PERIYAR UNIVERSITY

SALEM 636 011

M.Sc DEGREE COMPUTER

SCIENCE REGULATIONS AND

SYLLABUS

(Effective from the Academic year 2019-2020

and thereafter)

Regulations

Effective from the Academic year 2019 - 20

1. OBJECTIVE OF THE PROGRAMME

To Develop the Post Graduates in COMPUTER SCIENCE-S with strong knowledge of theoretical COMPUTER SCIENCE subjects who can be employed in research and development units of industries and academic institutions.

2. ELEIGIBILITY FOR ADMISSION

A candidate who has passed B.Sc ComputerScience/B.C.A/B.Sc Computer Technology/B.Sc Information Science/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 academic years.

3. DURATION OF THE PROGRAMME

The programme for the degree of Master of Science in COMPUTER SCIENCE shall consist of two Academic years divided into four semesters. Each semester consist of 90 working days.

CURRICULUM AND SCHEME OF EXAMINATIONS
Two year M. Sc-Computer Science Programme

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
Semester-I						
Core Course-19UPCSC2C01 Design and Analysis of Algorithm	4	4	3	25	75	100
Core Course-19UPCSC2C02 Advanced Web Technology	4	4	3	25	75	100
Core Course-19UPCSC2C03 Advanced Data Base Management Systems	4	4	3	25	75	100
Core Course-19UPCSC2C04 Compiler Design	4	4	3	25	75	100
Elective-01	4	4	3	25	75	100
Core Course-19UPCSC2C05 * Algorithm – Lab	2	4	3	40	60	100
Core Course-19UPCSC2C06 * Advanced Web Technology – Lab	2	4	3	40	60	100

SWAYAM / MOOC /SOFT SKILL-01 (Optional)	ADD ON COURSE					
Semester-II						
Core Course-19UPCSC2C07 Distributed Operating System	4	4	3	25	75	100
Core Course-19UPCSC2C08 Advanced Java Programming	4	4	3	25	75	100
Core Course-19UPCSC2C09 Cryptography and Network Security	4	4	3	25	75	100
Elective-02	4	4	3	25	75	100
Elective-03	4	4	3	25	75	100
Core Course-19UPCSC2C10 * Advanced Java-Lab	2	4	3	40	60	100
Non-major Elective / Supportive Course	4	4	3	25	75	100
SWAYAM / MOOC / SOFT SKILL-02 (Optional)	ADD ON COURSE					
Semester-III						
Core Course-19UPCSC2C11 Digital Image Processing	4	4	3	25	75	100
Core Course-19UPCSC2C12	4	4	3	25	75	100

Internet of Things						
Core Course-13 Machine Learning	4	4	3	25	75	100
Elective-04	4	4	3	25	75	100
Elective-05	4	4	3	25	75	100
Core Course-19UPCSC2C14 * Image Processing – Lab	2	4	3	40	60	100
Core Course-19UPCSC2C15 * Machine Learning-Lab/ Mini Project	2	4	3	40	60	100
SWAYAM / MOOC / SOFT SKILL-03 (Optional)	ADD ON COURSE					

Semester-IV						
Option-I						
Core Course-19UPCSC2C16 **Dissertation and Viva Voice (Industry/Research)**	16	-	-	50	150	200
Option-II						
Elective-06	4	4	3	25	75	100
Elective-07	4	4	3	25	75	100
Core Course-19UPCSC2C16 **Dissertation and Viva-Voce** **(Industry/Research)**	8	12	-	50	150	200
Grand Total	90					

*The additional list of experiments in computer laboratory may be added according to their needs related to the course

LIST OF ELECTIVES **

1. **19UPCSC2E01** Advanced Computer Network
2. **19UPCSC2E02** Cloud Computing
3. **19UPCSC2E03** Web Services
4. **19UPCSC2E04** Object Oriented System Development
5. **19UPCSC2E05** Mobile Computing
6. **19UPCSC2E06** Wireless Networks
7. **19UPCSC2E07** Theory of Computation
8. **19UPCSC2E08** Optimization Techniques
9. **19UPCSC2E09** Embedded Systems
10. **19UPCSC2E10** WAP and XML
11. **19UPCSC2E11** Statistical Computing
12. **19UPCSC2E12** Software Project management
13. **19UPCSC2E13** Dot Net Programming
14. **19UPCSC2E14** Data Science and Big Data Analytics
15. **19UPCSC2E15** Soft Computing
16. **19UPCSC2E16** Data Mining
17. **19UPCSC2E17** Discrete Mathematics For Computing

** The Elective Courses may be updated as per the Current Trends in Computer Science by their respective Boards

M. Sc- COMPUTER SCIENCE

SYLLABUS SEMESTER-I

CORE COURSE-19UPCSC2C01–DESIGN AND ANALYSIS OF ALGORITHMS
Credits: 4

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

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 - Strassen‟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 - Optimal Binary 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 – Biconnected 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 searched - 0/1 Knapsack Problem.

Text Book:

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer
   Algorithms, Universities Press, Second Edition, Reprint 2009.
   Unit-I : (Chapters: 1,2)
   Unit – II: (Chapters:3)
   Unit-III : (Chapters: 4)
   Unit – IV: (Chapters: 5,6)
   Unit – V: (Chapters: 7)

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.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen, "Evolutionary
   Algorithms for Solving Multi-Objective Problems", Springer 2nd Edition, 2007.

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

COURE COURSE-19UPCSC2C02-ADVANCED WEB TECHNOLOGY

Objectives: **Credits:4**

- ✓ 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
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: A simple page applet- Improving the currency converter- HTML control classes- The page class- Accessing HTML server controls.   Web controls: Web Control 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 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 DataReader - 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 StockQuote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service- Using the proxy class- An example with TerraService.

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

Text Book:

1. Mathew Mac Donald, "ASP.NET Complete Reference", TMH 2005.
    Unit-I : (Chapters: 1 to 4)
    Unit – II: (Chapters: 5 to 11)
    Unit-III : (Chapters: 10 to 17)
    Unit – IV: (Chapters: 18 to 20)
    Unit – V: (Chapters: 21 to 24)

References:

1. Crouch Matt J, "ASP.NET and VB.NET Web Programming", Addison Wesley 2002.
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 –19UPCSC2C03- ADVANCED DATABASE MANAGEMENT SYSTEMS

Objective:

Credits: 4

- 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, Intraoperation 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 Multiset, 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, 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 Comcepts", 6th edition , McGraw-Hill International Edition , 2011
   Unit-I : (Chapters: 2,7,18)
   Unit – II: (Chapters: 19,22)
   Unit – IV: (Chapters: 23)
   Unit – V: (Chapters: 25)
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education Reprint 2016.
   Unit-I : (Chapters: 11,12,14)
   Unit – II: (Chapters: 23)
   Unit – IV: (Chapters: 24)

Reference Books:
1. Ramez Elmasri, Shamkant B Navathe, "Fundamental of Database Systems", Pearson, 7th edition 2016.
2. Thomas Connolly, Carolyn Begg., "Database Systems a practical approach to Design , Inmplementation and Management ", Pearson Education, 2014.

Outcome:

On completion of the course, students will able to
- Know about the Various Datamodels and Works on Database Architecture
- Knowledge patterns, Object Oriented Databases are well equipped.

CORE COURSE 19UPCSC2C04   **COMPILER DESIGN**

Objectives: **Credits : 4**

- 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 - Inherited and 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 – Peephole Optimization.

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.

   Unit-I : (Chapters: 1.1,1.2,1.6.6, 2.7, 3.1, 3.2,3.3,3.4, 3.6, 3.7)
   Unit – II: (Chapters:4.1.1, 4.2, 4.3, 4.4, 4.5, 4.5, 4.7)
   Unit-III : (Chapters: 5.1.1, 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.3, 5.4, 7.1, 7.2)
   Unit – IV: (Chapters: 6.1 to 6.9)
   Unit – V: (Chapters: 8.1 to 8.7)

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. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.
5. S.Godfrey Winster, S.Aruna Devi, R.Sujatha, "Compiler Design", yesdee Publishers, Third Reprint 2019.

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 data mining.

COURSE- 19UPCSC2C05   **Credits: 4**

ALGORITHM - LAB

1. Apply the divide and conquer technique to arrange a set of numbers using merge sort.
2. Apply the divide and conquer technique to implement Strassen‟s matrix multiplication Algorithm
3. Computer the transitive closure of a given directed graph using Warshall‟s Algorithm.
4. Implement 0/1 knapsack problem using Dynamic programming
5. Find minimum cost spanning tree of a given undirected graph using Kruskal‟s Algorithm.
6. Find minimum cost spanning Tree of a given undirected graph using Prim‟s Algorithm.
7. Implement 8 Queen‟s problem using backtracking
8. Implement Knapsack problem using backtracking
9. Solve Dljkstra‟s Algorithm using greedy technique
10. Solve subset sum problem using backtracking

COURSE- 06   **Credits: 2**

ADVANCED WEB TECHNOLOGY - LAB

Course Objective:

- Learn how to create websites using Asp.Net
- Implement the advanced web concepts using Asp.Net and Ado.Net
- Learn to use Asp.Net web controls
- Design web applications using Asp.Net and Ado.Net

List of Programs:

Programs using ASP.NET Server controls

1. Create a website for a bank and include types of navigation.
2. Write a program to perform Asp.Net State.
3. Design Image Mapping using Asp.Net
4. Create the following using web controls
   a) Money conversion
   b) Temperature conversion
5. Write a program to create an advertisement using Ad rotator.
6. Create a user control that contains a list of colors. Add a button to the Web Form which when clicked changes the color of the Form to the color selected from the list.
7. Create a user control that displays the current date and time. Include it in a Web Form and refresh it each time a button is clicked.
8. Create a user control that receives the user name and password from the user and validates them. If the user name is "Radiant" and the password is "asp.net" then the user is authorized, otherwise not.

Programs using ADO.NET and ASP.NET

1. Create a web application to insert 3 records inside the SQL database table having following fields(DeptId, DeptName, EmpName, Salary). Update the salary for any one employee and increment it to 15% of the present salary. Perform delete operation on 1 row of the database table.
2. Create a Web App to display all the Empname and Deptid of the employee from the database using SQL source control and bind it to GridView. Database fields are(DeptId, DeptName,   EmpName,   Salary)

Course Outcomes:

- Apply .NET concepts to design and developweb applications
- Create a basic website using Asp.Net concepts
- Design web page and connect to the backend databases
- Applying different functionalities in Asp.Net and Ado.Net

CORE COURSE – 19UPCSC2C07 - DISTRIBUTED OPERATING SYSTEM
Credits:4

Objectives:
- To study Distributed operating system concepts
- 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 – 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 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 Nonblocking 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. MukeshSinghalN.G.Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill 2000.
   2. Distributed Operating System – Andrew S. Tanenbaum, PHI.

Reference Books:

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.

CORE COURSE –19UPCSC2C08 - ADVANCED JAVA PROGRAMMING

Credits:4

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 and Table 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- Multiresolution 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 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; 9th Edition.
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 Database Maintenance.

CORE COURSE – 19UPCSC2C09 - CRYPTOGRAPHY AND NETWORK SECURITY

Credits : 4

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: perfect security – information theory – product cryptosystem – cryptanalysis.

Unit II:
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, Key Management.

Unit III:
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 Over view, IP Security Architecture, Authentication Header, Encapsulating Security Payload, 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, 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 Mc Graw Hill, 2007, Reprint 2015.
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 And Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication In Public World", PHI 2002.
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/.

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

COURSE- 19UPCSC2C10   Credits: 4

ADVANCED JAVA LAB

Course Objective:

- ✓ To enable the students to implement different java packages.
- ✓ To develop the students with the skills to implement different java tools.

Use JAVA Programming Language to implement the following:

1. To create applets incorporating the following Features:

   a. Create a color palette with matrix of buttons

   b. Set background and foreground of the control text area by selecting
a color from color palette.

   c. In order to select Foreground or background use check box control
as radio buttons

   d. To set background images

2. Use GridLayout to design a calculator and simulate the functions of

simple calculator.

3. To create Input output and Random files

4. To develop chat application with datagram sockets and datagram packets.

5. To invoke servlet from HTML forms.

6. To invoke servlet from Applets.

7. To invoke servlet from JSP.

8. Simple client/server application.

9. JDBC to interact with database.

10. To create multiple chat applications using TCP packets.

CORE COURSE – 19UPCSC2C11 -   DIGITAL IMAGE PROCESSING

Credits : 4

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-causal models.

Color Models: Color Fundamentals, Color Models, Pseudo-color Image Processing, Full Color Image Processing, Color Transformation, Noise in 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 T^2 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 basedcoding; 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 Applications to 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 deasease using image such as tumor, cancer etc.

CORE COURSE – 19UPCSC2C12 - INTERNET OF THINGS

Credits:4

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 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 – Mobile Cloud 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, Synchronisation 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, Vlasios Tsiatsis , 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 real life.

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

CORE COURSE – 19UPCSC2C13 - MACHINE LEARNING

Credits:4

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 Neighbour 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 BOOK:

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

REFERENCES:

1. EthemAlpaydin, ─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.

IMAGE PROCESSING   - LAB

Course: 19UPCSC2C14   Credits: 2

MACHINE LEARNING - LAB

Course: 19UPCSC2C15   Credits: 2

Objectives:

- To implement mathematical aggregation operators in "R-script".
- To understand the Statistical operations in "R".

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

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

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

4. To perform statistical operations (Mean, Median, Mode and Standard deviation) using R.

5. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization

6. To perform dimensionality reduction operation using PCA for Houses Data Set

7. To perform Simple Linear Regression with R.

8. To perform K-Means clustering operation and visualize for iris data set

9. Write R script to diagnose any disease using KNN classification and plot the results.

10. To perform market basket analysis using Association Rules (Apriori).

19UPCSC2E01: ADVANCED COMPUTER NETWORKS

Credits:4

Objectives:

- To study communication network protocols, different communication layer structure
- To learn security mechanism for data communicaton

Unit 1:

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-2:

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 3:

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 4:

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

Unit 5:

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.

Reference Books:

1. **B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, New Delhi.**

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, New Delhi.

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

19UPCSC2E02: CLOUD COMPUTING

Credits: 4

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 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- File Handling-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. limited 2016.

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.

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.

19UPCSC2E03:WEB SERVICES

Credits:4

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, Technologies and 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 of information 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 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 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, Nov 2003.

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.

19UPCSC2E04: OBJECT ORIENTED SYSTEMS DEVELOPMENT

Credits:4

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: Rumbaugh et al.‟s object modeling technique – The Booch methodology – The Jacobson et al. 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 — Multidatabase 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. Rachita Misra, 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 use case 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: inheritance, association and aggregation.
- Show the role and function of test cases, testing strategies and test plans in developing object-oriented software.

1.

19UPCSC2E05: MOBILE COMPUTING

Credits:4

Objectives

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

Unit 1:
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 -2:
Mobile computing through Internet - Mobile-enabled Applications - Developing Mobile GUIs – VUIs and Mobile Applications – Characteristics and benefits -Multichannel and Multi modal user interfaces – Synchronization and replication of Mobile Data - SMS architecture – GPRS – Mobile Computing through Telephony.

Unit -3:
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 -4:
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 -5:
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, Second Edition,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. Fei Hu , 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 Ad hoc networks and its routing
- Understand the different types of security features

19UPCSC2E06: WIRELESS NETWORKS

Credits:4

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 1:
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 2:
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 3:
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 4:
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 5 :
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 book
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, Elsevier 2011.

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.

19UPCSC2E07: Theory of Computation

Credits:4

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 and algorithms.

Unit 1:
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 Epsilon transitions.

Unit 2:
Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

Unit 3:
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 Pushdown Automata.

Unit 4:
Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM. A language that is not Recursively Enumerable (RE).

Unit 5:
An undecidable problem RE – Undecidable problems about Turing Machine – Post"s Correspondence Problem – The classes P and NP.

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. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.
5. J. Martin, "Introduction to Languages and the Theory of computation," Third Edition, Tata Mc Graw Hill, 2007.

Outcomes:

After completing this course, students will be able to:

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

19UPCSC2E08: OPTIMIZATION TECHNIQUES

Credits:4

Objective

·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- primal to 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 – CPMComputation – Resource Scheduling.

Textbooks:

1. KantiSwarup, 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 Computatonal 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.

19UPCSC2E09: EMBEDDED SYSTEMS

Credits:4

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 and synchronisation
- 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 Synchronisation - 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.

Reference Books:
1. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", TMH. Second Edition 2009
2. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley. Third Edition 2006
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 between the 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.

19UPCSC2E10: WAP and XML

Credits:4

Objective:

The purpose of the course is to impart knowledge on eXtensible Markup Language (XML) and to achieve secured, messaging through web services.

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. Setting up 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: Need for WML script – Lexical Structure – Variables and literals – Operators – Automatic data type 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 Scripts on the Web Scripts, Character sets, Fonts and Glyphs – Legacy character sets– The Unicode Character set – Procedure to Write XML Unicode.

Text Books:

1. For Unit I, II, III
   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.

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

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 web sites using XML programming

19UPCSC2E011: Statistical Computing

Credits:4

Objectives:
- ✓ To understand the applications of various correlation methods
- ✓ To study and model the sampling concepts
- ✓ To acquire knowledge on Hypotheses test

Unit-I:
Correlation - Definition of Correlation- Scatter Diagram- Kari Pearson"s Coefficient of Linear Correlation- Coefficient of Correlation and Probable Error of r- Coefficient of Determination **-** Merits and Limitations of Coefficient of Correlation- Spearman"s Rank Correlation(7.1-7.9.4).

Unit-II:
Regression Analysis - Regression and Correlation(Intro)- Difference between Correlation and Regression Analysis- Linear Regression Equations -Least Square Method- Regression Lines- Properties of Regression Coefficients- Standard Error of Estimate.(8.1-8.8)

Unit-III:
Probability Distribution and mathematical Expectation- Random Variable- Defined - Probability Distribution a Random Variable- Expectation of Random Variable- Properties of Expected Value and Variance(12.2-12.4).

Unit-IV:
Sampling and Sampling Distributions - Data Collection- Sampling and Non-Sampling Errors – Principles of Sampling-- Merits and Limitations of Sampling- Methods of Sampling- Parameter and Statistic- Sampling Distribution of a Statistic- Examples of Sampling Distributions- Standard Normal, Student"s t, Chi-Square (x^2) and Snedecor"s F- Distributions(14.1-14.16).

Unit-V:
Statistical Inference- Estimation and Testing of Hypothesis - Statistical Inference- Estimation- Point and interval- Confidence interval using normal, t and x^2 Distributions- Testing of Hypothesis- Significance of a mean - Using t Distribution(15.1-15.10.2).

Textbook:
1. K.L. Sehgal, "Quantitative Techniques and Statistics", First Edition, Himalaya Publishing House, 2011.

References:

1. N. P. Bali, P. N. Gupta, C. P. Gandhi, "A Textbook of Quantitative Techniques", First Edition, Laxmi Publications, 2008.
2. U. K. Srivastava, G. V. Shenoy, S. C. Sharma, "Quantitative Techniques for Managerial Decisions", Second Edition, New Age International Publishers, 2005.
3. David Makinson, "Sets, Logic and Maths for Computing", Springer, 2011.
4. Christopher Chatfield,"Statistics for Technology- A Course in Applied Statistics, Third Edition", CRC Press, 2015.

Outcomes:

On successful completion of the course the students will be able to do
- Data analytics from a database formed from the real world problem
- Predict the exact reason for the real time issues

19UPCSC2E12: Software Project management

Credits:4

Objectives:
This course will enable students to:
- Understand the framework of project management
- Learn to monitor and control the project
- Know the sound knowledge in Agile method
- Know the team, cost, quality and resource management
- Identify and control the risk in the projects

Unit I

Project Management Framework: Introduction: Project - Project management - Relationship among Project, Program and Portfolio management - Project and operations management- Role of project manager - Project management body of knowledge - Enterprise Environmental factors. Project life cycle and Organization: Overview of project life cycle - Projects vs Operational Work - Stakeholders - Organizational influences on project management. **The Standard for Project Management of a Project**: Project management processes for a project: Common project management process interactions - Projects management process groups - Initiating process group - planning process group - Executing process group - Monitoring and controlling process group - Closing process group.

Unit II

Choosing Methodologies and Technologies – Software Processes and Process Models – Choice of Process Models – The Waterfall Model– Prototyping – other ways of categorizing prototype - **Agile Methods** – Extreme Programming Selecting the Most Appropriate Process Model- Need of Agile - Iterative vs Incremental-Agile Manifesto and Mindset – Lean, Scrum and Kanban methods-uncertainty, Risk, and lifecycle selection-Scrum Elements overview-5 levels of planning-Scrum Process overview-Agile Team-roles and responsibilities- Epic-feature-User Stories-PBI-The Sprint.

Unit III

The Project Management Knowledge Areas: Project integration management: Develop project charter - Develop project management plan - Direct and manage project execution - Monitor and control project work - Perform integrated change control - Close project or phase. Project scope management: Collect requirements - Define Scope - Create WBS - Verify Scope - Control Scope. Project team management: Define activities - Sequence activities - Estimate activity resources - Estimate Activity Durations - Develop Schedule - Control Schedule.

Unit IV

Project cost management: Estimate costs - Determine budget - Control costs. Project Quality Management: Plan quality - perform quality assurance - Perform quality control. Project Human Resource Management: Develop human resource plan - Acquire project team - Develop project team - Manage project team. Project Communications Management: Identify stakeholders - Plan communications - Distribute information - Manage stakeholder expectations - report performance.

Unit V

Project Risk Management: Plan risk management - Identify risks - Perform qualitative risk analysis - Perform quantitative risk analysis - plan risk responses - Monitor and control risks. Project Procurement Management: Plan - Conduct - Administer - Close procurements.

Text Book:
1. "A guide to the Project management Body of Knowledge (PMBOK Guide)" Fouth Edition, Project Management Institute, Pennsylvania, 2008
2. BOB Huges, Mike Cotterell, Rajib Mall "Software Project Management", McGraw Hill, Fifth Edition,2011.
3. Emerson, "Agile Handbook," Philosophie

Reference books:
1. Futrell, "Quality Software Project Management", Pearson Education India.
2. Royce, "Software Project Management", Pearson Education India.
3. C.Ravindranath Pandian, "Applied Software Risk Management-A Guide for Software Project Managers", Auerbach Publications, 2015.
4. Benjamin A. Lieberman, "The Art of Software Modeling", Auerbach Publications, 2010.

Outcomes:
- Analyze the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.
- Align the project to the organization's strategic plans and business justification throughout its lifecycle.
- Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.
- Implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.
- Adapt projects in response to issues that arise internally and externally.

19UPCSC2E13- DOT NET PROGRAMMING

Credits: 4

Objectives:
- To explore the backbone of web page creation by developing .NET skill.
- To Familiar with Application, session and view state management
- To Provide depth knowledge about ADO.NET
- To Understand the need of usability, evaluation methods for web services
- To acquire knowledge on the usage of recent platforms in developing web applications

Unit – I :
 The .NET Framework - Learning the .NET languages - Introduction - Net revolution - .Net framework and its architecture – CLR – What is Assembly – Components of Assembly – DLL hell and Assembly Versioning- O Objects and Namespaces - Setting Up ASP.NET and IIS

Unit – II *:*
Developing VB.NET Applications - Introduction to VB.Net, The .Net Frame work and Common language runtime, Building VB. Net Application, VB IDE, forms, properties, events, VB language-console application and 46 windows application, data type, declaring variable, scope of variable, operators and statements - Windows Applications-forms, adding controls to forms, handling events, MsgBox, Input Box, multiple forms, handling mouse and Keyboard events, object oriented programmingcreating and using classes and objects, Handling Exceptions- on Error Goto

Unit – III:
Developing ASP.NET Applications - ASP.NET Applications – Understanding ASP.NET Controls - Overview of ASP.NET framework, Web Form fundamentals - Web control classes – Using Visual Stdio.NET - Validation and Rich Controls   -State management – Tracing, Logging, and Error Handling.

Unit – IV*:*
Developing C#.NET Applications - Introducing C# - overview of C# - Literals,Variables- Data Types, -Operators, -checked and unchecked operators – Expressions – Branching - Looping-*Object Oriented Aspects Of C#:* Class – Objects - Constructors and its types- inheritance, properties, indexers, index overloading – polymorphism - sealed class and methods - interface, - abstract class, operator overloading, - delegates, events, errors and exception - Threading.

Unit – V:
ADO.NET - Overview of ADO.NET - ADO.NET data access – Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, Command Class Data binding – Data list – Data grid – Repeater – Files, Streams and Email – Using XML.

Text Books:
1. Struts: The Complete Reference,James Holmes 2nd Edition 2007 McGraw Hill Professional
2. Mathew Mac Donald, "ASP.NET Complete Reference", TMH 2005
3. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
   Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012
4. ASP.NET Unleashed, C# programming – Wrox publication
5. Visual Basic. NET Black Book, by Steven Holzner

Reference Books:
1. Jesse Liberty , „Programming C#, " , 4th Edition, O'Reilly Media
2. Mario Szpuszta, Matthew MacDonald , "Pro ASP.NET 4 in C# 2010: Includes Silverlight 2, "Apress, Third Edition
3. J.Liberty, D.Hurwitz, "Programming ASP.NET", Third Edition, O"REILLY, 2006.
4. Visual Basic. Net programming in easy steps by Tim Anderson, Dreamtech Press

Outcomes:

- Learn major programming paradigms and techniques involved in design and implementation of modern programming languages.

- Learn about Microsoft .NET framework

- By the end students can develop, implement and creating Applications with C#. VB.NET and ASP.NET

- Creating ASP.Net applications using standard .net controls.

- An ability to use current techniques, skills, and tools necessary for computing practice.

19UPCSC2E14: DATA SCIENCE AND BIG DATA ANALYTICS

Credits:4

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 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 – 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 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 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 Regrression 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 - 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 – Gaining Insights.

Unit V : 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 - Analytics Reports 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 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 Software Design", No Starch Press; 1 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

19UPCSC2E15: SOFT COMPUTING

Credits:4

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): Fundamental Concept – 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 Set Vs 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 – Defuzzification – 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 Book
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.

19UPCSC2E16: DATA MINING

Credits: 4

Objective:
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 Micheline Kamber, "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. Mohammed J.Zaki, Wagner Meira JR, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge India, 2016.

Outcome:

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

COURSE:19UPCSC2E17   **Credits: 4**

DISCRETE MATHEMATICS FOR COMPUTING

(Theorems and Proofs are not expected)

Course objective
- To understand the applications of functions and relations
- To understand the basic concepts of mathematical logic and predicate calculus
- To understand the concept of method of induction
- To develop the skills in solving recurrence relations.

Unit-I

Wellformed formulas – truth table of well formed formula – tautology, contradiction and contingency –equivalence of formulas. Algebra of propositions – Functionality complete sets – Normal forms of well formed formulas- Rules of Inference for propositional calculus – well formed formulas of predicate calculus – Rules of Inference for predicate calculus – predicate formulas involving two or more quantifiers.

Unit-II

Set theory – relations- functions – set identities – Binary relations – properties of binary relations in a set – Equivalence relations and partial orderings – Representation of a relation by a matrix - presentation of a relation by a digraph - Basics of Counting – Integers and Induction.

Unit-III

Formulation as Recurrence Relations-solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non   homogeneous Recurrence Relations. Permutations-Combinations-Permutations with repetitions-Combinations with repetition-permutations of sets with indistinguishable objects.

Unit-IV

Definition and examples-properties of lattices –lattices as algebraic systems-Sub lattices and lattice Isomorphism-special classes of lattice –distributive lattices and Boolean algebras.

Unit-V

Connected Graphs-Euler Graphs-Hamiltonian circuits and paths – planar graphs – matrix representation   of   graphs.

Course outcome

On successful completion of the course, students will

- solve problems in mathematical logic
- identify and apply basic concepts of set theory, arithmetic, logic, proof techniques, binary relations, graphs and trees
- solve recurrence relations
- construct lattice applications
- understand the applications of Graph Theory in Computer Science.

Text Book

1. N.Chandrasekaran and M.Umaparvathi, Discrete mathematics, PHI Learning Private Limited, New Delhi, 2010.

Unit 1:(2.1-2.11) **Unit 2:**(1.3-1.7, 4.1-4.2, 5.1-5.5)**Unit 3:**(6.1-6.5,3.1-3.6)
Unit 4:(8.1-8.6)**Unit 5:**(10.1-10.5 and 10.8)

Reference Books

1. J.P.Trembley and R.Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, New Delhi, 1997.
2. T. Sengadir, Discrete Mathematics and Combinatorics, Pearson New Delhi 2009.
3. RakeshDube,AdeshPandeyRitu Gupta, Discrete Structures and Automata Theory, Narosa publishing House New Delhi 2007.