



Lok Jagruti Kendra University
Ahmedabad – 382210

**Syllabus for Five Years Master of Science (Information
Technology) Integrated Programme**

Semester 3

(Effective from Academic 2020)

Course Code	050020301			
Category	Core Subject			
Course Title	Data Structures (DS)			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	4	0	4	6
Pre-requisites (if any)	<ul style="list-style-type: none"> • Basic knowledge of writing and understanding algorithms for solving a problem. • Basic knowledge of programming in C language 			

1.Course Objectives:

Sr.	Course Outcome (Learner will be able to)
1	To understand how a problem is solved step by step to get the desired output
2	To learn the right way to organize information in the digital space
3	To understand the fundamental concept of elementary data structures and their implementation.
4	To understand where and how the data structures are implemented in real world.
5	To learn how to write efficient and optimized computer programs.

2. Course Contents

Module	Course Content	Weightage
Unit 1	Introduction to Data Structures Concept of Data structures, Impact of using data structures in algorithms, Introduction to calculation of Time Complexity and Space Complexity, Introduction to Linear and Non Linear Data structures.	10%
Unit II	Linear Data Structures Storage representation of Arrays – Single dimensional arrays and double dimensional arrays (Row major order and column major order), Concept of Sparse Matrices and its operations (Transpose, addition and subtraction).	15%
Unit III	Advanced Linear Data Structures: Linked lists, Stacks, Queues Linked List: Basic concept, Storage representation, Types of Linked lists (Singly, Doubly, Circular), Operations on linked list (Insert, modify, delete, union, intersection, merge, sort, searching), Applications of Linked list (Polynomial operations – Addition and multiplication), Header linked lists. Stack: Basic concept, Storage representation (Array and linked list), Basic Operations (PUSH, POP, PEEK AND CHANGE), Applications of Stacks (Polish and reverse polish expressions), Arithmetic Expression	30%

	<p>evaluation using stack.</p> <p>Queues: Basic concept, Storage representation (Array and Linked list), Basic Operations (INSERT AND DELETE). Types of Queues- Circular, Deque, Priority queues (Only concept). Application of Queues (Simulation, Scheduling algorithms).</p>	
Unit IV	<p>Non Linear Data Structures – Trees and Graphs.</p> <p>Trees – Basic concept, terms associated with trees(Node, parent, child, link, root, leaf, level, height, indegree, outdegree, siblings), Storage representation – Linear and Linked , Types of tree (Binary Tree, BST, Expression tree, AVL Tree, 2-3 tree, B tree, Threaded binary tree), Conversion of General tree to Binary tree, Complete Binary tree, full binary tree, BST operations, Tree traversals – Inorder, Pre-order, Post-order</p> <p>Graphs-Basic concepts, technical terms associated with Graphs – Digraph, Weighted graph, adjacent vertices, self loop, parallel edges, simple graph, complete graph, isolated vertex, Degree of a vertex, connected graph-, Storage representation (Set representation, Adjacency matrix, Adjacency list), Graph Traversing algorithms- DFS and BFS.</p> <p>Overview of Concept of Minimum Spanning Tree – Prim's Algorithm, Kruskal's Algorithm, Shortest path algorithm – Dijkstra 's algorithm</p>	25%
Unit V	<p>Sorting and Searching Algorithms</p> <p>Sorting Algorithms: Bubble, Selection, Insertion, Shell, 2- Way Merge sort, Radix sort. heap sort and Quick sort.</p> <p>Searching Algorithms: Linear Search and Binary Search, Introduction to Hashing and hashing methods, collision resolution techniques.</p>	20%

3. Text Books:

- 1) Debasis Samanta ,Classic Data Structures , PHI, Second Edition.
- 2) Jean-Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, 2nd Edition, (2007).
- 3) Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson, Second Edition,
- 4) Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Education (2004).
- 5) G. A.V.PAI, "Data Structures and Algorithms, Concepts, Techniques and Applications", TMH , 1st Edition (2008).
- 6) Reema Thareja, Data Structures using C, Oxford

4. Webilography :

- 1) https://www.tutorialspoint.com/data_structures_algorithms
- 2) <https://www.javatpoint.com/>

5. Accomplishment of the student after completing the course: :

- 1) Ability to design and implement various abstract data types.
- 2) Understand the applications of various data structures in the basic computer system.
- 3) Understand and implement the various sorting and Searching methods on the data sets(big and small).

Course Code	050020302			
Category	Core Subject			
Course Title	Object Oriented Programming using C++			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	4	0	4	6
Pre-requisites (if any)	<ul style="list-style-type: none"> Basic knowledge of programming in C language 			

1. Course Objectives:

Sr.	Course Outcome (Learner will be able to)
1	To understand the Object oriented programming
2	To understand how to implement object, class, Inheritance, Polymorphism
3	To understand the concept of data storage in C++ using files.
4	To understand where and how the Standard Template Library are implemented in real world.

2. Course contents:

Module	Content	Weight
Unit I	Basics of OOP : Fundamentals: Introduction OOP, Procedural Vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP	10%
Unit II	Basics of C++: Overview, Program structure, identifiers, variables, constants, enum, operators, type casting, control structures, reference variables C++ Functions: Simple functions, Call and Return by reference, Overloading of functions, default arguments	15%
Unit III	Object Oriented Programming concepts Objects and Classes : Basics of object and class in C++, Introduction to Private and public members, inline function, static data and function members, constructors and their types, destructors, operator overloading, type conversion, friend functions, friend class, namespace and nested namespace, Type conversion, namespace, nested namespace Inheritance : Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, class initializer list Polymorphism : pointers, pointer object, this pointer, virtual and pure virtual functions, overriding and virtual base class, pointer to static data member and static member function	30%
Unit IV	I/O and File Management :	25%

	Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, manipulators & user-defined manipulators, File stream, C++ File stream classes, File management functions, File modes (binary & random)	
Unit V	Templates & Exceptions What is template? function templates and class templates, Introduction to exception, try-catch-throw, multiple catch, catch all, rethrowing exception, implementing user defined exceptions	20%

Desirable:

- Overview and use of Standard Template Library

3. Text Books:

- 1) E Balagurusamy, Object Oriented Programming With C++, , TMH
- 2) Deitel and Deitel , C++ : How to Program, 9th Edition, , PHI
- 3) Ashok Kamthane, Object Oriented Programming with ANSI and Turbo C++, , Pearson
- 4) Herbert Schlitz, The Complete Reference C++, , TMH
- 5) Saurav Sahay, Object Oriented Programming with C++, , Oxford
- 6) The C++ Programming Language by Bjarne Stroustrup, Pearson Education

4. Webliography

- i. <https://www.javatpoint.com>
- ii. <https://www.tutorialspoint.com>

5. Accomplishment of the student after completing the course:

- 1) Ability to write the skeleton of C++ program
- 2) Ability to write the simple object oriented programs in C++ using objects and class
- 3) Use standard template library for faster development.
- 4) Develop the applications using object oriented programming with C++.

Course Code	050020309			
Category	Interdisciplinary			
Course Title	Discrete Mathematics for Computer Science			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	3	0	0	3
Pre-requisites (if any)				

1. Course Objectives:

Sr.	Course Outcome (Learner will be able to)
1	To understand the foundations of many basic mathematical topics used in Computer Science including RDBMS, Data Structures, Analysis of Algorithms, Theory of Computation, Cryptography, Artificial Intelligence, Statistics and others.
2	To understand the concepts of basic algorithms related with Graphs and binary trees.

2. Course contents :

Module	Content	Weightage
Unit I	Graphs: Graph: Definition; Directed and undirected graphs; Loop (sling); Parallel edges; Simple graph, multi-graph; Weighted graph; Isolated node; Null graph; Isomorphism of graphs; In-degree, out-degree, total degree of a graph; Subgraph; Reflexive, symmetric, transitive, anti-symmetric graphs; Converse and directional dual of a digraph; Path of a graph; Length of a path; Simple path (edge simple), elementary path (node simple); Cycle (circuit); Path of minimum length (geodesic); Reachability; Reachable set; Node base; Connected graph – strongly connected, unilaterally connected, weakly connected; Subgraph generated by a given set; Maximal strongly (or unilaterally or weakly) connected subgraph; Matrix representation of graph; Adjacency matrix (A) of a graph; Deriving in (or out or total) degree from adjacency matrix; Path (reachability)	25%
Unit II	Tree: Definition, root and leaf nodes; Directed tree; Weighted tree; Degree of node; Disjoint tree, forest; Full (complete) m-ary tree, binary tree; Different representations of trees; Conversion of m-ary tree into a binary tree; Binary tree representation of a forest	15%
Unit III	Permutations, Combinations and Limits Permutations: Apply the concept of permutation to solve simple problems, Solving problems based with restrictions on permutations with restrictions Combinations: Define permutation, Define combination, Differentiate between permutation and combination, Apply the formula of	30%

	combination to solve the related problems, Solve problems using combination with repetitions Limit: Define limit of a function, Solve problems based on the algebra of limits, Define continuity of a function	
Unit IV	Differentiation and Integration Differentiation: Definition of Derivative, Rules for Differentiation (without proof), Differentiation of composite functions, Higher order derivatives till order 2 Integration: Introduction to indefinite integral, Definition of Integration & Methods of integration, Substitution Methods, Standard Formulae (without proof) and example based on the standard forms	30%

Note: Proofs of Theorems not required

Desirable:

Introduction to definite integration and simple examples on it

3. Text Books:

1. Swapan Kumar Chakraborty, Bikash Kanti Sarkar "Discrete Mathematics "(Oxford Higher Education) (2011)
2. J.P.Tremblay and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill (2010)
3. Bernard Kolmann & others, "Discrete Mathematical Structure", Pearson Education, Sixth Edition
4. D.S.Malik & M.K.Sen, "Discrete Mathematics", Cengage Learning (2004)
5. D.C. Sancheti & V.K Kapoor , Business Mathematics (Latest Edition) Publisher : S.Chand and Sons Publications

4. Bibliography

5. Accomplishment of the student after completing the course:

- This course will enhance the student's ability to think logically and mathematically.

Course Code	050020304			
Category	Core Subject			
Course Title	System Analysis and Design			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	3	0	2	4
Pre-requisites (if any)				

1. Course Objectives:

Sr.	Course Outcome (Learner will be able to)
1	Understand the need for systems analysis and design in organizations.
2	Realize what the many roles of a systems analyst are.
3	Depict systems graphically, using context-level data flow diagrams,
4	Recognize the value of using interactive methods for information gathering.
5	Construct interview questions, JAD to elicit human information requirements and structure them in a way that is meaningful to users.
6	Comprehend the importance of using logical and physical data flow diagrams (DFDs) to graphically depict data movement for humans and systems in an organization.
7	Understand how analysts use data dictionaries for analyzing data-oriented systems.
8	Recognize the difference between structured and semi structured decisions..

2. Course contents :

Module	Content	Weightage
Unit I	System Concept Data and Information ,Types of information, System definition, Characteristics of a system, Elements of a system, Types of systems, Roles of a Systems Analyst, Characteristics of System Analyst, Organization as a System.	20%
Unit II	System Development Life Cycle: SDLC and its phases: Identifying Problems, Opportunities, and Objectives, Determining Human Information Requirements, Analyzing System Needs, Designing the Recommended System, Developing and Documenting Software, Testing and Maintaining the System, Implementing and Evaluating the System.	15%
Unit III	Interactive methods: Fact Finding Techniques: Interview Steps, Document Review, Observation, Questionnaires and Surveys, Sampling, Research, Joint Application Design. Feasibility and its types, generation of Feasibility report, System Requirement Specification, Deciding project goal, CASE tools.	20%
Unit IV	System analysis :	25%

	Introduction, Data flow diagram (DFD), workflow diagram and mind map, DFD symbols, constructing a DFD, leveling of DFDs – leveling rules – logical and physical DFDs – software tools to create DFDs, Introduction to data dictionary. Process specifications using Structured English, Decision Tables and Decision	
Unit V	The essentials of design : Designing Effective Output: Output Design Objectives, Factors to Consider When Choosing Output Technology, Realizing How Output Bias Affects Users, Designing Output for Displays, Designing a Website, Designing Apps for Smartphones and Tablets Designing Effective Input: Good Form Design, Good Display and Web Forms Design, Website Design, Designing User interfaces: Understanding Human–Computer Interaction, Usability, Types of User Interface, Designing Interfaces for Smartphones And Tablets, Guidelines for Dialog Design, Feedback for Users.	20%

3. Text Books :

1. Kenneth E. Kendall and Julie E. Kendall , Systems Analysis and Design, PHI 9th Edition
2. System Analysis and Design Methods; 4th edition; by Shelly, Cashman, Rosenblatt; Cengage Learning India Edition.
3. Analysis and Design of Information Systems, 2nd Edition, By V Rajaraman, (PHI)

4. Webliography

5. Accomplishment of the student after completing the course:

After completion of the course the students would be well versed with

- the role of System Analyst,
- Design using interactive methods and
- Modern structured analysis approaches

6. Active learning Assignment

At least one Case Study analysis to be done by a group of students. The case study analysis should comprise of the following:

- Preliminary Investigation (Structured and Object-Oriented both)
- Feasibility Analysis (Structured and Object-Oriented both)
- System Analysis (DFD 0 and 1 Level)
- System Design – Data Dictionary, Input Screen Layouts and Report Layouts

Course Code	050020305			
Category	Elective I			
Course Title	Web Application Development using LAMP (WDT III)			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	0	1	4	3
Pre-requisites (if any)	Knowledge of Internet, HTML, CSS and Database Concepts			

Course Code	050020309			
Category	Elective I			
Course Title	Web Application Development using .Net Core (WDT III)			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	0	1	4	3
Pre-requisites (if any)	Knowledge of Internet and Database Concepts			

General Guidelines for Software Project

- Team Size: 3 Persons
 - It is suggested to develop Web/Desktop/Mobile applications using emerging frameworks like Magneto, CodeIgniter, Laravel, React.js, vue.js, Flutter, React Native, Angular, Node.js or any other open source frame works
- Project size in terms of Lines of Code (LOC) should be 1,000 lines or more(excluding comment lines). In case of extensive recursion used in medium to high complexity problem, this limit on LOC may be relaxed.
- Project definition should be such that it aims at providing solution to a specific requirement of real life problem.
- The code should be self-documented and should follow coding standards (Style including (i) Generalized-Parameterized, (ii) Structured-Modular Coding Style, (iii) Compactness & Clarity, (iv) Checkpoints for intermediate results, (v) Naming Conventions, (vi) Self-Documented).
- Project must include
 - Atleast one listing/register type of report
 - Atleast 2 advanced reports

Expected Minimum Deliverables

- Project document and code must be uploaded on Github.
- Documentation of the project should include at least description of the problem, algorithm/pseudo code/flow chart (if any), functional testing and solution methodology.
- Data storage

Criteria for Evaluation of Software Projects

- Problem understanding and logic :
- Coding Standard :
- Completion and Operational :
- Reports

Course Code	050020310			
Category	Communication Skills			
Course Title	Communication Skills – III			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	2	1	0	3
Pre-requisites (if any)	The course is based on the basic principle of learning language of LSRW (Listening, Speaking ,Reading and Writing). Hence students are supposed to read the English Newspaper and watch English or business channels, interact in English			

2. Course contents

:

Module	Content	Weightage
Unit I	Importance of Listening and understanding the human environment in corporate by developing Emotional Quotient	10 %
Unit II	Importance of an Interactive Communication through Role Plays, Case Studies, Presentations and Business Meetings. Pre Sales Talks, Networking , Digital Communication.	15%
Unit III	Reading Case Studies, Tender Conditions, Sales Offers, Proposals, Business Articles, Mission and Vision Statements.	15%
Unit IV	Writing Minutes of the Meeting, Quotations, Pre Sales offers, Inter Office Memo, Internal Correspondence , Preparing proposals, .Content Writing ,brochures leaflets, content writing	30%
Unit V	Practical Taking up a Real Life Case study or a General Study of any IT company or preparing a website or a brochure or a leaflet of any company.	30%

TEST: Daily Assessment on blended LSRW formula

Mainly in writing and Reading @ 20 marks per day .Assignment of 30 marks.

Pedagogy tools:

- Audio/Video
- Soft Skill Games
- Group Discussions
- Presentations
- Lectures
- Group Assignments

Books For reading

1. Games People Play by Eric Berne
2. How to make decision about people.
3. Chatur Chanakya, Himalayan Probleme

Course Code	050020307			
Category	Non-credit			
Course Title	Indian Constitution (IC)			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	2	0	0	0
Pre-requisites (if any)	NA			

1.CourseContents:

Sr No	Topic
1	Historical perspective of the Constitution of India
2	Preamble
3	Salient features of constitution of India
4	The Scheme of Fundamental Rights
5	Right to Equality and protective discrimination, Equality of opportunity in the matter of Public Employment
6	Freedoms guaranteed to citizens of India under Article 19 and reasonable restrictions
7	Right to Life and personal liberty under article 21
5	The Directive Principles of State Policy
6	The Scheme of Fundamental Duties
7	Scheme of functions and powers of Executives, Judiciary and Legislature
8	Federal structure and distribution of powers between the Union and the States (Schedule 7)
9	Scheme of functions and powers of executives, judiciary and legislature
10	Emergency provisions
11	Procedure for the amendment of the Constitution, Judicial pronouncement and theory of basic structure