

## **DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

### **M.C.A. (Master of Computer Applications – 2 Year Programme)**

#### **Scheme of Examination [Effect from 2020 – 2021]**

#### **REGULATIONS :**

##### **Eligibility for MCA (2 Years)**

Passed BCA/ Bachelor Degree in Computer Science or equivalent Degree or Passed B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University). Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination

##### **Entrance Test:**

Applicants seeking admission to M.C.A., are required to appear for the Tamilnadu Common Entrance Test (TANCET) to be conducted by Anna University, Chennai, for the respective year. Previous year TANCET score will not be considered for Admission. Those who have not appeared in TANCET can appear in the University Entrance Examination.

##### **Selection**

- Selection for the M.C.A. programme will be made based on the TANCET / University entrance examination marks
- Reservation of seats as per Tamilnadu Government norms.

##### **Requirements for the end semester examination of a course:**

- 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 (internal & External) in each Theory paper. For Practicals the internal & external marks are 50:50.
- A Minimum of 75% attendance is required to appear for the University Examinations.
- When a student completes the required 93 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 is multiplied by the credits assigned to the paper. Such weighted marks for all the papers are added and divided by the total credit.

##### **PROGRAMME EDUCATIONAL OBJECTIVES (PEO):**

The Educational Objectives of MCA programmes are:

- To prepare the graduates as successful professionals in software industry, government, academia, research, entrepreneurial pursuit.
- To prepare the graduates as broadly educated, expressive, ethical and responsible citizens with proven expertise and contributors to the society.
- To make the graduates recognized through demonstration of good analytical, design and implementation skills.
- To prepare the graduates as life-long learners to fulfil their goals.

**PROGRAMME OUTCOMES (PO):**

After completion of the MCA programme the students are expected to have the:

- ability to apply the knowledge of computing techniques and other related specialisation for the abstraction and conceptualisation of computing models from the user requirements
- ability to select modern computing tools and techniques and use them confidently
- ability to transform complex business challenges into well defined problems, investigate, understand and propose integrated solutions using emerging technologies
- ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development
- ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude
- ability to communicate the technical information effectively both orally and practically
- ability to appreciate the importance of goal setting and to recognize the need for life-long learning
- ability to work collaboratively as a member or a leader in multidisciplinary teams

**COURSE NAME : Master of Computer Applications**

**SEMESTER : I**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCAC11	Mathematical Foundations for Computer Applications	4	3	1	0	25	75
2	NCAC12	Design and Analysis of Algorithms	4	3	1	0	25	75
3	NCAC13	Cryptography and Network Security	4	3	1	0	25	75
4	NCAC14	Advanced Database Management Systems	4	3	1	0	25	75
5	NCAC15	Advanced Web Technology	4	3	1	0	25	75
6	NCAL11	Advanced Web Technology Laboratory	2	0	0	3	50	50
7	NCAL12	Advanced Database Management Systems Laboratory	2	0	0	3	50	50
8	NCAL13	Communication Skill Laboratory	2	1	0	2	50	50
<b>Sub total</b>			<b>26</b>					

**COURSE NAME : Master of Computer Applications**

**SEMESTER : II**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCAC21	Distributed Operating System	4	3	1	0	25	75
2	NCAC22	Python Programming	4	3	1	0	25	75
3	NCAC23	Advanced Java Programming	4	3	1	0	25	75
4	NCAEPA	Software Engineering	4	3	1	0	25	75
5		Supportive Course	3	3	0	0	25	75
6	NCAL21	Advanced Java Programming Laboratory	2	0	0	3	50	50
7	NCAL22	Python Programming Laboratory	2	0	0	3	50	50
<b>Sub total</b>			<b>23</b>					

**COURSE NAME : Master of Computer Applications****SEMESTER : III**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCAC31	Data Science and Big Data Analytics	4	3	1	0	25	75
2	NCAC32	Internet of Things	4	3	1	0	25	75
3	NCAC33	Digital Image Processing	4	3	1	0	25	75
4	Annexure	Elective	3	3	0	0	25	75
5		Supportive Course	3	3	0	0	25	75
6	NCAL31	Data Science and Big Data Analytics Laboratory	2	0	0	3	50	50
7	NCAP31	Mini Project	7	0	0	3	50	50
8	NCAP32	Industry Seminar and Report Writing *	1	2	0	0	50	50
<b>Sub total</b>			<b>28</b>					
<p>*One lecture per week in the 5th semester by an industry representative who would present the current application of computer in their industry. Practical Examination will be based on technical report writing alone.</p>								

**COURSE NAME : Master of Computer Applications****SEMESTER : IV**

S.No	SUB CODE	SUBJECT TITLE	C	L	T	P	INT	EXT
1	NCAP41	Major Project	16	0	0	16	50	50
<b>Sub total</b>			<b>16</b>					
<b>Total Credits</b>			<b>93</b>					

### LIST OF ELECTIVE COURSES

<b>S.No</b>	<b>SUB CODE</b>	<b>SUBJECT TITLE</b>	<b>C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>INT</b>	<b>EXT</b>
1.	NCAEA	Advanced Computer Networks	3	3	0	0	25	75
2.	NCAEB	Cloud Computing	3	3	0	0	25	75
3.	NCAEC	Theory of Computation	3	3	0	0	25	75
4.	NCAED	Embedded Systems	3	3	0	0	25	75
5.	NCAEE	Natural Language Processing	3	3	0	0	25	75
6.	NCAEF	Cyber Forensics	3	3	0	0	25	75
7.	NCAEG	Wireless Sensor Networks	3	3	0	0	25	75
8.	NCAEH	Human Computer Interaction	3	3	0	0	25	75
9.	NCAEJ	Bio Informatics	3	3	0	0	25	75
10.	NCAEK	Block Chain Technology	3	3	0	0	25	75
11.	NCAEL	Web Services	3	3	0	0	25	75
12.	NCAEM	Soft Computing	3	3	0	0	25	75
13.	NCAEN	Dot Net Programming	3	3	0	0	25	75

**Objectives:**

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

**Unit I: Mathematical Logic**

Statements and Notations – Connectives: Negation – Conjunction - Disjunction – Statement formulae and Truth tables – Well Formed Formulae - Tautology – Conditional and Biconditional. Normal forms: Disjunctive. Conjunctive – Ordering and uniqueness. Theory of Inference: Rules of inference – Validity using truth tables – Predicate Calculus: Predicates – The statement functions – Variables and Quantifiers.

**Unit II: Set Theory**

Basic Concept of set Theory: Notation – The Power Sets. Operation on sets – Some basic set identities – Ordered Pairs and n-tuples – Cartesian Product Relations and Ordering: Properties of Binary relations in Set – Equivalence relations – Composition of Binary relations. Functions: Composition of functions – Inverse Functions – Characteristic function of a set – Pigeonhole Principle – Inclusion-Exclusion Principle – Measures for Information.

**Unit III: Algebraic Structure**

Algebraic systems – Properties – Semigroups – Monoids – homomorphism – Subsemigroups and submonoids. Algebraic Systems with two binary Operations. The application of Residue arithmetic to Computers: Introduction of Number Systems – residue Arithmetic.

**Unit IV: Lattices and Boolean Algebra**

Partial Ordering – Poset – Hassae diagram – Lattices and their Properties – Sublattices – Some Special Lattices – Boolean algebra: Subalgebra. Direct Product and Homomorphism – Boolean Functions: Boolean Forms and free Boolean algebra.

**Unit V: Graph Theory**

Basic definitions – Paths, reachability and connectedness – Regular and Bipartite Graphs- Cycles and Circuits – Trees – Distance and centers in Tree – rooted and Binary trees – Spanning Trees – Eccentricity of a vertex, radius and diameter of graph – Hamiltonian and Eulerian Graph – Planner Graph – Note: Definitions and Examples only on Unit III, IV & V, No Theorem Proofs.

**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 Boolean algebra and graph theory.
- ✓ Be in a position to apply the concepts such as set theory and algebraic structure.

**Reference:**

1. J.P.Trembley, R.Manohar, “Discrete Mathematical Structures with Applications to Computer Science” – Tata Mc – Graw Hill Publication, Edition – 2000.
2. NarsinghDeo, “Graph Theory and its Applications”, Tata Mc - Graw Hill Publication – 1989.
3. Kenneth. H. Rosen –“Discrete Mathematics and its Applications” - Tata Mc – Graw Hill Publication, Edition –1999.
4. B.S.VatsaWishwaPrakashan, “Discrete Mathematics” - Tata McGraw Hill Publication – 2001.
5. Kamala Krithivasan, “Discrete Mathematics & Its Applications” - TataMcGraw Hill Publication – 2011.
6. 1. V. Krishnamurthy, “Graph Theory”, 1988.  
2. T. Sengadir, “Discrete Mathematics and Combinatorics” , 2009
7. Richard A. Brualdi, “Introductory Combinatorics”, 4<sup>th</sup> Ed, Pearson Education, 2008.

## DESIGN AND ANALYSIS OF ALGORITHMS 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. Elementary Data Structures: Stacks and Queues– Trees – Dictionaries – Priority Queues– Sets and Disjoint Set Union– 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 - 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**

**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 BACK TRACKING**

**Backtracking:** The General Method – The 8-Queens Problem – Sum of 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

## **References**

1. Ellis Horowitz, SatrajSahni and SanguthevarRajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint2009.
- 2.Data Structures Using C - Langsam, Augenstein, Tenenbaum, PHI
- 3.Data structures and Algorithms, V.Aho, Hopcroft, Ullman ,LPE
- 4.Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem-TMH.
- 5.CarlosA.CoelloCoello, Gary B.Lamont, David A.VanVeldhuizen, “Evolutionary Algorithms for Solving Multi-Objective Problems”, Springer 2<sup>nd</sup>Edition,2007.

**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**

**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 ENCRYPTION & DECRYPTION**

**Symmetric Encryption and Message Confidentiality** - Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher 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**

**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 Overview, 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** - 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 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

## References

- Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata McGraw Hill, 2007, Reprint 2015.
- Stallings William, “Cryptography and Network Security - Principles and Practice 2017.
- William Stallings, “Network Security Essentials Applications and Standards ”Third Edition, Pearson Education, 2008.
- Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms And Protocols”, Wiley Publications, 2003.
- Charles Pfleeger, “Security In Computing”, 4th Edition, Prentice Hall Of India, 2006.
- Ulysess Black, “Internet Security Protocols”, Pearson Education Asia, 2000.
- Charlie Kaufman And Radia Perlman, Mike Speciner, “Network Security, Second Edition, Private Communication In Public World”, PHI 2002.
- Bruce Schneier And Neils Ferguson, “Practical Cryptography”, First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
- Douglas R Simson “Cryptography – Theory And Practice”, First Edition, CRC Press, 1995.
- [Http://Nptel.Ac.In/](http://Nptel.Ac.In/).

**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 Query Processing.

**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 be able to

- Know about the Various Data models and Works on Database Architecture
- Knowledge patterns, Object Oriented Databases are well equipped.

## **Reference**

- Abraham Silberschatz, Henry F Korth , S Sudarshan, “Database System Concepts”, 6th edition , McGraw-Hill International Edition ,2011
- C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8<sup>th</sup> Edition, Pearson Education Reprint 2016.
- Ramez Elmasri, Shamkant B Navathe, “Fundamentals of Database Systems”, Pearson, 7th edition 2016.
- Thomas Connolly, Carolyn Begg., “Database Systems a practical approach to Design, Implementation and Management “, Pearson Education, 2014.

## Objectives

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

## Unit – I 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 spaces and assemblies. Setting Up ASP.NET and IIS

## 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: A simple page applet- Improving the currency converter- HTML control classes- The page class- Accessing HTML server controls. Web controls: WebControl Classes – AutoPostBack and WebControl 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- Understanding regular expressions- A validated customer form. State management - Tracing, Logging, and Error Handling.

## 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 with data 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. Using web services: Consuming a web service- Using the proxy class- An example with TerraService.

## **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.

### **References**

- 1 Mathew Mac Donald, “ASP.NET Complete Reference”, TMH 2005.
- Crouch Matt J, “ASP.NET and VB.NET WebProgramming”, Addison Wesley2002.
- J.Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O’REILLY,2006.

**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 program for implementing the simple, multiple inheritances.



**PHASE I Working with SQL Commands**

1. Draw the ER symbols and write the use of each symbol.
2. Write and execute Data Definition Language (DDL) commands.  
(CREATE, ALTER, DROP, TRUNCATE)
3. Write and execute Data Manipulation Language (DML) commands.  
(INSERT, UPDATE, DELETE)
4. Write SQL commands for aggregate functions.
5. Write SQL commands using IN, LIKE, BETWEEN and ESCAPE clauses.
6. Write SQL Commands using Numerical, String, Date and Financial functions
7. Write SQL commands using sub-query.
8. Write SQL commands for VIEW (CREATE, MODIFY, DELETE).
9. Write SQL commands for INDEX (CREATE, MODIFY, DELETE).
10. Write SQL commands using GROUP BY, ORDER BY clauses.
11. Write SQL commands using following constraints.  
PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, CHECK
12. Write SQL commands for JOIN operations (ALL types of JOINS)

**PHASE II Working with PL/SQL**

1. Write a PL/SQL program for read a string and check whether the given string is Palindrome or Not.
2. Write a PL/SQL program to find the sum of digits.
3. Write a PL/SQL program using CURSOR.
4. Write a PL/SQL program using function call.
5. Write a PL/SQL program using Named Block with parameters.
6. Write a PL/SQL program using TRIGGER.

**Objectives:**

- To provide opportunities to the learners to practice their communicative skills to make them become proficient users of English.
- To enable the learners to fine-tune their linguistic skills with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

**LIST OF EXPERIMENTS:****1. PC based session (Weightage 40%) A. English Language Lab (15)**

**i. Listening Comprehension:**(5) Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

**ii. Reading Comprehension:**(5) Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

**Speaking:** (5) Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English. Conversations: Face to Face Conversation – Telephone conversation– Role play activities

**2. Discussion of audio-visual materials (Samples to learn and practice) (6)****i. Resume / Report Preparation / Letter Writing (1)**

Structuring the resume / report - Letter writing / Email Communication - Samples.

**ii. Presentation skills: (1)**

Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

**iii. Soft Skills: (2)**

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

**iv. Group Discussion: (1)**

Why is GD part of selection process? - Structure of GD – Moderator – led and other GDs Strategies in GD – Team work - Body Language - Mock GD –Video samples

**v. Interview Skills: (1)**

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

**3. Practice Session (Weightage – 60%) Resume / Report Preparation / Letter writing: (2)****4. Soft Skills (6)**

soft skills: self-management skills & people skills - training in soft skills persuasive skills – sociability skills –interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills

**5. Presentation Skills (6)**

Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentation

**6. Group Discussion Skills (5)**

Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD.

## **7. Interview Skills**

**(5)**

Interview etiquette – dress code – body language – mock interview --attending job interviews – answering questions confidently – technical interview – telephone/Skype interview - practice in different types of questions – one to one interview & panel interview – FAQs related to job interview- Emotional and cultural intelligence

### **Outcomes:**

Upon Completion of the course, the students will:

- ✓ be able to make presentations and participate in group discussions with high level of self-confidence.
- ✓ be able to perform well in the interviews
- ✓ have adequate reading and writing skills needed for workplace situations

**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**

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**

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 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 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 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 Android OS, Ubuntu, Google Chrome OS and Linux operating systems.

## **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.

## **Reference**

1. Mukesh Singh and N.G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill 2000.
2. Distributed Operating System – Andrew S. Tanenbaum, PHI.
3. Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating Concepts", 6<sup>th</sup> Edition Addison Wesley publications 2003.
4. Andrew S. Tanenbaum, "Modern Operating Systems", 2<sup>nd</sup> Edition Addison Wesley 2001

**OBJECTIVES**

- To understand the concepts of list and tuple.
- To know the concepts of network programming.

**UNIT I WELCOME TO PYTHON**

Welcome to Python - What is Python – History of Python – Features of Python – Installing Python – Running Python - Comments - Operators - Variables and Assignment - Python Objects - Standard Types - Other Builtin Types - Internal Types - Standard Type Operators - Standard Type Builtin Functions - Categorizing the Standard Types - Unsupported Types

**UNIT II INTRODUCTION TO NUMBERS**

Introduction to Numbers – Integers - Floating Point Real Numbers - Complex Numbers – Operators - Built-in Functions - Sequences – Strings - Strings and Operators - String-only Operators - Built-in Functions - String Built-in Methods - Special Features of Strings

**UNIT III LISTS, TUPLES, LOOPS**

Lists – Operators - Built-in Functions - List Type Built-in Methods - Special Features of Lists - Tuples - Tuple Operators and Built-in Functions - Special Features of Tuples - Conditionals and Loops - if statement - else statement - else if statement - while statement - for statement - break statement - continue statement - pass statement - else statement

**UNIT IV EXPRESSIONS**

Regular Expressions – Introduction – Special symbols and characters for Regular Expressions – Regular Expressions and Python – Network Programming – Introduction – Network programming in Python – Sockets : Communication end points

**UNIT V GUI PROGRAMMING**

GUI Programming with TKinter – Introduction TKinter and Python Programming – Tkinter examples – Related modules and other GUIs – Web programming – Web surfing with Python – Advanced web clients. 8

**REFERENCE:**

- Chun, J Wesley, CORE Python Programming, 2 nd Edition, Pearson, 2007 Reprint 2010.
- UNIT I : Chapter 1, 2, 4 UNIT II : Chapter 5, 6 UNIT III : Chapter 6, 8 UNIT IV : Chapter 15, 16 UNIT V : Chapter 18, 19
- Jeffrey Elkner, Chris Meyers Allen Downey, Learning with Python, Dreamtech Press, 2015

**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**

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 APPLETT**

Applet Fundamentals- Applet Class - Applet lifecycle- Steps for Developing 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 Database Maintenance.

## **References**

1. Bert Bates, Karthy Sierra, Eric Freeman, Elisabeth Robson, “Head First Design Patterns”, O’REILLY Media Publishers.(1<sup>st</sup>- Unit).
2. Herbert Schildt, “Java: A Beginner Guide”, Oracle Press-Seventh Edition. (2<sup>nd</sup> and 3<sup>rd</sup> Unit).
3. Murach’s, “Java Servlets and JSP”, 2<sup>nd</sup> Edition, Mike Murach & Associates Publishers; 3<sup>rd</sup> Edition. (4<sup>th</sup> Unit).
4. Warburton Richard, “Java 8 Lambdas”, Shroff Publishers & Distributors Pvt Ltd. (5<sup>th</sup> Unit).
5. Paul Deitel and Harvey Deitel, “Java: How to Program”, Prentice Hall Publishers; 9<sup>th</sup> Edition.
6. Jan Graba, “An Introduction to Network Programming with Java- Java 7 Compatible”, 3<sup>rd</sup> Edition, Springer.



**Objectives :**

To make the students to understand several processes that are involved in the software development, the software engineering models, Cost estimation, etc and to apply the concepts in their project developments.

**Unit I**

Introduction – Characteristics of software – Evolution of software for Business – Software crisis and Emergence of software engineering – salient features of software Development – software Development process – software processes – Software Development Life cycle models

**Unit II**

Software Requirement Engineering – Requirement Engineering process – Requirement Elicitation- Requirement Elaboration – Negotiation- Requirement validation – structure of Sas – characteristics of RE process. Software Design Approaches – Different approaches to SAD – Overview of the FO approach – overview of the OO Approach comparison of OOAD with S5AD. Structured Analysis – Introduction to structured analysis – path flow Diagram – process specification- Data Dictionary – Entity relationship model – state transition diagrams. Structured design – structured Design methodologies – coupling and cohesion – structure chart – mapping DFD into a structured chart – Data design – detail design.

**Unit III**

Software testing – Testing fundamentals – Black box testing – white box testing – unite testing – Integration testing – System testing – Usability testing – software metrics – software metrics and its classification – software size metrics- Quality metrics – process metrics – design metrics.

**Unit IV**

Software project Estimation – Software project parameters – Approaches to software estimation – project estimation techniques – classification of software projects – constructive. Cost estimation model – cocomo – II – software project management – Introduction – project planning – work breakdown structure – project scheduling- Execution, monitoring and control – Risk management.

**Unit V**

Software quality management – Introduction – process quality models – Quality Assurance – process standard. ISO 9000 and ISO 12207 – capability maturing model – web engineering – web engineering process – web design process – web metrics.

**Outcomes :**

At the end of the course the student will:

- Understand the process and model involved in the software development
- Be familiar with ISO 9000 and ISO 1220 standards on Software quality
- Be able to apply the software engineering models for the project development

**REFERENCE**

1. Software Engineering **Jibitesh Mishra**, Ashok Mohenty, Pearson publisher Publication 2011
2. Software Engineering Sixth Edition, Pressman. Tata McGraw-Hill Edition 2010
3. Software Engineering Principles and Practices, Deepak Jain, OXFORD University 2009
4. Software Engineering Principles and Practices, Jawadekar Tata McGraw-Hill Edition 2005.

- 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

**OBJECTIVES**

- To study the basics of Python programming.
  - To study about decision making, Functions and Files Handling in Python.
1. Program to demonstrate arithmetic operations.
  2. Program using numbers and operators.
  3. Program to demonstrate string manipulation.
  4. Program using user defined functions.
  5. Program using lists.
  6. Program using tuples.
  7. Program using conditional statement.
  8. Program using looping statement.
  9. Program using continue, pass and else statement.
  10. Program to demonstrate the use of regular expressions.
  11. Program to demonstrate exception handling.
  12. Program to demonstrate network programming.
  13. Program to demonstrate GUI programming with Tkinter.
  14. Program using web programming.
  15. Program using advanced web clients.

**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 Analytics Lifecycle – Data Discovery – Data Preparation – Model Planning – Model Building – Communicate Results – Operationalize.

**Unit II DATA ANALYTIC METHODS**

**Basic Data Analytic Methods Using R :** Introduction to R programming – R Graphical User Interfaces – Data Import and Export Attribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Before Analysis – Dirty Data – Visualizing a 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 METHODS**

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

**Unit IV CLASSIFICATION**

**Classification :** Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Naïve Bayes – Bayes Theorem – Naïve Bayes Classifier – 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 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 –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

### Outcomes

On successful completion of the course the student should

- Able to apply Hadoop ecosystem components.
- Able to participate in data science and big data analytics projects

### Reference

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, EMC Education Services Published by John Wiley & Sons, Inc. 2015
2. Noreen Burlingame , “The little book on Big Data”, New Street publishers, 2012.
3. Anil Maheshwari, “ Data Analytics”, McGraw Hill Education, 2017.
4. Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, Starch Press; 1 edition, 2011.
5. Sandip Rakshit, “R for Beginners”, McGraw Hill Education, 2017
6. [http://www.johndcook.com/R\\_language\\_for\\_programmers.html](http://www.johndcook.com/R_language_for_programmers.html).
7. <http://bigdatauniversity.com/>.

[8. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction](http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction).

**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- IoT PlatformsDesign 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 real life.
- It helps to rely less on physical resources and started to do their work smarter.

## **Reference:**

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 Höller, 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.

**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,  $\sigma$ -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 & FREQUENCY DOMAIN**

**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, Hotelling'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 based coding; Lossy Compression: FFT; DCT; KLT; DPCM; MRFM based compression; Wavelet transform based; Image Compression standards.



## 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 on Color.

**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 be able to

- Review the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques.
- Interpret Image compression standards, and Interpret image segmentation and representation techniques.
- Gain idea to process various image used in various fields such as weather forecasting, Diagnosis of various disease using image such as tumor, cancer etc.

### References

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.
3. B. Chan la, D. DuttaMajumder, "Digital Image Processing and Analysis", PHI, 2003.
4. Nick Elford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.
5. Todd R. Reed, "Digital Image Sequence Processing, Compression, and Analysis", CRC Press, 2015.
6. L. Prasad, S.S. Iyengar, "Wavelet Analysis with Applications to Image Processing", CRC Press, 2015.

1. (i) Perform setting up and installing Hadoop in its two operating modes: Pseudo distributed, Fully distributed.  
(ii) Use web based tools to monitor your Hadoop setup.
  
2. (i) Implement the following file management tasks in Hadoop: Adding files and directories  
Retrieving files, Deleting files  
ii) Benchmark and stress test an Apache Hadoop cluster
  
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm. Find the number of occurrence of each word appearing in the input file(s)  
Performing a MapReduce Job for word search count (look for specific keywords in a file)
  
4. Stop word elimination problem: Input: A large textual file containing one sentence per line A small file containing a set of stop words (One stop word per line)  
Output: A textual file containing the same sentences of the large input file without the words appearing in the small file.
  
5. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data
  
6. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
  
7. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scale
  
8. Demonstrate handling of missing data, Demonstrate hierarchical indexing using PANDAS

**Objectives**

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

**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 – Theoretical basis for data communication - guided transmission media

**Unit-2 WIRELESS TRANSMISSION**

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 DATA LINK PROTOCOLS**

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**

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 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.

## **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

## **Reference**

1. S. Tanenbaum, 2011, Computer Networks, Fifth Edition, Pearson Education, Inc.
2. B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, New Delhi.
3. F. Halsall, 1995, Data Communications, Computer Networks and Open Systems, Addison Wesley.
4. D. Bertsekas and R. Gallager, 1992, Data Networks, Prentice hall of India, New Delhi.
5. Lamarca, 2002, Communication Networks, Tata McGraw Hill, New Delhi.
6. Teresa C. Piliouras, "Network Design Management and Technical Perspectives, Second Edition", Auerbach Publishers, 2015.

## **Website, E-learning resources**

1. <http://peasonhighered.com/tanenbaum>

**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**

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 - 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 RESTful WebAPI.

## **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.

### **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.

### **References:**

1. Buyya, Vecciola and Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Tata McGraw Hill, 2013.
2. ArshdeepBahga, Vijay Madiseti, “Cloud Computing: A Hands–OnApproach”Universitiespress(India)Pvt.limited2016.
3. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press,2016.
4. Michael Miller “Cloud Computing Web based application that change the way you work and collaborate online”. Pearson edition,2008.
5. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, 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 and algorithms.

## 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 Epsilon transitions.

## Unit 2 EXPRESSION

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

## Unit 3 GRAMMAR

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

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 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, and grammars.
- 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.

## **Reference**

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



**Objective**

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 synchronization
- Learn the development life cycle of embedded system

**Unit I INTRODUCTION**

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 EMBEDDED SYSTEM**

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 APPLICATIONS**

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 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 – Different Phases of 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 embedded systems.
- Become aware of interrupts, hyper threading and software optimization.
- Design real time embedded systems using the concepts of RTOS.

### **Reference**

1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 2009.
2. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", TMH. Second Edition 2009
3. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley. Third Edition 2006
4. 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.
5. David E. Simon, "An Embedded Software Primer" Pearson Education, 1999

**Objectives:**

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

**Unit I INTRODUCTION**

Introduction to NLP, Language Structure and Language Analyzer.

**Unit II WORDS AND THEIR ANALYZER**

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

**Unit III MACHINE TRANSLATION**

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

**Unit IV TREE ADJOINING GRAMMAR**

Adjoining Grammar, Comparing TAG with PG.

**Unit V GOVERNMENT AND BINDING**

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, Grammar, 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

**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**

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

**Unit II E-MAIL SECURITY & FIREWALLS**

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**

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**

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

**Unit V ANALYSIS AND VALIDATION**

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

**Objectives:**

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

**Unit I**

Introduction to WSN - overview of WSN - Technological background - Network architecture for WSN - Classification of WSN - Protocol stack for WSN - Fundamental MAC Protocols - MAC design for WSN

**Unit II**

Routing and Data Dissemination - Fundamentals and challenges - Taxonomy - Location aided protocols - Layered and In-Network processing protocols - Data centric protocols - Broadcasting multicasting and geocasting: Concepts and major challenges - Broadcasting mechanisms - Multicasting and geocasting mechanisms

**Unit III**

Node clustering: Introduction - Cluster head election algorithms - Node clustering algorithms for WSN - Query processing and data aggregation

**Unit IV**

Node localization: Concepts and challenges - TOA based ranging - Wireless sensor node localization - Energy efficiency and power control: Need - Physical layer power conservation mechanisms - MAC layer mechanisms

**Unit V**

Transport protocols for WSN - Sensor network Standards - IEEE 802.15.4 - ZigBee - Wireless multimedia network - Wireless sensor and actor networks - Sensor network application in Challenging environments - Cross layer design for WSN.

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 Sensor networks
- ✓ Able to design a new sensor network based on their needs

**Reference:**

1. Wireless Sensor Networks - A networking Perspective - Jun Zheng, Abbas Jamalipour - Wiley 2014
2. Wireless Sensor networks :FengZhao,LeonidasGuibas –Morgan Kaufmann Publications – 2012
3. Wireless Sensor Networks: Technology, Protocols and Applications - TaiebZnatiKazemSohraby, Daniel Minoli - Wiley India 2010
4. Protocols and Architectures for Wireless Sensor Networks- Holger Karl 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**

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**

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 – Universal Design.

**Unit III COGNITIVE MODELS**

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

**Unit IV MOBILE ECOSYSTEM**

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.

**UnitV WEB INTERFACES**

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)



**Objectives:**

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

**Unit I INTRODUCTION**

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

**Unit II ANALYSIS**

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

**Unit III HIDDEN MARKOV MODELS**

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

**Unit IV CLASSIFICATION**

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

**Unit V COMPUTATIONAL METHODS**

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. Bioinformatics Computing – Bryan Bergeron, PHI Learning Private Limited, 2010.

**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**

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**

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

**Unit III BITCOIN**

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

**Unit IV SMART CONTRACTS & ETHEREUM**

Smart Contracts – Ethereum 101 – Introduction – Ethereum blockchain – Elements of Ethereum blockchain – Precompiled 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**

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.

**Reference:**

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

**Objectives**

- To enable the student to be familiar with distributed services, XML and webservice
- To study the use of webservice in B2C and B2B applications

**Unit – I OVERVIEW**

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**

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 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 APPLICATIONS**

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 TECHNOLOGIES**

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.

## **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 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.

## **References**

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

**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**

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**

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**

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 CONCEPTS**

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**

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.

## **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.

## **Reference Book**

1. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley India, 2007.
2. S. Rajasekaran, G.A.V. Pai, "Neural Networks, Fuzzy Logic, Genetic Algorithms", Prentice Hall India, 2004.

**Objectives :**

To make the students to learn the .NET programming and XML and also prepare them to apply it to the real world problems.

**Unit – I**

Introducing .NET-.NET framework-Common Language Runtime-The .NET class library-Data types-Variable operations-Conditional and loop structures-Functions and subroutines-Types, objects and namespaces-Setting up ASP.NET and IIS. ASP.NET applications-Code behind-The Global.asax application file-Understanding Asp.NET classes-ASP.NET configuration-Web controls-Web control classes-Auto PostBack and web control events-Validation and rich controls.

**Unit-II**

Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

**Unit III**

Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

Overview of ADO.NET- ADO.NET object model- accessing data –creating a connection-using a command with a data reader- binding data into data binding controls- displaying data with data grid controls.

**Unit IV**

Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.XML's hidden role in .NET- XML explained- XML classes: text writer, text reader, XML documents-XML validation- XML display and transforms- XML in ADO.NET- XML Data document.

**Unit V**

Web services architecture-WSDL-Creating web services-Documenting and testing web services-Web service data types-ASP.NET intrinsic objects-Using web services.

Assemblies, Versioning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET.



**Outcomes :**

At the end of the course the students will be in a position to:

- Know the basics of .NET framework
- Apply the .NET programming skills to solve the practical problems.
- Explain the web service architecture.
- Connect the various database tools with .NET

**REFERENCE**

1. The Complete Reference ASP.NET – Mathew MacDonald, Tata McGraw-Hill.
2. Professional ASP.NET - Wrox publication Pvt Ltd.
3. ASP.NET Developer's Guide - Greg Buczek - Tata McGraw Hill Edition.
4. Introduction to .NET framework – Wrox publication Pvt Ltd

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