DETAILED SYLLABUS

SEMESTER-I

Course Title: MATHEMATICAL FOUNDATIONS FOR COMPUTING		
Course Code:	24MCMFCT101	CIE Marks: 40
Teaching Hours/week(L:T:P)	3:1:0	SEE Marks:60
Total Contact Hours:	46	Total Marks: 100
Course Credits:	4	Exam Duration: 3 hours

Course Outcomes (COs) with Revised Cognitive levels (RCL):
U-Understanding, R-Remembering, AP-Applying, A-Analyzing, E-Evaluating, C-Creating

COs	DESCRIPTION	RCL
CO1	Utilize concepts of Sets, Relations, and Functions.	AP
CO2	Solve problems involving the Number Theory and Recurrence Relations	AP
CO3	Explore Graph Theory and Models	AP
CO4	Solve Linear Systems and Matrix Theory	AP
CO5	Make use of Statistics and Data Analysis	AP

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO1	3	3	2	-	-	-	1	3
CO2	3	3	2	-	-	-	1	3
CO3	3	3	3	-	1	-	1	3
CO4	3	3	2	-	-	-	1	1
CO5	3	3	2	-	1	-	1	3

UNIT	DESCRIPTION	HOURS
I	Sets, Set Operations, Relations, Classification of relations, Equivalence Relations, Closures of Relations, Matrix Representation of Relations, Partial Ordering, n-ary Relations, Functions.	09
II	Division Algorithm, GCD, Primes, Euclidean Algorithm, Congruences, Properties of Congruences, Solutions of Linear Congruences. First Order Linear Recurrence Relation, Second Order Linear Homogeneous Recurrence Relations with Constant coefficients, Non Homogeneous Recurrence Relation.	09
III	Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Directed Graph, Multigraph, Connected graph, Euler circuit and trail, Planar and Non-planar Graphs.	09
IV	Linear system of equations, coefficient matrix, augmented matrix, Gauss elimination method and back substitution, elementary row operations, row equivalent systems, Gauss elimination- three possible cases, Row Echelon form and information from it, Linear independence- rank of a matrix. Solution of linear system, fundamental theorem of non- homogeneous linear system (without proof). Homogeneous linear system (theory only), Matrix eigen value problem- determination of eigen values and eigen vectors, Basis of eigen vectors-diagonalization of matrix- Quadratic formprinciple axis theorem (without proof).	09

V	Bivariate data – Scatter Diagram – Interpretation of the nature and degree of relation using scattered diagram - Curve fitting – Principle of least squares – fitting a straight line – fitting a parabola – linear correlation and regression – Karl's Pearson's Coefficient of Correlation – Spearman's rank correlation coefficient (problems based on the formula).	10

Question paper pattern:

There will be two parts; Part A and Part B.

- Part A contains 5 compulsory short answer questions,1 from each module. Each question carries 4 marks.
- Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 8 marks.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Elementary Number Theory	David M. Burton	McGraw-Hill	7th Edition, 2012
2	Discrete and Computational Mathematics: An applied introduction	Ralph P Grimaldi	Pearson Education	5th Edition, (2007).
3	Advanced Engineering Mathematics	Erwin Kreyszig		10th ed., Wiley
4	Fundamentals of Mathematical Statistics	Gupta S.C and Kapoor V .K	Sultan Chand and Sons	11th edition.
Reference Books				
1	Discrete mathematics and its applications	Kenneth H. Rosen	McGraw-Hill	7th Edition
2	Elements of Discrete Mathematics: A Computer Oriented Approach	C. Liu	McGraw-Hill	4th Edition, 2012
3	Discrete Mathematical Structures with applications to Computer science	Jean-Paul Tremblay	McGraw-Hill	1st Edition, 2001
4	Elementary Number Theory with Programming	Marty Lewinter, Jeanine Meyer	Wiley- Blackwell	2015
5	Introduction to practice of statistics	David S. Moore and George P. McCabe	W.H. Freeman & Company	5th Edition (2005)
6	Applied Statistics and Probability for Engineers	Douglas C. Montgomery and George C. Runger	Wiley India	5th Edition (2012)
7	Probability and Random Process	Veerarajan T	Tata McGraw-Hill	3rd Edition, (2002)
8	Introduction to Probability and Statistics Using R	G. Jay Kerns	Chapman & Hall	(2010)
9	Higher Engineering Mathematics	B.S Grewal	Khanna Publishers New Delhi	

Web links and Video Lectures:

1. .https://www.openintro.org/stat/textbook.php
2. http://www.math.uah.edu/stat/index.html
3. http://www.socr.ucla.edu/

Activity-Based Learning (Suggested Activities in Class/ Practical)

1. Quiz
2. Open ended Experiments
3. Group Assignment/Project
4. Seminars
5. Others

Course Title: DIGITAL FUNDAMENTALS & COMPUTER ARCHITECTURE		
Course Code:	**24MCDFCT102**	CIE Marks: 40
Teaching Hours/week(L:T:P)	3:1:0	SEE Marks:60
Total Contact Hours:	46	Total Marks: 100
Course Credits:	4	Exam Duration: 3 hours

Course Outcomes (COs) with Revised Cognitive levels (RCL):
U-Understanding, R-Remembering, AP-Applying, A-Analyzing, E-Evaluating, C-Creating

COs	DESCRIPTION	RCL
CO1	Apply the basics of digital electronics for realization of simple combinational logic circuits.	AP
CO2	Apply the digital electronics principles for sequential logic circuits.	AP
CO3	Discuss the different design features and key components.	U
CO4	Express the basic data path with processor logic design conventions and direct memory access	U
CO5	Recognize different types of memories and memory design techniques.	U

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO1	3	3	2	2	-	-	1	3
CO2	3	3	2	2	-	-	1	3
CO3	2	2	1	2	-	-	1	2
CO4	2	2	1	2	-	-	1	2
CO5	2	2	1	2	-	-	1	2

UNIT	DESCRIPTION	HOURS
I	Representation of signed numbers – 1's complement and 2's complement, Logic gates – AND - OR – NOT - NAND- NOR - XOR , Boolean algebra - Basic laws and theorems , Boolean functions- truth table, Standard forms of Boolean Expressions – Sum of Products and Product of Sums - minimization of Boolean function using Karnaugh map method - Realization using logic gates, Combinational Circuits - Half adder - Full Adder-Decoder -Encoder-Multiplexer – De-multiplexer	11
II	Sequential circuit - Clocking, Flip flops - SR – JK- D -T flip flops, Counters - Synchronous and asynchronous counters - UP/DOWN counters , Registers - Serial in serial out - Serial in parallel out - Parallel in serial out - Parallel in parallel out registers	10
III	Introduction, Computer architecture -8 Design features, Application program - layers of abstraction, Five key components of a computer, Performance, Instruction set principles – Introduction, Classifying instruction set architectures, Memory addressing, Encoding an instruction set..	10
IV	The Processor - Introduction, Logic design conventions, Building a datapath, A simple implementation scheme, An overview of pipelining - Pipelined datapath and control - Structural hazards - Data hazards - Control hazards, interrupts - handling multiple devices, Direct memory access	9
V	The Memory System – basic concepts, semiconductor RAM memories organization – static anddynamic RAM, Structure of larger memories, semiconductor ROM memories, Speed, Size and cost ,Cache memory – mapping functions – replacement algorithms , Virtual memory	8

Question paper pattern:

There will be two parts; Part A and Part B.

- Part A contains 5 compulsory short answer questions,1 from each module. Each question carries 4 marks.
- Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 8 marks.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Digital Fundamentals	Floyd	Pearson Education, New Delhi	10th Edition, 2011(module 1 & 2)
2	Computer Organization and Design: TheHardware/Software Interface	Davida Patterson John l.Hennesy	ELSEVIER	5TH edition,2016
Reference Books				
1	Computer Architecture A Quantitative Approach	Davida Patterson John l.Hennesy	ELSEVIER	5th edition,2014
2	Computer Organization	Carl Hamacher Zvonko Vranesic Safwat Zaky	McGrawHill	5th Edition,2016
3	Computer Organization and Architecture: Designing for Performance	William Stallings	Pearson Education	9th Edition,2013
4	Modern Digital Electronics	R.P.Jain	McGraw Hill.	4th Edition,2009

Web links and Video Lectures:

1. https://www.coursera.org/learn/build-a-computer

Activity-Based Learning (Suggested Activities in Class/ Practical)

1. Quiz
2. Open ended Experiments
3. Group Assignment/Project
4. Seminars
5. Others

Course Title: ADVANCED DATA STRUCTURES		
Course Code:	**24MCADST103**	**CIE Marks: 40**
Teaching Hours/week(L:T:P)	3:1:0	SEE Marks:60
Total Contact Hours:	46	Total Marks: 100
Course Credits:	4	Exam Duration: 3 hours

Course Outcomes (COs) with Revised Cognitive levels:
U-Understanding, R-Remembering, AP-Applying, A-Analyzing, E-Evaluating, C-Creating

COs	DESCRIPTION	RCL
CO1	Recall the key characteristics and operations associated with basic data structures, Set Data Structures and Hashing	R
CO2	Discuss the Advanced Tree Structures along with their operations	U
CO3	Explain the concepts of Advanced Heap Structures along with their operations	U
CO4	Explain the key concepts of advanced graph structures	U
CO5	Explain the fundamental components of blockchain architecture, including its underlying data structures and types of contract data.	U

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO1	3	2	3	2	2	-	1	3
CO2	3	3	3	3	2	-	1	3
CO3	3	2	3	3	2	-	1	3
CO4	3	3	3	3	2	-	1	3
CO5	3	2	3	3	2	-	1	3

UNIT	DESCRIPTION	HOURS
I	Review of basic data structures: - Array, linked list and its variants, Stack, Queue and Trees. Set Data Structure: - Representation of sets, Set implementation using bit string. Hashing: - Simple hash functions, Collision and Collision Resolution techniques. Disjoint sets- representations, Union, Find algorithms	08
II	Advanced Tree Structures:- Binary Search trees, Red-Black trees- Properties of Red Black trees, Rotations, Insertion, Deletion. B-Trees- Basic operations on B-Trees – Insertion and Deletion, Introduction to Splay Trees and Suffix Trees.	10
III	Advanced Heap Structures: - Mergeable Heaps and operations on Mergeable Heaps. Binomial Heaps, Binomial Heap operations and Analysis, Fibonacci Heaps, Fibonacci Heap operations and Analysis.	08
IV	Advanced Graph Structures Graphs: - Definition & Terminology, Representation. Traversals-Depth First and Breadth First Traversals, Minimum Cost Spanning Tree algorithms- Prim's Algorithm, Kruskal' Algorithm, Shortest Path Finding algorithms – Dijikstra's single source shortest paths algorithm.	10
V	Blockchain Data Structure:- Blockchain Architecture, Blockchain Data Structures and Data types, Contract Data, Problems to be solved in Blockchain data analysis	10

Question paper pattern:
There will be two parts; Part A and Part B.

- Part A contains 5 compulsory short answer questions,1 from each module. Each question carries 4 marks.

- Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 8 marks

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Introduction to Algorithms	Cormen T.H., Leiserson C.E, Rivest R.L. and Stein C	Prentice Hall India, New Delhi,	3rd Edition, 2004.
2	Data Structures and Algorithms	Aho A.V., Hopcroft J.E., and Ullman J.D.	Pearson Education, New Delhi,	1st Edition, 1983
3	Research and Analysis of Blockchain Data	Yang, Xiaojing, Jinshan Liu, and Xiaohe Li	Journal of Physics: Conference Series. Vol. 1237. No. 2.	IOP Publishing, 2019
Reference Books				
1	Algorithm design	Kleinberg, Jon, and Eva Tardos	Pearson Education India,.	6th Edition, 2006
2	Data Structures, Algorithms, and Applications in C++	Sahni S	Mc Graw Hill, Singapore,	4th Edition 1998.

Web links and Video Lectures:

1. https://nptel.ac.in/courses/106102064
2. https://www.classcentral.com/course/data-structures-the-georgia-institute-of-technolo-23256
3. https://academicearth.org/courses/data-structures-2/

Activity-Based Learning (Suggested Activities in Class/ Practical)

1. Quiz
2. Open ended Experiments
3. Group Assignment/Project
4. Seminars
5. Others

Course Title: ADVANCED SOFTWARE ENGINEERING		
Course Code:	**24MCASET104**	**CIE Marks: 40**
Teaching Hours/week(L:T:P)	3:1:0	SEE Marks:60
Total Contact Hours:	48	Total Marks: 100
Course Credits:	4	Exam Duration: 3 hours

Course Outcomes (COs) with Revised Cognitive levels:

U-Understanding, R-Remembering, AP-Applying, A-Analyzing, E-Evaluating, C-Creating

COs	DESCRIPTION	RCL
CO1	Describe software engineering principles, lifecycle models, and project planning techniques.	U
CO2	Learn coding standards, version control systems (Git), and software documentation techniques for efficient software development.	U
CO3	Discuss object-oriented concepts, design patterns for real-world scenarios with proper testing frameworks.	U
CO4	Gain knowledge about Agile methodology, Scrum framework, and various software testing principles (black-box, white-box, regression).	U
CO5	Learn about configuration management tools (Git, Ansible), continuous integration, and test automation for software quality.	U

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO1	3	3	2	1	2	1	1	2
CO2	2	2	3	-	2	2	1	1
CO3	-	2	3	3	2	1	1	2
CO4	2	3	2	3	1	3	1	3
CO5	3	2	2	-	3	2	1	1

UNIT	DESCRIPTION	HOURS
I	Introduction to Software Engineering: What is Software Engineering, Characteristics of Software. Life cycle of a software system: software design, development, testing, deployment, Maintenance. Project planning phase: project objectives, empirical estimation models, COCOMO, staffing and personnel planning. Software Engineering models: Predictive software engineering models, predictive and adaptive waterfall, waterfall with feedback (Sashimi), incremental waterfall, V model; Use cases and User stories	08
II	Programming Style Guides and Coding Standards; Literate programming and Software documentation; Documentation generators, Javadoc. Version control systems basic concepts; Concept of Distributed version control system and Git; Setting up Git; Core operations in Git version control system using command line interface (CLI): Clone a repository; View history; Modifying files; Branching; Push changes, Clone operation, add, commit, log. Pushing changes to the master; Using Git in IDEs and UI based tools. Software Quality: Understanding and ensuring requirements specification quality, design quality, quality in software development, conformance quality.	10
III	OOP Concepts; Design Patterns: Basic concepts of Design patterns, How to select a design pattern, Creational patterns, Structural patterns, Behavioural patterns. Concept of Anti-patterns. Unit testing and Unit Testing frameworks, The xUnit Architecture, Writing Unit Tests using at least one of Junit (for Java), unittest (for Python). Writing tests with Assertions, defining and using Custom Assertions, single condition tests, testing for expected errors, Abstract test.	10
IV	Concepts of Agile Development methodology; Scrum Framework. Software testing principles, Program walkthroughs, Program reviews; Blackbox testing: Equivalence class testing, Boundary value testing, White box testing: control flow testing, Data flow testing. Defect life cycle; Regression testing,	10
V	Software Configuration Management: Using version control, Managing dependencies, Continuous Integration: Prerequisites for continuous integration .Continuous Delivery: Principles of Software delivery. Build and	10

	deployment automation, Learn to use Ansible for configuration management. Test automation (as part of continuous integration), Learn to set up test automation cases using Robot Framework.	

Question paper pattern:

There will be two parts; Part A and Part B.

- Part A contains 5 compulsory short answer questions,1 from each module. Each question carries 4 marks.
- Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 8 marks.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	What Every Engineer Should Know about Software Engineering	Philip A. Laplante	CRC Press	2007
2	Mastering Software Quality Assurance: Best Practices, Tools and Technique for Software Developers	Murali Chemuturi	J Ross Publishing	2010
Reference Books				
1	Pro Git,	Ben Straub, Scott Chacon,	Apress	2nd Edition
2	Design Patterns: Elements of Reusable Object-Oriented Software,	Erich Gamma et. al.,	Addison-Wesley	2009
3	Agile Software Development: The Cooperative Game	Alistair Cockburn and Robert Cecil Martin,	Addition Wesley	2nd edition
4	A Practitioner's Guide to Software Test Design	Lee Copeland	Artech House Publishers	2004
5	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation,	Jez Humble and David Farley	Pearson Education	2010

Web links and Video Lectures:

1. Git Handbook https://guides.github.com/introduction/git-handbook/
2. Git User Manual https://mirrors.edge.kernel.org/pub/software/scm/git/docs/user-manual.html Retrieved 8 July 2020 [Module 2]
3. Introduction to Software Engineering/Quality https://en.wikibooks.org/wiki/Introduction_to_Software_Engineering/Quality
4. Understanding software design patterns https://opensource.com/article/19/7/understandingsoftware-design-patterns
5. The Scrum Guide https://www.scrumguides.org/docs/scrumguide/v2017/2017-Scrum-GuideUS.pdf
6. unittest — Unit testing framework https://docs.python.org/3/library/unittest.html
7. What is CI/CD? https://www.redhat.com/en/topics/devops/what-is-ci-cd

Activity-Based Learning (Suggested Activities in Class/ Practical)

1. Prepare Software Specification Document for a moderately complex process flow system
2. Clone an open source project using Git and perform all based operations
3. Seminar
4. Assignments
5. Others

Course Title: **PROGRAMMING LAB**		
Course Code:	**24MCPRLP105**	CIE Marks:50
Teaching Hours/week(L:T:P)	0:1:3	SEE Marks:50
Total Contact Hours:	46	Total Marks: 100
Course Credits:	4	Exam Duration: 3 hours

Course Outcomes (COs) with Revised Cognitive levels:
U-Understanding, R-Remembering, AP-Applying, A-Analyzing, E-Evaluating, C-Creating

COs	Description	RCL
CO1	Discuss the basics of Python Programming Language	A
CO2	Implement decision making, Looping construct and functions of Python	AP
CO3	Construct and make use of package	C
CO4	Implement Object Oriented Programming and exception handling	AP
CO5	Construct files and form regular expressions.	C

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	3	2	2	-	1	3
CO 2	3	3	3	3	2	-	1	3
CO 3	3	3	3	3	3	-	1	3
CO 4	3	3	3	3	3	-	1	3
CO 5	3	3	3	3	3	-	1	3

Syllabus:

Serial no:	Exercise/Experiment
1	Input, Output and Import Functions, Operators, Data Types
2	Decision Making & Loops, Functions
3	Modules and Packages, File Handling, Object Handling
4	Exception Handling
5	Regular Expressions

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Let us Python	Aditya kanetkar Yashavant kanetkar	BPB Publication	6th edition,2023
2	Python programming	Ryan Turner	Nelly B.L. International Consulting Ltd.	4th edition,2020
Reference Book				

1	How to think like a Computer Scientist: Learning with Python",	Downey, A. et al.	Wiley	2nd edition,2015
2	"Core Python Applications Programming	Wesley J. Chun	, Pearson Education	3rd edition,2016

Web links and Video Lectures:

1. https://archive.org/details/MIT6.00SCS11
2. https://www.coursera.org/course/pythonlearn
3. http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv163-Page1.htm
4. https://www.coursera.org/learn/python-databases

Activity-Based Learning (Suggested Activities in Class/ Practical)

1. Quiz
2. Open ended Experiments
3. Group Assignment/Project

Course Title: WEB PROGRAMMING LAB		
Course Code:	**24MCWPLP106**	CIE Marks: 50
Teaching Hours/week(L:T:P)	0:1:3	SEE Marks:50
Total Contact Hours:	46	Total Marks: 100
Course Credits:	2	Exam Duration: 3 hours

Course Outcomes (COs) with Revised Cognitive levels:
U-Understanding, R-Remembering, AP-Applying, A-Analyzing, E-Evaluating, C-Creating

COs	DESCRIPTION	RCL
CO1	Explore markup languages features and create interactive web pages using them	AP
CO2	Learn and design client-side validation using scripting languages.	AP
CO3	Design front end web page and connect to the back-end databases.	AP
CO4	Do Client-side & Server-side scripting	AP
CO5	Develop Web Applications	AP

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO1	3	2	3	2	2	-	1	3
CO2	3	3	3	3	2	-	1	3
CO3	3	3	3	3	3	-	1	3
CO4	3	3	3	3	3	-	1	3
CO5	3	3	3	3	3	-	1	3

DESCRIPTION	HOURS
Client/Server concepts, Components of Web Application, Types of Web Content, Overview of HTTP - HTTP request – response, Generation of dynamic web pages, Application Servers, Web Security.	1
HTML - Formatting and Fonts, Commenting Code, Anchors,Backgrounds, Images, Hyperlinks.	4
The need for CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds.	4
CSS - Manipulating text, Margins and Padding, Positioning using CSS.	4
JavaScript: Core features, Data types and Variables, Operators - Expressions and Statements.	4
JavaScript: Functions, Objects, Array, String - Date and Math related Objects, Document Object Model, Event Handling.	3
JavaScript: Form handling and validations.	4
An overview of Relational Database Design: Tables, Attributes, Tuples, Primary keys, Foreign keys, Indexes, DDL Commands – CREATE, ALTER, DROP and TRUNCATE.	4
DML Commands – SELECT, INSERT, UPDATE and DELETE	4
PHP: Setting up the environment (Example - XAMP server), PHP Programming basics - Print/echo, Variables and constants.	4
Strings and Arrays, Operators, Control structures and looping structures.	4
Functions, Reading Data in Web Pages, Embedding PHP within HTML, Establishing connectivity with database.	4
PHP framework: naming convention, MVC model, Connectivity with Database, Database Interaction.	6

Syllabus:

Introduction To Web: Client/Server concepts, Components of Web Application, Types of Web Content, Overview of HTTP - HTTP request – response, Generation of dynamic web pages, Application Servers, Web Security.

Markup Language (HTML): Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, HTML Forms.

Cascading Style Sheet (CSS): The need for CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, Manipulating text, Margins and Padding, Positioning using CSS.

Client Side Scripting using JavaScript: Core features, Data types and Variables, Operators -Expressions and Statements, Functions, Objects, Array, String - Date and Math related Objects, Document Object Model, Event Handling, Form handling and validations.

An overview of Relational Database Design: Tables, Attributes, Tuples, Primary keys, Foreign keys, Indexes, DDL Commands – CREATE, ALTER, DROP and TRUNCATE; DML Commands – SELECT, INSERT, UPDATE and DELETE.

Server Side Scripting using PHP: Setting up the environment (Example - XAMP server), PHP Programming basics - Print/echo, Variables and constants, Strings and Arrays, Operators, Control structures and looping structures, Functions, Reading Data in Web Pages, Embedding PHP within HTML, Establishing connectivity with database, Debugging with phpdbg.

Web Application development in any PHP framework (Laravel, CodeIgniter, Symfony, CakePHP etc.): Naming convention, MVC model, Connectivity with Database, Database interaction.

Debugging web apps: Browser debugging tools (Any browser web developer tools) - View and change the DOM and CSS, Console, Debug JavaScript, View and debug network activity, Performance tools etc.

Course Title: DATA STRUCTURES LAB		
Course Code:	**24MCDSLP107**	CIE Marks:50
Teaching Hours/week(L:T:P)	0:1:3	SEE Marks:50
Total Contact Hours:	46	Total Marks: 100
Course Credits:	2	Exam Duration: 3 hours

Course Outcomes (COs) with Revised Cognitive levels:
U-Understanding, R-Remembering, AP-Applying, A-Analyzing, E-Evaluating, C-Creating

COs	**DESCRIPTION**	**RCL**
CO1	Discuss basic Data Structures and its operations implementations.	AP
CO2	Identify the Set and Disjoint Set Data Structures.	AP
CO3	Discover how advanced tree structures are implemented in practice.	AP
CO4	Describe a strong understanding of modern heap structures to effectively solve advanced computational problems	
CO5	Use advanced graph algorithms to tackle intricate computational problems.	AP

Mapping of course outcomes with program outcomes

	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	3	2	3	3	2	2	1	2
CO 2	3	2	3	3	2	2	1	2
CO 3	3	2	3	3	2	2	1	3
CO 4	3	3	3	2	2	2	2	3
CO 5	3	3	3	2	2	2	2	3

UNIT	**DESCRIPTION**	**HOURS**
I	Advanced use of gcc : Important Options -o, -c, -D, -l, -I, -g, -O, -save-temps, -pg	1
II	Familiarization with gdb : Important Commands - break, run, next, print,display, help	1
III	Using gprof : Compile, Execute and Profile	1
IV	Review of Basic Data Structures (Array, List, Stack, Queue, Trees) Merge two sorted arrays and store in a third array Circular Queue - Add, Delete, Search Singly Linked Stack - Push, Pop, Linear Search Doubly linked list - Insertion, Deletion, Search Binary Search Trees- Insertion, Deletion, Search	8
V	Set Data Structure and set operations (Union, Intersection and Difference)using Bit String.	3
	Disjoint Sets and the associated operations (create, union, find)	3
	Binomial Heaps and operations (Create, Insert, Delete, Extract-min,Decrease key)	3
	B Trees and its operations	4
	Red Black Trees and its operations	4
	Graph Traversal techniques (DFS and BFS) and Topological Sorting	4

	Finding the Strongly connected Components in a directed graph	4
	Prim's Algorithm for finding the minimum cost spanning tree	3
	Kruskal's algorithm using the Disjoint set data structure	3
	Single Source shortest path algorithm using any heap structure thatsupports mergeable heap operations	3

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Introduction to Algorithms	Thomas H.Cormen	PHI	Introduction to Algorithms
Reference book				
1	Algorithm design	Kleinberg, Jon, and Eva Tardos.	Pearson Education India,	2006
2	Data Structures and Algorithms.	Aho A.V., Hopcroft J.E., and Ullman J.D	Pearson Education, New Delhi	1983

Web links and Video Lectures:

1. https://gcc.gnu.org/onlinedocs/gcc/Option-Summary.html
2. https://www.gnu.org/software/gdb/documentation/
3. https://ftp.gnu.org/old-gnu/Manuals/gprof-2.9.1/html_mono/gprof.html

Activity-Based Learning (Suggested Activities in Class/ Practical)

1. Quiz
2. Open ended Experiments
3. Group Assignment/Project
4. Seminars