



NORTH MAHARASHTRA UNIVERSITY, JALGAON

School of Computer Sciences

**MASTER OF SCIENCE in Computer Science
[M. Sc.(Computer Science)]**

Syllabus

[under Academic Flexibility]

Faculty of Science and Technology

With effect from July- 2017-18

School of Computer Sciences

School of Computer Sciences
NORTH MAHARASHTRA UNIVERSITY, JALGAON – 425 001

COURSE STRUCTURE WITH CREDIT

[under Academic Flexibility]

M.Sc. (Computer Science) w.e.f. June 2017

Semester	Course	Marks	Hour/week	Credit	Total
Semester-I	CS-101	100	04	04	28
	CS-102	100	04	04	
	CS-103	100	04	04	
	CS-104	100	04	04	
	CS-105	100	04	04	
	CS LAB-I	100	06	04	
	CS LAB-II	100	06	04	
Semester-II	CS-201	100	04	04	30
	CS-202	100	04	04	
	CS-203	100	04	04	
	CS-204	100	04	04	
	CS-205	100	04	04	
	CS LAB-III	100	06	04	
	CS LAB-IV	100	06	04	
	Audit Course-I	50	02	02	
Semester-III	CS-301	100	04	04	30
	CS-302	100	04	04	
	CS-303	100	04	04	
	CS-304	100	04	04	
	CS-305	100	04	04	
	CS LAB-V	100	06	04	
	CS LAB-VI	100	06	04	
	Audit Course-II	50	02	02	
Semester-IV	Industrial Training/Project				12

Audit Course I and II: To be completed using IIT Bombay's SPOKEN TUTORIAL online Courseware. It is mandatory for the students to complete the credits of this course along with passing the online examination conducted by Spoken Tutorial IIT Bombay.

Degree Name	:	Master of Science in Computer Science [M. Sc. (Computer Science)] [Under Academic Flexibility]
Faculty	:	Science and Technology
Duration	:	02 years, Full Time course
Medium of Instruction	:	English
Pattern	:	Semester Pattern (04 semesters)
Examination Pattern	:	60% (External Assessment) + 40%(Internal Assessment)
Passing Standard	:	Separate Passing for internal as well as external assessment.
Evaluation Mode	:	CGPA
Lecture	:	Clock hour (60 minutes)

NORTH MAHARASHTRA UNIVERSITY, JALGAON
School of Computer Sciences

SYLLABUS for M. Sc. (Computer Science)
(With effect from June-2017)

Semester-I

Course Code	Course Title
CS-101	Data Structures and Algorithms
CS-102	Database Management System (DBMS)
CS-103	Automata Theory and Computability
CS-104	Operating Systems
CS-105	Object Oriented Programming using JAVA
CS LAB-I	LAB on Data Structures and Algorithms and JAVA programming
CS LAB-II	LAB on DBMS

Semester-II

Course Code	Course Title
CS-201	Compiler Construction
CS-202	Mathematical Foundations of Computer Science
CS-203	Artificial Intelligence
CS-204	Design and Analysis of Algorithms
CS-205	Python Programming
CS-206	Audit Course-I
CS LAB-III	LAB on Design and Analysis of Algorithms(DAA)
CS LAB-IV	LAB on Python Programming

Semester-III

Course Code	Course Title
CS-301	Machine Learning
CS-302	Natural Language Processing
CS-303	Computer Graphics and Digital Image Processing
CS-304	Software Engineering
CS-305	Web Application Development Technology
CS-306	Audit Course-II
CS LAB-V	LAB on Web Application Development Technology
CS LAB-VI	LAB on Computer Graphics and Digital Image Processing

Note: Audit Course I and II: To be completed using IIT Bombay's SPOKEN TUTORIAL online Courseware. It is mandatory for student to complete the credits of this course along with passing the online examination conducted by Spoken Tutorial IIT Bombay.

Semester-IV

Course Code	Course Title
CS-401	Full Time Industrial Training

Semester-I

Course Code:CS-101

Data Structures and Algorithms

Clock Hours: 60

Total Marks: 100

Unit-I

[08]

Max Marks:06

Introduction to Data Structures and Algorithms: Algorithmic Notation: Format Conventions, Statement and Control Structures. Time and Space Analysis: Data types and Abstract data types, Types of Data structures; Primitive, Non primitive, Linear and Nonlinear Data structures

Unit-II

[08]

Max Marks:15

Array: Storage representation, operations and applications (Polynomial addition and subtraction) **Stack:** operations and applications (infix, postfix and prefix expression handling), **Queue:** operations and applications, **Circular Queues:** operations and applications, Concept of Double ended Queue and Priority Queue, Linked representation of stack and queue.

Unit-III

[10]

Max Marks:12

Linked Lists: Operations and Applications of Linear linked list (Polynomial addition and subtraction), Circular linked list and Doubly linked list.

Unit-IV

[11]

Max Marks:21

Trees: Binary Trees, Binary Tree: Representations, Operations (insert/delete), Traversal (inorder, preorder, postorder, level order), Threaded Binary Tree, Search Trees: AVL Tree, single and double rotations, B-Trees: insertion and deletion, Introduction to B+ and B* Trees

Unit-V

[11]

Max Marks:18

Graphs and Their Applications: Representation (Matrix/Adjacency) and Traversal (Depth First Search/Breadth First Search), Spanning Trees, Minimal Spanning Tree (Prim's and Kruskal's algorithm), Shortest Paths and All Pair Shortest Path, Dijkstra's, Floyd-Warshall Algorithms.

Unit-VI

[12]

Max Marks:18

Hash Table: Hash Function, Collision and its Resolution, Separate Chaining, Open Addressing (linear probing, quadratic probing, double hashing), Rehashing, Extendible Hashing Searching: Linear Search and Binary Search (array/binary tree). **Sorting:** General Background, Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Quicksort, Mergesort, Heapsort and Radix Sort.

References:

1. Tremblay, J. & Sorenson, P.G., (2001), An Introduction to Data Structures with Application, Mcgraw Hill India, ISBN: 978-0074624715, 0074624717
2. Langsam, Y., Augenstein, M.J. & Tenenbaum A.M., (2015), Data Structures using C and C++, 2nd Edition, Pearson Education ISBN: 978-9332549319, 9332549311
3. Balagurusamy, E., (2013), Data Structures using C, 1st Edition, Mcgraw Hill Education, ISBN: 978-1259029547, 1259029549
4. Weiss, M.A., (2002), Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson India, ISBN: 978-8177583588, 8177583581
5. Horowitz, E., Sartaj S. & Mehta, D. (2008), Fundamentals of Data Structures in C++, Universities Press ISBN: 978-8173716065, 8173716064 *
6. Lafore, R., (2003), Data Structures & Algorithms in Java, 2nd Edition, Pearson India, ISBN: 978-8131718124, 8131718123
7. Kruse, R., Tondo, C.L., Leung B., & Mogalla S, (2006), Data Structures and Program Design in C, Pearson India, ISBN: 978-8177584233.

Course Code: **CS-102**

**Database Management System
(DBMS)**

Clock Hours: **60**
Total Marks: **100**

Unit-I

[05] Max Marks:**08**

Introduction: Database system application and purpose, Characteristics of DBMS, Database Users, 1-tier, 2-tier and 3-tier architecture of DBMS along with its advantages, Levels of Database Architecture, Data Models, Data-schemas and instances, Data Independence, Role and responsibilities of DBA.

Unit-II

[10] Max Marks:**10**

Database Design and E-R Model: Overviews of Database Design, ER Modeling concepts, ER Diagrams, Reduction to Relational Schemas, Extended ER Features, Alternative notations for Modelling, Cardinality constraints, Atomic Domains and 1NF, Decomposition using Functional Dependencies (BCNF, 3NF and 4NF).

Unit-III

[12] Max Marks:**20**

Relational Databases: Structure of Relational Databases, Database Schemas, Keys, Schema diagrams, Relational Query Languages, Relational Operation. Overview of SQL, SQL Data Definition, Basic Structure of SQL Queries, Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of Databases. Join Expressions, Views, Transactions, Integrity Constraints, SQL data types and Schemas, Authorization, Accessing SQL from Programming Languages, Overview of Dynamic SQL and SQL CLI. Functions and Procedures, Triggers. The relational Algebra fundamental and extended Operations. Tuple and

Domain Relational Calculus.

Unit-IV [10] Max Marks:22
Transaction Management and Query Processing: Transaction Concept, Model, Storage Structure, Atomicity and Durability, Isolation, Levels of Isolation, Overview of Query Processing, Measuring Query Cost, Selection Operation, Sorting, Join Operation, Other Operations and Evaluation of Expression. Overview of Query Optimization, Transformation of Relational Expression, Choice of Evaluation Plan.

Unit-V [10] Max Marks:15
Concurrency Control and Recovery System: Lock based Protocol, Timestamp based Protocol, Validation based Protocol, Deadlock Handling, Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithms, Buffer Management, Early lock release and logical undo operations, Remote Backup Systems. Case study: ARIES

Unit-VI [13] Max Marks:25
Advanced Topics in Databases: Type your unit content here. (comma separated) Introduction to Object Databases: Shortcomings of Relational Data Model, The Conceptual Object Data Model, Objects in SQL:1999 and SQL:2003. Introduction to XML and Web Data: Semi-structured Data, Overview of XML, XML Data Definitions, XML Schema, XML Data Manipulation: XQuery, XPath Query Languages: XPath and SQL/XML. Distributed Databases: Overview, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control, Cloud based Databases.

References:

1. Michael Kifer, Arthur Bernstein, P.M, Lewis and P.K. Panigrahi, "Database Systems: An Application Oriented Approach", Second Edition, Pearson Education, ISBN:978-81-317-0374-8.
2. C.J.Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, ISBN:978-81-7758-556-8
3. A. Silberschatz, H.F.Korth, and S.Sudarshan, "Database System Concepts", TMH Publications, Sixth Edition, ISBN:978-007-132522-6.

Unit-I

[10] Max Marks: 20

Grammars: Production systems, Chomskian Hierarchy, Right linear grammar and Finite state automata, Context free grammars, Normal forms, uvwxy theorem, Parikh mapping, Self-embedding property, Subfamilies of CFL, Derivation trees and ambiguity

Unit-II

[10] Max Marks: 20

Finite State Automata: Nondeterministic and deterministic FSA, NFSA with ϵ -moves, Regular Expressions, Equivalence of regular expression and FSA, Pumping lemma, closure properties and decidability, Myhill - Nerode theorem and minimization, Finite automata with output

Unit-III

[08] Max Marks: 15

Pushdown Automata: Acceptance by empty store and final state, Equivalence between pushdown automata and context-free grammars, Closure properties of CFL, Deterministic pushdown automata

Unit-IV

[12] Max Marks: 20

Turing Machines: Techniques for Turing machine construction, Generalized and restricted versions equivalent to the basic model, Godel numbering, Universal Turing Machine, Recursively enumerable sets and recursive sets, Computable functions, time space complexity measures, context sensitive languages and linear bound automata

Unit-V

[08] Max Marks: 10

Decidability: Post's correspondence problem, Rice's theorem, decidability of membership, emptiness and equivalence problems of languages

Unit-VI

[10] Max Marks: 15

Complexity Measures: Time and tape complexity measures of Turing machines, Random access machines, the classes P and NP, NP-Completeness, satisfiability and Cook's theorem, Polynomial reduction and some NP-complete problems, Regulated rewriting L systems, Grammar systems

References:

1. K. Krithivasan and R. Rama (2009). Introduction to Formal Languages, Automata Theory and Computation: Pearson Education, ISBN 9788131723562.
2. J. E. Hopcroft, R. Motwani and J.D. Ullman (2001). Introduction to Automata Theory Languages and computation: Pearson Education Asia, ISBN 978-0321455369.
3. Peter Linz (2006). An Introduction to Formal Language and Automata 4th Edition:

Narosa Publishing house, ISBN 978-1-4496-1552-9.

4. M.Sipser (1997). Introduction to the Theory of Computation; Singapore: Brooks/Cole, Thomson Learning ISBN, 978-1133187790.
5. John. C. Martin (2003). Introduction to the Languages and the Theory of Computation Third edition Tata McGraw-Hill ISBN 9780070660489.
6. <http://nptel.ac.in/>

Course Code: **CS-104**

Operating Systems

Clock Hours: **60**

Total Marks: **100**

Unit-I

[04] Max Marks:08

Introduction: review of computer organization, introduction to popular operating systems like UNIX, Windows, etc., OS structure, system calls, functions of OS, evolution of OSs.

Unit-II

[03] Max Marks:06

Computer organization interface: using interrupt handler to pass control between a running program and OS.

Unit-III

[08] Max Marks:12

Concept of a process: states, operations with examples from UNIX (fork, exec), Process scheduling, inter-process communication (shared memory and message passing), UNIX signals.

Unit-IV

[04] Max Marks:06

Threads: multithreaded model, scheduler activations, examples of threaded programs.

Unit-V

[06] Max Marks:10

Scheduling: multi-programming and time sharing, scheduling algorithms, multiprocessor scheduling, thread scheduling (examples using POSIX threads).

Unit-VI

[08] Max Marks:12

Process synchronization: critical sections, classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).

Unit-VII

[06] Max Marks:10

Deadlocks: modelling, characterization, prevention and avoidance, detection and recovery.

Unit-VIII

[07] Max Marks:12

Memory management: with and without swapping, paging and segmentation, demand paging, virtual memory, page replacement algorithms, working set model, implementations from operating systems such as UNIX. Current Hardware support for paging: e.g., Pentium/ MIPS

processor etc.

Unit-IX [07] Max Marks:12
Secondary storage and Input/Output: device controllers and device drivers, disks, scheduling algorithms, file systems, directory structure, device controllers and device drivers, disks, disk space management, disk scheduling, NFS, RAID, other devices. operations on them, UNIX FS, UFS protection and security, NFS

Unit-X [04] Max Marks:06
Protection and security: Illustrations of security model of UNIX and other OSs. Examples of attacks.

Unit-XI [03] Max Marks:06
Epilogue: Pointers to advanced topics (distributed OS, multimedia OS, embedded OS, real-time OS, OS for multiprocessor machines).

All above topics shall be illustrated using UNIX as case-studies.

References:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne (2009), Operating System Concepts, 8th Ed., John Wiley, ISBN 0-471-69466-5.
2. William Stallings (2014), Operating Systems: Internals and Design Principles. Pearson, 8th Ed., ISBN-13: 978-0-13-230998-1
3. AS Tanenbaum (2009), Modern Operating Systems, 3rd Ed., Pearson, ISBN: 0135013011
4. AS Tanenbaum, AS Woodhull (2006), Operating Systems Design and Implementation, 3rd Ed., Prentice Hall, ISBN-10: 0131429388
5. M. J. Bach (1986), Design of the Unix Operating System, Prentice Hall of India, ISBN 0 -13-201757-1 025

Course Code: CS-105

**Object Oriented Programming
using JAVA**

*Clock Hours: 60
Total Marks: 100*

Unit- I [08] Max Marks:12
An Introduction to Java: Java as a Programming Platform, The Java “White Paper” Buzzwords, Java Applets and the Internet, Common Misconceptions about Java, The Java Programming Environment, Installation, A Simple Java Program, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays.

Unit-II [08] Max Marks:12
Objects and Classes: Introduction to Object-Oriented Programming, Using Predefined Classes, Defining Your Own Classes, Static Fields and Methods, Method Parameters, Object

Construction, Packages, The Class Path, Documentation Comments

Unit-III [10] Max Marks:16

Inheritance, Interfaces, Lambda Expressions, and Inner Classes: Classes, Super classes, and Subclasses, Object: The Cosmic Superclass, Generic Array Lists, Object Wrappers and Autoboxing, Methods with a Variable Number of Parameters, Enumeration, Classes, Reflection, Interfaces, Examples of Interfaces, Lambda Expressions, Inner Classes, Proxies

Unit-IV [10] Max Marks:16

Exceptions and Generic Programming: Dealing with Errors, Catching Exceptions, Assertions and Logging, Why Generic Programming? Simple Generic Class, Generic Methods, Bounds for Type Variables, Inheritance Rules for Generic Types, Wildcard Types, Reflection and Generics

Unit-V [12] Max Marks:24

Graphics Programming, Event Handling and Swing Components: Introducing Swing, Creating a Frame, Positioning a Frame, Displaying Information in a Component, Working with 2D Shapes, Using Color, Using Special Fonts for Text, Displaying Images, Basics of Event Handling, Actions, Mouse Events, The AWT Event Hierarchy, Swing and the Model-View-Controller Design Pattern, Introduction to Layout Management, Text Input, Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes.

Unit-VI [12] Max Marks:20

Deployment and Concurrency and Database Programming: JAR Files, Storage of Application Preferences, Service Loaders, Applets, Java Web Start, Threads, Interrupting Threads, Thread States, Thread Properties, Synchronization, Blocking Queues, Thread-Safe Collections, Callables and Futures, Executors, Synchronizers, Threads and Swing, The Design of JDBC, The Structured Query Language, JDBC Configuration, Working with JDBC Statements, Query Execution, Scrollable and Updatable Result Sets, Row Sets, Metadata.

References:

1. Cay S. Horstmann Core Java Volume I—Fundamentals (December 2015), Tenth Edition, Prentice Hall, ISBN: 9780134177335
2. Cay S. Horstmann Core Java, Volume II—Advanced Features (December 2016), Tenth Edition, Prentice Hall, ISBN: 9780134177878
3. Herbert Schildt, Java: The Complete Reference, Ninth Edition, McGraw Hill Education, ISBN 978-0-07-180855-2

Data Structures and Algorithms

1. Implementation of programs based on the following
 - Arrays
 - Multidimensional Arrays, Matrices
 - Stacks, Polish Notation
 - Queues
 - Deques
 - Linear Linked List, Circular Linked List, Doubly Linked List
 - Polynomial Addition/Subtraction
2. Implementation of programs based on Trees
 - Binary Search Tree
 - In-order, Pre-order and Post-order Traversals
 - Heap Tree
 - Balanced Binary Tree (AVL)
 - B-Trees
3. Implementation of programs based on Graphs
 - Depth First Traversal
 - Breadth First Traversal
 - Obtaining Shortest Path (Dijkstra and Floyd-Warshall)
 - Minimum spanning tree (Kruskal and Prim)
4. Implementation of programs for Hash Table, Searching and Sorting techniques
 - Hash Table
 - Linear and Binary Search (using array)
 - Bubble sort
 - Selection sort
 - Insertion sort
 - Radix sort
 - Quick sort
 - Merge sort
 - Heap sort

JAVA programming

1. Write a program that demonstrates program structure of java.
2. Write a program that demonstrates string operations.
3. Write a program that demonstrates package creation and use in program.
4. Write a program that demonstrate sinner class.

5. Write a program that demonstrates inheritance.
6. Write a program that demonstrates 2D shapes on frames.
7. Write a program that demonstrates text and fonts.
8. Write a program that demonstrates event handling for various types of events.
9. Write a program to illustrate use of various swing components.
10. Write a program that demonstrates use of dialog box.
11. Write a program to create own dialog box.
12. Write a program to create toolbar, menu & popup menu.
13. Write a program to implement file handlings.
14. Write a program that demonstrates Applet programming.
15. Write a program to implement generic programming.
16. Write a program that demonstrates JDBC on applet/application.
17. Write a program that demonstrates multithreading.

Course Code: CS LAB-II

LAB on DBMS

Total Marks: 100

1. Creating database tables and using data types.
 - Create table
 - Modify table
 - Drop table
2. Practical Based on Data Manipulation.
 - Adding data with Insert
 - Modify data with Update
 - Deleting records with Delete
3. Practical Based on Implementing the Constraints.
 - NULL and NOT NULL
 - Primary Key Constraint
 - Foreign Key Constraint
 - Unique Constraint
 - Check Constraint
 - Default Constraint
4. Practical for Retrieving Data Using following clauses.
 - Simple select clause
 - Accessing specific data with Where
 - Ordered By
 - Distinct

- Group By
5. Practical Based on Aggregate Functions.
 - AVG
 - COUNT
 - MAX
 - MIN
 - SUM
 - CUBE
 6. Practical Based on implementing all String functions.
 7. Practical Based on implementing Date and Time Functions.
 8. Practical Based on implementing use of UNION, INTERSECTION, SET DIFFERENCE.
 9. Implement Nested Queries & all types of JOIN operation.
 10. Practical Based on performing different operations on a view.
 11. Practical Based on implementing use of Procedures.
 12. Practical Based on implementing use of Triggers
 13. Practical Based on implementing Cursor.
 14. +++++VB.NET, C#.NET, JAVA, D2K, etc.
 15. Practical based on creating Data Reports.
 16. Design entity relationship models for a business problem and develop a normalized database structure

Semester-II

Course Code: CS-201

Compiler Construction

Clock Hours: 60

Total Marks: 100

Unit-I

[05] Max Marks:10

Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool-based approach to compiler construction.

Unit-II

[06] Max Marks:15

Lexical analysis: Interface with input, parser and symbol table, token, lexeme and patterns, Difficulties in lexical analysis, Error reporting, Implementation, Regular definition, Transition diagrams, LEX.

Unit-III

[15] Max Marks:30

Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.

Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.

Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.

Unit-IV

[10] Max Marks:15

Run time system: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

Unit-V

[10] Max Marks:15

Intermediate code generation: Intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls. Implementation issues.

Unit-VI

[10] Max Marks:15

Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from dags, peep hole optimization, code generator generators, specifications of machine.

References:

1. Aho A.V., R. Sethi and J.D. Ullman. Compiler Principle, Techniques and Tools: Addison Wesley, ISBN 0-321-48681-1.
2. Barret, Couch. Compiler Construction Theory and Practice: Computer Science series,

Asian Student Ed, ISBN 978-0574213358

3. Dhamdhare D.M. Compiler Construction Principle and Practice: McMillan India, ISBN 9780333904060
4. Gres D. Compiler Construction for Digital Computer: Wiley, ISBN 047132776X.
5. David Galles (2009). Modern Compiler Design: Pearson Education, ISBN 9788131709412

Course Code: CS-202

**Mathematical Foundations of
Computer Science**

*Clock Hours: 60
Total Marks: 100*

Unit-I

[15] Max Marks:25

Induction and Recursion: Mathematical Induction, Strong Induction and Well Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness, The Towers of Hanoi, Merge Sort, Linear Recurrences, Divide-and-Conquer Recurrences, A Feel for Recurrences

Unit-II

[15] Max Marks:20

Advance Counting Techniques: Recursive Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

Unit-III

[05] Max Marks:10

Statistics: Population and sample, parameters and statistics: definition, types: Descriptive and Inferential, applications, Descriptive Statistics: Mean, median, mode and standard deviation, variance, Graphical statistics

Unit-IV

[15] Max Marks:20

Probability: Making decisions under uncertainty, Classical definition of Probability, Events and their Outcomes, Rules of Probability, Probability axioms, Random variables (discrete and continuous), Joint and Conditional probability, independence and Bayes theorem, Distribution of a random vector, Probability mass function, Probability density function and distribution function. Distributions: Binomial, Poisson, Uniform, Exponential, Normal.

Unit-V

[10] Max Marks:15

Stochastic Processes: Definitions and classifications of Stochastic Processes, discrete and continuous Markov models, Hidden Markov Models, Chapman-Kolmogorov equation

References:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications 6th Ed, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007 ISBN 10: 0070681880
2. Michael Baron (2014) Probability and Statistics For Computer Scientists Second Edition, CRC press. ISBN: 978-1-4822-1410-9

3. Bhat B.R, Srivenkatramana T and Rao Madhava K.S. (1996): Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
4. Croxton F.E, Cowden D.J and Kelin S (1973): Applied General Statistics, Prentice Hall of India ISBN 10: 0201089947 ISBN 13: 9780201089943
5. Hogg, Robert V. & Craig Allen T. (2008). Introduction to Mathematical Statistics, Pearson Education ISBN 0-02-978990-7
6. Goon A.M., Gupta M.K., Dasgupta. B. (2001), Fundamentals of Statistics, Volume I and II, World Press, Calcutta.
7. Ross, S. (2005). Introduction to Probability Models, (6th Ed. Academic Press). ISBN 978-0-12-375686-2
8. Medhi, J. (1994). Stochastic Processes, (2nd Ed. New Age Publisher) ISBN : 978-93-86286-48-2

Course Code: CS-203

Artificial Intelligence

Clock Hours: 60

Total Marks: 100

Unit-I

[08] Max Marks:10

Introduction: Overview and Historical Perspective, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents.

Unit-II

[06] Max Marks:10

State Space Search: Depth First Search, Breadth First Search, DFID.

Unit-III

[08] Max Marks:12

Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search.

Unit-IV

[08] Max Marks:15

Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony Optimization.

Unit-V

[08] Max Marks:12

Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net.

Unit-VI

[06] Max Marks:12

Game Playing: Minimax Algorithm, AlphaBeta Algorithm, SSS*.

Unit-VII

[08] Max Marks:14

Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graphplan, Constraint Propagation.

Unit-VIII

[08] Max Marks:15

Logic and Inferences: Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward chaining.

References:

1. Deepak Khemani (2013). A First Course in Artificial Intelligence, McGraw Hill Education (India), ISBN 9781259029981
2. Elaine Rich and Kevin Knight (1991). Artificial Intelligence, Tata McGraw Hill, ISBN 13: 9780070087705
3. Stuart Russell and Peter Norvig (2009). Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, ISBN-13: 978-0-13-604259-4.

Course Code: CS-204

Design and Analysis of Algorithms

Clock Hours: 60

Total Marks: 100

Unit-I

[10] Max Marks:15

Introduction: What Is An Algorithm?, Algorithm Specification, Pseudocode Conventions, Recursive Algorithms, Complexity, Asymptotic Notation, Practical Complexities And Performance Measurement

Tree And Graph Representations, Binary Trees Basics, Heaps And Heap Sort, Sets And Disjoint Set Union And Find.

Unit-II

[12] Max Marks:15

Divide and Conquer: General Method, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Unit-III

[08] Max Marks:15

The Greedy Method: General Method, Knapsack Problem, Huffman Code, Minimum-Cost Spanning Trees (Prim's & Kruskal's Algorithm), Optimal Storage On Tapes, Single-Source Shortest Paths.

Unit-IV

[08] Max Marks:15

Dynamic Programming: General Method, All-Pair Shortest Path, Matrix Chain Multiplication, Longest Common Sub Sequence, 0/1knapsack, Flow Shop Scheduling

Unit-V

[06] Max Marks:15

Basic Search and Traversal Techniques: Breadth First Search and Traversal, Depth First Search And Traversal, Spanning Trees.

Unit-VI

[08] Max Marks:15

Backtracking: General Method, Constrains, 8-Queens Problem Graph Coloring

References:

1. Horowitz E. and Sahni S. "Fundamentals of computer Algorithms" Galgotia publications. ISBN:0716783169
2. Horowitz E., Sahni S. and Rajshekaran S(), Computer Algorithms, Computer Science Press, ISBN-10: 8173716129
3. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani(2006), Algorithms. McGraw-Hill publications, ISBN 9780073523408
4. Cormen, Leiserson and Rivest, Introduction to Algorithms, Prentice Hall of India, ISBN: 978-81-203-4007-7

Course Code: CS-205

Python Programming

Clock Hours: 60

Total Marks: 100

Unit-I

[12] Max Marks:20

The Python Programming Language, Python Data, Variables, Expressions and Statements, Values and Data Types, Type conversion Functions, Operators and Operands, Input, Order of Operations, Functions, Calling Functions, Passing Functions, Formal Arguments, Variable-length Arguments, Functional Programming, Boolean Expressions, Logical operators, Precedence of Operators, Conditional Execution, Unary Selection, Nested conditionals, Chained conditionals, Boolean Functions, Iteration, The for loop, The while Statement

Unit-II

[08] Max Marks:15

Strings, A Collection Data Type, Operations on Strings, Index Operator: Working with the Characters of a String, String Methods, Length, The Slice Operator, String Comparison, Lists, List Values, List Length, Accessing Elements, List Membership, Concatenation and Repetition, List Slices, Lists are Mutable, List Deletion, Objects and References, Aliasing, Cloning Lists, Repetition and References, List Methods, Append versus Concatenate Lists and for loops, Using Lists as Parameters, Nested Lists, Strings and Lists, List Type Conversion Function, Tuples, Tuple operators and built-in functions, Tuples and Mutability, Tuple Assignment, Tuples as Return Values

Unit-III

[15] Max Marks:20

Dictionaries, Dictionary Operations, Dictionary Methods, Dictionary Keys, Aliasing and Copying, Sparse Matrices, Working with Data Files, Finding a File on your Disk, Reading a File, Iterating over lines in a file, Writing Text Files, Object Oriented Programming, Classes, Instances, Class method Calls, Coding Class Tree, Attributes, Building and Method Invocation, Composition, Inheritance, Operator Overloading, Encapsulation and Information Hiding, Search Algorithms, Sorting Algorithms, Hash Tables

Unit-IV

[10] Max Marks:20

Regular Expressions, Exceptions, Standard Exceptions, Exceptions Syntax, The try/except/else Statement, The try/finally Statement, Unified try/except/finally, The raise Statement, The assert Statement, with/as Context Managers String-Based Exceptions, Class-Based Exceptions, General raise Statement Forms, Nesting Exception Handlers, Exception Idioms, Exception Design Tips. Catch All Exceptions, Catch A Specific Exception, Catch Multiple Specific Exceptions, Clean-up After Exceptions, GUI Programming using TKinter.

Unit-V

[15] Max Marks:25

Advance Function Topics: Anonymous Function Lambda, Mapping Functions over Sequences: map, Functional Programming Tools: filter and reduce, List Comprehensions Revisited: Mappings. Modules: Python Program Architecture, Module Creation, Module usage, Module Namespaces, Reloading Modules, Module Packages. Data Hiding in Modules, Enabling Future Language Features, Mixed Usage Modes, Changing the Module Search Path, The import as Extension, Relative Import Syntax, Module Design Concepts

References:

1. John V Guttag (2013), Introduction to Computation and Programming Using Python, Prentice Hall of India, 2013, ISBN: 9780262525008
2. R. Nageswara Rao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427
3. Wesley J. Chun(2006), Core Python Programming - Second Edition, Prentice Hall, ISBN-13: 978-0132269933, ISBN-10: 0132269937
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013), Data Structures and Algorithms in Python”, Wiley, 2013, ISBN : 978-1-118-54958-2, ISBN : 978-1-118-29027-9(HardCover)
5. Kenneth A. Lambert(2011), Fundamentals of Python – First Programs, CENGAGE Publication, 2011, ISBN 1111822700, ISBN 9781111822705
6. Luke Sneeringer(2015), Professional Python, Wiley Inc.,2015, ISBN: 1119070856
7. Mark Lutz (2007), Learning Python, 3rd Edition, O’Reilly Media, Inc., 2007, ISBN-13: 978-0-596-51398- 6, ISBN-10: 0-596-51398-4

OS: Windows/Linux, **Programming Language:** C++/Java/C#

1. Write a program for creating max./min. heap using
 - INSERT
 - ADJUST/HEAPIFY
2. Write a program to implement union and find operation.
3. Write a program to find minimum and maximum form a given array.
4. Write a program for searching element form given array using binary search for n=1000,2000,3000 find exact time of execution.
5. Write a program for sorting given array in ascending/descending order with n=1000,2000,3000 find exact time of execution using
 - Heap sort
 - Merge sort
 - Quick sort
6. Write a program for matrix multiplication using Strassen's matrix multiplication.
7. Write a program to find solution of Knapsack instant.
8. Write a program to find shortest path using single source shortest path.
9. Write a program to find Minimum-Cost Spanning Trees (Prim's & Kruskal's Algorithm).
10. Write a program to find shortest path using all pair path.
11. Write a program to find longest common subsequence.
12. Write a program to implement breadth first and depth first search.
13. Write a program to implement breadth first and depth first traversal.
14. Write a program to find all solutions for 8-queen problem using backtracking.
15. Write a program for creating max./min. heap using
 - INSERT
 - ADJUST/HEAPIFY
16. Write a program to implement union and find operation.
17. Write a program to find minimum and maximum form a given array.
18. Write a program for searching element form given array using binary search for n=1000,2000,3000 find exact time of execution.
19. Write a program for sorting given array in ascending/descending order with n=1000,2000,3000 find exact time of execution using
 - Heap sort
 - Merge sort
 - Quick sort
20. Write a program for matrix multiplication using Strassen's matrix multiplication.

21. Write a program to find solution of Knapsack instant.
22. Write a program to find shortest path using single source shortest path.
23. Write a program to find Minimum-Cost Spanning Trees (Prim's & Kruskal's Algorithm).
24. Write a program to find shortest path using all pair path.
25. Write a program to find longest common subsequence.
26. Write a program to implement breadth first and depth first search.
27. Write a program to implement breadth first and depth first traversal.
28. Write a program to find all solutions for 8-queen problem using backtracking.

Course Code: CS-LAB-IV

LAB on Python Programming

Total Marks: 100

1. Develop programs to understand the control structures of python
2. Develop programs to learn different types of structures (list, dictionary, tuples) in python
3. Develop programs to learn concept of functions scoping, recursion and list mutability.
4. Develop programs to understand object oriented programming using python.
5. Develop programs for data structure algorithms using python – searching, sorting and hash tables.
6. Develop programs to learn regular expressions using python.
7. Develop programs to learn GUI programming using Tkinter.
8. Demonstrate the concept of exception handling using try/except/else Statement, Unified try/except/finally, try/finally Statement, raise Statement, assert Statement, catch multiple specific exceptions
9. Demonstrate the concept of String-Based Exceptions, Class-Based Exceptions and Nesting Exception handlers.
10. Demonstrate implementation of the Anonymous Function Lambda.
11. Demonstrate implementation Mapping Functions over Sequences.
12. Demonstrate implementation functional programming tools such as filter and reduce
13. Demonstrate the Module Creation, Module usage, Module Namespaces, Reloading Modules, Module Packages, Data Hiding in Modules.
14. Demonstrate Mixed Usage Modes of modules, Changing the Module Search Path, The import as Extension, Relative Import Syntax, Module Design Concepts

Semester-III

Course Code: **CS-301**

Machine Learning

Clock Hours: **60**

Total Marks: **100**

Unit-I

[08] Max Marks:10

Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation

Unit-II

[08] Max Marks:15

Linear regression, Decision trees, overfitting

Unit-III

[09] Max Marks:15

Instance based learning, Feature reduction, Collaborative filtering based recommendation

Unit-IV

[08] Max Marks:15

Probability and Bayes learning

Unit-V

[09] Max Marks:15

Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM

Unit-VI

[09] Max Marks:15

Neural network: Perceptron, multilayer network, backpropagation, introduction to deep neural network

Unit-VII

[09] Max Marks:15

Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

References:

1. Tom Mitchell (1997). Machine Learning. First Edition, McGraw- Hill, ISBN 10: 0070428077
ISBN 13: 9780070428072
2. Ethem Alpaydin (2009). Introduction to Machine Learning, Edition 2, The MIT Press. ISBN
978-0-262-01243-0

Unit-I

[08] Max Marks:12

Introduction to NLP, brief history, NLP applications: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers etc., challenges/Open Problems, NLP abstraction levels, Natural Language (NL) Characteristics and NL computing approaches/techniques and steps, NL tasks: Segmentation, Chunking, tagging, NER, Parsing, Word Sense Disambiguation, NL Generation, **Web 2.0 Applications** : Sentiment Analysis; Text Entailment; Cross Lingual Information Retrieval (CLIR).

Unit-II

[12] Max Marks:16

Text Processing Challenges, Overview of Language Scripts and their representation on Machines using Character Sets, Language, Corpus and Application Dependence issues, Segmentation: word level(Tokenization), Sentence level. Regular Expression and Automata Morphology, Types, Survey of English and Indian Languages Morphology, Morphological parsing FSA and FST, Porter stemmer, Rule based and Paradigm based Morphology, Human Morphological Processing, Machine Learning approaches

Unit-III

[12] Max Marks:18

Word Classes and Part-of-Speech tagging(POS), survey of POS tagsets, Rule based approaches (ENGTOWL), Stochastic approaches(Probabilistic, N-gram and HMM), TBL morphology, unknown word handling, evaluation metrics: Precision/Recall/F-measure, error analysis

Unit-IV

[15] Max Marks:22

NL parsing basics, approaches: TopDown, BottomUp, Overview of Grammar Formalisms: constituency and dependency school, Grammar notations CFG, LFG, PCFG, LTAG, Feature-Unification, overview of English CFG, Indian Language Parsing in Paninian Karaka Theory, CFG parsing using Earley's and CYK algorithms, Probabilistic parsing

Unit-V

[15] Max Marks:22

Concepts and issues in NL, Theories and approaches for Semantic Analysis, Meaning Representation, word similarity, Lexical Semantics, word senses and relationships, WordNet (English and IndoWordnet), Word Sense Disambiguation: Lesk Algorithm Walker's algorithm, Coreferences Resolution: Anaphora, Cataphora

References:

1. Indurkha, N., & Damerau, F. J. (Eds.). (2010). *Handbook of Natural Language*

- Processing, 2nd Edition*. New York: CRC Press Taylor and Francis Group, Boca Raton London, New York. ISBN-10: 1420085921, ISBN-13: 978-1420085921
2. Martin, J. H., & Jurafsky, D.(2013), *Speech and Language Processing*, Pearson Education India; 2 edition, ISBN-10: 9332518416, ISBN-13: 978-9332518414
 3. Manning, Christopher and Heinrich, Schutze(1999), *Foundations of Statistical Natural Language Processing*”, MIT Press, ISBN-10: 0262133601, ISBN-13: 978-0262133609.
 4. Akshar Bharati, Chaitanya, V., Kulkarni, A., & Sangal, R. (July 1997). *Machine translation in Stages* (Vol. 10 no. 3). Mumbai: NCST, Mumbai.
 5. Bharati, A., Chaitanya, V., & Sangal, R. (1995). *Natural Language Processing: A Paninian Perspective*, New Delhi: Prentice Hall of India, ISBN 10: 8120309219, ISBN 13: 9788120309210.
 6. Steven Bird, Edward Loper (2016), *Natural Language Processing With Python*, Ed. 2, O'Reilly Media, ISBN 1491913428, 9781491913420

Auxiliary Resources:

1. Web Links

1. <https://see.stanford.edu/Course/CS224N>
2. <https://web.stanford.edu/~jurafsky/NLPCourseraSlides.html>

2. Video Links

1. <http://www.nptelvideos.in/2012/11/natural-language-processing.html>
2. <https://www.youtube.com/playlist?list=PL6397E4B26D00A269>

Course Code: CS-303

**Computer Graphics and Digital
Image Processing**

**Clock Hours: 60
Total Marks: 100**

Unit-I

[08] Max Marks:12

Introduction to Computer Graphics and Output Primitives: Overview of Computer Graphics, Its Applications and Software, Representation in Graphics, Vector Graphic Display, Raster Graphics Display, I/O Devices, Representing Image, Straight Line, Line Drawing Algorithm, DDA, Bresenham’s Line Algorithm, Circle-generating algorithm, Ellipse-generating Algorithm, Polygon Filling Algorithm.

Unit-II

[06] Max Marks:12

Two-Dimensional Transformation: Matrix and transformation, 2D Basic transformation, Homogeneous coordinates, Translation, Scaling and Rotation of straight line or polygon, Combined Transformation, Rotation about an arbitrary point/line, Reflection and Shearing

Transformation, Viewing Transformation, Clipping, Cohen-Sutherland line clipping.

Unit-III **[06] Max Marks:12**

Three-Dimensional Transformation: Introduction, Matrix representation of 3D Transformation, 3D Translation, Scaling, Rotation, Composition of 3D Transformation, Projection, Orthographic, Isometric, Oblique Projection, Perspective Projection, One-Two-Three point perspective Projection.

Unit-IV **[08] Max Marks:12**

Introduction to Digital Image Processing & Applications: Digital Image Processing. Applications of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image Sensing and Acquisition. Image Sampling and Quantization. Some Basic Relationships Between Pixels.

Unit-V **[10] Max Marks:15**

Image Enhancement: Background, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods,

Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering

Unit-VI **[10] Max Marks:15**

Image Restoration and Color Image Processing: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering,

Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening.

Unit VII **[06] Max Marks: 12**

Morphological Image Processing & Segmentation: Detection of Discontinuities, Edge linking & Boundary Detection, Thresholding, Region based segmentation Laplacian of Gaussian, Derivative of Gaussian, Canny Edge Detection, Morphological operation: Dilation erosion, Opening & Closing, Basic Morphological Algorithm, Image representation schemes.

Unit VIII **[06] Max Marks: 10**

MATLAB Image processing toolbox: Introduction to MATLAB, Matrix Operations, Introduction to Image Processing Tool Box, Image Read & Write, Filters (spatial and frequency domain), Image Restoration and Reconstruction, Morphological Operations, Edge

Detection and linking, Segmentation.

References:

1. Amarendra N Sinha, Arun D. Udai, (2008). Computer Graphics, TMH publication ISBN- 13 : 978-0-07-063437-4.
2. D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition ISBN-13: 978-0135309247
3. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition, ISBN-13:978-0-07-0486775
4. R.C.Gonzalez & R.E.Woods, Digital Image Processing, Pearson Education, 3rd edition, ISBN. 13:978-0131687288
5. S. Jayaraman Digital Image Processing TMH (McGraw Hill) publication, ISBN-13:978-0-07-0144798
6. Gonzalez, Woods & Steven, Digital Image Processing using MATLAB, Pearson Education, ISBN-13:978-0130085191

Course Code: **CS-304**

Software Engineering

Clock Hours: **60**

Total Marks: **100**

Unit-I

[10] Max Marks:10

Introduction and Process Models: Nature of Software, Software Engineering the process, Software Myths. Process Models: Generic process model, Prescriptive process models, Specialized process models, Unified process, Personal and Team process model, Process Technology, Product and Process. Agility, cost of change, Agile process, Extreme Programming, Agile Process models: Adaptive Software development, Scrum, Dynamic system development model, Crystal, Feature Driven development, Lean Software development, Agile modelling, Agile Unified process. Tool set for Agile process

Unit-II

[10] Max Marks:15

Requirement Analysis and Modelling: Requirement Engineering, Establishing Groundwork, Eliciting Requirements Developing Use cases, Building Requirement model, Negotiating and Validating requirements. Requirement analysis, Scenario based modelling, UML models that supplements use case, Data modelling concepts, class based modelling. Requirement Modelling strategy, Flow oriented modelling, Creating Behaviour model, Pattern for Requirement modelling.

Unit-III

[08] Max Marks:15

Quality Assurance and Change Management: Elements of SQA, SQA Tasks, Goal and Metrics, Formal approaches to SQA, Software Reliability, ISO 9000 Quality standards, SQA Plan. Software Configuration Management, SCM Repository, SCM process

Unit-IV

[11] Max Marks:20

Design Concept: Design process, Design Concept: Abstraction, Architecture, Pattern, Separation of concept, Modularity, Information hiding, Functional independence, Refinement, Aspects, Refactoring. Design Model: Data design element, Architectural design element, Interface design element, Component level design element, Deployment level design element.

Unit-V

[11] Max Marks:20

Architectural and Component Level Design: Software Architectures, Architectural Genres, Architectural styles, Architectural design, Accessing alternatives Architectural design, Architectural mapping using dataflow. Introduction to component, Designing class based component, Conducting component level design, Designing traditional component, component based development.

Unit-VI

[10] Max Marks:20

Software Testing: Strategic approach to software testing, Test strategies for conventional software, Validation Testing, System testing, Software testing fundamentals, Internal and external view of testing, White box testing, Basic path testing, Control structure testing, Black box testing, model based testing, Testing for specialized Environment, Architectures and applications.

References:

1. R. S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, ISBN:978-007-126782-3.
2. Pankaj Jalote, "Software Engineering: A Precise Approach", Wiley India Pvt. Limited ISBN: 978-81-265-2311-5.
3. K. K. Aggarwal and Yogesh Singh, "Software Engineering", Third Edition, New Age International Publishers, ISBN:978-81-224-2360-0.

Course Code: CS-305

**Web Application Development
Technology**

*Clock Hours: 60
Total Marks: 100*

Unit-I

[10] Max Marks:15

Desktop Computing vs. Internet Computing, Internet computing infrastructure, Client side scripting vs. Server Side Scripting technologies, Web Server basics and configuration: IIS, Apache etc., Web site hosting basics, Web Publishing, HTML, introduction to .NET framework, Features of .NET framework:CTS,CLS,CLR,.NET technologies, languages'C#.NET,VB.NET, basics of ASP.NET page framework, Visual studio .NET IDE, Page Life Cycle,PostBack, Viewstate, Page directives, ASP.Net page execution cycle, HTTP

Pipeline, HTTP Application, HTTP Request, HTTP Response classes, HTTP Modules and HTTP Handlers, State Management, Role of Global.asax, Application configuration using web.config file

Unit-II [15] Max Marks:25
ASP.NET Control hierarchy, HTML Server Controls, Web Server Controls, User and Server controls, Validation Controls, List bound controls: dropdown lists, list boxes, Repeater, DataList, Data Grid, DataGridView, FormsView controls, Data binding to List Bound Controls, Templating and Styling of ASP.NET server controls

Unit-III [20] Max Marks:25
Web Page Designing principles, CSS anatomy, Anatomy of Master Pages, nesting master pages, Site map file, Web site Navigation controls, properties:TreeView, Sitemap Path, Menu, Other Navigation methods: Response.Redirect(), Server.Transfer(), Personalization through Profiles, Themes/Skins, Web Site security basics: authentication modes:Windows,Forms,passport, authorization, roles/Membership, access rules, login controls,Web services: working, anatomy, hosting

Unit-IV [15] Max Marks:25
Database technology: ADO.NET, Anatomy/architecture of ADO.NET, working with Connection, Command, Data Adaptor, DataReader, DataSet, DataTable objects, Editing data in Data Tables, concurrency control. Introduction to MVC, Data Reports

References:

1. Richard Anderson, Brian Francis, Alex Homer, Rob Howard, David Sussman, Karli Watson(2002), Professional ASP.NET 1.0, Special Edition, Wrox Press Ltd., 2002, ISBN 1-861007-0-3-5.
2. Chris Hart, John Kauffman, Dave Sussman, and Chris Ullman(2006), Beginning ASP.NET 2.0, Wiley Publishing, Inc., 2006, ISBN-13: 978-0-7645-8850-1, ISBN-10: 0-7645-8850-8.
3. Beginning ASP.NET 4: in C# and VB, Imar Spaanjaars, Wiley Publishing, Inc 2010., ISBN: 978-0-470-50221-1
4. Bill Evjen, Scott Hanselman, Devin Rader (2008), Professional ASP .NET 3.5 in C# and VB, Wiley Publishing Inc.,2008 ISBN:978-0-470-18757-9.
5. Dino Esposito (2008), Programming Microsoft ASP.NET 3.5, Second Edition, Microsoft Press, 2008, ISBN-10: 0735625271, ISBN-13: 978-0735625273

Auxiliary Resources:

Website URLs

- <https://www.asp.net/>
- <http://asp.net-tutorials.com/>

Video Links

- <https://www.asp.net/web-forms/videos>
- https://www.youtube.com/playlist?list=PL6n9fhu94yhXQS_pli-HLIftB9Y7Vnxlo&feature=view_all

Course Code: CS LAB-V

**LAB on Web Application
Development Technology**

Total Marks: 100

1. Demonstrate followings in IIS:
 - a. Creation of Virtual Directory, Home directory, Home page, hosting of website
2. Demonstrate Page Life Cycle of ASP.NET. Use important page events for your demonstration.
3. Write VB.Net/C# console applications to demonstrate: OO concepts: polymorphism, encapsulation, inheritance, interface inheritance, abstract classes/methods, overloading, overriding, collection classes, properties
4. Demonstrate concept of postback and viewstate using web form server controls of ASP.NET
5. Demonstrate various Web form server controls using sample data entry screen form for registering for a service on website. Also use validation controls to validate input data.
6. Demonstrate DropDown List box, CheckButtonList, RadioButtonList controls.
7. Demonstrate Databinding using Hashtable, ArrayList, DataTable data sources.
8. Demonstrate Repeater control with the help of various templates.
9. Demonstrate paging, sorting, filtering of data in asp:DataGrid/DataGridView.
10. Demonstrate editing process in DataGrid and DataList controls. Make use of necessary templates for proper visual appearance.
11. Demonstrate State Management features of ASP.NET using sample shopping cart application.
12. Create sample website for demonstrating use of Profiles/Themes using skin files.
13. Demonstrate Master Pages and website navigation controls(sitemap path, treeview, menu) using SiteMap file.
14. Demonstrate Properties of website navigation controls.
15. Demonstrate Authorization/Authentication using Login controls and Roles/Membership/AccessRules
16. Demonstrate creation of simple/complex DataReader/DataSet Objects.
17. Demonstrate editing in DataTable objects.
18. Demonstrate Web Service hosting, access in ASP.NET

1. Line drawing algorithm (DDA and Bresenham's Line Algorithm)
2. Circle drawing algorithm
3. Ellipse drawing algorithm
4. Polygon filling algorithm
5. Windowing and clipping algorithm (Point, line and polygon clipping)
6. Composite 2-D transformation, (rotation, scaling & reflection)
7. 3-D geometric transformation (rotation, scaling & reflection)
8. Introduction to Image Processing Toolbox
9. Read an 8 bit image and then apply different image enhancement techniques:
 - Brightness improvement
 - Brightness reduction
 - Thresholding
 - Negative of an image
 - Log transformation
 - Power Law transformation.
10. Implement different interpolation techniques using MATLAB/ SciLab
11. Read an image, plot its histogram then do histogram equalization. Comment about the result.
12. Read an image and apply
 - Implement Gray level slicing (intensity level slicing) in to read cameraman image.
 - Read an 8 bit image and to see the effect of each bit on the image.
 - Read an image and to extract 8 different planes i.e. 'bit plane slicing.'
13. Implement various Smoothing spatial filter.
14. Read an image and apply
 - Gaussian 3x3 mask for burring
 - High pass filter mask with different masks
 - Laplacian operator with centre value positive and negative
 - High boost filtering.
15. Write a program to implement various low pass filters and high pass filter in frequency domain.
16. Write a program for erosion and dilation, opening & closing using inbuilt and without inbuilt function.
17. Implement and study the effect of Different Mask (Sobel, Prewitt and Roberts)
18. Implement various noise models and their Histogram
19. Implement inverse filter and wiener filter over image and comment on them

Semester- IV

CS-401 Full Time Industrial Training

Twelve credits shall be awarded to the Industrial Training/Project course, which will commence in the IVth Semester and the final work and report will be completed at the end of IVth Semester of M. Sc. (Computer Science). The student is expected to work on software development project. The project work should have coding part. Student will have to submit the bound project report in university prescribed format at the end of the semester. Student will have to appear for Project Viva-voce and the marks and the credits will be allotted at the end of IVth semester of M. Sc. (Computer Science).