Distributed File Systems (05 Hrs)

Distributed File System Design
Distributed File System Implementation
Trends in Distributed File Systems

MODULE 4

Case Study of Distributed Systems (05 Hrs)
Case study 1: AMOEBA

Introduction
Objects and capabilities
Process management
Memory management
Communication
Amoeba Servers

Case study 2: Distributed Computing Environment (05 Hrs)

Introduction
Threads
RPC
Time Service
Directory Service
Security Service

TEXT BOOKS:

1. Distributed Operating Systems by A.S. Tanenbaum, Pearson Education, ISBN:81-7758-179-1.

REFERENCE BOOKS:

1. Distributed Systems: Concepts and Design by G. Coulouris, J. Dollimore and T. King Berg., Addison Wesley, ISBN:81-7808-462-7
2. Advanced Concepts in Operating Systems by M. Singhal and N. G. Shivaratri, TMH, ISBN:0-07-047268-8

CE8.3.d.DM DATA MINING (Elective III)

Course Objective:

This course will focus on imparting a complete introduction to data mining for students. It will provide a sound understanding of the foundations including fundamental concepts and algorithms of data mining.

Instructional Objective:

The student at the end of the course will be able to:

- Describe the theory underlying the fundamental techniques and concepts of data mining with detailed instruction for their applications by illustrating the concepts with examples and simple descriptions of key algorithms.
- Understand and encompass the field of data mining which includes data, classification, association analysis, and clustering and anomaly detection.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction (04 Hrs)

Challenges
Origin of Data Mining
Data Mining Tasks

Data (06 Hrs)

Types of Data
- Attributes and Measurement
- Types of Data Sets

Data Quality
- Measurement and Data Collection Issues
- Issues Related to Applications

Data Preprocessing
- Aggregation
- Sampling
- Dimensionality Reduction
- Feature Subset Selection
- Feature Creation
- Discretization and Binarization
- Variable Transformation

Measures of Similarity and Dissimilarity
- Similarity and Dissimilarity between Simple Attributes
- Dissimilarities between Data Objects
- Similarities between Data Objects
- Examples of Proximity Measures
- Issues in Proximity Calculation
- Selecting the Right Proximity Measures

MODULE 2

Exploring Data (05 Hrs)

Summary Statistics
- Frequencies and the Mode
- Percentiles
- Measures of Location: Mean and Median
- Measures of Spread: Range and Variance
- Multivariate Summary Statistics
- Other Ways to Summarize the Data

Visualization
- Motivations for Visualization
- Techniques
- Visualizing Higher-Dimensional Data

OLAP and Multidimensional Data Analysis
- Representation of Multidimensional Data
- Analyzing Multidimensional Data

Classification: Basic concepts, Decision Trees, and Model Evaluation (05 Hrs)

General Approach to Solving a Classification Problem

Decision Tree Induction
- Working
- Construction
- Methods for Expressing Attribute Test Conditions
- Measures for Selecting the Best Split
- Algorithm and Characteristics for Decision Tree Induction

Model Overfitting
- Overfitting Due to Presence of Noise
- Overfitting Due to Lack of Representative Samples
- Overfitting and the Multiple Comparison Procedures
- Estimation of Generalization Errors
- Handling Overfitting in Decision Tree Induction

MODULE 3

Classification: Alternative Techniques (05 Hrs)

- Rule-Based Classifier
  - Concept
  - Rule-Ordering Schemes
  - Building a Rule-Based Classifier
  - Direct Methods for Rule Extraction
  - Indirect Methods for Rule Extraction
  - Characteristics of Rule-Based Classifiers
- Nearest-Neighbor classifiers
  - Algorithm
  - Characteristics of Nearest-Neighbor Classifiers

Association Analysis: Basic Concepts and Algorithms (05 Hrs)

- Frequent Itemset Generation
  - The Apriori Principle
  - Frequent Itemset Generation in the Apriori Algorithm
  - Candidate Generation and Pruning
  - Support Counting
  - Computational Complexity
- Rule Generation
  - Confidence-Based Pruning
  - Rule Generation in Apriori Algorithm
  - An Example: Congressional Voting Records
- Compact Representation of Frequent Itemsets
  - Maximal Frequent Itemsets
  - Closed Frequent Itemsets
- Alternative Methods for Generating Frequent Itemsets

MODULE 4

Cluster Analysis: Basic Concepts and Algorithms (05 Hrs)

- Overview
- K-means
  - The Basic K-means Algorithm
  - K-means: Additional Issues
  - Bisecting K-means
  - K-means and Different Types of Clusters
  - Strengths and Weaknesses
  - K-means as an Optimization Problem
- Agglomerating Hierarchical Clustering
  - Basic Agglomerative Hierarchical Clustering Algorithm
  - Specific Techniques
  - The Lance-Williams Formula for Cluster Proximity
  - Key Issues in Hierarchical Clustering
  - Strengths and Weaknesses

Anomaly Detection (05 Hrs)

Preliminaries
Statistical Approaches
Detecting Outliers in a Univariate Normal Distribution
Outliers in a Multivariate Normal Distribution
A Mixture Model Approach for Anomaly Detection
Strengths and Weaknesses
Proximity-Based Outlier Detection
Strengths and Weaknesses
Density-Based Outlier Detection
Detection of Outliers Using Relative Density
Strengths and Weaknesses
Clustering-Based Techniques
Assessing the Extent to Which an Object Belongs to a Cluster
Impact of Outliers on the Initial Clustering
The Number of clusters to Use
Strengths and Weaknesses

TEXT BOOK

1. Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education, ISBN:81-317-1472-1

REFERENCE BOOK

1. Data Mining - Concepts and Techniques by Jiawei Han and Micheline Kamber, Elsevier, Second Edition, Original ISBN: 978-1-55860-901-3, Indian Reprint ISBN: 978-81-3120535-8

CE8.3.e.WS WEB SERVICES (Elective III)

Course Objective:

To learn and understand the various concepts of Web Services. Students will first learn basics of XML which is the basic prerequisite to understand how the different documents of the respective protocols are designed. Then they will learn the different protocols used in web services and their role and importance in designing a web service.

Instructional Objective:

Students completing the course will be able to understand to the methods of developing the web services within real world enterprise environments.
Students will gain knowledge of

- How information is exchanged between applications within a distributed environment. (SOAP).
- How the web services are described to the world over internet (WSDL).
- How the web service is published and made known to the world over the internet. (UDDI).
- How to explain the conversation pattern that a web service is expecting to engage in. (WSCL)
- How workflow systems automate business processes. (Workflow).
- Advantages and Disadvantages of Web Services.
- Transactions and the transaction protocols used in web service.
- Security issues in Web Services

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Web Services Basics: (01 Hr)

What Are Web Services?
Why Web Services Are Important?

Comparing Web services to the other Technologies

Extensible Markup Language (XML): (04 Hrs)

XML Fundamentals
XML Profile
XML DTD and XSL
XML Schema
XML Documents

XML Namespaces
Processing XML
SAX
DOM
XSLT and XPATH

Simple Object Access Protocol (SOAP):
SOAP Basics (05 Hrs)

SOAP messages
SOAP Envelope
SOAP Header
SOAP Body
SOAP Faults
SOAP Encoding
SOAP RPC
Using alternative SOAP Encodings
Document, RPC, Literal, Encoded
SOAP, Web services, and the REST Architecture.

MODULE 2

Web Service Description Language (WSDL): (05 Hrs)

WSDL Structure
The Stock Quote WSDL Interface
The Types Element
Message Elements
Bindings
Services
Managing WSDL Descriptions
Extending WSDL
Using SOAP and WSDL

Universal Description, Discovery and Integration (UDDI): (05 Hrs)

UDDI at a Glance
Analogies with Telephone Directories
The UDDI Business Registry
UDDI under the Covers
Accessing UDDI
How UDDI is Playing Out

MODULE 3

Web Service Conversation Language (WSCL): (05 Hrs)

Conversations
Conversations Overview
Web Services Conversation Language
WSCL Interface Components
The Bar Scenario Conversation
Relationship between WSCL and WSDL

Workflow (03 Hrs)

Business Process Management
Workflows and Workflow Management Systems
Business Process Execution Language for Web Services (BPEL)

Advantages of Web Services (02 Hrs)
Disadvantages and Pitfalls of Web Services

MODULE 4

Transaction (05 Hrs)

ACID Transactions
Distributed Transactions and Two-Phase Commit
Dealing with Heuristic Outcomes
Scaling Transactions to Web Services
Web Services Transaction Protocols

Security (04 Hrs)

Everyday Security Basics
Security Is an End-to-End Process
Web Service Security Issues
Types of Security Attacks and Threats
Web Services Security Roadmap
WS-Security

Web Services in the real World (01 Hr)

TEXT BOOKS:

1. Developing Enterprise Web Services – An Architect's Guide by Sandeep Chatterjee and James Webber, Pearson Education, ISBN: 0-13-140160-2
2. Sams Teach Yourself Web Services in 24 Hours by Stephen Potts and Mike Kopack, Sams Publications, ISBN:13:978-0672325151

REFERENCE BOOKS:

1. Web Services A Technical Introduction BY Deitel and Deitel, Prentice Hall, ISBN:0130461350
2. Web Services An Introduction By B. V. Kumar and S.V. Subrahmanya, TMH, ISBN:13-978-0070593787.

CE8.4.a.GA GENETIC ALGORITHM (Elective IV)

Course Objective:

The aim of the course is to introduce genetic algorithms and to give students an insight into the various types of algorithms and their industrial applications. The course will help them to be able to assess the suitability of genetic algorithms for specific problems.

Instructional Objective:

To familiarize students with genetic and evolutionary computation techniques and to enable them to read the literature and solve practical problems of their choosing.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Genetic Algorithms (04 Hrs)

Definition
Robustness of traditional optimization and search techniques
Goals of optimization
A Simple Genetic Algorithm
Similarity Templates

Mathematical Foundations (08 Hrs)

Fundamental theorem
Schema Processing
Problem solving-2 armed and K armed bandit problem
Building block hypothesis
Minimal deceptive problem
Similarity templates as hyper planes

MODULE 2

COMPUTER Implementation Of Genetic Algorithms (06 Hrs)

Data structure, reproduction, crossover and mutation
Mapping objective functions to fitness form
Fitness scaling, discretization and constraints

Applications Of Genetic Algorithms (06 Hrs)

DeJong and Function optimization structural optimization via genetic algorithm
Medical image registration with genetic algorithms
Iterated prisoner's dilemma problem..

MODULE 3

Advanced Operators And Techniques In Genetic Algorithm Search (08 Hrs)

Dominance, Diploidy and abeyance
Inversion and other re-ordering operators
Macro operators, niche and special speciation
Multi objective optimization
Knowledge based techniques
Genetic Algorithms and Parallel processors
Genetic Based machine learning
Classifier systems

MODULE 4

Industrial Application Of Genetic Algorithms (08 Hrs)

Data mining using genetic Algorithms
Search in data mining
Genetic algorithms for game playing eg TIC TAC TOE

TEXT BOOKS:

1. Genetic Algorithms in search, optimization machine leaning - David Goldberg 6th edition , ISBN No-81-7808-130-X
2. Industrial applications of Genetic Algorithms- Charles L Karr and L.Michael Freeman, CRC Press, ISBN No-0-8493-9801-0

REFERENCE BOOKS

1. Handbook of Genetic Algorithms -Davis, Lawrence, ISBN:0-442-00173-8
2. An Introduction to Genetic Algorithms Melanie Mitchell, ISBN:81-203-1358-5

CE8.4.b.IP IMAGE PROCESSING (Elective IV)

Course Objectives:

The goal of this course is to provide an introduction to basic concepts and methodologies in digital image processing, and to develop a foundation that can be used as the basis for further study and research in image processing.

Instructional Objectives:

Upon successfully completing the course, the student should:

- Have a fundamental understanding of digital image processing techniques, including image enhancement, restoration, compression and segmentation.
- Be able to implement basic image processing algorithms
- Have the skill base necessary to further explore advanced topics of Digital Image Processing.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction (02 Hrs)

What Is Digital Image Processing?
Fundamental Steps in Digital Image Processing
Components of an Image Processing System

Digital Image Fundamentals (03 Hrs)

Elements of Visual Perception
Light and the Electromagnetic Spectrum
Image Sensing and Acquisition
Image Sampling and Quantization
Some Basic Relationships between Pixels

Image Enhancement in the spatial domain (06 Hrs)

Background
Some Basic Intensity Transformation Functions
Histogram Processing
Histogram Equalization
Histogram Matching (Specification)
Enhancement using arithmetic/logic operations
Basics of Spatial filtering
Smoothing Spatial Filters
Sharpening Spatial Filters

MODULE 2

Image Enhancements in the Frequency Domain (05 Hrs)
Introduction to the Fourier Transform and the Frequency Domain
Smoothing Frequency Domain Filters
- Ideal Lowpass Filters
- Butterworth Lowpass Filters
- Gaussian Lowpass Filters

Sharpening Frequency Domain Filters
- Ideal Highpass Filters
- Butterworth Highpass Filters
- Gaussian Highpass Filters

Implementation
- Properties of 2-D FT
- Convolution and Correlation theorems
- The Fast Fourier Transform (FFT)

Image Restoration (04 Hrs)
- A Model of the Image Degradation/Restoration Process
- Noise Models
- Restoration in the Presence of Noise
- Mean Filters
- Order-Statistics Filters
- Inverse Filtering
- Minimum Mean Square Error (Wiener) Filtering

MODULE 3

Color Image Processing (05 Hrs)
Color Fundamentals
Color Models
Basics of Full-Color Image Processing
Color Transformations
- Formulation
- Color Complements
- Color Slicing
- Tone and Color Corrections
- Histogram Processing

Smoothing and Sharpening
- Color Image Smoothing
- Color Image Sharpening

Image Segmentation Based on Color
- Segmentation in HSI Color Space
- Segmentation in RGB Vector Space

Image Compression (04 Hrs)
Fundamentals
Image Compression Model
Error-Free Compression
Variable-Length Coding
LZW Coding

Lossy Compression
Lossy Predictive Coding

Morphological Image Processing (03 Hrs)
Preliminaries
Erosion and Dilation
Opening and Closing
The Hit-or-Miss Transformation
Some Basic Morphological Algorithms

MODULE 4

Image Segmentation (05 Hrs)
Detection of Discontinuities
Edge Linking and Boundary Detection
Local Processing
Global Processing via the Hough Transform

Thresholding
Foundation
Basic Global Thresholding
Basic Adaptive Thresholding
Optimal Global and Adaptive Thresholding

Region-Based Segmentation

Representation and Description (04 Hrs)
Representation

Boundary Descriptors
Some Simple Descriptors
Shape Numbers
Fourier Descriptors
Statistical Moments

Regional Descriptors
Some Simple Descriptors
Topological Descriptors

TEXT BOOKS

1. Digital Image Processing by R.C. Gonzalez and R.E. Woods, Second Edition, Addison Wesley, ISBN: 81-7808-629-8.

REFERENCE BOOKS

1. Fundamentals of Digital Image Processing by A.K.Jain, PHI. ISBN:81-203-0929-4
2. Digital Image Processing by W.K.Pralt, McGraw Hill, ISBN: 9-814-12620-9

CE8.4.c.MC MOBILE COMPUTING (Elective IV)

Course objectives:

The course aims at providing the students with a deeper understanding of wireless basics, the protocols used for wireless system, wireless LAN technologies, telecommunication systems, some important layers of mobile protocol stack,

Instructional Objectives:

After completing the course the students will be able to know

- Details of wireless transmission
- MAC protocol
- GSM and DECT Telecommunication systems
- Mobile Network layer and Mobile Transport Layer
- Bluetooth
- WAP

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Introduction: (01 Hr)

Simplified Reference model

Wireless Transmission: (10 Hrs)

Frequencies for Radio Transmission
Signals
Antenna
Signal Propagation
Multiplexing
Modulation
Spread spectrum
Cellular systems

MODULE 2

Medium Access Control: (07 Hrs)

Motivation for a specialized MAC
SDMA
FDMA
TDMA
CDMA
Comparison of S/T/F/CDMA

Telecommunication System: (05 Hrs)

GSM
DECT

MODULE 3

Mobile Network Layer (05 Hrs)

Mobile IP
Dynamic Host Configuration Protocol
Mobile ad-hoc networks

Mobile Transport Layer (05 Hrs)

Traditional TCP
Classical TCP improvements
TCP over 2.5/3G wireless networks
Performance Enhancing Proxies

MODULE 4

Wireless LAN:

Bluetooth (05 Hrs)

Support for Mobility: (06 Hrs)

Wireless Application Protocol (version 1.x)

TEXT BOOKS:

1. Mobile Communications by Jochen Schiller, Pearson Education, Second Edition, 2003, ISBN:978-81-317-2426-2

CE8.4.d.MVL MACHINE VISION AND LEARNING (Elective IV)

Course Objectives: Objective of this course is to learn application of machine learning techniques in the field of Image processing.

Instructional Objectives: At the end of this course students will get hands-on experience on using machine vision techniques.

Lectures per week : (3 + 1 +2)
Max marks for theory paper : 100
Max marks for Sessionals : 20 + 5
Max marks for Orals : 50
Duration of paper : 3 hours
Total no. of modules : 4
No. of questions from each module : 2
Total no. of questions to be answered: 5
(At least one question from each module with two compulsory questions from any one module.)

MODULE 1

Overview and Perspective of Image Interpretation (03 Hrs)

Introduction
Learning Image Interpretation
Image Interpretation Systems

Fuzzy Conditional Rule Generation for the Learning and Recognition of 3D objects from 2D images (08 Hrs)

Introduction
Literature Review
Input Data
Features and Their Attributes
The Fuzzy Conditional Rules Generation (FCRG) Classifier
Hypothesis Verification
Results

MODULE 2

Relational Evidence Theory and Interpreting Schematics (11 Hrs)

Introduction
Recognition by parts
Relational Learning
The Consolidated Relational Learning Algorithm (CLARET)
Relational Evidence and Hierarchical Modeling
Finite Interpretation
Schematic Interpretation
Performance Comparison

MODULE 3

Cite- Scene Understanding and Object Recognition (11 Hrs)

Recent Systems and Proposed Theory
Work Knowledge
Interpretation Structures
Operational Overview
Learning World Knowledge
Hypothesis generation
Relaxation Labeling with Hierarchical Constraint
Knowledge Driven Segmentation
Feature Extraction
System Performance and Results
System Operation

MODULE 4

See++: An Object Oriented theory of Task Specific Vision (10 Hrs)

Introduction
See++ Theory of Vision
System Architecture
Image Query Language
Knowledge Base
Machine Learning
See++ in action

TEXTBOOK

1. Machine Learning and Image Interpretation by Terry Caelli and Walter F. Bischof, Plenum Publishing Corporation, ISBN-0-306-45761-X