Manonmaniam Sundaranar University

Department of Computer Science & Engineering
University Department
M.Sc. COMPUTER SCIENCE -CBCS
[Effect from 2019 – 2020]

REGULATIONS

Eligibility

Bachelor degree in B.Sc. (Computer Sc.) or B.Sc. (I.T) or B.Sc. (S.E.) or B.Sc. (Computer Tech.) or B.C.A. with at least 50% (SC/ST-45%) marks in Part III of this University or any other University accepted by the Syndicate of Manonmaniam Sundaranar University as equivalent in the 10+2+3 pattern.

Entrance Test:

Applicants seeking admission to M.Sc. are required to appear for the Entrance Test to be conducted by M.S. University, Tirunelveli for the respective year.

Selection

1. Selection for the M.Sc. (C.S) programme will be made based on the entrance test marks.
2. Reservation of seats as per Tamilnadu Government norms.

Student Evaluation

1. Choice Based Credit System is followed for all the Courses.
2. Evaluation is based on continuous internal assessment (25%) and end-semester examination (75%). The Candidates have to score a minimum of 50% in the end semester examinations and 50% of total together in Internal & External in each Theory paper. For Practical papers the internal external marks are 50% & 50% respectively.
3. A Minimum of 75% attendance is required to appear for the University Examinations. The student failed to make the minimum required attendance shall not be permitted to appear the end semester examination.
4. When a student completes the required credits prescribed for the course, Overall Percentage of Marks (OPM) will be calculated as follows. The marks obtained by the candidate (sum of external and internal marks) in a paper are multiplied by the credits assigned to the paper. Such weighted marks for all the papers are added and divided by the total credit.

MASTER OF SCIENCE (COMPUTER SCIENCE)

PROGRAM EDUCATIONAL OBJECTIVES

The program educational objectives of M.Sc (Computer Science) program is designed to produce post graduates who are ready to apply their programming skills effectively to provide the solutions to industrial / social computational problems with minimum efforts.

The graduate shall:

1. Engage in professional practice to promote the development of innovative systems and optimized solutions for Computer Science and Engineering
2. Adapt to different roles and responsibilities in multidisciplinary working environment by respecting professionalism and ethical practices within organization and society at national and international level
3. Enhance skills and adapt new computing technologies for professional excellence

PROGRAM OUTCOMES

On completion of the M.Sc.(Computer Science) programme, the students shall be able to:

1. Apply their knowledge of computing to evaluate, analyze, synthesize, model and integrate technologies to develop new computerized solution for the industrial and social problem
2. Work upon unfamiliar problems through investigative studies and research and contribute to the development of technological knowledge and intellectual property. Comprehend and make effective technical reports and presentations on software / Hardware related issues.
3. Communicate effectively, as a member or team leader, in software projects involving multidisciplinary environments.
4. Learn reflectively from mistakes, engage in lifelong learning, adapt new developments and participate in continuing education opportunities to foster personal and organizational growth.
5. Understand contemporary issues in providing technological solutions for sustainable development considering impact on economic, social, political, and global issues and thereby contribute to the welfare of the society.
6. Demonstrate integrity, ethical behavior and commitment to code of conduct of professional practices and standards.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

M.Sc. Computer Science

Scheme of Examination [Effect from 2019 – 2020]

COURSE NAME : **M.Sc. (Computer Science)**

SEMESTER : **I**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCSC11	Mathematical Foundation Of Computer Science	4	3	1	0	25	75
2	NCSCPA	Design and Analysis of Algorithms	4	3	1	0	25	75
3	NCSC12	Principles of Compiler Design	4	3	1	0	25	75
4	NCSC13	Advanced Database Management Systems	4	3	1	0	25	75
5	NCSC14	Advanced Web Technology	4	3	1	0	25	75
6	NCSL11	Advanced Web Technology Laboratory	2	0	0	3	50	50
7	NCSL12	Design & Analysis of Algorithms Laboratory	2	0	0	3	50	50
TOTAL CREDITS 24								

COURSE NAME : **M.Sc. (Computer Science)**

SEMESTER : **II**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCSC21	Distributed Operating System	4	3	1	0	25	75
2	NCSC22	Free Open Source Software	4	3	1	0	25	75
3	NCSC23	Advanced Java Programming	4	3	1	0	25	75
4	NCSC24	Cryptography and Network Security	4	3	1	0	25	75
5	NCSMSA	Supportive Course	3	3	0	0	25	75
6	NCSL21	Advanced Java Programming Laboratory	2	0	0	3	50	50
7	NCSL22	Python Laboratory	2	0	0	3	50	50
TOTAL CREDITS 23								

COURSE NAME : **M.Sc. (Computer Science)**

SEMESTER : **III**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCSC31	Digital Image Processing	4	3	1	0	25	75
2	NCSC32	Internet of Things	4	3	1	0	25	75
3	NCSC33	Machine Learning	4	3	1	0	25	75
4	Annexure	Elective	3	3	0	0	25	75
5	NCSMSB	Supportive Course	3	3	0	0	25	75
6	NCSL31	Digital Image Processing Laboratory	2	0	0	3	50	50
7	NCSP31	Mini Project	7	0	0	3	50	50
TOTAL CREDITS 27								

COURSE NAME : **M.Sc. (Computer Science)**

SEMESTER : **IV**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCSP41	Major Project	16	0	0	16	50	50
TOTAL CREDITS 16								

CREDIT SUMMARY FOR M.Sc. (Computer Science)	
SEMESTER I	**24**
SEMESTER II	**23**
SEMESTER III	**27**
SEMESTER IV	**16**
TOTAL CREDITS	**90**

LIST OF ELECTIVE COURSES

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1.	NCSEA	Advanced Computer Networks	3	3	0	0	25	75
2.	NCSEB	Cloud Computing	3	3	0	0	25	75
3.	NCSEC	Theory of Computation	3	3	0	0	25	75
4.	NCSED	Embedded Systems	3	3	0	0	25	75
5.	NCSEE	Natural Language Processing	3	3	0	0	25	75
6.	NCSEF	Data Science and Big Data Analytics	3	3	0	0	25	75
7.	NCSEG	Cyber Forensics	3	3	0	0	25	75
8.	NCSEH	Wireless Sensor Networks	3	3	0	0	25	75
9.	NCSEJ	Human Computer Interaction	3	3	0	0	25	75
10.	NCSEK	Bioinformatics	3	3	0	0	25	75
11.	NCSEL	Block Chain Technology	3	3	0	0	25	75
12.	NCSEM	Web Services	3	3	0	0	25	75
13.	NCSEN	Soft Computing	3	3	0	0	25	75

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE [C L T P 4 3 1 0]

Objectives:

- To provide the strong fundamentals that will help the students in writing programs.
- To improve the logical reasoning while programming with computer languages.

UNIT I MATHEMATICAL LOGIC & SETS AND RELATIONS

Mathematical Logic: Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules ofInference.

Sets and Relations: Set Operations, Representation and Properties of Relations, Equivalence Relations, PartiallyOrdering.

UNIT II DISCRETE PROBABILITY

Counting, Mathematical Induction and Discrete Probability: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Inclusion- Exclusion Principle, Mathematical Induction, Probability, Bayes' Theorem.

UNIT III GRAPH THEORY

Group Theory: Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of GroupTheory.

Graph Theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees andCut-Sets.

UNIT IV BOOLEAN ALGEBRA

Boolean Algebra: Boolean Functions and its Representation, Simplifications of Boolean Functions.

UNIT V OPTIMIZATION

Optimization: Linear Programming - Mathematical Model, Graphical Solution, Simplex and Dual Simplex Method, Sensitive Analysis; Integer Programming, Transportation and Assignment Models, PERT-CPM: Diagram Representation, Critical Path Calculations, ResourceLevelling, Cost Consideration in Project Scheduling.

Outcomes:

At the end of the course the students will:

- ✓ Be familiar with the mathematical logic and the other related concepts.
- ✓ Understand the importance of the matrix, boolean algebra and graph theory.
- ✓ Be in a position to apply the concepts such as set theory and algebraic structure.

Reference:

1. M.K. Venkataraman, N. Sridharan and N. Chandrasekaran, ―Discrete Mathematics, The National Publishing Company, 2007.
2. Y.N. Singh, - Mathematical Foundation of Computer Science, New Age International Publishers, 2005.
3. Kenneth H. Rosen, ―Discrete Mathematics and its Applications, 6th Edition, TMH, 2008.
4. R.P. Grimaldi, ―Discrete and Combinatorial Mathematics, 5th Edition, Pearson Edition, 2007.
5. J.P. Tremblay and R. Manohar, ―Discrete Mathematical Structures with Applications to Computer Science, TMH, 2008.

DESIGN AND ANALYSIS OFALGORITHMS [C L T P 4 3 1 0]

Objective:

To learn effective problem solving in Computing applications and analyze the algorithmic procedure to determine the computational complexity of algorithms.

Unit I INTRODUCTION

Introduction: Algorithm Definition – Algorithm Specification – Performance Analysis-Asymptotic Notations. ElementaryData Structures: Stacks and Queues– Trees – Dictionaries – Priority Queues– SetsandDisjointSetUnion–Graphs

Unit II DIVIDE AND CONQUER

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

Unit III THE GREEDY METHOD

The Greedy Method: General Method - ContainerLoading - Knapsack Problem - Tree Vertex Splitting – Job Sequencing With Deadlines - MinimumCost Spanning Trees - Optimal Storage On Tapes– OptimalMergePatterns-SingleSourceShortestPaths.

Unit IV DYNAMIC PROGRAMMING

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-SourceShortest Paths - Optimal Binary Search Trees - StringEditing - 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 SpanningTrees
– Biconnected Components and DFS.

Unit V BACK TRACKING

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

Outcomes

- It gives stepwise procedure to solve problems.
- The Problems can be broken down into small pieces for program development.
- Efficient approach of solving problems by a model of computations

Text Book

1. Ellis Horowitz, SatrajSahni and SanguthevarRajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint2009.

References

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.

PRINCIPLES OF COMPILER DESIGN [C L T P 4 3 1 0]

Objectives

- Discover principles, algorithms and techniques that can be used to construct various phases ofcompiler.
- Acquire knowledge about finite automata and regularexpressions
- Learn context free grammars, compiler parsingtechniques.
- Explore knowledge about Syntax Directed definitions and translation scheme
- Understand intermediate machine representations and actual code generation

Unit – I LEXICAL ANALYSIS

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 oftokens–Finiteautomata- Regularexpressiontoautomata.

Unit – II SYNTAX ANALYSIS

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

Semantic Analysis - Inherited and Synthesized attributes– Dependency graphs – Ordering the evaluation of attributes –S- attributed definitions – L-attributeddefinitions – Applications of Syntax Directed translation – Syntax Directed translations schemes - Storageorganization–Stackallocationofspace.

Unit – IV INTERMEDIATE CODE GENERATION

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 & CODE OPTIMIZATION

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 – PeepholeOptimization.

Outcome

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

- Use the knowledge of patterns, tokens & regular expressions for solving a problem in the field of datamining.

Text Book

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,CompilerDesigninC,PrenticeHallofIndia,2001.
5. S.GodfreyWinster, S.Aruna Devi, R.Sujatha, "Compiler Design", yesdee Publishers, Third Reprint2019.

ADVANCED DATABASE MANAGEMENT SYSTEMS [C L T P 4 3 1 0]

Objective

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

Unit-I RELATIONAL AND PARALLEL DATABASE DESIGN

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, Intraoperation Parallelism, Interoperation Parallelism.

Unit-II DISTRIBUTED AND OBJECT BASED DATABASES

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 Multiset, Object Identity and Reference Types, Object Oriented versus ObjectRelational.

Unit-III SPATIAL AND LOGIC DATABASE

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 QueryProcessing.

Unit-IV XML DATABASE

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

Unit-V TEMPORAL DATABASE

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.

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.

Text Book

1. Abraham Silberschatz, Henry F Korth , S Sudarshan, "Database System Comcepts", 6th edition , McGraw-Hill International Edition ,2011
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education Reprint2016.

Reference Books

1. RamezElmasri, Shamkant B Navathe, "Fundamental of Database Systems", Pearson, 7th edition 2016.
2. Thomas Connolly, Carolyn Begg., "Database Systems a practical approach to Design,Implementation and Management ", Pearson Education,2014.

ADVANCED WEB TECHNOLOGY [C L T P 4 3 1 0]

Objectives

- Explore the backbone of web page creation by developing .NET skill.
- Enrich knowledge about HTML control and web controlclasses
- Provide depth knowledge aboutADO.NET
- Understand the need of usability, evaluation methods for web services

Unit –I OVER VIEW

OVERVIEW OF ASP.NET - The .NET framework – Learning the .NET languages Data types – Declaring variables- Scope and Accessibility- Variable operations- ObjectBased manipulation- Conditional Structures- LoopStructures- Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spacesandassemblies.SettingUpASP.NETandIIS

Unit – II APPLICATIONS

Developing ASP.NET Applications - ASP.NET Applications: ASP.NET applications– Code behind- The Global.asax application file- Understanding ASP.NET Classes- ASP.NET Configuration. Web Form fundamentals: Asimple page applet- Improving the currency converter- HTML control classes- The pageclass- Accessing HTML server controls. Web controls: WebControl Classes – Auto PostBack 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 RichControls: Validation- A simple Validation example- Understandingregular expressions- A validated customer form. State management - Tracing, Logging, and ErrorHandling.

Unit – III WORKING WITH DATA

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 DataReader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding withdata bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML

Unit – IV WEB SERVICES

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 StockQuote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Usingweb services: Consuming a web service- Using the proxy class- An example withTerraService.

Unit – V ADVANCED ASP.NET

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- Catching- Output catching- Data catching. Implementing security: Determining security requirements- TheASP.NET security model- Forms authentication-Windows authentication.

Outcomes

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

- Design a web page with Web form fundamentals and web controlclasses
- Recognize the importance of validation control, cookies and session
- ApplytheknowledgeofASP.NETobject,ADO.NETdataaccess and SQL to develop a client servermodel.
- Recognize the difference between Data list and Data grid controls in accessingdata.

TextBook

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

References

2. Crouch Matt J, “ASP.NET and VB.NET WebProgramming”, Addison Wesley2002.
3. J.Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O’REILLY,2006.

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Advanced Web Technology Laboratory [C L T P 2 0 0 3]

List of Experiments:

1. HTML
   - I. Simple HTML
   - II. Hyper Links
   - III. Using Frames
   - IV. Registration Form with Table
2. CSS
   - I. Inline Style, Internal Style, and External Style Sheets
3. DHTML
   - I. Use user defined function to get array of values and sort them in Ascending order
   - II. Demonstrate String and Math Object's predefined methods
   - III. Demonstrate Array Objects and Date Object's predefined methods
   - IV. Exception Handling
   - V. Calendar Creation: Display all month
   - VI. Event Handling
4. ASP
   - I. Create a welcome Cookie (Hit for a page) and display different image and text content each time when the user hit the page
   - II. List a table of content and navigate within the pages
   - III. Demonstrate Request and Response object using HTML Form
   - IV. Database Connection to display all the values in the table
5. Java Servlets
   - I. Simple Servlets
   - II. Servlets with HTML form
   - III. Cookie creation and retrieval using servlet
6. XML
   - I. Create a any catalog
   - II. Display the catalog created using CSS or XSL
7. PHP
   - I. File operation
   - II. Regular Expression, Array, Math, String, Date functions

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Design and Analysis of Algorithm [C L T P 2 0 0 3]

List of Experiments:

1. Write a C++ program to perform Selection Sort using Brute Force Technique.
2. Write a C++ program to perform Sequential Search using Brute Force Technique
3. Write a C++ program to perform Quick sort & Merge Sort using the Divide and Conquer Technique.
4. Write a C++ program to perform Binary Tree Traversal using the Divide and Conquer Technique.
5. Write a C++ program to perform Binary Search using the Decrease and Conquer Technique.
6. Write a C++ program to implement Matrix operations using Transform and Conquer Technique.
7. Write a C++ program to perform Heap Sort using the Transform and Conquer Technique.
8. Write a C++ program to solve the Knapsack problem using Greedy Method.
9. Write a C++ program to find the Minimum Spanning Tree using Greedy Method.
10. Compute the Transitive Closure of a given Directed Graph using Warshall's Algorithm in Dynamic Programming.
11. Write a C++ program to implement Matrix Chain Multiplication problem using Dynamic Programming.
12. Write a C++ program to perform Optimal Binary Search Tree using the Dynamic Programming.
13. Write a C++ program to implement Travelling Salesman Problem
14. Write a C++ program to find the solution to Subset -Sum Problem using the Backtracking method.
15. Write a C++ program to find the solution to the 8 Queen’s problem using the Backtracking method.

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DISTRIBUTED OPERATING SYSTEM [C L T P 4 3 1 0]

Objectives

- To study Distributed operating systemconcepts
- To understand hardware, software and communication in distributedOS
- To learn the distributed resource managementcomponents.
- Practices to learn concepts of OS and Program the principles of OperatingSystems

UNIT I INTRODUCTION

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

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

UNIT III DISTRIBUTED RESOURCE MANAGEMENT

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 RECOVERY

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

UNIT V MULTIPROCESSOR AND OPERATING SYSTEMS

Multiprocessor and Database Operating Systems –Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory management – Reliability/Fault Tolerance– Database Operating Systems – concepts – Features of AndroidOS, Ubuntu, GoogleChromeOSandLinuxoperatingsystems.

Outcomes

- Clear understanding on several resource management techniques like distributed shared memory and otherresources
- Knowledge on mutual exclusion and Deadlock detection of Distributed operatingsystem.
- Able to design and implement algorithms of distributed shared memory and commitprotocols
- Able to design and implement faulttolerant distributed systems.

Text Books

1. MukeshSinghalN.G.Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill2000.
2. DistributedOperatingSystem–AndrewS.Tanenbaum,PHI.

Reference Books

1. Abraham Silberschatz, Peter B.Galvin, G.Gagne, "Operating Concepts", 6thEdition Addison Wesley publications2003.

2. Andrew S.Tanenbaum, "Modern Operating Systems", 2ndEdition Addison Wesley2001

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FREE OPEN SOURCE SOFTWARE [C L T P 4 31 0]

Objectives:

- The student should be made to be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.

Unit I INTRODUCTION 9

Notion of Community–Guidelines for effectively working with FOSS community–, Benefits of Community based Software Development –Requirements for being open, free software, open source software –Four degrees of freedom – FOSS Licensing Models – FOSS Licenses – GPL- AGPL- LGPL – FDL – Implications – FOSS examples.

Unit IILINUX 9

Linux Installation and Hardware Configuration – Boot Process-The Linux Loader (LILO) – The Grand Unified Bootloader (GRUB) – Dual-Booting Linux and other Operating System – Boot-Time Kernel Options- X Windows System Configuration-System Administration – Backup and Restore Procedures-Strategies for keeping a Secure Server.

Unit III INTRODUCTION TO PYTHON 9

Introduction to Software Devlopment – Values and variables – Expressions and Arithmetic – Conditional Statements – Iterations.

Unit IV FUNCTIONS AND OBJECTS 9

Introduction to Functions – Functions and Modules – Writing Functions – Objects – Lists.

Unit V EXCEPTION HANDLING 9

Exception Handling – Class Design.

Outcomes:

Upon completion of the course, the student should be able to:

- ✓ Install and run open-source operating systems.
- ✓ Gather information about Free and Open Source Software projects from software releases and from sites on the internet.
- ✓ Build and modify one or more Free and Open Source Software packages.
- ✓ Use a version control system.
- ✓ Contribute software to and interact with Free and Open Source Software development projects.

References:

1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, Sixth Edition, OReilly Media, 2009.
2. Philosophy of GNU URL: http://www.gnu.org/philosophy/.
3. Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-made-easy/.
4. Richard L.Halterman, Fundamentals of Python Programming, 2017.

ADVANCED JAVA PROGRAMMING [C L T P 4 3 1 0]

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 timeprojects
- 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 ofsociety

UNIT-I DESIGN PATTERNS

Design Patterns: Introduction toDesign 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 Setclass 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

Applet Fundamentals- Applet Class - Applet lifecycle- Steps forDeveloping Applet Programs- Passing Values through Parameters- Graphics in Applets- GUI Application - DialogBoxes - 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

JDBC -Introduction -JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating aNew Database and Table with JDBC - Working with Database Metadata; Java NetworkingBasics of Networking - Networking in Java- Socket Program using TCP/IP- SocketProgramusingUDP-URLandInetaddressclasses.

UNIT–IV SERVLET

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 JSPPage-DatabaseConnectivityusingServletsandJSP.

UNIT-V EXPRESSIONS

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- Multiresolution Image API.

Outcomes

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

Textbooks

1. Bert Bates, KarthySierra , 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 3rd Unit).
3. Murach's, "Java Servlets and JSP", 2nd Edition, Mike Murach& Associates Publishers; 3rd Edition. (4th Unit).
4. Warburton Richard, "Java 8 Lambdas", Shroff Publishers & Distributors Pvt Ltd. (5th Unit).

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.

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CRYPTOGRAPHY AND NETWORK SECURITY [C L T P 4 3 1 0]

Objectives

- To understand Cryptography Theories, Algorithms andSystems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computernetworks.
- To know about the malicious software &firewalls.

Unit I INTRODUCTION

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

Unit II ENCRYPRION & DECRYPTION

Symmetric Encryption and Message Confidentiality - Symmetric Encryption Principles, Symmetric Block Encryption 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, KeyManagement.

Unit III AUTHENTICATION APPLICATIONS

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

Unit IV IP SECURITY

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

Unit V INTRUDERS

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.

Outcomes

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

- Understand the fundamentals of networks security, security architecture, threats andvulnerabilities
- Apply the different cryptographic operations of symmetric cryptographicalgorithms
- 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

Text books

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007, Reprint2015.
2. Stallings William, "Cryptography and Network Security - Principles and Practice2017.
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", PHI2002.
5. Bruce Schneier And Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd,2003.
6. Douglas R Simson "Cryptography – Theory And Practice", First Edition, CRC Press,1995.
7. Http://Nptel.Ac.In/.

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ADVANCED JAVA PROGRAMMING LABORATORY [C L T P 2 0 0 3]

1. Simple Javaprogram
2. ProgramusingJDBCwithcreate,inserttabledata
3. SQLException,SQLWarning
4. ProgramsusingTCP/IPclientsockets,TCP/IPserversockets
5. ProgramwithURL,URLconnection,Datagramsconnection
6. Client/Server applications usingRMI
7. SimpleprogramsusingBeanDevelopmentKit,JARfiles
8. Program with DesignPatterns,
9. Program with Events andmethods
10. Create a servlet to read theparameters
11. Programs usingcookies
12. Programs with sessiontracking
13. Programs using JApplet, Buttons, Combo, Trees, Tables,Panes
14. ProgramswithAWTClasses,WorkingwithGraphics,ColorandFont

Python Laboratory [C L T P 2 0 0 3]

List of Experiments:

1. Write a program that declares 3 integers, determines and prints the largest and smallest in the group.
2. Write a program to sort a list of elements using Bubble Sort.
3. Write a program to perform Insertion Sort.
4. Write a Program to find the Exponentiation of a number.
5. Write a program to implement Linear Search.
6. Write a program to calculate Binomial Coefficient using Function.
7. Write a program to calculate Average of numbers using Function.
8. Write a program to convert Decimal Number into Binary Number.
9. Write a program to calculate Addition of two number using Methods.
10. Write a Program to Find the Area of a Rectangle Using Classes.
11. Write a Program to Create a Class and Compute the Area and the Perimeter of the Circle.
12. Write a Program to Create a Class which Performs Basic Calculator Operations.
13. Write a Program to Create a Class in which One Method Accepts a String from the User and Print it.
14. Write a Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File.
15. Write a Program to Read a Text File and Print all the Numbers Present in the Text File.

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DIGITAL IMAGE PROCESSING [C L T P 4 3 1 0]

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 INTRODUCTION

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-causal models.

ColorModels: ColorFundamentals,ColorModels,Pseudo-colorImage Processing, Full Color Image Processing, Color Transformation, Noise in ColorImages.

UNIT–II SPATIAL DOMAIN & FREQUENCY DOMAIN

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

Frequency Domain: Image transforms: FFT, DCT, Karhunen-Loevetransform,Hotlling's T^2 transform, Wavelet transforms and their properties. Image filtering in frequency domain.

UNIT–III EDGE DETECTION

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

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

UNIT–V IMAGE SEGMENTATION

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 onColor.

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

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 usingvarioustransforms.
- Evaluate the techniques for image enhancement andimage restoration. Categorize various compressiontechniques.
- Interpret Image compression standards, and Interpret image segmentation and representationtechniques.
- Gain idea to process various image used in various fields such as weather forecasting, Diagnosis of various disease using image such as tumor, canceretc.

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. DuttaMajumder, "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 Applications to Image Processing", CRC Press,2015.

INTERNET OF THINGS [C L T P 4 3 1 0]

Objective

- In order to gain knowledge on bases 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

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- IoTPlatformsDesign Methodology.

UNIT II ARCHITECTURE

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 PROTOCOLS

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– ZigbeeArchitecture– Networklayer–6LowPAN-CoAP-Security

UNIT IV WEB OF THINGS

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 – WoTPortals and Business Intelligence.Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – TheCloud of ThingsArchitecture.

UNIT V APPLICATIONS

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, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.

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 worksmarter.

Reference Books:

1. ArshdeepBahga, 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 ofThings–KeyapplicationsandProtocols”,Wiley,2012.

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MACHINE LEARNING [C L T P 4 3 1 0]

Objectives

- To Learn about Machine Intelligence and Machine Learning applications
- To implement and apply machine learning algorithms to real-worldapplications.
- 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 modelselection.

UNIT I INTRODUCTION

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

UNITIINEURALNETWORKSANDGENETICALGORITHMS

NeuralNetworkRepresentation – Problems – Perceptrons – Multilayer Networks and BackPropagationAlgorithms–AdvancedTopics–GeneticAlgorithms– Hypothesis Space Search – Genetic Programming – Models of Evaluation andLearning.

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 BoundModel.

UNIT IVINSTANT BASED LEARNING

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT V ADVANCEDLEARNING :

Learning Sets of Rules – Sequential Covering Algorithm – LearningRule 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 DifferenceLearning

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 learningapproaches.
- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervisedlearning.
- Be able to design and implement various machine learning algorithms in a range of real-worldapplications.

TEXT BOOK

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

REFERENCES

1. EthemAlpaydin, ―Introduction to Machine Learning (Adaptive ComputationandMachine 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 FrancisGroup.

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Digital Image Processing Laboratory [C L T P 2 0 0 3]

List of Experiments:

1. Write a program in Matlab to convert Gray Scale image to Binary Image.
2. Write a program in Matlab for finding Negative of an Image.
3. Write a program in Matlab for Histogram Equalization.
4. Write a program in Matlab for Arithmetic Operators using Image.
5. Write a program in Matlab for Gaussian Low pass Filter.
6. Write a program in Matlab for Gaussian High pass Filter.
7. Write a program in Matlab for Homomorphic Filtering.
8. Write a program in Matlab for Edge Detection.
9. Write a program in Matlab for Erosion of an Image.
10. Write a program in Matlab for Dilation of an Image.
11. Write a program in Matlab for conversion between color spaces.
12. Write a program in Matlab for Segmentation using watershed transform

ELECTIVES

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ADVANCED COMPUTER NETWORKS [C L T P 3 3 0 0]

Objectives

- To study communication network protocols, different communication layerstructure
- To learn security mechanism for datacommunicaton

Unit 1 INTRODUCTION

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 – Theoreticalbasis for data communication - guided transmission media

Unit-2 WIRELESS TRANSMISSION

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

Unit 3 DATA LINK PROTOCOLS

Elementary data link protocols - sliding window protocols – Example Data Link protocols – Packet over SONET, ADSL- Medium Access Layer– ChannelAllocationProblem–MultipleAccessProtocols.

Unit 4 NETWORK LAYER

Network layer - designissues - Routing algorithms - Congestion control algorithms – Quality of Service – Network layer of Internet- IP protocol– IPAddress–InternetControlProtocol.

Unit 5 TRANSPORT LAYER

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

Outcomes

After the completion of this course students will be able to

- To master the terminology and concepts of the OSIreference model and the TCP-IP referencemodel.
- 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 networkingtechnologies.
- To be familiar with network tools and networkprogramming

Text Book

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

Reference Books

1. B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, NewDelhi.
2. F.Halsall,1995,DataCommunications,ComputerNetworksand 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, NewDelhi.
5. Teresa C.Piliouras, "Network Design Management and Technical Perspectives, Second Edition", Auerbach Publishers,2015.

Website, E-learning resources

1. http://peasonhighered.com/tanenbaum

CLOUD COMPUTING [C L T P 3 3 0 0]

Objective

- The objective of this course is 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.
- Another objective is to expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study andresearch.

UNIT - I COMPUTING

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 – IIVIRTUALIZATION, 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 - DocumentStorage - Map Reduce - Social Media Analytics.

UNIT –IV PYTHON FOR CLOUD

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

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 –AuthenticationAuthorization - Identity and Access management - Data Security - Key Management- Auditing- Cloud for Industry, Healthcare & Education.

Outcome

- Completing this course should provide you with a good understanding of cloud computing and a systematic knowledge of the fundamental technologies, architecture, and security.

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–OnApproach"Universitiespress(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, BusinessModels, Mobile,Security and More, Jones & Bartlett Learning, 2012.

THEORY OF COMPUTATION [C L T P 3 3 0 0]

Objectives

- The learning objectives of this course are to introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability. To enhance/develop students' ability to understand and conduct mathematical proofs for computation andalgorithms.

Unit 1 INTRODUCTION

Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite. Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite.Automata (NFA) – Finite Automata with Epsilontransitions.

Unit 2 EXPRESSION

Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties ofregular languages – Equivalence and minimization ofAutomata.

Unit 3GRAMMAR

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata– Equivalence of Pushdown automata and CFG– Deterministic PushdownAutomata.

Unit 4 NORAML FORMS

Normal forms for CFG – Pumping Lemma for CFL – Closure Propertiesof CFL – Turing Machines – Programming Techniques for TM. AlanguagethatisnotRecursivelyEnumerable(RE).

Unit 5 CLASSES

An undecidable problem RE – Undecidable problems about Turing Machine – Post’s Correspondence Problem – The classes P and NP.

Outcomes

After completing this course, students will be able to:

- Analyse and design finite automata, pushdown automata, Turing machines, formal languages, andgrammars.
- Demonstrate their understanding of key notions, such as algorithm, computability, decidability, and complexity through problemsolving.
- Prove the basic results of the Theory of Computation, state and explain the relevance of the Church-Turingthesis.

Textbook

1. Peter Linz, "An Introduction to Formal Languages and Automata", Third Edition ,Narosa,2005
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", second Edition, Pearson Education,2007.

Reference Books

1. H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education,2003.
2. Thomas A. Sudkamp," An Introduction to the Theory of Computer Science,Languages and Machines", Third Edition, Pearson Education,2007.
3. Raymond Greenlaw an H.James Hoover, " Fundamentals of Theory of Computation, Principles and Practice", Morgan Kaufmann Publishers,1998.
4. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole,1997.
5. J. Martin, "Introduction to Languages and the Theory of computation," Third Edition, Tata McGraw Hill,2007.

EMBEDDED SYSTEMS [C L T P 3 3 0 0]

Objective

This course will enable studentsto:

- Understand the basic hardware components and their selection method based on the characteristics and attributes of anembeddedsystem.
- 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 embeddedsystem

Unit I INTRODUCTION

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

Unit II EMBEDDED SYSTEM

Elements of an Embedded system - core of the embedded system: General purpose and domain specific processors, ASICs, PLDs, COTSMemory - 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 PassiveComponents

Unit III APPLICATIONS

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

Unit IV DESIGNS

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

Unit V COMPONENTS

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

Outcomes

Students are able to

- Describe the differences between the general computing system and the embedded system, also recognize the classification of embeddedsystems.
- Become aware of interrupts, hyper threading and software optimization.
- DesignrealtimeembeddedsystemsusingtheconceptsofRTOS.

Text Book

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

Reference Books

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

NATURAL LANGUAGE PROCESSING [C L T P 3 3 0 0]

Objectives:

- To make the students to be competent enough to apply the NLP techniques to provide the solutions.

Unit I INTRODUCTION **9**

Introduction to NLP, Language Structure and Language Analyzer.

Unit II WORDS AND THEIR ANALYZER **9**

Words and Their Analyzer, Local Word Grouping, Paninian Grammar, Paninian Parser.

Unit III MACHINE TRANSLATION **9**

Machine Translation**,** Lexical Functional Grammar, LFG and Indian Languages.

Unit IV TREE ADJOING GRAMMAR **9**

Adjoining Grammar, Comparing TAG with PG.

Unit V GOVERNMENT AND BINDING **9**

Government and Binding, Comparing GB with PG.

Outcomes:

At the end of the course the students will be able to:

- ✓ Describe the various NLP techniques, Grammer, machine translation
- ✓ Apply the NLP concepts to provide the solutions.

References:

1. Natural Language Processing: A Paninian Perspective - AksharBharati, Chaitanya&Sangal – PHI - 2010
2. Natural Language Processing and Text mining – Anne Kao – Springer – 2011
3. Natural Language Processing – Semantic Aspects – CRC Press 2013

DATA SCIENCE AND BIG DATA ANALYTICS [C L T P 3 3 0 0]

Objectives

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

Unit I INTRODUCTION

Introduction to Big Data Analytics : Big Data Overview – Data Structures – Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – Big Data Ecosystem - Data Ana lytics Lifecycle – Data Discovery – Data Preparation – Model Planning – ModelBuilding–CommunicateResults– Operationalize.

Unit II DATA ANALYTIC METHODS

Basic Data Analytic Methods Using R : Introduction to R programming – R Graphical User Interfaces – Data Import and ExportAttribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Befor Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables Data Exploration Versus Presentation -– Statistical Methods of Evaluation : Hypothesis Testing – Difference of Means – Wilcoxon Rank-Sum Test – Type I and TypeIIErrors–PowerandSampleSize–ANOVA..

Unit III ADVANCED METHODS

Advanced Analytical Theory and Methods: Clustering – K Means – Use Cases – Overview – Determining number of clusters –DiagnosticsReasons to choose and cautions– Additional Algorithms - AssociationRules:APrioriAlgorithm– EvaluationofCandidateRulesApplications of Association Rules – Validation and Testing – Diagnostics.Regression:LinearRegrressionandLogisticRegression: – Use cases – Model Description – Diagnostics - Additional Regression Models.

UnitIV CLASSIFICATION

Classification : Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Na'ive Bayes – Bayes Theorem – Naïve Bayes Clasifier – Smoothing – Diagnostics – Naïve Bayes in R – Diagnostics of Classifiers – Additional Classification Methods -Time Series Analysis : Overview – Box – Jenkins Methodology – ARIMA Model – Autocorrelation Function – Autoregressive Models – Moving Average Models – ARMA and ARIMA Models – Building and Evaluating and ARIMA Model - Text Analysis : Text Analysis Steps – Example – Collecting – Representing Term Frequency – Categorizing – Determining Sentiments – GainingInsights.

Unit V TECHNOLOGY

Advanced Analytics-Technology and Tools:

MapReduce 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

Outcomes

On successful completion of the course the student should

- Able to apply Hadoopecosystemcomponents.
- Abletoparticipatedatascienceandbigdataanalyticsprojects

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 Books

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 SoftwareDesign",StarchPress;1edition,2011.
4. SandipRakshit, "R for Beginners", McGraw HillEducation, 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.

CYBER FORENSICS [C L T P 3 3 0 0]

Objectives:

- To study the fundamentals of Computer Forensics, and also to learn, analyze and validate Forensics Data. Further to study the tools and tactics associated with Cyber Forensics

Unit I NETWORK & TRANSPORT LAYER SECURITY 9

IPsec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPsec . Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

Unit IIE-MAIL SECURITY & FIREWALLS 9

PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

Unit III INTRODUCTION TO COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud.Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

Unit IV EVIDENCE COLLECTION AND FORNSICS TOOLS 9

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

Unit V ANALYSIS AND VALIDATION 9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

Outcomes:

At the end of the course the student will be able to:

- ✓ Understand and appreciate the importance of cyber forensic in the day to day life.
- ✓ Collect, Process, Analyze, and present Computer Forensic Evidence.
- ✓ Apply Criminal Justice Methods to Cyber Security and Computer Forensic Investigations.
- ✓ Analyze and resolve Cyber Security issues.

References:

1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003. 2. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.
2. John R.Vacca, "Computer Forensics", Cengage Learning, 2005
3. Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education, 2008.
4. MarjieT.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013

WIRELESS SENSOR NETWORKS [C L T P 3 3 0 0]

Objectives:

- To enable the students to learn and understand the fundamental concepts behind the Sensor Networks and its applications in the practical life.

Unit IINTRODUCTION **10**

Unique constraints and challenges – advantages of WSNs – Sensor network applications –Collaborative processing – Key definitions of sensor networks Canonical Problem: Localization and tracing – tracking scenario – Problem formulation – distributed representation and inference of states – tracking multiple objects – sensor models – performance comparison and metrics

Unit IINETWORKING SENSORS **9**

Networking sensors: Key assumptions – Medium access control – General issues – Geographic energy aware routing – attribute based routing - Infrastructure Establishment: Topology control – clustering – Time synchronization –Localization and localization service

Unit III SENSOR TASKING AND CONTROL **9**

Sensor tasking and control: Task driven sensing – roles of sensor nodes and utilities – information based sensor tasking – joint routing and information aggregation

Unit IV SENSOR NETWORK DATABASES **9**

Sensor network databases: Sensor database challenges – Querying the physical environment –Query interfaces – High level database organization – In-Network aggregation – Data centric storage – Data indices and range queries – Distributed hierarchical aggregation – temporal data

Unit VSENSOR NETWORK PLATFORMS AND TOOLS **9**

Sensor Network platforms and tools: Sensor node hardware – sensor network programming challenges – node level software platforms –Node level simulations – State centric programming - Application and future directions: Emerging applications – future research directions

Outcomes:

At the end of the course the students will be:

- ✓ Able to describe the features of Sensor networks
- ✓ Able to appreciate the need for underlying concepts of Adhoc and Sensor networks
- ✓ Able to design a new network based on their needs

References:

1. Wireless Sensor networks : FengZhao,LeonidasGuibas –Morgan Kaufmann Publications – 2012
2. Fundamentals of Wireless sensor networks Theory and Practice – WaltenegusDargie, Christian Poellabauer – Wiley – 2010
3. Protocols and Architectures for wireless sensor networks – Holger Karl, Andreas Willig,Wiley - 2011

HUMAN COMPUTER INTERACTION [C L T P 3 3 0 0]

Objectives:

The student should be made to:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Be aware of mobile HCI
- Learn the guidelines for user interface.

Unit I INTRODUCTION 9

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Unit II INTERACTIVE DESIGNS 9

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques–UniversalDesign.

Unit III COGNITIVE MODELS 9

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit IV MOBILE ECOSYSTEM 9

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Unit V WEB INTERFACES 9

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Outcomes:

Upon completion of the course, the student should be able to:

- ✓ Design effective dialog for HCI.
- ✓ Design effective HCI for individuals and persons with disabilities.
- ✓ Assess the importance of user feedback.

References:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O?Reilly Media Inc., 2009 (UNIT –IV)
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O?Reilly, 2009.(UNIT-V)

BIO INFORMATICS [C L T P 3 3 0 0]

Objectives:

- To prepare the students to understand the importance of Bio-Informatics and to apply the concepts in analysis of genome.

Unit I INTRODUCTION **9**

An Introduction – Information Search and Data Retrieval – Genome Analysis and Gene Mapping.

Unit II ANALYSIS **9**

Alignment of Pairs of Sequences – Alignment of Multiple Sequences and Phylogenetic Analysis – Tools for Similarity Search and Sequence Alignment.

Unit III HIDDEN MARKOV MODELS **9**

Profiles and Hidden Markov Models – Gene Identification and Prediction – Gene Expression and Microarrays.

Unit IV CLASSIFICATION **9**

Protein Classification and Structure Visualization – Protein Structure Prediction – Proteomics.

Unit V COMPUTATIONAL METHODS **9**

Computational Methods for Pathways and Systems Biology – Introduction to Drug Discovery – Drug Discovery: Technology and Strategies.

Outcomes:

Upon completion of the course the students will be:

- ✓ Able to describe the process of genome analysis, protein classification, etc.
- ✓ Able to analyse the given genomic sequence and classify the proteins.
- ✓ Able to design an algorithm for drug discovery.

References:

1. Bioinformatics , Methods and Applications – S.C.Rastogi, N.Mendiratta&P.Rastogi, PHI Learning Private Limited, Third Edition, 2010.
2. Bioinfomatics Computing – Bryan Bergeron, PHI Learning Private Limited, 2010.

BLOCK CHAIN TECHNOLOGY [C L T P 3 3 0 0]

Objectives:

- The target is to cover both the conceptual as well as application aspects of Blockchain.
- This includes the fundamental design and architectural primitives of Blockchain, the system and the security aspects, along with various use cases from different application domains.

Unit I INTRODUCTION 9

Introduction to blockchain - Types of blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain - Decentralization – Decentralization using blockchain – Methods of Decentralization – Routes to Decentralization – Blockchain and full ecosystem Decentralization – Smart Contract - Decentralization Organizations – Decentralization applications – Platforms of Decentralization.

Unit II CRYPTOGRAPHY & TECHNICAL FOUNDATION 9

Cryptography and Technical Foundations – Introduction – Cryptographic primitives – Asymmetric Cryptography – Public and Private keys – Financial marketing and trading.

Unit III BITCOIN 9

Bitcoin – Transactions – Blockchain – Alternative Coins – bitcoin limitations – Namecoin – Litecoin – Primecoin.

Unit IV SMART CONTRACTS & ETHEREUM 9

Smart Contracts – Ethereum 101 – Introduction – Ethereumblockchain – Elements of Ethereumblockchain – Precomplied contracts – Accounts – Block – Ether – Messages – Mining – Clients and Wallets – Trading and investment – The ethereum network – Applications developed on ethereum – Scalability and security issues.

Unit V ALTERNATIVE BLOCKCHAINS 9

Alternative Blockchains – Blockchains – Platforms – Blockchain-Outside of Currencies – Internet of Things – Government – Health – Finance – Scalability and other challenges – Scalability – Privacy – Security.

Outcomes:

- ✓ The widespread popularity of digital cryptocurrencies has led the foundation of Blockchain, which is fundamentally a public digital ledger to share information in a trustworthy and secure way.
- ✓ The concept and applications of Blockchain have now spread from cryptocurrencies to various other domains, including business process management, smart contracts, IoT and so on.

References:

1. Mastering Blockchain - Master the theoretical and technical foundations of Blockchain technology and explore future of Blockchain technology, Imran Bashir, Packt Publishing , 2017

WEB SERVICES [C L T P 3 3 0 0]

Objectives

- To enable the student to be familiar with distributed services, XML and webservices
- TostudytheuseofwebservicesinB2CandB2Bapplications

Unit – I OVERVIEW

Overview of Distributed Computing. Introduction to web services – Industrystandards, Technologies and concepts underlying web services – their support to web services. Applications thatconsumewebservices.

Unit – II XML

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

Unit – III SERVICES

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 attacksfacilitated within web services 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 servicesmanagement.

Unit – IV APPLICATIONS

Building real worldenterprise applications using web services – sample source codes todevelop web services – steps necessary to build anddeploy web services and client applications to meet customer s requirement – Easier development, customization, maintenance,transactional requirements, seamless porting to multiple devices andplatforms.

Unit – V TECHNOLOGIES

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

Outcomes

On completion of this course you should be able to:

- Understand the design principles and application of SOAP and REST based webservices.
- Design collaborating web services according to aspecification.
- Implement an application that uses multiple web services in a realistic businessscenario.
- 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 consumethem.

Textbooks

1. SandeepChatterjee, James Webber, "Developing Enterprise Web Services:AnArchitectsGuide,PrenticeHall,Nov2003.
2. Heather Williamson, "XML: The Complete Reference ",Tata McGraw-Hill EducationIndia.

References

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

SOFT COMPUTING[C L T P 3 3 0 0]

Objectives

- Develop the skills to gain a basic understanding of neural network theory and fuzzy logictheory.
- Introduce students to artificial neural networks and fuzzy theory from an engineeringperspective.

UNIT I INTRODUCTION

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

UNIT II SUPERVISED LEARNING NETWORKS

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 – ARTNetwork.

UNIT III FUZZY SETS

Fuzzy Sets: Basic Concept – Crisp Set Vs Fuzzy Set - Operations onFuzzy Set – Properties of Fuzzy Sets– Fuzzy Relations: Concept – Fuzzy Composition – Fuzzy Equivalence and Tolerance Relation - Membership Functions: Features – Fuzzification – Methods of Membership value assignments – Defuzzification –Methods.

UNIT IV FUZZY CONCEPTS

Fuzzy Arithmetic – Extension Principle – Fuzzy Measures – FuzzyRules 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 ControlSystems.

UNIT V GENETIC ALGORITHM

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 ofGA.

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 settheory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzylogic
- To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and theirlimitations.
- 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 otherproblems.

Text Book

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

Reference Book

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