DAV UNIVERSITY JALANDHAR

FACULTY OF SCIENCE

Course Scheme and Syllabus
for

Master of Science in Computer Science
(Two Years Degree Course)
(Programme ID-70)
1st to 4th Semester

(As per Choice Based Credit System)

Syllabi Applicable for 2020 Batch

Duration: 2 years (4 Semesters)

Eligibility: B.Tech/BE in relevant subject/BCA/B.Sc. (CS)/B.Sc. (IT)/BIT or equivalent from any recognized university with at least 50% aggregate marks (45% in case of candidate belonging to SC/ST) or a bachelor's degree with Computers/Mathematics/ Statistics /Business Mathematics /Business Statistics/ Quantitative Techniques as compulsory/elective/optional/additional subject with at least 50% aggregate marks (45% in case of candidate belonging to SC/ST).

Master of Science in Computer Science
Syllabus 2020-22

Semester 1

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA517	Discrete Mathematical Structures	Core	4	0	0	4
2	CSA518	Advanced Database Management System	Core	4	0	0	4
3	CSA519	Data Structures and File Processing	Core	4	0	0	4
4	CSA520	Software Testing and Quality Assurance	Core	4	0	0	4
5	CSA521	Python Programming	Core	4	0	0	4
5	CSA522	Advanced Database Management Systems Laboratory	Core	0	0	4	2
6	CSA523	Data Structures and File Processing Laboratory	Core	0	0	4	2
7	CSA524	Python Programming Laboratory	Core	0	0	4	2
				20	**0**	**12**	**26**

Semester 2

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA510	Computer Networks and Data Communication	Core	4	0	0	4
2	CSA577	Design and Analysis of Algorithms	Core	4	0	0	4
3	CSA578	Computer Based Optimization Techniques	Core	4	0	0	4
4	CSA579	Interactive Computer Graphics	Core	4	0	0	4
5	CSA580	Theory of Computer Science	Core	4	0	0	4
6	CSA516	Computer Networks and Data Communication Laboratory	Core	0	0	4	2
7	CSA581	Design and Analysis of Algorithms Laboratory	Core	0	0	4	2
8	CSA582	Interactive Computer Graphics Laboratory	Core	0	0	4	2
				20	**0**	**12**	**26**

Note: Scheme and syllabus of 3rd and 4th semesters will be uploaded shortly.

Course Title: Discrete Mathematical Structures
Course Code: CSA517
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of this course is to acquaint the students with the basic concepts in Discrete Mathematics viz. sets, functions, relations, groups, graphs etc. required for the implementation of various computer science courses.

UNIT – A **12 Hours**

Set Theory

- Set and its Representations, Types of sets
- Subsets
- Operations on Sets-Union, Intersection and Difference of Sets
- Venn Diagrams, Statement Problems
- Laws- Associative Laws, Distributive Laws, Demorgan's Laws

Relation and Functions

- Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties
- Equivalence Relations and Partitions, Hasse diagram, Lattices, Bounded Lattices, Distributive Lattices.
- Functions, Special functions, Composition of Functions, one-one, onto and Inverse of a function
- Mathematical functions, Exponential and Logarithmic Functions

UNIT – B

Group Theory **13 Hours**

- Group Axioms, Semi groups, Properties of Groups
- Subgroups
- Cosets, , Normal subgroup
- Permutation Group
- Dihedral Group

Recurrence relations

- Characteristic Equation
- Homogeneous and non-homogeneous linear recurrence relations with constant coefficients
- Generating Functions for some standard sequences

UNIT – C **10 Hours**

Graphs

- Basic Terminology, Special Graphs,
- Handshaking Theorem,
- Isomorphism of Graphs,
- Walks, Paths, Circuits, Eulerian and Hamiltonian Paths
- Planar and Non Planar Graphs,
- Coloring of Graph, Directed graphs, Travelling Salesman Problem

Logic and Propositional Calculus

- Propositions,
- Basic logic operators
- Logic equivalence involving Tautologies and Contradiction
- Algebra of Propositions
- Conditional and Biconditional Statements
- Logical Implication, Propositional Functions, Quantifiers

UNIT – D **10 Hours**

Vectors and Matrices

- Vectors, Matrices
- Matrix Addition, Scalar Multiplication
- Matrix Multiplication, Transpose
- Square matrices
- Invertible Matrices, Inverses, Determinants

Counting and Probability Theory

- Basic counting principle, Factorial Notation
- Binomial Coefficients, Permutations, Combinations
- Sample Space and Events
- Finite Probability Spaces
- Conditional Probability
- Independent Events, Binomial Distribution
- Random variables

Reference Books:

1. Rosen, K. H.,*Discrete Mathematics and its Applications*, 6th Edition, McGraw Hill, 2007.
2. Malik, D.S. andSen, M.K., *Discrete Mathematical Structures: Theory and Applications*, ThomsonCengagae Learning, New Delhi, 2004.
3. Lipschutz, S. and Lipson M.,*Schaum's Outline of Discrete Mathematics*,Schaum's Outlines, New Delhi, 2007
4. Ram, B., *Discrete Mathematics*, Pearson Publications, 2011.
5. Liu, C. L.,*Elements of Discrete Mathematics***,** McGraw Hill, International Edition, Computer Science Series, 1986.
6. Trembley, J.P. and Manohar, R.P., *Discrete Mathematical Structures with Applicationsto Computer Science*, McGraw Hill.
7. Joshi, K.D., *Foundations of Discrete Mathematics*, Wiley, 1989
8. Alan Doerr and Kenneth Levarseur., *Applied Discrete Structures for Computer Science*, Creative Commons, 2012.

Course Title: Advanced Database Management System
Course Code: CSA518
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The concepts related to database, database design techniques, transaction management, SQL, PL/SQL and database operations are introduced in this subject. This creates strong foundation for data base creation.

UNIT– A **10 Hours**

Data Base Concepts

- Data base vs. file oriented approach, Data Independence, Database models, General Architecture of a Data Base Management Software
- Advantages and Disadvantages of DBMS

Introduction to Data Models

- Entity Relationship model, hierarchical model from network to hierarchical, relational model, object oriented database, object relational database,

Data Base Design

- Entities, Attributes, ER Diagrams, Functional dependencies; Normalization
- Multivalued dependencies, decomposition, Relational algebra and calculus, Need and types of query optimization procedures, phases of query optimization

UNIT – B **10 Hours**

Data Base Protection

- Concurrency, recovery, Integrity, Protection, essentials of security authorization, types of database security

Relational Query Language

- SQL, client/server architecture, Technical introduction to Oracle.

Software Development using SQL

- SQL data types, Querying database tables
- Conditional retrieval of rows, working with Null values, matching a pattern from the table querying multiple tables: Equi joins, Cartesian joins, Outer joins
- Self joins; Set operator: Union, Intersect, Minus, Nested queries

UNIT – C **10 Hours**

Introduction to PL/SQL

- The PL/SQL block structure, PL/SQL data types, Variables and constants, assignment and expressions, Writing PL/SQL code, cursor management in PL/SQL
- Concept of stored procedures, Database triggers, types of triggers, Dropping triggers, storage of triggers

Parallel Databases

- **Database System Architectures:** Centralized and Client-Server Architectures, Server System Architectures, Parallel Systems, **Parallel Databases:** I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism

UNIT – D **15 Hours**

Distributed Database Concepts

- Distributed Data Storage, Distributed Transaction, Commit Protocols, Distributed Query Processing, Multidimensional Databases

Temporal Databases.

- Introduction to Temporality, Temporal relationships, temporal hierarchies

Spatial Databases

- Spatial data types, spatial relationships, Topological Relationships, Spatial Data Structures and methods of storage.

NOSQL Databases

- Introduction to Open Source Database

XML Databases

- XML Data Model, DTD, XML Schema

Reference Books:

1. Desai. B.C., *An Introduction to Database Systems*, New Delhi: Galgotia Publ. Private Ltd, 2000.
2. C.J.Date, A.Kannan, S.Swamynathan, *An Introduction to Database Systems*, 8th Edition,
3. Pearson Education, 2006.
4. Silberscatz, Korth and Sudarshan, *Database System Concepts*, Third Ed., New York: McGraw Hill International Editions, Computer Science Series, 2010.
5. Peter Rob Carlos Coronel, *Data Base Systems* (3rd Edition), New Delhi: Galgotia Publications (P) Ltd, 2001.
6. Elmasri, Navathe, *Fundamentals of Database System*, 7e, Pearson India.
7. Kleinberg J., Tardos E., Algorithm Design, 1st Edition, Pearson, 2012.
8. Ivan Bayross, *SQL, PL/SQL The Programming Language of Oracle*, 4th Revised Edition, BPB Publications, 2009.
9. Peter Rob Carlos Coronel, *Database Systems*, Cengage Learning, 8th ed, 2007.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Data Structures and File Processing
Course Code: CSA519
Course Duration: 45-60 Hours

Course Objective: The emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs.

UNIT– A **12 Hours**

Preliminaries

- Introduction to Data Structures: Primitive and Composite, Various data structures
- Common operations on data structures, algorithm complexity
- big O notation, timespace tradeoff between algorithms
- Complexity of Algorithms, Records and Pointers.

Arrays

- Arrays defined, representing arrays in memory, various operations on linear arrays
- Multi dimensional arrays, Records, Matrices, Sparse Matrices
- Linear Search, Binary Search
- Insertion Sort, Selection Sort, Bubble Sort
- Merge Sort, Radix Sort
- String, Representation and Manipulation

UNIT – B **13 Hours**

Linked Lists

- Types of linked lists, representing linked lists in memory
- Advantage of using linked lists over arrays
- Various operation on linked lists

Stacks

- Description of stack structure, implementation of stack using arrays and linked lists
- Applications of stacks converting arithmetic expression from infix notation to polish and their subsequent evaluation
- Quicksort technique to sort an array, parenthesis checker.

Queues

- Implementation of queue using arrays and linked lists
- Deques, Priority Queues and their implementation, applications of queues.

UNIT – C **10 Hours**

Trees

- Description of tree structure and its terminology, binary search tree
- Implementing binary search tree using linked lists

- Various operations on binary search trees, AVL Trees
- Threaded Binary Trees, BTrees, B+ trees
- Red-Black Trees, Splay Trees, B-trees, Binomial Heaps, Fibonacci heaps, Data Structures for Disjoint Sets

Heaps

- Description of heap structure, implementing heaps using arrays
- Various operations on heaps, Applications of heaps
- Heapsort technique to sort an array

UNIT – D **10 Hours**

Graphs and Hash Tables

- Representation of Graphs and Applications: Adjacency Matrix, Path Matrix
- Warshall's Algorithm, Linked Representation of a Graph
- Traversing a Graph, DFS and BFS.
- Direct address tables, hash tables
- Collision resolution by chaining, hash functions
- Open addressing – linear probing, quadratic probing, double hashing

Files

- Operations on files, Types of files
- File Organizations: Sequential files, Indexed Sequential file, Directed files and multikey files
- File performance criteria and terms.

Reference Books:

1. LipschutzSeymour, *Theory and Problems of Data Structures*, Schaum Outline Series, New Delhi: Tata McGrawHill Book Company, 2001.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis In C* ,Mexico City:Addison Wesley, (An Imprint of Pearson Education),.New Delhi: Prentice Hall of India Pvt. Ltd, 1993.
3. Esakov Jeffery, Weiss Tom, *Data Structures: An Advanced Approach Using C*, New Delhi: Prentice Hall International, Inc, 2007.
4. Trembley and Sorenson,*An Introduction to Data Structures with Application*, New York : McGraw Hill Company, 1984.
5. Tanenbaum, *Data Structures using C,* New Delhi: Pearson Education*, 2009*.
6. Kleinberg J., Tardos E., "Algorithm Design", 1st Edition, Pearson, 2012.

Course Title: Software Testing and Quality Assurance
Course Code: CSA520
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The students will gain the knowledge about software testing techniques**,** STEP methodology, software testing strategies, software metrics, software quality assurance tools and techniques, quality management, quality models and system configuration management.

UNIT-A

Introduction **15 Hours**

- Software Testing, Objectives of Software Testing, Software Testing Process, Static and Dynamic Analysis
- STEP Methodology, Elements of STEP and STEP Architecture

Software Testing Techniques

- BBT & its Technique, Boundary Value Analysis, Cause-Effect Graph, White-Box Testing and its Techniques
- Domain and Boundary Testing, Logic Based Testing, Data Flow Testing

UNIT-B **15 Hours**

Software Testing Strategies

- Characteristics, Integration Testing, Functional Testing
- Object Oriented Testing, Alpha and Beta Testing, Overview of Testing Tools
- Test planning, functional testing, stability testing and debugging techniques

Metrics for Software

- Importance of Metrics to Software Project, Software Quality Metrics
- Software Metrics: Product Metrics: Software Size Metrics, Control Complexity Metrics, Object-Oriented Metrics, Software Quality Metrics

UNIT-C

Quality Assurance **15 Hours**

- Concept of Software quality, product and process quality, software quality metrics, quality control and total quality management,
- Quality tools and techniques, quality standards, Software Quality Attributes, Factors Affecting Software Quality
- Building software quality assurance plan, Components of SQAP

Quality Management & Quality Models

- Software Quality System, Quality Management Principles, Essence of

International Standards

- ISO 9000 Quality Standard, SEI Capability Maturity Model

Designing software quality assurance system

- Statistical methods in quality assurance, fundamentals of statistical process control, process capability, Six-sigma quality

UNIT-D **15 Hours**

Reliability

- Basic concepts, reliability measurements, predictions and management
- Factors affecting software reliability, Software reliability vs hardware reliability, Software reliability metrics

System Configuration Management (SCM)

- Basic requirements for SCM System, SCM principles, Planning and organizing for SCM
- Benefits of SCM, Change Management, Version and Release Management

Reference Books

1. SchulmeyerG.G. and McManus J. (eds.), *Handbook of Software Quality Assurance*New Delhi: Prentice Hall, 3rd Ed. 1999
2. Deutsch, Wills and Hall, *Software Quality Engineering: A Total Technique and Management Approach*, New Delhi: PHI, 1993.
3. FutrellRobert T., SnaferDonald F., Shafter Linda I., *Quality Software Project Management*, New Delhi: Pearson, 2002.
4. Perry, William E., *Effective Methods for Software Testing*, New York: Wiley, 1995
5. Hutcheson, *Software Testing Fundamentals*, Wiley India Pvt. Ltd, 2007.
6. Gill Nasib Singh,*Software Engineering: Software Reliability, Testing and Quality Assurance*, Khanna Book Publishing, 2009.
7. GalinDaniel, *Quality Assurance: From theory to implementation*, New Delhi: Pearson Education Ltd., 2004
8. Kan S.H., *Metrics and Models in Software Quality Engineering*, New Delhi: Pearson, 2nd Ed, 2003.
9. Myers Glenford J., *The Art of Software Testing*, New York: John Wiley, 2nd Ed. 2004.

Course Title: Python Programming
Course Code: CSA521
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides the knowledge about developing programs and scripts using Python programming language. All the advanced concepts of programming will help benefit the students in research as well in software development.

UNIT-A

Introduction to Python Language **15 Hours**

- Programming language, History of Python, Origin of Python Programming, Features, Limitations, Applications, Getting and Installing Python, Python Environment Variables, Python Help, Python differences from other languages.

Python Data Types and Input Output

- Keywords, Identifiers, Variables, Statements, Indentation, Documentation, Data Type, Type Conversion.
- Python Input and Output.

Operators and Expressions

- Arithmetic, Comparison, Assignment, Logical, Bitwise, and Python special operators.
- Expressions, Precedence and Associatively.

UNIT-B **15 Hours**

Control Structures

- Decision Making Statements
- Python Loops

Python Native Data Types

Creation of following Data Types along with methods and functions

- Number, String, Tuple,Set, Dictionary

Python Functions and Modules

- Creating Functions, Advantages of Functions, Types of Functions, Built-In, User Defined Functions, Anonymous Functions, Call by Value, Call by Reference, Recursion.
- Designing of Modules. Importing Modules

UNIT-C **15 Hours**

Python Class and Objects

- Designing Classes, Creating Objects, Accessing Objects, __init__ method,

constructor, garbage collection, destroying objects.

- Inheritance and Operator Overloading.

File Handling

- File creation, open() and close() methods, read() and write() methods, file modes, file encoding, file object attributes, renaming and deleting files, Python directory, directory methods and functions.

Exception Handling

- Python Exception, Built-in Exception, Exception Handling, Try, except, finally, Python user defined exceptions.

UNIT-D **15 Hours**

GUI Programming in Python (using Tkinter/wxPython/Qt)

- What is GUI, Advantage of GUI, Introduction to GUI, Layout Management, Events and Bindings, Fonts, Colors, Drawing on Canvas, Line, Oval, Rectangle, etc. Widget such as Frame, Label, Button, Check Box, Entry, ListBox, Radiobutton, Message, Text, Spinbox, etc.

Database connectivity in Python

- Installing mysql connector, accessing connector module module, using connect, cursor, execute & close functions, reading single & multiple results of query execution

Algorithm Sorting and Searching

- Searching and Sorting Techniques, Efficiency of Algortihms.

Reference Books:

1. M. C. Brown, *The Complete Reference Python*, Osborne/McGraw-Hill, 2001.
2. S. Maruch, A. Maruch, *Python for Dummies*, John Wiley & Sons, 2011.
3. A. B. Downey, *Think Python*, O'Reilly Media Inc., 2012.
4. B. Slatkin, *Effective Python*, Addison Wesley Professional, 2015.
5. J. M. Zelle, *Python Programming: An Introduction to Computer Science*, Franklin, Beedle & Associates, Inc., 2004.

Course Title: Advanced Database Management Systems Laboratory
Course Code: CSA522

L	T	P	Credits	Marks
0	0	4	2	50

1. Implementation of SQL: DDL, DML, DCL, TCL
2. Implementation of Nested Queries and Join Queries.
3. Implementation of Cursors.
4. Implementation of Procedures and Functions
5. Implementation of Triggers
6. Implementation of various DBA roles/techniques: Creation of user, Granting of privileges to the users, Creation of roles, Loading of privileges into user defined roles,
7. Import/Export data between various databases and flat files

Course Title: Data Structures and File Processing Laboratory
Course Code: CSA523

L	T	P	Credits	Marks
0	0	4	2	50

1. Implementation of Data Structures: **Arrays Linked List, Stack, Queues, Trees**, etc
2. Implementation Searching: Linear and Binary
3. Implement Sorting: Bubble, Selection, Insertion, and Quick
4. Binary tree using pre-order, post-order and in-order traversals
5. Implementation of Traversal on graph using Depth First Search and Breadth First Search
6. Implement AVL Trees as well as various operations of searching, insertion and deletion on AVL Trees.

Course Title: Python Programming Laboratory
Course Code: CSA524

L	T	P	Credits	Marks
0	0	4	2	50

1. Implementation of Python programs: Control Structures, Lists, Tuples,
2. Strings, Dictionary, Sets, Files,
3. Exception handling, Classes and Objects,
4. Inheritance, Overloading, GUI Programming,
5. Database Connectivity, etc

Course Title: Computer Networks and Data Communication
Course Code: CSA510
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: As part of this course, students will be introduced to computer networks and data communication paradigms, about network models and standards, network protocols and their use, wireless technologies.

UNIT – A **18 Hours**

Introduction to Data Communication

- Components of Data Communication, Data Representation
- Transmission Impairments, Switching, Modulation, Multiplexing

Review of Network Hardware

- LAN, MAN, WAN
- Wireless networks, Internetworks

Review of Network Software

- Layer, Protocols, Interfaces and Services

Review of Reference Models

- OSI, TCP/IP and their comparison

Physical Layer

- Transmission Media**:** Twisted pair, Coaxial cable, Fiber optics
- Wireless transmission (Radio, Microwave, Infrared)
- Introduction to ATM, ISDN
- Cellular Radio and Communication Satellites

UNIT – B **15 Hours**

Data Link Layer

- Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat)
- Examples of DLL Protocols–HDLC, PPP

Medium Access Sub layer

- Channel Allocation, MAC protocols – ALOHA, CSMA protocols
- Collision free protocols, Limited Contention Protocols
- Wireless LAN protocols
- IEEE 802.3, 802.4, 802.5 standards and their comparison

Bridges

- Transparent, source routing, remote

UNIT – C **15 Hours**

Network Layer

- Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast
- Internetworking, IP Protocol, ARP, RARP.

UNIT – D **12 Hours**

Transport Layer

- Addressing, Establishing and Releasing Connection
- Flow Control, Buffering
- Internet Transport Protocol (TCP and UDP).
- Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding)

Application Layer

- Domain name system, Email, File transfer protocol
- HTTP, HTTPS, World Wide Web.

Reference Books:

1. Tanenbaum. Andrew S. ,*Computer Networks*, 4th Edition, New Delhi: PHI, 2013.
2. Forouzan B. A.,*Data Communications and Networking*, Fourth Edition, New Delhi: Tata McGraw Hill, 2003.
3. Stallings William,*Data Computer Communications*, (8th Edition), New Delhi: PHI, 2008.
4. Bary Nance, *Introduction to Networking*, 4th Edition, New Delhi: PHI, 1997.

Course Title: Design and Analysis of Algorithms
Course Code: CSA577
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of the module is to create skills in students to design and analysis of algorithms.

UNIT – A **10 Hours**

Algorithms and Analysis

- Introduction
- Algorithms specification
- Recursive algorithms
- Space and Time Complexity
- Asymptotic Notation (O, Θ and Ω) practical complexities, Best, average and worst case performance of algorithms
- Introduction to recurrence relations

Divide and Conquer

- General method
- Binary Search, Merge sort, Quick sort, Selection sort,
- Analysis of these problems

UNIT – B **10 Hours**

String Processing and Greedy Method

- KMP
- Boyre-Moore
- Robin Karp algorithms

Greedy Method

- General Method, Knapsack problem
- Job sequencing with deadlines
- Minimum spanning Trees
- Single Source Shortcut paths and analysis of these problems

UNIT – C **10 Hours**

Dynamic Programming

- General method, Optimal Binary Search Trees
- 0/1 Knapsack
- The Travelling Salesperson Problem

Back Tracking

- General method, 8 queen's problem
- Graph Coloring
- Hamiltonian Cycles
- Analysis of these Problems

UNIT – D **15 Hours**

Branch and Bound

- Least Cost Search and LC Branch and Bound
- Bounding
- FIFO Branch and Bound
- 0/1 Knapsack Problem
- Travelling Salesperson Problem

Introduction to Complexity Theory

- NP-Hard and NP-Complete Problem
- Basic concepts, Cook's theorem, examples of NP-Hard problems
- Approximation Algorithms

Reference Books:

1. Horowitz, Ellis and Sahni, *Fundamentals of Computer Algorithms*, New Delhi: GalgotiaPublications, 2nd Edition, 2008
2. Aho, A.V., Hopcroft, J.E., Ullman, J.D., *The Design and Analysis of Computer Algorithms*, Addison-Wesley, First Edition, 2003.
3. Bentley, J.L., *Writing Efficient Programs*, New Delhi: Prentice-Hall India, Eastern Economy Edition, 2009.
4. Goodman, S.E. &Hedetniemi,*Introduction to the Design and Analysis of Algorithms*, New Delhi: Tata McGraw-Hill Book Comp, 2004.
5. Anany Levitin, *Introduction to the Design and Analysis of Algorithms*, Pearson Education, 3rd Edition, 2012.
6. Michael T Goodrich and Roberto Tamassia : Algorithm Design, Wiley India, 2002.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Computer Based Optimization Techniques
Course Code: CSA578
Course Duration: 45-60 Hours

Course Objective: To introduce linear programming, dynamic programming and related Optimization Theories to solve real life / simulated problems.

UNIT – A **10 Hours**

Introduction

- The Historical development
- Nature, Meaning and Management Application of Operations Research Modelling
- Its Principal and Approximation of O.R.Models
- Main Characteristic and Phases
- General Methods of solving models
- Scientific Methods, Scope, Role on Decision Making
- Development of Operation Research in India

UNIT – B **15 Hours**

Linear Programming

- Mathematical formulation of linear programming problems
- Canonical and standard forms of linear programming problems
- Solution by Graphical & Simplex method
- Revised simplex method
- Two phase & Big-M method, Duality, Primal-Dual Relationship
- Simplex Method
- Economic Interpretation of Optimal simplex Solution

Special Types of Linear Programming Problems

- Transportation
- Assignment Problems

UNIT – C **10 Hours**

Integer & Dynamic Programming

- Integer programming problem
- Branch and Bound Techniques
- Characteristics
- Deterministic DP Problems, Recursive Approach and Tabular method

PERT / CPM

- Project Planning
- Scheduling
- Activity Cost

- Network Diagram Representation
- Difference between CPM and PERT
- Floats and Slack Times

UNIT-D **10 Hours**

Queuing Models

- Introduction, Applications
- Characteristic, Waiting and Ideal time costs
- Transient and Steady states
- Kendall's Notations
- M/M/1, M/M/C, M/Ek/1 and Deterministic Models

Reference Books:

1. Hiller, F.S. &Liberman, G.J., *Introduction to Operations Research*, 2nd Edn. London Holden Day Inc., 1974.
2. Tara, H.A., *Operations Research*, 3rd Edn., New Delhi:PHI, 2004.
3. Beightler, C.S. & Phillips, D.T., *Foundations of Optimisation*, 2nd.Edn. New Delhi: Prentice-Hall, 1979.
4. McMillan Claude Jr., *Mathematical Programming*, 2nd. Edn., J. Wiley Series, 1975.
5. Srinath, L.S., *Linear Programming*,New Delhi: East-West, 1975.
6. Churchman, C.W. &Arnchoff, E.L.,*Introduction to Operations Research*, New York: John Wiley and Sons, 1988.
7. Srinivasan G., *Operations Research: Principles and Applications*, PHI,2010
8. Prasad Durga, M.V, *Operations Research* , Cengage Publications, 2012.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Interactive Computer Graphics
Course Code: CSA579
Course Duration: 45-60 Hours

Course Objective: The aim is to introduce the students to key concepts of Computer Graphics likedisplay devices, co-ordinate system, transformations, line and circle drawing, pointing,positioning, projections, etc.

UNIT – A **15 Hours**

Display Devices

- Line and point plotting systems
- Raster, vector, pixel and point plotters
- Continual Refresh and storage displays
- Digital frame buffer
- Plasma panel displays, Display processors
- Character generators
- Color-display techniques : shadow mask and penetration CRT, Color look-up tables

Elementary Drawing Algorithms

- Line drawing using direct method, simple DDA, integer DDA
- Incremental method, and Bresenham's algorithm
- Circle drawing using incremental method,Bresenham's and MidPoint algorithm
- drawing arcs, sectors
- Flood Fill Algorithms, Boundary Fill Algorithms

UNIT – B **15 Hours**

Geometric Transformations.

- Two Dimensional Translation, rotation, scaling, reflection and shear
- Concept of homogenous coordinates
- Building composite transformations

Viewing Transformations

- Concept of Windows & Viewport
- Window-To-Viewport Mapping
- Clipping Operations - Point Clipping
- Line Clipping Algorithms (Cohen - Sutherland, Mid-Point, Subdivision, Cyrus - Beck),
- Sutherland - Hodgeman Polygon Clipping Algorithm

UNIT – C **15 Hours**

Three-dimensional concepts

- 3-D representations and transformations
- perspective and parallel projections
- spline curves and surfaces

- Quadtree and Octree data structures

Hidden line/surface Removal

- Back Face Removal
- Z-Buffer Algorithm
- Painters (Depth Sort) Algorithm
- Subdivision Algorithms - Warnock's Algorithm
- Scan Line Algorithms - Scan Line

UNIT – D **15 Hours**

Rendering

- Introduction, a simple illumination model
- Shading - Gouraud shading &Phong Shading
- Ray Tracing, Shadows, Textures

Open GL

- Primitives of the language and interface with C/C++

Reference Books:

1. D. Hearn and M.P. Baker, *Computer Graphics*(2nd ed.), New Delhi: Prentice–Hall of India, 2004.
2. Foley. J.D., Dam A van, FeinerS.K. andHughes J.F., *Computer Graphics: Principals and Practices*(2nd ed.), Addison-Wesley, MA, 1990.
3. Rogers D.F., *Procedural Elements in Computer Graphics (2nd ed.),* New Delhi:McGraw Hill Book Company, 2001.
4. PlastockRoy A., KalleyGordon,*Computer Graphics*, New Delhi: McGraw Hill Book Company, 1996.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Theory of Computer Science
Course Code: CSA580
Course Duration: 45-60 Hours

Course Objective Understanding and development of theoretical models of computations and their analysis. The models of computations include (i) Finite Automata (and Regular Languages), (ii) Push Down Automata (and Context-free Languages), (iii) Turing Machine (and their Languages).

UNIT – A **15 Hours**

Automata Theory
- Deterministic Finite Automata, Moves
- Non Deterministic Finite Automata
- Moore and Mealy Machines
- Minimization Algorithm

Regular Languages
- Regular Sets
- Regular Expressions
- Pumping Lemma for Regular Sets

UNIT – B **15 Hours**

Context Free Grammars
- Context free grammars (CFG)
- Derivation Graphs
- Ambiguities in Grammars and Languages
- Properties of Context Free Languages
- Normal Forms
- Pumping Lemma for CFL
- Closure Properties

Pushdown Automaton
- Pushdown Automaton (PDA)
- Deterministic Pushdown Automaton (DPDA)
- Non-equivalence of PDA and DPDA
- Language Accepted by PDA

UNIT – C, **15 Hours**

Linear Bounded Automata (LBA)
- Power of LBA
- Closure properties

Turing Machines
- Turing Machine as A Model of Computation
- Programming with a Turing Machine
- Variants of Turing Machine and Their Equivalence

- Turing Machines and Languages

UNIT – D **15 Hours**

Undecidability

- **Chomsky Hierarchy of Languages**
- Recursive and Recursive-Enumerable Languages
- Halting Problem, Undecidable Problems about Turing machines
- Rice theorem
- The Equivalence of the Automata and the Appropriate Grammars

Reference Books:

1. G.E. Reevsz, *Introduction to Formal Languages*, New Delhi: McGraw Hill 1983.
2. HopcroftJ. E., MotwaniR., and Ullman J. D., *Introduction to Automata Theory*, *languages, and computation*(2nd ed.), New Delhi: Addison-Wesley, 2001
3. Lewis H.R., Papadimitriou C.H., *Elements of the Theory ofComputation*(2nd ed.), NJ:Prentice-Hall,1997.
4. Anderson J.A., *Automata Theory with Modern Applications*, New York: Cambridge University
Press, 2006.

Course Title: Computer Network and Data Communication Laboratory

L	T	P	Credits	Marks
0	0	4	2	50

Course Code: CSA516

- Specifications of latest desktops and laptops.
- Familiarization with Networking Components and Devices: LAN Adapters, Hubs, Switches, Routers etc.
- Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc.
- Preparing straight and cross cables.
- Study of various LAN topologies and their creation using network devices, cables and computers.
- Configuration of TCP/IP Protocols in Windows and Linux.
- Implementation of file and printer sharing.
- Designing and implementing Class A, B, C Networks
- Subnet planning and its implementation
- Installation of ftp server and client
- Implementation of Various routing protocol (With the help of simulation)

Course Title: Design and Analysis of Algorithms Laboratory

L	T	P	Credits	Marks
0	0	4	2	50

Course Code: CSA581

Implementation of various algorithms divide and conquer, string processing, greedy methods, dynamic programming, etc.

Course Title: Interactive Computer Graphics Laboratory
Course Code: CSA582

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of various algorithms of drawing line, circle, ellipse, etc. and2D transformations