PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR SALEM 636 011

MASTER OF SCIENCE IN COMPUTER SCIENCE

SEMESTER PATTERN

Under Choice Based Credit System

REGULATIONS AND SYLLABUS

FOR AFFILIATED COLLEGES

(Effective from the Academic year 2021 - 2022 onwards)

PERIYAR PALKALAI NAGAR SALEM 638 011

Regulations
Effective from the Academic year 2021 - 2022

1. OBJECTIVE OF THECOURSE

To Develop the Post Graduate in Computer Science with strong knowledge of theoretical computer science and who can be employed in research and development units of industries and academic institutions.

2. CONDITION FORADMISSION

A candidate who has passed in B.Sc Computer Science / B.C.A / B.Sc Computer Technology / B.Sc Information Science / B.Sc Information Technology degree of this University or any of the degree of any other University accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M. Sc Computer Science degree examination of this University after a course of study of two academicyears.

3. DURATION OF THE COURSE

The programme for the degree of Master of Science in Computer Science shall consist of two Academic years divided into four semesters.

4. EXAMINATIONS

The examination shall be of three hours duration for each course at the end of each semester. The candidate failing in any subject(s) will be permitted to appear in the subsequent examination.

The practical / project should be an individual work. The University examination for practical / project work will be conducted by the internal and external examiners jointly at the end of each semester.

5. STRUCTURE OF M. Sc (Computer Science) PROGRAMME UNDER CBCS PATTERN FOR AFFILIATED COLLEGES

CURRICULUM AND SCHEME OF EXAMINATIONS

Courses	Number of Credits	Hours Per Week	Exam Duration (Hrs.)	Marks		
				CIA	EA	Total
Semester-I						
Core Course-I- Design and Analysis of Algorithms	4	4	3	25	75	100
Core Course-II- Distributed Operating System	4	4	3	25	75	100
Core Course-III-Advanced Java Programming	4	4	3	25	75	100
Core Course-IV- Internet of Things	4	4	3	25	75	100
Elective Course – I	4	4	3	25	75	100
Core Course-V - Lab - I - Advanced Java Programming Lab	2	5	3	40	60	100
Core Course-VI - Lab - II Algorithms Using C++ Lab	2	5	3	40	60	100
Semester-II						
Core Course-VII-Advanced Web Technology	4	4	3	25	75	100
Core Course - VIII - Complier Design	4	4	3	25	75	100
Core Course - IX-Data Mining	4	4	3	25	75	100
Elective Course II	4	4	3	25	75	100
EDC –I	4	4	3	25	75	100
Core Course-X-Lab – III Web Technology Lab	2	4	3	40	60	100
Core Course - XI-Lab – IV Data Mining Lab	2	4	3	40	60	100
Human Rights	-	2	3	25	75	100*

Courses	Number of Credits	Hours Per Week	Exam Duration (hrs)	Marks		
				CIA	EA	Total
Semester-III						
Core Course - XII - Open Source Computing	4	4	3	25	75	100
Core Course - XIII - Digital Image Processing	4	4	3	25	75	100
Core Course - XIV - Big Data Analytics	4	4	3	25	75	100
Elective Course III	4	4	3	25	75	100
Elective Course IV	4	4	3	25	75	100
Core Course-XV - Digital Image Processing Lab	2	5	3	40	60	100
Core Course-XVI – Mini Project Using Open Source	4	5	3	40	60	100
Add On Course - SWAYAM/MOOC/SOFT SKILL	3					
Semester-IV(Option I)						
Core Course - XVII – Machine Learning	4	5	3	25	75	100
Elective Course V	4	5	3	25	75	100
Core Course-XVII - Project Work and Viva-Voce	8	-	-	50	150	200
Total Core EDC Elective Add On Course Human Rights	66 04 20 03 -			590 25 125 - 25	1410 75 375 - 75	2000 100 500 - 100*
Grand Total	93			765	1935	2700
Semester-IV(Option II)						
Core Course-XVII - Project Work and Viva-Voce	16	-	-	100	300	400
Total Core EDC Elective Add On Course Human Rights	70 04 16 03 -			615 25 100 - 25	1485 75 300 - 75	2100 100 400 - 100*
Grand Total	93			765	1935	2700

ELECTIVES

Elective Course–I	Elective Course–II
Advanced Computer Architecture	Soft Computing
Optimizing Techniques	Advanced Database Management System
Embedded Systems	Advanced Computer Networks

Elective Course–III	Elective Course–IV
Object Oriented System Development	WAP and XML
Cloud Computing	Mobile Computing
Artificial Intelligence	Gird Computing

Elective Course–V

Web Services
Wireless Networks
Cryptography and Network Security

EDC-EXTRA DISCIPLINARY COURSE
Students are expected to opt EDC (Non major elective) offered to other departments.

1. Principles of Information Technology
2. Fundamentals of Computers and Communications
3. E-Commerce

CIA – CONTINUOUS INTERNAL ASSESSMENT
EA – EXTERNAL ASSESSMENT

6.　　EXAMINATIONS
THEORY
EVALUATION OF CONTINUOUS INTERNAL ASSESSMENT

Test	:10 Marks
Seminar	:05 Marks
Assignment	:05 Marks
Attendance	:05 Marks

Total	:25 Marks

(No passing minimum)

EVALUATION OF EXTERNAL ASSESMENT QUESTION PAPER PATTERN

Time: 3 Hours   Max. Marks: 75

PART- A: 15x1 = 15 marks
Answer all the questions
Three questions from each unit (Multiple Choice Questions)

PART- B: 2x5 = 10 marks
Answer any TWO questions
One question from each unit

PART- C: 5x10 = 50 marks
Answer all the questions
One question from each unit (either or type)

The Passing minimum shall be 50% out of 75 marks (38 marks)

PRACTICAL / SOFTWARE DEVELOPMENT
EVALUATION OF CONTINUOUS INTERNAL ASSESSMENT

Test1   :   15 Marks
Test2   :   15 Marks
Record   :   10 Marks

Total   :   40 Marks

(Record Note must be compulsorily submitted while attending the Practical Examination and No passing minimum)

EVALUATION OF EXTERNAL ASSESSMENT
  I) **PRACTICAL**
     QUESTION PAPER PATTERN

Time: 3Hours   Max. Marks:60

There will be two questions with or without subsections to be given for the practical examination. Every question should be chosen from the question bank prepared by the examiner(s).

Distribution of Marks

Each question : 30 Marks Problem Understanding : 05	
Marks Program writing	: 10 Marks
Debugging	: 10 Marks
For Correct Results	: 05 Marks

II) SOFTWARE DEVELOPMENT

        Viva-voce (jointly)   : 30 Marks Modification   : 30Marks

Students should write about their software development briefly.
 i.   Aim
 ii. Features
 iii. Modules
 iv. Modification

III) PROJECT WORK
        Continuous Internal Assessment   : 50 Marks Evaluation & Viva-Voce (Jointly)
                                              : 150Marks

7. REGULATIONS FOR THE PROJECT WORK
  ➢ **OPTION – I for IV SEMESTER**
  - Students should do their Project work in the Institution along with one Core Course and one Elective Course
  ➢ **OPTION – II for IV SEMESTER**
  - Students should do their Project work in Government/Government Aided / Multinational Company

  ➢ **Common instruction for the project work (For both OPTION – I and OPTION – II) of IV SEMESTER**
  - The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the 1st Week of December.
  - Periodically the project should be reviewed.
  - The Student should submit three copies of their Project work.
  - A Sample format is enclosed in Annexure-II.
  - Format of the Title page and Certificate are enclosed in Annexure-III.
  - The students may use power point presentation during their viva voce examination.

8. PASSING MINIMUM
        The candidate shall be declared to have passed in the Theory / Practical / Project Work examination, if the candidate secures not less than 50% marks in EA and also in total of the prescribed marks. However submission of a record note book is a must.

9. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who obtain 75% and above in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the examinations prescribed for the programme at the first appearance. Candidates, other than the above, who secure not less than 60% of the aggregate marks in the whole examinations, shall be declared to have passed the examination in **First Class**. The remaining successful candidates shall be declared to have passed in **Second Class**.

Candidates who pass all the examinations prescribed for the programme in first instance and within a period of two academic years from the year of admission are only eligible for **University Ranking.**

10. MAXIMUM DURATION FOR THE COMPLETION OF THE PROGRAMME

The maximum duration to complete the programme shall be three academic years after normal completion of the programme.

11. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2021-22, that is, for students who are admitted to the first year of the programme during the academic year 2021-22 and thereafter.

12.   TRANSITORY PROVISION

Candidates who were admitted to the M.Sc., Computer Science programme of study before 2021-2022 shall be permitted to appear for the examinations under those regulations for a period of three years after completion of the programme. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

PERIYAR UNIVERSITY

Name of the College   :

Programme   :

Name of the Student   :

Register Number   :

Title of the Project Work   :

Address of Organization / Institution:

Name of the External Guide   :

Designation   :

Place :

Date: Signature of External Guide

                                        (With seal)

Name of the Internal Guide   :

Qualification   :

Teaching Experience   :

Place :

Date: Signature of Internal Guide

Principal [Approved or not Approved]

[University Use]

CONTENTS

A. Format of the title page

<div align="center">

TITLE OF THE PROJECT WORK

A Project Work submitted in partial fulfillment of the requirements for the degree of
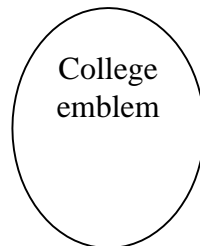
Master of Science in Computer Science

To the

Periyar University, Salem - 11

By

NAME OF THE STUDENT

REG. NO.

College emblem

COLLEGE NAME

(AFFILIATED TO PERIYAR UNIVERSITY)

Place with Pin Code

MONTH – YEAR

</div>

B. Format of the Certificate

Name and Address of the Internal Guide

Place

Date

CERTIFICATE

This is to certify that the Project Work entitled ……...............................………

…………………………………… submitted in partial fulfillment of the requirements of the degree

of Master of Science in Computer Sciences to the Periyar University, Salem is a record of bonafide

work carried out by ....………… Reg. No. ....… under my supervision and guidance.

Internal Guide

Head of the Department

Date of Viva-Voce:

Internal Examiner   External Examiner

Core Course-I-DESIGN AND ANALYSIS OF ALGORITHMS

OBJECTIVES:

- To learn effective problem solving in computing applications and analyze the algorithmic procedure to determine the computational complexity ofalgorithms

UNIT - I

Introduction: Algorithm Definition – Algorithm Specification – Performance Analysis-Asymptotic Notations. Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues–Sets and Disjoint Set Union–Graphs

UNIT - II

Divide and Conquer: The General Method – Defective Chessboard – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Selection - Stassen's Matrix Multiplication.

UNIT - III

The Greedy Method: General Method - Container Loading - Knapsack Problem - Tree Vertex Splitting – Job Sequencing With Deadlines - Minimum Cost Spanning Trees – Optimal Storage on Tapes–Optimal Merge Patterns-Single Source Shortest Paths.

UNIT - IV

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - OptimalBinary Search Trees - String Editing - 0/1 Knapsack - Reliability Design - The Traveling Salesperson Problem - Flow Shop Scheduling. Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs–Connected Components and Spanning Trees– Bi-connected Components and DFS.

UNIT - V

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets– Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: Least Cost search - 0/1 Knapsack Problem.

TEXT BOOK

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009.

REFERENCE BOOKS

1. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI

2. Data structures and Algorithms, V.Aho, Hopcropft,Ullman,LPE

3. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem-TMH.

4. Carlos A.CoelloCoello, Gary B.Lamont, David A.VanVeldhuizen, "Evolutionary Algorithms for Solving Multi-Objective Problems", Springer 2nd Edition,2007.

OUTCOMES:

- It gives stepwise procedure to solveproblems

- The Problems can be broken down into small pieces for program development

- Efficient approach of solving problems by a model of computations

SEMESTER I

Core Course-II - DISTRIBUTED OPERATING SYSTEM

OBJECTIVES:

- To study Distributed operating systemconcepts
- To understand hardware, software and communication in distributed OS
- To learn the distributed resource management components
- Practices to learn concepts of OS and Program the principles of Operating Systems

UNIT - I

Introduction – Operating System Definition – Functions of Operating System – Types of Advanced Operating System – Design Approaches – Synchronization Mechanisms – concepts of a Process – Critical Section Problem – Process Deadlock – Models of Deadlock – Conditions for Deadlock – System with single-unit requests, Consumable Resources , Reusable Resources.

UNIT - II

Distributed Operating Systems: Introduction- Issues – Communication Primitives – Inherent Limitations –Lamport's Logical Clock, Vector Clock, Global State, Cuts – Termination Detection – Distributed Mutual Exclusion – NonToken Based Algorithms – Lamport's Algorithm - Token Based Algorithms –Distributed Deadlock Detection – Distributed Deadlock Detection Algorithms – Agreement Protocols

UNIT - III

Distributed Resource Management – Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed shared Memory – Architecture – Algorithm – Protocols – Design Issues – Distributed Scheduling–Issues–Components–Algorithms.

UNIT - IV

Failure Recovery and Fault Tolerance– Concepts – Failure Classifications – Approaches to Recovery – Recovery in Concurrent Systems– Synchronous and Asynchronous Check pointing and Recovery –Check pointing in Distributed Database Systems – Fault Tolerance Issues – Two-Phase and Non blocking Commit Protocols – Voting Protocols – Dynamic Voting Protocols.

UNIT - V

Multiprocessor and Database Operating Systems –Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory management– Reliability/Fault Tolerance – Database Operating Systems – concepts– Features of Android OS, Ubuntu, Google Chrome OS and Linux operating systems.

TEXT BOOKS

1. Mukesh Singhal N.G.Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill2000.

2. Distributed Operating System–Andrew S. Tanenbaum, PHI.

REFERENCES

1. Abraham Silberschatz, Peter B.Galvin, G.Gagne, "Operating Concepts", 6th Edition Addison Wesley publications 2003.

2. Andrew S. Tanenbaum, "Modern Operating Systems", 2nd Edition Addison Wesley 2001

OUTCOMES:

- Clear understanding on several resource management techniques like distributed shared memory and other resources

- Knowledge on mutual exclusion and Deadlock detection of Distributed operating system.

- Able to design and implement algorithms of distributed shared memory and commit protocols

- Able to design and implement fault tolerant distributed systems.

SEMESTER I

Core Course – III - ADVANCED JAVA PROGRAMMING

OBJECTIVES:

- To deepen student's programming skills by analyzing the real world problem in a programmer's point of view and implement the concepts in real time projects

- To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming and how it impacts the social and economic development of society

UNIT-I

Design Patterns: Introduction to Design patterns- Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern- Adapter Pattern- Proxy Pattern- Decorator Pattern- Command Pattern- Template Pattern- Mediator Pattern-Collection Framework – Array List class – Linked List class – Array List vs. Linked List - List Iterator interface - Hash Set class- Linked Hash Set class-Tree Set class Priority Queue class - Map interface - Hash Map class- Linked Hash Map class –Tree Map class - Comparable interface -Comparator interface-Comparable vs.Comparator

UNIT-II

Applet Fundamentals- Applet Class - Applet lifecycle- Steps for Developing Applet Programs- Passing Values through Parameters- Graphics in Applets- GUI Application **-** Dialog Boxes -Creating Windows - Layout Managers – AWT Component classes – Swing component classes- Borders – Event handling with AWT components - AWT Graphics classes - File Choosers - Color Choosers – Tree –Table–Tabbed panels–Progressive bar - Sliders.

UNIT-III

JDBC **-**Introduction - JDBC Architecture -JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database andTable with JDBC - Working with Database Metadata; Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP –Socket Program using UDP-URL and Inet address classes.

UNIT–IV

Servlet: Advantages over Applets - Servlet Alternatives - Servlet Strengths - Servlet Architecture - Servlet Life Cycle – Generic Servlet, Http Servlet - First Servlet - Invoking Servlet - Passing Parameters to Servlets - Retrieving Parameters - Server-Side Include – Cookies- JSP Engines - Working with JSP - JSP and Servlet - Anatomy of a JSP Page-Database Connectivity using Servlets and JSP.

UNIT-V

Lambda Expressions- Method Reference- Functional Interface - Streams API, Filters-Optional Class- Nashorn- Base 64 Encode Decode- JShell (RPEL)- Collection Factory Methods- Private Interface Methods-Inner Class Diamond Operator-Multi resolution Image API.

TEXTBOOKS

1. Bert Bates, Karthy Sierra , Eric Freeman, Elisabeth Robson, "Head First Design Patterns", O'REILLY Media Publishers.(1st- Unit).

2. Herbert Schildt, "Java: A Beginner Guide", Oracle Pres-Seventh Edition. (2nd and 3rdUnit).

3. Murach's, "Java Servlets and JSP", 2ndEdition, Mike Murach& Associates Publishers; 3rd Edition. (4thUnit).

4. Warburton Richard, "Java 8 Lambdas", Shroff Publishers & Distributors Pvt Ltd. (5thUnit).

REFERENCES

1. Paul Deitel and Harvey Deitel, "Java: How to Program", Prentice Hall Publishers; 9thEdition.

2. Jan Graba, "An Introduction to Network Programming with Java- Java 7 Compatible", 3rd Edition,Springer.

OUTCOMES:

- Able to develop a Graphical User Interface (GUI) with Applet and Swing
- Develop a Client-Server Application with DatabaseMaintenance

Core Course-IV-INTERNET OF THINGS

OBJECTIVES:

- In order to gain knowledge on basics of Internet of Things (IoT), IoT Architecture, and the Protocols related to IoT; and understand the concept of the Web of Thing and the relationship between the IoT and WoT

UNIT - I

INTRODUCTION To IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies – IoT Levels and Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

UNIT - II

IoT ARCHITECTURE: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model- IoT reference architecture

UNIT - III

IoT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols –Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP -Security

UNIT - IV

WEB OF THINGS: Web of Things versus Internet of Things –Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards –Cloud Providers and Systems – MobileCloud Computing – The Cloud of Things Architecture.

UNIT - V

APPLICATIONS: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications- Smart Grid– Electrical Vehicle Charging.

TEXT BOOKS

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.

2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things",Springer,2011.

3. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to- Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier,2014.

4. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press -2010.

5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things– Key applications and Protocols",Wiley,2012.

OUTCOMES:

At the end of this course, students should be able to

- Gain the basic knowledge about IoT and they will be able to use IoT related products in reallife

- It helps to rely less on physical resources and started to do their work smarter

SEMESTER I

Core Course-V - Lab – I - ADVANCED JAVA PROGRAMMING LAB

1. Implementation of Multi-threading and Exception handlingconcepts
2. Write a program to read, write and copy a file using bytestreams.
3. Write a program to read, write and copy a file using characterstreams.
4. Develop a programs using AWT to display the personal detail of anemployee.
5. Develop a banking system using Swing.
6. Write a program to handle Mouse and Key events.
7. Implement TCP/IP protocol for message communication.
8. Implement UDP protocol for message communication.
9. Using JDBC develop a student information system.
10. Implement client/server communication using servlets.
11. Develop a web page using JSP.
12. Implementation of RMI.

SEMESTER I

Core Course-VI- 17PCSP02- Lab - II ALGORITHMS USING C++ LAB

1. Apply the Divide and Conquer technique to arrange a set of numbers using Merge Sort method.

2. Perform Strassen's matrix multiplication using Divide and Conquer method.

3. Solve the Knapsack problem using Dynamic Programming.

4. Construct a Minimum Spanning Tree using Greedy method.

5. Perform Warshall's Algorithm using Dynamic Programming.

6. Solve Dijkstra's Algorithm using Greedy Technique.

7. Solve Subset Sum problem using Backtracking

8. Implement the 8-Queens Problem using Backtracking.

9. Implement Knapsack Problem using Backtracking.

10. Find the solution of Traveling Salesperson Problem using Branch and Bound technique.

Core Course - VII –ADVANCED WEB TECHNOLOGY

OBJECTIVES:

- Explore the backbone of web page creation by developing .NET skill

- Enrich knowledge about HTML control and web control classes

- Provide depth knowledge about ADO.NET

- Understand the need of usability, evaluation methods for web services

UNIT - I

OVERVIEW OF ASP.NET - The .NET framework – Learning the.NET languages Data types – Declaring variables- Scope and Accessibility- Variable operations- Object Based manipulation- Conditional Structures- Loop Structures- Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spaces and assemblies. Setting up ASP.NET and IIS.

UNIT – II

DevelopingASP.NETApplications-ASP.NETApplications:ASP.NET Code behind- The Global.asax application file- Understanding ASP.NET Classes- ASP.NET Configuration. Web Form fundamentals: A simple page applet-Improving the currency converter- HTML control classes- The page class- Accessing HTML server controls. Web controls: Web Control Classes –Auto Post Back and Web Control events- Accessing web controls. Using Visual Studio.NET: Starting a Visual Studio.NET Project- Web form Designer- Writing code- Visual studio.NET debugging. Validation and Rich Controls: Validation- A simple Validation example- Understanding regular expressions- A validated customer form. State management - Tracing, Logging, and Error Handling.

UNIT – III

Working with Data - Overview of ADO.NET - ADO.NET and data management-Characteristics of ADO.NET-ADO.NET object model. ADO.NET data access : SQL basics–Select , Update, Insert, Delete statements- Accessing data- Creating a connection- Using a command with a Data Reader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding with data bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML

UNIT - IV

Web Services - Web services Architecture: Internet programming then and now- WSDL–SOAP- Communicating with a web service-Web service discovery and UDDI. Creating Web services: Web service basics- The Stock Quote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming aweb service- Using the proxy class- An example with Terra Service.

UNIT – V

Advanced ASP.NET - Component Based Programming: Creating a simple component – Properties and state- Database components- Using COM components. Custom controls: User Controls- Deriving Custom controls. Caching and Performance Tuning: Designing and scalability– Profiling- Caching- Output caching- Data caching – Object Caching. Implementing security: Determining security requirements- The ASP.NET security model- Forms authentication- Windows authentication.

TEXTBOOK

1. Mathew Mac Donald, "ASP.NET Complete Reference", TMH 2005.

REFERENCES

1. Crouch Matt J, "ASP.NET and VB.NET Web Programming", Addison Wesley2002.

2. J.Liberty, D.Hurwitz, "Programming ASP.NET", Third Edition, O'REILLY,2006.

OUTCOMES:

On the successful completion of this course, Students will be able to:

- Design a web page with Web form fundamentals and web control classes

- Recognize the importance of validation control, cookies and session

- Apply the knowledge of ASP.NET object, ADO.NET data access and SQL to develop a client server model

- Recognize the difference between Data list and Data grid controls in accessing data

Core Course - VIII–COMPILER DESIGN

OBJECTIVES:

- Discover principles, algorithms and techniques that can be used to construct various phases of compiler.

- Acquire knowledge about finite automata and regular expressions

- Learn context free grammars, compiler parsing techniques.

- Explore knowledge about Syntax Directed definitions and translation scheme

- Understand intermediate machine representations and actual code generation

UNIT – I

Lexical analysis - Language Processors, The Structure of a Compiler, Parameter passing mechanism – Symbol table - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – Finite automata - Regular expression to automata.

UNIT – II

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers.

UNIT – III

Semantic Analysis - Inheritedand Synthesized attributes – Dependency graphs – Ordering the evaluation of attributes – S- attributed definitions – L-attributed definitions – Applications of Syntax Directed translation – Syntax Directed translations schemes - Storage organization – Stack allocation of space.

UNIT– IV

Intermediate Code Generation - Variants of Syntax trees – Three Address code – Types and Declarations – Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements – Procedure calls.

UNIT – V

Code Generation and Code Optimization - Issues in the design of a code generator - The target language – Address in the Target Code –Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peep hole Optimization.

TEXTBOOK

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers-Principles, Techniques and Tools", Second Edition, Pearson Education Asia, 2009.

REFERENCES

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools, Addison- Wesley,2003.

2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park,1988.

3. Kennath C.Louden, Compiler Construction Principles and Practice, Vikas publishing House,2004.

4. AllenI.Holub, Compiler Design in C,Prentice Hall of India,2001.

5. S.GodfreyWinster, S.Aruna Devi, R.Sujatha, "Compiler Design", yesdee Publishers, Third Reprint2019.

OUTCOMES:

On the successful completion of this course, Students will be able to: Use the knowledge of patterns, tokens & regular expressions for solving a problem

SEMESTER II

Core Course - IX–DATA MINING

OBJECTIVES:

- To introduce the fundamental concepts of Data Mining Techniques and various Algorithms used for Information Retrieval from Datasets

UNIT - I

Data Mining And Data Preprocessing: Data Mining – Motivation – Definition – Data Mining on Kind of Data – Functionalities – Classification – Data Mining Task Primitives – Major Issues in Data Mining – Data Preprocessing – Definition – Data Clearing – Integration and Transformation – Data Reduction.

UNIT - II

Data Warehousing: Multidimensional Data Model –Data Warehouse Architecture – Data Warehouse Implementation –From data Warehousing to Data Mining – On Line Analytical Processing - On Line Analytical Mining.

UNIT - III

Frequent Patterns, Associations And Classification: The Apriori Algorithm – Definition of Classification and Prediction – Classification by Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Lazy Learners – K-Nearest Neighbor–Other Classification Methods.

UNIT - IV

Cluster Analysis: Definition – Types of data in Cluster Analysis – Categorization of major Clustering Techniques – Partitioning Methods Hierarchical Clustering – BIRCH - ROCK – Grid Based Methods – Model Based Clustering Methods–Outlier Analysis.

UNIT - V

Spatial, Multimedia, Text And Web Data: Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web – Data Mining Applications – Trends in Data Mining.

TEXT BOOKS

1. Jiawei Han and MichelineKamber, "Data Mining: Concepts and Techniques (The Morgan Kaufmann Series in Data Management Systems) 3rd Edition, July 6,2011.

2. Ian H. Witten, Eibe Frank, Mark A. Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Elsevier; Third edition,2014.

REFERENCES

1. Margret H. Dunham, "Data Mining: Introductory and Advanced Topics",Pearson Education,2003.

2. M. Awad, Latifur Khan, Bhavani Thuraisingham, Lei Wang, "Design and Implementation of Data Mining Tools", CRC Press- Taylor & Francis Group,2015.

3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining-Instructor's Solution Manual", Pearson Education, First Edition,2016.

4. MohammedJ.Zaki, Wagner Meira JR, "Data Mining and Analysis: Fundamental Concepts and Algorithms",Cambridge India, 2016.

OUTCOMES:

- After completing this course, students will be familiar with basic data mining concepts for solving real world problems

SEMESTER II

Core Course - X- Lab – III WEB TECHNOLOGY LAB

1. Create minimum two simple applications using controls. Eg: Calculator, Drawing Pictures using GDI, Animation and Trainer Kit.

2. Create a program to perform validation using validation controls.

3. Develop a website using ADO.Net to implement online Banking with login page, account details, deposit, withdraw, fund transfer and report of transaction with following options –last 10 days, last 1 month, last 6 month, last 1 year.

Note: create menu for navigation and also maintain session that expires after inactive of 5min.

4.Write a simple ASP.NET program to display the following Web Controls:

• A button with text "click me". The button control must be in the center of the form.

• A label with a text hello

• A checkbox.

 The form name must be Web Controls.

5.Write an application that simulates sending a SOAP message as a request and receiving another as a response.

6. Develop a web page to insert, update, delete student details using web service for accessing database.

7. Write a simple ASP.NET program using COM component.

8. Write a simple ASP.NET program to check whether a given string is palindrome or not using custom controls.

9. Create a Web Page and add Enable Caching attribute by the concept of Caching in ASP.Net.

10. Write a simple ASP.Net program to perform Form Authentication.

SEMESTER II

Core Course – XI-Lab – IV DATA MINING LAB

Develop **R** Script for the following:

1. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND).

2. To perform data import/export (.CSV, .XLS, .TXT) operations using dataframes.

3. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept.

4. To perform statistical operations (Mean, Median, Mode and Standarddeviation).

5. To perform data pre-processing operations

    i)   Handling Missing data   ii) Min-Maxnormalization

6. To perform dimensionality reduction operation using PCA.

7. To perform Simple Linear Regression and Multi Linear Regression.

8. To perform K-Means clustering operation and visualize it.

9. Write R script to diagnose any disease using KNN classification.

10. To perform market basket analysis using Apriori algorithm.

Core Course- XII - OPEN SOURCE COMPUTING

OBJECTIVES:

- To understand the basic Concepts of Python

UNIT - I

Python: Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets – Comparison.

UNIT - II

Code Structures: if, elif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions. Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods – Composition

UNIT-III

Data Types: Text Strings – Binary Data. Storing and Retrieving Data: File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – No SQL Data Stores.

UNIT-IV

Web: Web Clients – Web Servers – Web Services and Automation – Systems: Files – Directories – Programs and Processes – Calendars and Clocks

UNIT-V

Concurrency: Queues – Processes – Threads – Green Threads and gevent – twisted – Redis. Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.

TEXT BOOK

1. Bill Lubanovic, "Introducing Python", O"Reilly, First Edition-Second Release, 2014.

REFERENCE

1. Mark Lutz, "Learning Python", O"Reilly, Fifth Edition, 2013. David M. Beazley, "Python Essential Reference", Developer"s Library, Fourth Edition, 2009.

OUTCOMES:

- After completing this course, students will be familiar with the basics of Python programming for writing programs for the real world problems

SEMESTER III

Core Course- XIII – DIGITAL IMAGE PROCESSING

OBJECTIVES:

- To provide complete knowledge on Digital Image Processing methods, such as image processing methods in Spatial domain and Frequency domain, Edge detection, Compression, Segmentation, and Morphological concepts, which enable the students to understand the concepts and implement them empirically

UNIT–I

Fundamentals: Image Sensing and Acquisition, Image Sampling and Quantization, relationship between Pixels; Random noise; Gaussian Markov Random Field, σ-field, Linear and Non-linear Operations; Image processing models: Causal, Semi-causal, Non-causalmodels.

Color Models: Color Fundamentals, Color Models, Pseudo-color Image Processing, Full Color Image Processing, Color Transformation, Noisein Color Images.

UNIT–II

Spatial Domain: Enhancement in spatial domain: Point processing; Mask processing; Smoothing Spatial Filters; Sharpening Spatial Filters; Combining Spatial Enhancement Methods.

Frequency Domain: Image transforms: FFT, DCT, Karhunen-Loeve transform, Hotlling's T2 transform, Wavelet transforms and their properties - Image filtering in frequency domain.

UNIT–III

Edge Detection: Types of edges; threshold; zero-crossing; Gradient operators: Roberts, Prewitt, and Sobel operators; residual analysis based technique; Canny edge detection. Edge features and their applications.

UNIT–IV

Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory. Error Free Compression: Huff-man coding; Arithmetic coding; Wavelet transform based coding; Lossy Compression: FFT; DCT; KLT; DPCM; MRFM based compression; Wavelet transform based; Image Compression standards.

UNIT–V

Image Segmentation: Detection and Discontinuities: Edge Linking and Boundary Deduction; Threshold; Region-Based Segmentation. Segmentation by Morphological watersheds. The use of motion in segmentation, Image Segmentation based on Color.

Morphological Image Processing: Erosion and Dilation, Opening and Closing, Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology.

TEXT BOOKS

1. Rafael Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, PHI/Pearson Education, 2013.

2. A. K. Jain, Fundamentals of Image Processing, Second Ed., PHI, New Delhi, 2015.

REFERENCES

1. B. Chan la, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.

2. Nick Elford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.

3. Todd R.Reed, "Digital Image Sequence Processing, Compression, and Analysis", CRC Press, 2015.

4. L.Prasad, S.S.Iyengar, "Wavelet Analysis with Applicationsto Image Processing", CRC Press, 2015.

OUTCOMES:

At the end of this course, students should able to

- Review the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms

- Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques

- Interpret Image compression standards, and Interpret image segmentation and representation techniques

- Gain idea to process various image used in various fields such as weather forecasting, Diagnosis of various disease using image such as tumor, cancer etc

Core Course- XIV –BIG DATA ANALYTICS

OBJECTIVES:

- The course provides grounding in basic and advanced methods to big data technology and tools, including Map Reduce and Hadoop and its ecosystem

UNIT - I

Introduction to Big Data Analytics : Big Data Overview – Data Structures – Analyst Perspective on Data Repositories - State ofthe Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – BigData Ecosystem - Data Analytics Lifecycle – Data Discovery – Data Preparation – Model Planning – Model Building – Communicate Results –Operationalize.

UNIT - II

Basic Data Analytic Methods Using R : Introduction to R programming – R Graphical User Interfaces – Data Import and Export -Attribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Before Analysis– Dirty Data – Visualizing a SingleVariable – Examining Multiple Variables Data Exploration Versus Presentation -– Statistical Methods of Evaluation : Hypothesis Testing – Difference of Means – Wilcoxon Rank-Sum Test – Type I and Type II Errors – Power and Sample Size– ANOVA..

UNIT - III

Advanced Analytical Theory and Methods: Clustering – K Means – Use Cases – Overview – Determining number of clusters – Diagnostics –Reasons to choose and cautions –
Additional Algorithms - Association Rules : A Priori Algorithm – Evaluation of Candidate Rules-Applications of Association Rules – Validation and Testing – Diagnostics. Regression: Linear Regression and Logistic Regression: – Use cases – Model Description – Diagnostics - Additional Regression Models.

UNIT - IV

Classification : Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Naive Bayes – Bayes Theorem– Naïve Bayes Classifier – Smoothing – Diagnostics– Naïve Bayes in R – Diagnostics of Classifiers – Additional Classification Methods - Time SeriesAnalysis : Overview – Box – Jenkins Methodology – ARIMA Model – Auto correlation Function – Auto regressive Models – Moving Average Models – ARMA and ARIMA Models – Building and Evaluatingand ARIMA Model - Text Analysis : Text Analysis Steps – Example – Collecting – Representing Term Frequency – Categorizing – Determining Sentiments – Gaining Insights.

UNIT - V

Advanced Analytics-Technology and Tools: Map Reduce and Hadoop: Analytics for Unstructured Data .- *UseCases - MapReduce-* Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase – Manout – NoSQL - Tools in Database Analytics : SQL Essentials – Joins – Set operations – Grouping Extensions – In Database Text Analysis - Advanced SQL – Windows Functions – User Defined Functions and Aggregates – ordered aggregates- MADiib - AnalyticsReports Consolidation – Communicating and operationalizing and Analytics Project – Creating the Final Deliverables : Developing Core Material for Multiple Audiences – Project Goals – Main Findings – Approach Model Description – Key points support with Data -Model details – Recommendations –Data Visualization

TEXT BOOK

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services Published by John Wiley & Sons, Inc.2015

REFERENCE

1. Noreen Burlingame, "The little book on Big Data", New Street publishers, 2012.

2. Anil Maheshwari, "Data Analytics", McGraw Hill Education, 2017.

3. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", Starch Press; edition,2011.

4. Sandip Rakshit, "R for Beginners", McGraw Hill Education,2017

5. http://www.johndcook.com/R_language_for_programmers.html.

6. http://bigdatauniversity.com/.

7. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction.

OUTCOMES:

On successful completion of the course the student should

- Able to apply Hadoop ecosystem components

- Able to participate data science and big data analytics projects

Core Course – XV - Lab – IV DIGITAL IMAGE PROCESSING LAB

1. Choose two grayscale images or RGB images that you will first have to grayscale (with rgb2gray() function) . Display original images and the same images after their **QUANTIZATION** with different number of bits (1 to 8) using MATLAB.

2. Perform Histogram Equalization on a Color image using MATLAB.

3. Using Spatial Domain technique, write a program in MATLAB to perform Smoothening operation in an image.

4. Write a MATLAB code to transform 1-D FIR Filter to 2-D FIR Filter using Frequency Transformation Method. **(FIR-Finite Impulse Response).**

5. Find the Boundaries of Objects within an image by Sobel operator method in MATLAB.

6. Write a MATLAB program to detect the edges within the image and compare the results of both Canny and Prewitt Methods.

7. Write a program to Compress an image using Huffman coding method in MATLAB.

8. Implement Discrete Cosine Transformation method to compress an image using MATLAB.

9. Write a MATLAB code for Image Segmentation to convert to a binary image to improve the legibility of text Using thresholding technique.

10. Compute the Watershed Transform of the Segmentation function in an image at foreground and background marker pixels using Marker-Controlled Watershed Segmentation in MATLAB.

SEMESTER III

Core Course – XVI - Lab – IV MINI PROJECT USING OPEN SOURCE

The student must submit a report to the Guide allotted to them and appear for viva-voce examination. The project report may contain the following:

1. Introduction

2. Data Collection / system study

3. System development

4. Implementation

   • Source code

   • Sample input

   • Sample output

5. Conclusion

Core Course- XVII – MACHINE LEARNING

OBJECTIVES:

- To Learn about Machine Intelligence and Machine Learning applications

- To implement and apply machine learning algorithms to real-world applications.

- To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.

- To understand how to perform evaluation of learning algorithms and model selection.

UNIT - I

INTRODUCTION:Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT - II

NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms– Hypothesis Space Search – Genetic programming –Models of Evaluation and Learning.

UNIT - III

BAYESIAN AND COMPUTATIONAL LEARNING: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier –Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity –Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT - IV

INSTANT BASED LEARNING:K- Nearest Neighbor Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT - V

ADVANCED LEARNING :Learning Sets of Rules– Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution –Analytical Learning – Perfect Domain Theories– Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TEXT BOOKS

1. Tom M. Mitchell,―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES

1. Ethem Alpaydin,―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.

2. Stephen Marsland,―Machine Learning: An Algorithmic Perspective, CRC Press,2009.

3. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, "Genetic Algorithms and Genetic Programming",CRC Press Taylor and Francis Group.

OUTCOMES:

On completion of the course students will be expected to:

- Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc

- Have an understanding of the strengths and weaknesses of many popular machine learning approaches

- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning

- Be able to design and implement various machine learning algorithms in a range of real-world applications

ADVANCED COMPUTER ARCHITECTURE

OBJECTIVES:

- To study parallel computer architecture, design and micro-operations

- To understand the interconnection networks and synchronization mechanism

UNIT-I

Evolution of Computer systems – Parallelism in Uniprocessor Systems: Architecture, Mechanisms – Parallel Computer Structures: Pipeline , Array, Multiprocessor.

UNIT – II

Linear Pipeline processors: Asynchronous and Synchronous Models – Non-linear PipelineProcessors: Reservation and Latency Analysis –Collision-free scheduling – Instruction Pipeline Design: Instruction Execution Phases – Mechanisms f or Instruction Pipelining – Arithmetic Pipeline Design: Computer Arithmetic Principles – Static Arithmetic Pipelines – Multifunctional Arithmetic Pipelines - Superscalar Pipeline Design.

UNIT- III

SIMD Array Processor – SIMD Interconnection Network: Static vs Dynamic Network – Mesh connection Iliac Network- Tube interconnection Network. Associative Array Processing: Associative memory organization.

UNIT – IV

Multiprocessor System Interconnects: Hierarchical Bus System - Crossbar Switch and Multiport Memory - Multistage and Combining Networks – Cache Coherence and Synchronization Mechanisms: The Cache Coherence Problem – Snoopy Bus Protocols – Directory-Based Protocols – Hardware Synchronization Mechanisms – Message-Passing Mechanisms: Message-Routing Schemes – Deadlock and Virtual Channels – Flow Control Strategies – Multicast Routing Algorithms.

UNIT – V

Multiprocessor Operating Systems- Interprocessor Communication Mechanisms - Multiprocessor Scheduling Strategies.

TEXT BOOKS

1. Kai Hwang, Faye A.Briggs, "Computer Architecture and Parallel Processing," McGrawHill, 1985.

2. Kai Hwang, "Advanced Computer Architecture," McGraw -Hill International Editions, 2001.

REFERENCES

1. Grama, "An Introduction to Parallel Computing: Design and Analysis of Algorithms," 2 nd Edition, Pearson, 2004.

 2. Gita Alaghband, Harry Frederick Jordan, "Fundamentals of Parallel Processing," Prentice Hall, 2003.

 3. Seyed H Roosta, "Parallel Processing and Parallel Algorithms: Theory and Computation," Springer Science & Business Madia, 1999

OUTCOMES:

On completion of the course the student can understand

- Parallel computer architecture, design and micro-operations
- Interconnection of networks and synchronization mechanism
- Develop design skills of Instruction Sets
- Know how to design a pipelined data path

ELECTIVE I

OPTIMIZATION TECHNIQUES

OBJECTIVES:

- To understand the concept of optimization
- To develop mathematical model of real life cases
- To study Optimization algorithms

UNIT – I

Linear Programming Problem (LPP): Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem. Simplex method, two phase simplex method

UNIT – II

Duality in LPP- dual problem to primal- primalto dual problem- duality simplex method- Revised simplex method-revised simplex algorithm-revised simplex method versus simplex method

UNIT – III

Transportation Model: North West corner Method, Least cost method, and Vogel's approximation method. Determining Net evaluation- Degeneracy in TP- Assignment Model: Hungarian assignment model – Travelling sales man problem.

UNIT – IV

Replacement Problem: Replacement policy for equipment that deteriorate gradually, Replacement of item that fail suddenly- Individual and group replacement, Problems in mortality and staffing.

UNIT – V

Project Scheduling PERT/CPMNetworks – Fulkerson's Rule– Measure of Activity – PERT Computation – CPM Computation – Resource Scheduling.

TEXT BOOKS

1. Kanti Swarup, P.K. Gupta & Manmohan – Operation Research 1996.

2. S.Kalavathy: Operations Research – Second Edition – Vikas Publishing House Pvt.Ltd.,

3. S.Godfrey Winster, S. Aruna Devi, R.Sujatha, "Compiler Design", Yesdee Publishing.

REFERENCES

1. D.Shanthi, N.Uma Maheswari, S.Jeyanthi, "Theory of Computation", Yesdee Publishing.

2. John W.Chinneck, "Feasibility and Infeasibility in Optimization- Algorithms and Computational Methods", Springer, 2015.

OUTCOMES:

Upon completion of the course, students will have:

- Describe clearly a problem, identify its parts and analyze the individual functions. Feasibility study for solving an optimization problem

- Evaluate and measure the performance of an algorithm, Discovery, study and solve optimization problems

- Understand optimization techniques using algorithms, and Investigate, study, develop, organize and promote innovative solutions for various applications

EMBEDDED SYSTEMS

OBJECTIVES:

This course will enable students to:

- Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system

- Describe the hardware software co-design and firmware design approaches

- Know the RTOS internals, multitasking, task scheduling, task communication andsynchronization

- Learn the development life cycle of embedded system

UNIT - I

Introduction to Embedded system - Embedded system vs. General computing systems - History - Classification - Major Application Areas Purpose of Embedded systems - Smart running shoes: The innovative bonding of lifestyle with embedded technology. Characteristics and Quality Attributes of Embedded systems

UNIT - II

Elements of an embedded system - core of the embedded system: General purpose and domain specific processors, ASICs, PLDs, COTS- Memory - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces – Embedded Firmware - Reset circuit, Brown-out protection circuit, Oscillator unit, Real-time clock, and Watchdog timer - PCB and Passive Components

UNIT - III

Embedded Systems - Washing machine: Application-specific - Automotive: Domain specific - Hardware Software Co-Design - Computational Models - Embedded Firmware Design Approaches - Embedded Firmware Development Languages - Integration and testing of Embedded Hardware and firmware.

UNIT - IV

RTOS based Embedded System Design: Operating System Basics -Types of operating Systems - Tasks, process and Threads - Multiprocessing and Multitasking - Task Scheduling- Task Communication - Task Synchronization - Device Drivers - choosing an RTOS.

UNIT - V

Components in embedded system development environment, Files generated during compilation, simulators, emulators and debugging - Objectives of Embedded product Development Life Cycle – Different Phases of EDLC - EDLC Approaches - Trends in Embedded Industry - Case Study: Digital Clock.

TEXT BOOK

1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd.2009.

REFERENCES

1. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", TMH. Second Edition2009

2. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley. Third Edition2006

3. Cliff Young, Faraboschi Paolo, and Joseph A. Fisher, "Embedded Computing: A VLIW Approach to Architecture, Compilers and Tools", Morgan Kaufmann Publishers, An imprint of Elsevier,2005.

4. David E. Simon, "An Embedded Software Primer" Pearson Education,1999

OUTCOMES:

Students are able to

- Describe the differences betweenthe general computing system and the embedded system, also recognize the classification of embedded systems

- Become aware of interrupts, hyper threading and software optimization

- Design real time embedded systems using the concepts of RTOS

ADVANCED DATABASE MANAGEMENT SYSTEMS

OBJECTIVES:

- Acquire Knowledge of Database Models, Applications of Database Models and Emerging Trends

UNIT-I

Relational and parallel Database Design: Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF,BCNF, 4NF and 5NF. Architecture, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Interoperation Parallelism, Interoperation Parallelism.

UNIT-II

Distributed and Object based Databases: Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multi-set, Object Identity and Reference Types, Object Oriented versus Object Relational.

UNIT-III

Spatial Database: Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing.

UNIT-IV

XML Databases: XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, and Illustrative Experiments.

UNIT-V

Temporal Databases: Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

TEXT BOOK

1. Abraham Silberschatz, Henry F Korth , S Sudarshan, "Database System Concepts", 6th edition , McGraw-Hill International Edition ,2011

2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education Reprint 2016.

REFERENCES

1. Ramez Elmasri, Shamkant B Navathe, "Fundamental of Database Systems", Pearson, 7th edition2016.

2. Thomas Connolly, Carolyn Begg., "Database Systems a practical approach to Design, Implementation and Management", Pearson Education,2014.

OUTCOMES:

On completion of the course, students will able to

- Know about the Various Data models and Works on Database Architecture

- Knowledge patterns, Object Oriented Databases are well equipped

SOFT COMPUTING

OBJECTIVES:

- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory

- Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

UNIT - I

Introduction: Soft Computing Constituents – Soft Computing Vs. Hard Computing – Characteristics - Applications - Artificial Neural Network (ANN): FundamentalConcept – Application Scope - Basic Terminologies – Neural Network Architecture – Learning Process – Basic Models of ANN: McCulloch-Pitts Model – Hebb Network – Linear Separability.

UNIT - II

Supervised Learning Networks: Perceptron Networks – Adaline and Madaline Networks –Back Propagation Network – Radial Basis Function Network. Associative Memory Networks – BAM - Hopfield Network - Boltzmann Machine. Unsupervised Learning Networks: Kohonen Self Organizing Network – Counter Propagation Network – ART Network.

UNIT - III

Fuzzy Sets: Basic Concept – Crisp SetVs. Fuzzy Set - Operations on Fuzzy Set –Properties of Fuzzy Sets – Fuzzy Relations: Concept – Fuzzy Composition – Fuzzy Equivalence and Tolerance Relation - Membership Functions: Features – Fuzzification – Methods of Membership value assignments – De-fuzzification –Methods.

UNIT - IV

Fuzzy Arithmetic– Extension Principle – Fuzzy Measures – Fuzzy Rules and Fuzzy Reasoning: Fuzzy Propositions – Formation of Rules – Decomposition of Rules –Aggregation of Rules – Approximate Reasoning – Fuzzy Inference and Expert Systems –Fuzzy Decision Making – Fuzzy Logic Control Systems.

UNIT - V

Genetic Algorithm: Fundamental Concept – Basic Terminologies – Traditional Vs.Genetic Algorithm - Elements of GA - Encoding - Fitness Function – Genetic Operators: Selection – Cross Over - Inversion and Deletion - Mutation – Simple and General GA– The Schema Theorem - Classification of Genetic Algorithm – Genetic Programming – Applications of GA.

TEXT BOOK

1. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley India,2007.

REFERENCE

1. S. Rajasekaran, G.A.V. Pai, "Neural Networks, Fuzzy Logic, Genetic Algorithms", Prentice Hall India,2004.

OUTCOMES:

Upon completion of the course, the student are expected to

- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory

- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules,approximate reasoning, fuzzy inference systems, and fuzzy logic

- To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations

- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications

- Reveal different applications of these models to solve engineering and other problems

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ELECTIVE II

ADVANCED COMPUTER NETWORKS

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OBJECTIVES:

- To study communication network protocols, different communication layer structure

- To learn security mechanism for data communication

UNIT - I

Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP models – Example networks: Internet, 3G Mobile phone networks, Wireless LANs –RFID and sensor networks - Physical layer – Theoretical basis for data communication - guided transmission media

UNIT - II

Wireless transmission – Communication Satellites – Digital modulation and multiplexing - Telephones network structure – local loop, trunks and multiplexing, switching. Data link layer: Design issues – error detection and correction.

UNIT - III

Elementary data link protocols – sliding window protocols – Example Data Link protocols – Packet over SONET, ADSL - Medium Access Layer–Channel Allocation Problem–Multiple Access Protocols.

UNIT - IV

Networklayer - design issues - Routing algorithms - Congestion control algorithms – Quality of Service – Network layer of Internet- IP protocol – IP Address – Internet Control Protocol.

UNIT - V

Transport layer – transport service- Elements of transport protocol - Addressing, Establishing & Releasing a connection– Error control, flow control, multiplexing and crash recovery - Internet Transport Protocol – TCP- Network Security: Cryptography.

TEXT BOOK

1. S. Tanenbaum, 2011, Computer Networks, Fifth Edition, Pearson Education,Inc.

REFERENCES

1) B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, NewDelhi.

2) F.Halsall,1995, Data Communications, Computer Networks and Open Systems, Addison Wessley.

3) D. Bertsekas and R. Gallagher, 1992, Data Networks, Prentice hall of India, NewDelhi.

4) Lamarca, 2002, Communication Networks, Tata McGraw Hill, New Delhi.

5) Teresa C.Piliouras, "Network Design Management and Technical Perspectives, Second Edition", Auerbach Publishers, 2015.

WEBSITE, E-LEARNING RESOURCES

1) http://peasonhighered.com/tanenbaum

OUTCOMES:

After the completion of this course students will be able to

- To master the terminology and concepts of the OSI reference model and the TCP-IP reference model

- To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks

- To be familiar with wireless networking concepts, and be familiar with contemporary issues in networking technologies

- To be familiar with network tools and network programming

ELECTIVE III

CLOUD COMPUTING

OBJECTIVES:

- To provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations

- To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research

UNIT - I

COMPUTING BASICS: Cloud computing definition- Characteristics- Benefit-Challenges- Distributed Systems- Virtualization-Service-oriented computing- Utility-oriented computing- Building Cloud Computing environments- computing platforms & technologies - Cloud Models – Cloud Service Examples - Cloud Based Services & Applications - Cloud concepts and Technologies.

UNIT - II

VIRTUALIZATION, CLOUD SERVICES AND PLATFORMS : Virtualization:Virtualization- Characteristics-taxonomy-types- Pros and Cons- Examples Architecture: Reference model- types of clouds- Compute Service - Storage Services - Cloud Database Services - Application Services - Content Delivery Services - Analytics Services - Deployment And Management Service - Identity And Access Management Services - Open Source Private Cloud Software.

UNIT – III

CLOUD APPLICATION DESIGN AND DEVELOPMENT : Design consideration- Reference Architecture for Cloud Application - Cloud Application Design Methodologies - Data Storage Approaches- Development in Python: Design Approaches – Application: Image Processing - Document Storage – Map Reduce - Social Media Analytics.

UNIT–IV

PYTHON FOR CLOUD : Introduction- Installing Python-Data types & Data Structures- Control Flow- Functions- Modules- Packages- FileHandling- Date/Time Operations – Classes- Python for Cloud: Amazon Web Services –Google Cloud Platform - Windows Azure –Map Reduced – Packages of Interest–Designing a RESTful Web API.

UNIT – V

BIG DATA ANALYTICS, MULTIMEDIA CLOUD & CLOUD SECURITY: Big Data Analytics: Clustering big data - Classification of Big Data – Recommendation systems. Multimedia Cloud: Case Study: Live Video Stream App - Streaming Protocols – Case Study: Video Transcoding App-Cloud Security: CSA Cloud Security Architecture – Authentication - Authorization - Identity and Access management - Data Security - Key Management- Auditing- Cloud for Industry, Healthcare & Education.

TEXT BOOKS

1. Buyya, Vecciola and Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Tata McGraw Hill, 2013.

2. ArshdeepBahga, Vijay Madisetti, "Cloud Computing: A Hands – On Approach" Universities press (India) Pvt. limited2016.

REFERENCES

1. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press,2016.

2. Michael Miller "Cloud Computing Web based application that change the way you work and collaborate online". Pearson edition,2008.

3. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Jones & Bartlett Learning, 2012.

OUTCOMES:

Completing this course provides

- a good understanding of cloud computing and a systematic knowledge of the fundamental technologies, architecture, and security

ARTIFICAL INTELLIGENCE

OBJECTIVES:

- To understand about the basic theory of problem solving paradigms and search strategies in artificial intelligence

- To make the students familiar with knowledge representation, planning, learning, natural language processing and robotics

UNIT – I

Introduction - Intelligent Agents- Problem Solving - by Searching - Informed Search Strategies-Optimization Problems - Adversarial Search

UNIT – II

Knowledge and Reasoning - Logical Agents - First-Order Logic - Inference in First-Order Logic - Knowledge Representation

UNIT – III

Planning – Planning and Acting in the Real World - Uncertain knowledge and reasoning - Uncertainty - Probabilistic Reasoning - Probabilistic Reasoning over Time - Making Simple Decisions - Making Complex Decisions

UNIT – IV

Learning - Learning from Examples - Knowledge in Learning - Statistical Learning Methods - Reinforcement Learning

UNIT – V

Communicating, Perceiving and Acting - Natural Language Processing – Communication - Perception – Robotics.

TEXT BOOK

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach," Third Edition, Prentice Hall of India, New Delhi, 2010.

REFERENCES

1. Elaine Rich, Kevin Knight, B. Nair, "Artificial Intelligence," Third Edition, Tata McGraw-Hill, New Delhi, 2017.

2. Eugene Charniak, Drew McDermott, "Introduction to Artificial Intelligence," Pearson, 2002.

3. Mick Benson, "Artificial Intelligence: Concepts and Applications," Willford PR, 2018.

OUTCOMES:

After completing this course the student will be able to

- Understand the computation intelligence

- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning

OBJECT ORIENTED SYSTEM DEVELOPMENT

OBJECTIVES:

- Introduce the concept of Object-oriented design and understand the fundamentals of OOSD life cycle

- Familiar with evolution of object-oriented model, classes and it notations

- Practice UML in order to express the design of software projects

- Specify, analyze and design the use case driven requirements for a particular system

- Enrich knowledge about DBMS, designing classes and object oriented testing

UNIT - I

Fundamentals of OOSD - Overview of Object Oriented Systems Development: Two orthogonal view of the software - OOSD methodology - Why an object Object orientation. Object basics: Object Oriented Philosophy-Objects – Attributes – Object respond to messages – Encapsulation and information hiding – class hierarchy – Polymorphism – Object relationship and associations. OOSD life cycle: Software development process – OOSD Use case Driven Approach – Reusability.

UNIT – II

Methodology, Modeling and UML - Object Oriented Methodologies: Rumbaughet al.'s object modeling technique – The Booch methodology – The Jacobson etal. Methodology– Patterns – Frameworks -The Unified approach. Unified Modeling Language : Static and dynamic models – Why modeling - UML diagrams – UML class diagram – Use case diagram - UML dynamic modeling – packages and model organization.

UNIT – III

Object Oriented Analysis – Object Oriented Analysis process: Business Object Analysis - Use case driven object oriented analysis – Business process modeling – Use-Case model – Developing effective documentation. Classification : Classifications theory – Approaches for identifying classes –Noun phrase approach – Common class patterns approach – Use-Case Driven approach – Classes, Responsibilities and Collaborators - Naming classes. Identifying object relationships, attributes, and methods: Association– Super - Sub class relationship – Aggregation – Class responsibility – Object responsibility.

UNIT – IV

Object Oriented Design - Object Oriented Design Process and Design Axioms - OOD process- OOD axioms – Corollaries – Design patterns. Designing classes: Designing classes – Class visibility – Refining attributes – Designing methods and protocols – Packages and managing classes. Access layer: Object Store and persistence–DBMS - Logical and physical Database Organization and access control – Distributed Databases and Client Server Computing — Multi-database Systems – Designing Access layer classes. View Layer:

Designing view layer classes – Macro level process – Micro level process – The purpose of view layer interface – Prototyping the user interface.

UNIT – V

Software Quality - Software Quality Assurance: Quality assurance tests – Testing strategies – Impact of Object Orientation on Testing - Test Cases- Test Plan – Continuous testing. System Usability and Measuring User satisfaction: Usability Testing–User satisfaction test- A tool for analyzing user satisfaction. System Usability and Measuring User satisfaction: Introduction–Usability Testing.

TEXT BOOK

1. Ali Bahrami, "Object Oriented Systems Development using UML", McGraw-Hill,2008

REFERENCES

1. Booch Grady, Rumbaugh James, Jacobson Ivar, "The Unified modeling Language – User Guide, Pearson Education,2006

2. Brahma Dathan, Sarnath Ramnath, "Object Oriented Analysis, Design and Implementation", Universities Press,2010.

3. Mahesh P.Matha, "Object-Oriented Analysis and Design Using UML", PHI Learning Private Limited, 2012.

4. RachitaMisra, Chhabi Rani Panigrahi, Bijayalaxmi Panda, "Principles of Software Engineering and System Design", Yesdee Publishing 2019.

OUTCOMES:

On the successful completion of this course, Students will be able to

- Show how the object-oriented approach differs from the traditional approach to systems analysis and design

- Analyze, design, document the requirements through usecase driven approach

- Explain the importance of modeling and how the Unified Modeling Language (UML) represents an object-oriented system using a number of modeling views

- Recognize the difference between various object relationships

ELECTIVE IV

WAP AND XML

OBJECTIVES:

- The purpose of the course is to impart knowledgeon extensible Markup Language (XML) and to achieve secured, messaging through webservices

UNIT - I

Overview of WAP: WAP and the wireless world – WAP application architecture – WAP internal structure – WAP versus the Web – WAP 1.2 – WTA and push features. Settingup WAP: Available software products – WAP resources – The Development Toolkits.

UNIT - II

WAP gateways: Definition – Functionality of a WAP gateway – The Web model versus the WAP model – Positioning of a WAP gateway in the network – Selecting a WAP gateway Basic WML: Extensible markup language – WML structure – A basic WML card – Text formatting – navigation – Advanced display features.

UNIT - III

Interacting with the user: Making a selection –Events – Variables – Input and parameter passing. WML Script: Needfor WML script – Lexical Structure – Variables and literals – Operators – Automatic datatype conversion – Control Constructs Functions – Using the standard libraries – programs – Dealing with Errors.

UNIT - IV

XML: Introduction XML: An Eagle's Eye view of XML – XML Definition List of an XML Document – Related Technologies – An introduction to XML Applications – XML Applications – XML for XML – First XML Documents Structuring Data: Examining the Data XMLizing the data - The advantages of the XML format – Preparing a style sheet for Document Display.

UNIT - V

Attributes, Empty Tags and XSL: Attributes – Attributes Versus Elements – Empty Tags – XSL – Well-formed XML documents – Foreign Languages and Non Roman Text – Non Roman Scriptson the Web Scripts,Character sets, Fonts and Glyphs – Legacy character sets– The Unicode Character set – Procedure to Write XML Unicode.

TEXT BOOKS

1) Charles Arehart and Others. "Professional WAP with WML, WML script, ASP, JSP, XML, XSLT, WTA Push and Voice XML" Shroff Publishers and Distributers Pvt. Ltd 2000. (For Unit - I, II,III)

2) Eliotte Rusty Harlod "XML TM Bible", Books India (P) Ltd, 2000 (For Unit - IV &V)

REFERENCES

1. Heather Williamson, "XML: The Complete Reference ", Tata McGraw-Hill Education India.

OUTCOMES:

Students who successfully complete this course will be able to

- Apply XML concepts to develop Web application
- Develop SOA application using XML and Web Services
- Extract information from the websites using XML programming

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ELECTIVE IV

MOBILE COMPUTING

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OBJECTIVES:

- Understand the basic concepts ofmobile
- Be familiar with GPRS Technology
- system be exposed to Ad-Hoc networks
- Gain knowledge about different mobile platforms and application development

UNIT - I

Basics of mobile - Mobile device profiles - Middleware and gateways - Wireless Internet - Smart clients - Three-tier Architecture- Design considerations for mobile computing-–Mobility and Location based services.

UNIT - II

Mobile computing through Internet - Mobile-enabled Applications - Developing Mobile GUIs – VUIs and Mobile Applications – Characteristics and benefits – Multi channel and Multi modal user interfaces – Synchronization and replication of Mobile Data - SMS architecture – GPRS – Mobile Computing through Telephony.

UNIT - III

Mobile Application Development - Android- wi-fi –GPS – Camera – Movement – orientation - event based programming – iOS/ windows CE - Blackberry – windows phone – M-Commerce-structure – pros & cons – Mobile payment system -J2ME

UNIT - IV

ADHOC Wireless Network - Ad Hoc Wireless Network –MAC protocol - Routing protocols - Transport Layer Protocol - QoS – Energy Management– application design – work flow – composing applications –Dynamic linking – Intents and Services – Communication via the web.

Unit - V

Security and Hacking - Password security – Network security – web security – Database security **-**Wireless Sensor Network - Architecture and Design – Medium Access Control – Routing – Transport Layer –Energy model.

TEXT BOOKS

1. Jochen Schiller, Mobile Communications, SecondEdition, 2012.

2. William Stallings,"Wireless Communications & Networks", Pearson Education,2009.

REFERENCES

1. C.Siva Ram Murthy, B.S. Manoj,"Ad Hoc Wireless Networks – Architectures and Protocols", 2nd Edition, Pearson Education. 2004

2. Ashok K Talukder, Roopa R Yavagal, "Mobile Computing", Tata McGraw Hill,2005.

3. Jochen Burkhardt Dr.Horst Henn, Klaus Rintdoff, Thomas Schack, "Pervasive Computing", Pearson, 2009.

4. FeiHu,Xiaojun Cao, "Wireless Sensor Networks Principles and Practice "CRC Press,2010.

OUTCOMES:

- Able to explain the basics of mobile system

- Able to develop mobile application

- Understand the Mobile Adhoc networks and its routing

- Understand the different types of security features

ELECTIVE IV

GRID COMPUTING

OBJECTIVES:

- Understanding the fundamentals of gird computing
- Familiar with grid monitoring
- Learning the concepts of grid security and resources
- Be familiar with grid portals

UNIT-I

Introduction-Parallel and Distributed computing- Evolution of Distributed computing-Cluster computing-Grid Computing- Introduction to Grid Architecture and standards – Elements of Grid computing-Overview of Grid Architecture

UNIT-II

Review of Web Services-OGSA-WSRF-Challenges and Applications- Open Grid Services Architecture (OGSA)- Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- Grid ICE-– JAMM -MDS-Network Weather Service-R-GMA-Other Monitoring Systems

UNIT-III

Grid Security and Resource Management - Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms-Working principles of Scheduling - Grid Scheduling with QoS.

UNIT-IV

Data Management and Grid Portals-Data Management-Categories and Origins of Structured Data-Data Management-Challenges-Architectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals

UNIT-V

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

TEXT BOOK:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

2. Maozhen Li, Mark Baker, The Grid Core Technologies, John Wiley & Sons ,2005.

OUTCOMES:

On completion of this course you should be able to:

- have knowledge on grid computing, web services and service-oriented architecture, architecture for grid computing and grid scheduling

- explain about the grid security and privacy issues in the cloud

ELECTIVE V

WEB SERVICES

OBJECTIVES:

- To enable the student to be familiar with distributed services, XML and web services

- To study the use of web services in B2C and B2B applications

UNIT – I

Overview of Distributed Computing: Introduction to web services – Industry standards, Technologiesand concepts underlying web services – their support to web services. Applications that consume web services.

UNIT – II

XML – its choice for web services – network protocols to back end databases- technologies – SOAP, WSDL – exchange ofinformation between applications in distributed environment – locating remote web services – its access and usage. UDDI specification – an introduction.

UNIT - III

A brief outline of web services – conversation – static and interactive aspects of system interface and its implementation, work flow – orchestration and refinement, transactions, security issues – the common attacks – security attacks facilitated within webservices quality of services – Architecting of systems to meet users requirement with respect to latency, performance, reliability, QOS metrics, Mobile and wireless services – energy consumption, network bandwidth utilization, portals and services management.

UNIT – IV

Building real world enterprise applications using web services – sample source codes to develop web services – steps necessary to build and deploy web services and client applications to meet customer s requirement – Easier development, customization, maintenance, transactional requirements, seamless porting to multiple devices and platforms.

UNIT - V

Deployment of Web services and applications onto Tomcat application server and axis SOAP server (both are free wares) – Web services platform as a set of enabling technologies for XML based distributed computing.

TEXTBOOKS

1. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide, Prentice Hall and Nov2003.

2. Heather Williamson, "XML: The Complete Reference ", Tata McGraw-Hill Education India.

REFERENCES

1. Martin Kalin, "Java Web Services: Up and Running", O'Reilly Publishers.

OUTCOMES:

On completion of this course you should be able to:

- Understand the design principles and application of SOAP and REST based web services

- Design collaborating web services according to a specification

- Implement an application that uses multiple web services in a realistic business scenario

- Use industry standard open source tools such as Apache Axis2, Tomcat, Derby and Eclipse to build, test, deploy and execute web services and web applications that consume them

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ELECTIVE V

WIRELESS NETWORKS

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OBJECTIVES:

- To Study about Wireless Networks, Protocol Stack and Standards

- To Study about Fundamentals of 3G Services, its Protocols and Applications

- To Study about Evolution of 4G Networks, its Architecture and Applications

UNIT - I

WIRELESS LAN - Introduction-WLAN Technologies: Infrared, UHF Narrowband, Spread Spectrum -IEEE802.11: System Architecture, Protocol Architecture, Physical Layer, MAC Layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Manager Protocol, Security – IEEE802.16-WIMAX: Physical Layer, MAC, Spectrum Allocation For WIMAX

UNIT - II

MOBILE NETWORK LAYER - Introduction – Mobile IP: IP Packet Delivery, Agent Discovery, Tunneling and Encapsulation, IPV6- Network Layer In The Internet- Mobile IP Session Initiation Protocol – Mobile Ad-Hoc Network: Routing, Destination Sequence Distance Vector, Dynamic Source Routing.

UNIT - III

MOBILE TRANSPORT LAYER - TCP Enhancements For Wireless Protocols – Traditional TCP: Congestion Control, Fast Retransmit/Fast Recovery, Implications Of Mobility – Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time Out Freezing, Selective Retransmission, Transaction Oriented TCP – TCP Over 3G Wireless Networks.

UNIT - IV

WIRELESS WIDE AREA NETWORK - Overview of UTMS Terrestrial Radio Access Network-UMTS Core Network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High Speed Downlink Packet Access (HSDPA)- LTE Network Architecture and Protocol.

UNIT - V

4G NETWORKS - Introduction – 4G Vision – 4G Features And Challenges – Applications Of 4G – 4G Technologies: Multicarrier Modulation, Smart Antenna Techniques, OFDM-MIMO Systems, Adaptive Modulation And Coding With Time Slot Scheduler, Cognitive Radio.

TEXT BOOKS

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.(Unit - I,II,III)

2. Vijay Garg , "Wireless Communications And Networking", First Edition, Elsevier 2014.(Unit - IV,V)

REFERENCES

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming,"3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press,2008.

2. Anurag Kumar, D.Manjunath, Joy Kuri, "Wireless Networking", First Edition, Elsevier2011.

3. Simon Haykin , Michael Moher, David Koilpillai,"Modern Wireless Communications", First Edition,Pearson Education 2013.

4. David G. Messerschmitt, "Understanding Networked Applications", Elsevier,2010.

OUTCOMES:

Upon Completion of the course, the Students will be able to

- Conversant With the Latest 3G/4G and WiMAX Networks and its Architecture

- Design and Implement Wireless Network Environment for any application using Latest Wireless Protocols and Standards

- Implement different type of Applications for Smart Phones and Mobile Devices with Latest Network Strategies

CRYPTOGRAPHY AND NETWORK SECURITY

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems

- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks

- To know about the malicious software & firewalls

UNIT - I

Introduction - Security trends – Legal,Ethical and Professional Aspects of Security,Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture– Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfectsecurity– information theory – product cryptosystem – cryptanalysis.

UNIT - II

Symmetric Encryption and Message Confidentiality - Symmetric Encryption Principles, Symmetric BlockEncryption Algorithms, Stream Ciphers and RC4, Chipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. Public-key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures, Key Management.

UNIT - III

Authentication Applications - Kerberos, x.509 Authentication Service, Public-Key Infrastructure. Electronic MailSecurity: Pretty Good Privacy (PGP),S/MIME.

UNIT - IV

IP Security - IP Security Over view, IP Security Architecture, Authentication Header, Encapsulating Security Payload, and Combining Security Associations. Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, and SNMPv3.

UNIT - V

Intruders - Intruders, Intrusion Detection, Password Management. **Malicious Software:** Virus and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. **Firewalls:** Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

TEXT BOOKS

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007, Reprint2015.

2. Stallings William, "Cryptography and Network Security- Principles and Practice 2017.

3. William Stallings, "Network Security Essentials Applications and Standards" Third Edition, Pearson Education, 2008.

REFERENCES

1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.

2. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall Of India,2006.

3. Ulysess Black, "Internet Security Protocols", Pearson Education Asia,2000.

4. Charlie Kaufman andRadia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002.

5. Bruce Schneierand Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech IndiaPvt Ltd, 2003.

6. Douglas R Simson "Cryptography – Theory And Practice", First Edition, CRC Press, 1995.

7. Http://Nptel.Ac.In/.

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of networks security, security architecture, threats and vulnerabilities

- Apply the different cryptographic operations of symmetric cryptographic algorithms

- Apply the different cryptographic operations of public key cryptography

- Apply the various Authentication schemes to simulate different applications.

- Understand various Security practices and System security standards

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EXTRA DISCIPLINARY PAPERSCOMPUTER SCIENCE

List of **Extra Disciplinary Courses** (Non-Major Electives) offered by the Department ofComputer Science/Applications for other PG programmes

EDC – I - PRINCIPLES OF INFORMATION TECHNOLOGY

OBJECTIVES:

- To learn the basic concept and skills associated with information technology

- To know the Computer hardware and software technologies

- To gain the knowledge of organizing data

- To assess the current role of Information Science in an organization

- To understand how IT relates to organizational goals

UNIT-I

Business Environment: Business and Information technology – business in the information age–about information technology–what is an information system– Information Technology in the Modern Organization.

UNIT-II

Computer Hardware – Significance of Hardware – Central Processing Unit– Computer Memory – Computer Hierarchy – Input Technologies – Output Technologies. Computer Software: Software History and Significance–System Software–Application Software–Software issues–Programming languages–Enterprise Software.

UNIT-III

Managing Organizational Data and Information: Basics of Data arrangement and Access – Traditional file environment – modern approach: database management systems – logical data models – data warehouses – Networks– Internet- Evolution of the Internet –Operation of the Internet– WWW-Intranets and Extranets.

UNIT-IV

Functional, Enterprises, and Inter organizational Systems: Information system to support business functions – transaction processing information systems – accounting and finance system – marketing and sales system – production and operations management system –Integrated information system and enterprises resource planning–inter organizational/Global information system. –Electronic Commerce

UNIT-V

Information Systems Development: Information system planning–Traditional systems development life cycle – alternative methods for system development –system development outside the IS department – building Internet and Intranet applications –Implementing: Ethics, Impacts and Security.

TEXTBOOK

1. Turban, Rainer, Potter "Introduction to Information Technology," Second edition, Wiley India, 2007.

REFERENCE BOOK

1. V. Rajaraman, "Introduction to Information Technology, "Prentice Hall of India,2007

OUTCOMES:

- Able to understand the basics of information technology

- Gaining the knowledge of Hardware and Software technologies

- Learning the method of organizing data

- Assessing the role of Information Science to an organization.

- Understanding the role of IT in organizations

EDC - II - FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS

OBJECTIVES:

- To know the basics of Computers

- To learn the internal Components of Computers

- To understand the OS and its types

- To study the basics of networks and Internet

- To get a clear idea on DBMS and its concepts

UNIT-I

Introduction: What is computer – Components of Computers – Advantages and Disadvantages of using computers – Computer Software – Categories of Computers - Elements of information systems. The Components of the Systems Unit: Processor – Data representation – Memory – Mobile Computers and Devices.

UNIT–II

Input and Output Device: What is input – what are input devices – keyboard – pointing device – mouse – other pointing devices – Voice input –Digital Cameras – Video input – Scanners and Reading devices Terminals – Biometric input - Input devices for physically challenged users-Output: What is output – display devices – Monitors – Printers –Speakers, Headphones and Ear phones – output device for physically challenged users – Storage devices.

UNIT-III

Operating Systems and Utility Programs: System software – Operating system – Operating system functions – types of operating systems – standalone operating systems–network operating systems – embedded operating system. Application Software: Application software – Business software – Graphics and Multimedia Software–Application software for Communication.

UNIT-IV

Internet and World Wide Web: Internet – History of the Internet – How the Internet works –WWW– E-commerce–Communications and Networks: Communications – Uses of Computer Communications – Networks – Communication software – Communication devices – Communications Channel – Physical transmission media and Wireless transmission media.

UNIT-V

Database Management: Databases, Data and Information, The Hierarchy of data–Maintaining data – File processing versus databases – database management systems–relational, object oriented and multi dimensional databases – web databases – database administration. Computer Security: Computer security risks – Internet and network attacks –Unauthorized access and use.

TEXT BOOK

1. Gary B. Shelly, Thomasj. Cashman, Misty E.Vermaat, "Introduction to Computers,"Cengage Learning, 2008

REFERENCE BOOKS

1. Reema Thareja, "Fundamentals of Computers", Oxford Univ. Press,2015

2. Deborah Morley, Charles S.Parker, "Understanding Computers-Today and Tomorrow",14th Edition, Thomson Course Technology, 2012

3. Alexis Leon, Mathew's Leon, "Fundamentals of Computer Science and Communication Engineering", Vikas Publishing House, New Delhi, 1998.

OUTCOMES:

- Understanding the basics and internal parts of Computers

- Gaining the knowledge on OS and its types

- Studying the basics of networks and Internet

- Learning the databases and DBMS concepts

EDC - III – E – COMMERCE

OBJECTIVES:

- To know the mercantile and consumer process model

- To understand the Consumer's and Merchant's perspective

- To get an in depth idea on electronic data interchange

- To gain the knowledge on Internet, growth of internet and its commercial uses

UNIT-I

Electronic Commerce – Electronic Commerce Frame work – The Anatomy of Electronic Commerce Applications - Electronic Equipment Consumer Applications - Electronic Commerce Organization Applications - Components of I-Way – Network Access Equipment.

UNIT-II

Architecture Framework for Electronic Commerce- World Wide Web as the Architecture – Consumer Oriented Applications – Mercantile Process Models – Mercantile Models from the Consumer's Perspective and Merchant's Perspective.

UNIT-III

Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems–Smart Card and Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems.

UNIT-IV

Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues EDI and Electronic Commerce – Standardization and EDI – EDI Software Implementation.

UNIT–V

Internet and World Wide Web: origin of the Internet – New uses for the Internet – Commercial use of the Internet–Growth of the Internet – Advertising on the Internet.

TEXT BOOKS

1. Kalakota and Whinston, "Frontiers of Electronic Commerce", Pearson Education, 2004.

2. Gray P.Scheider, "Fourth Annual Edition Electronic Commerce", Thomson Course Technology, 2003.

REFERENCE BOOKS

1. Kamalesh K. Baja, Debjani Nag, "E-Commerce–The Cutting Edge of Business", TMH Publications, 2005.

2. Agarwala, K.N,   Deeksha Agarwala, "Business on the Net: What's and How's of E-Commerce;" Macmillan, New Delhi.

3. Parag Diwan, Sunil Sharma, "Electronic Commerce: A Manager's Guide to E-Business", Excel books, 2005.

COURSE OUTCOMES:

- Learning the introduction on e-commerce

- Understanding the mercantile and consumer process models

- Analysing the consumers and merchant's perspective on e-commerce

- Getting an idea on Electronic Data Interchange

- Gaining the knowledge on Internet