SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

Master of Computer Science & Applications – MCA Programme

Scheme of Instructions – 2024

FIRST SEMESTER

Sl. No	Course Code	Course Title	HC/SC	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	M23DE0101	Mathematics for Computer Applications	HC	3	0	0	3	3
2	M23DE0102	Data Structures	HC	3	1	0	4	4
3	M23DE0103	Relational Database Management Systems	HC	3	1	0	4	4
4	M23DE0104	Software Engineering	HC	3	1	0	4	4
5	M23DE0105	Operating Systems and Linux Programming	HC	3	0	1	4	5
6	M23DE0106	Python Programming	HC	3	0	1	4	5
Practical Courses								
7	M23DE0107	Data Structures Lab using C	HC	0	0	2	2	4
8	M23DE0108	RDBMS Lab	HC	0	0	2	2	4
*Mandatory – (Non-Creditable Courses)								
9	M23DEM101	Entrepreneurship and Technology Innovations						
10	M23DEM102	Technical Certification						
Total Credits				18	3	6	27	33

Note: Bridge Course: Basic Mathematics, Fundamentals of Computer Organization and Architrcture and Programming Fundamentals in C.

DETAILED SYLLABUS

FIRST SEMESTER:

COURSE DESCRIPTION		
Course Code	M23DE0101	**Course Credit:** 3
Course Name	Mathematical Foundations for Computer Applications	
L–T–P	3 – 0 – 0	
Pre-requisite	Number System, Linear algebra, and Basic knowledge of calculus.	
Year of Introduction	2023	

COURSE OBJECTIVES	
1	Equip students to solve given problems using set theory concepts. Also examine and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
2	Introduce Random variables and Probability distributions
3	Learn the statistical procedures most often used by practicing all fields.
4	Understand apply for business applications.

COURSE OUTCOMES (COs)	
At the end of the course students will be able to:	
CO1	Demonstrate a working knowledge of set notation and elementary set theory, recognize the connection between set operations, critical thinking to arrive at conclusions from Venn Diagrams, syllogistic forms and prove elementary results involving sets and work with functions. Gain and historical perspective of the development of modern discrete mathematics.
CO2	Identify and recognize Random variables, Random vectors and distributions.
CO3	Express the statistical procedures most often used by practicing programmers.
CO4	Illustrate Forecasting methods and apply for business applications. Implement and demonstrate a variety of problem-solving techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	M	M	M	M	M	M	L	H	L
CO2	H	M	M	H	M	M	H	M	H	M	H	M
CO3	M	H	M	M	M	M	M	H	M	M	H	L
CO4	H	M	M	M	M	M	H	M	M	M	H	M

SYLLABUS (Brief)
This course provides an introduction to the basic concepts and techniques of statistics and probability theory, random variables and develops problem solving skills with both theoretical and practical problems. Probability theory is the branch of mathematics that deals with modelling uncertainty. It is important because of its direct application in all areas. It also forms the fundamental basis for many other areas in the mathematical sciences including modern optimization methods and risk modelling.

COURSE CONTENT

Unit –I		COs	Hrs.	SEE Marks
Unit Title	Set Theory, Relation and Functions			
Introduction, Basic concepts of sets, and its types, Operations on sets, Venn diagrams, Some basic set identities, Cardinal number and its problems. Cartesian products , Relations, Properties of relations, Equivalence relation, Relation matrix and the Graph of binary relation, Partition set, POSET. Hasse Diagram. Functions and its types, Composition of a functions and Inverse functions, Recursive function.		1	10	25%
Unit –II		COs	Hrs.	SEE Marks
Unit Title	Predictive Analytics:			
Predictive modelling and Analysis – Regression Analysis, Correlation analysis, Rank correlation coefficient, multiple correlation, least square, Curve fitting and goodness of fit.		2	10	25%
Unit –III		COs	Hrs.	SEE Marks
Unit Title	Random Variable and Probability Distribution:			
Introduction probability and its property, Random variable, its types DRV, CRV and its distributions, two dimensional R V, joint probability function, marginal density function. Some special probability distribution- Binomial, Poison, Uniform, Exponential		3	10	25%

Unit -IV		COs	Hrs.	SEE Marks
and Normal Distribution.				
Unit Title	Hypothesis Testing :			
Introduction Sampling, Sampling distribution, one and two tailed test, Test of significance, (mean, difference of means), confidence interval 1% and 5% level of significance - Design of Experiments, one way classification, two way classification, ANOVA.		4	10	25%

TEXT BOOKS	
1	Grimaldi, Ralph P, "Discrete and Combinational Mathematics", Pearson Education, Singapore, 2003.
2	Gupta. S.C and Kapoor V.K. Fundamentals of Mathematical Statistics 13 edition , Sultan Chand and sons, 2021
3	Larsen, Richard J., and Morris L. Marx. An introduction to mathematical statistics and its applications. Vol. 5. Pearson, 2017.
REFERENCE BOOKS / MOOCs	
1	Trembly. J.P &Manohar. P., "Discrete Mathematical Structures with Applications to Computer Science" McGraw Hill.
2	P K Srimani and M Vinayaka Murthy, "Probability and Statistics", Subhas Stores, 2020
3	S.P. Gupta, "Statistical methods"- Sultan Chand & Sons, New Delhi, 2021 Edition
4	Dr M Vinayaka Murthy, "Discrete Mathematical Structures", Subhas Stores, ISBN: 978-93-92369-24-7, First Edition 2022
5	Tremblay and Manohar R, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, New Delhi, 2021.
6	S M Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic Foundation, 2021

COURSE DESCRIPTION		
Course Code	M23DE0102	Course Credit: 4
Course Name	Data Structures	

L-T-P	**3-1-0**
Pre-requisite	Basic Logic developing ability
Year of Introduction	**2023**

COURSE OBJECTIVES

1	Provide a detailed understanding of Data Structures
2	Introduce the concepts of Linear and Non-Linear Data Structures
3	Develop applications using Linear and Non- Linear Data Structures

COURSE OUTCOMES (COs)

At the end of the course, students will be able to:

CO1	Understand the concepts of arrays, pointers, and Linear data structure Stack.
CO2	Master the concepts like searching, insertion, deletion etc. the linear data structures, Queues and Linked Lists.
CO3	Illustrate the concepts of Searching and Sorting. Introduce Non-linear tree data structures explore Graph data structure.
CO4	Introduce Tree and Heap data Structures. Illustrate the traversal mechanisms in various Tree structures.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	L	-	-	-	-	-	-	-
CO2	M	M	H	M	L	-	L	-	-	-	-	-
CO3	H	H	M	L	M	-	L	-	-	-	-	-
CO4	H	M	M	M	M	-	L	-	-	-	L	-

SYLLABUS

Basics of Data Structures – Linear Data Structures: Stack- Queue- Linked List- Searching -Sorting- Non-Linear Data Structures: Tree-Graph-Heap.

COURSE CONTENT

Unit -I		COs	Hrs.	SEE

Unit Title	Basics of Data Structures			Marks
Arrays -Insertion and deletion operations-Functions-Pointers-Declaring and Initializing Pointers-Pointer Arithmetic- Function and Pointer Parameters-Pointer and Arrays-Dynamic Memory Allocation Structures- Defining and using a Structure-Passing Structures to Functions-Structure and Pointers	1	6		25%
Basics of Data Structures- Classifications (Primitive & Non-Primitive)- Data Structure Operations- Linear Data Structures-Stack: Definition- Array representation- Operations- Recursion, Towers of Hanoi- Applications of stack (Infix to postfix conversion, evaluation of expression).	1	7		
Unit -II		COs	Hrs.	SEE Marks
Unit Title	Queue and Linked List			
Queue: Definition- Array representation Operations- Applications. Types of queues- Simple queue- Circular queue- Double-ended queue-Priority queue.	2	6		25%
Linked List: Definition- Singly linked list: Representation in memory- Traversing - Insertion- Deletion and Searching. Doubly linked list- Header linked list- Circular linked list.	2	7		
Unit -III		COs	Hrs.	SEE Marks
Unit Title	Searching, Sorting and Introduction to Non-Linear Data Structures-Graphs			
Searching: Linear Search- Binary Search- Comparison of Linear and Binary Search.	3	4		
Sorting: Insertion Sort- Selection Sort- Bubble sort - Quick Sort-Merge Sort.	3	6		25%
Non-linear structures: Introduction- Graphs: Introduction- Graph representations- Graph traversals: DFS-BFS- Graph applications.	3	3		
Unit -IV		COs	Hrs.	SEE Marks
Unit Title	Trees and Heaps			
Trees: Trees and its representation-Binary Tree- Types of Binary Trees. Binary tree traversals- Binary Search Tree- B Tree- AVL tree -	4	10		25%

Threaded Binary tree- Red-Black trees - Properties of Red Black trees- Applications of trees.			
Heaps: Introduction about heap structure - max and min heap- Applications of Heap data structure.	4	3	

TEXT BOOKS	
1	G S Baluja, "Data Structures – Through C", Dhanpat Rai & CO, 2016, ISBN: 9786500092332
2	Ashok N Kamthane, "Introduction to Data Structures in C", Pearson Education (S) Pvt Ltd., New Delhi: 2005.
3	Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenanbanum, "Data Structures Using C and C++", 2nd Edition, Pearson Education Asia, 2002.
REFERENCE BOOKS / MOOCs	
1	Byron S. Gottfried, "Theory and Problems of Programming With C", Second Edition, Tata McGraw Hill, 1996.
2	Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan (2008), Fundamentals of Data structure in C, 2nd Edition, University Press, India.
3	Aho A.V., Hopcroft J.E., and Ullman J.D., Data Structures and Algorithms, Pearson Education, New Delhi, 1983, ISBN 13: 9780201000238

COURSE DESCRIPTION		
Course Code	M23DE0103	Course Credit: 4
Course Name	Relational Database Management Systems	
L–T–P	3-1-0	
Pre-requisite	Basic knowledge of working with computers and Database Systems.	
Year of Introduction	2023	

COURSE OBJECTIVES	
1	To introduce the basic concepts in Relational Databases and its design approaches.
2	To provide practical experience in using Oracle/MySQL software

3	To train the students to develop database by creating tables and alter tables using updation, deletion and also performing arithmetic operations.
4	To provide the basic understanding to group data using built-in functions and join multiple tables.
5	To expose the students in the creation and manipulation of tables using PL/SQL.

COURSE OUTCOMES (COs)

At the end of the course students will be able to:

CO1	Relate all basic terminologies in Relational Databases, formulate relational algebra expressions, be skilled in understanding of normalization theory and apply such knowledge to the normalization of a database.
CO2	Identify and recognize Oracle/MySQL software to develop and formulate solutions to a broad range of query, and data update, delete & alter tables.
CO3	Have a basic understanding to group data using built-in functions, arithmetic operations and join multiple tables.
CO4	Demonstrate a new programming language PL/SQL to create and manipulate tables, records in databases.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	H	L	L	L	L	H	H	H	H	H
CO2	L	M	M	L	L	L	L	H	H	H	H	H
CO3	L	M	M	L	L	L	L	L	H	H	H	H
CO4	L	M	M	L	L	L	L	L	H	H	H	H

SYLLABUS (Brief)

Database Concepts, Database Design, RDBMS Tools, Oracle Tables, Working with Oracle Tables

Functions and Grouping,

PL/SQL: PL/SQL Control Structures and Embedded SQL, PL/SQL Cursors and Exceptions:

COURSE CONTENT

Unit –I			COs	Hrs.	SEE Marks
Unit Title	**Introduction to Database System**				
Database and Users: Introduction (Basic Concepts: Data, Database,Database systems, Database Management Systems), Characteristics of Database Approach, Advantages of using the DBMS approach Database System Concepts and Architecture: Data Models, Schemas, Instances, the three schema architectures and data independence, Database Languages and interfaces, Database Systemenvironment, Centralized and client / Server Architecture for DBMS, Classifications of Database Management Systems, Integrity Rules and Theoretical Relational Languages, Relational Model concepts: Relational Model concepts, Relational Model constraints and Relational Database Schemas			1	13	25%
Unit –II			COs	Hrs.	SEE Marks
Unit Title	**Entity Relationship Diagram and Database Design**				
Using high level conceptual data models for database design (Design Phases of database design), Entity types, Entity Sets, Attributes and keys, Relationship Types, Relationship sets, Roles and structural constraints, Weak entity Types, Refining the ER diagram for company Database, Entity Relationship Diagram Naming conventions Design issues. Informal Design Guidelines for Relational Schema, Functional Dependencies, Normal Forms based on Primary keys, General definitions of 1NF, 2NF and 3NF, Boyce-Codd Normal Forms (BCNF), Multi-valued Dependency and Fourth Normal Form			2	13	25%
Unit –III			COs	Hrs.	SEE Marks
Unit Title	**SQL Concepts**				
Basics of SQL: DDL,DML,DCL Oracle Tables: DDL: Naming Rules and conventions , Data Types, Constraints, Creating Oracle Table, Displaying Table Information, Altering an Existing Table, Dropping, Renaming, Truncating Table, Table Types, Spooling, Error codes. Working with Oracle Tables : Working with Table: Data Management and Retrieval: DML, adding a new Row/Record, Customized Prompts, Updating and Deleting an Existing Rows/Records, retrieving Data from Table, Arithmetic			3	13	25%

Operations, restricting Data with WHERE clause, Sorting, Revisiting Substitution Variables, DEFINE command, CASE structure.			
Unit -IV	COs	Hrs.	SEE Marks
Unit Title	**SQL Concepts and PL/SQL**			
Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. Transaction control commands – Commit, Rollback, Savepoint. PL/SQL: A Programming Language: History, Fundamentals, Block Structure, Comments, Data Types, Other Data Types, Declaration, Assignment operation, Bind variables, Substitution Variables, Printing, Arithmetic Operators. PL/SQL Control Structures and Embedded SQL : Control Structures, Nested Blocks, SQL in PL/SQL, Data Manipulation, Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors, Implicit & Explicit Cursors and Attributes, Cursor FOR loops, Cursor with Parameters, Cursor Variables, Exceptions, Types of Exceptions. Named Blocks: Procedures, Functions Packages, Triggers, Data Dictionary Views.	4	13	25%

TEXT BOOKS	
1	Ramez Elmsari,Shamkant B Navathe, "Fundamentals of Database Systems", PearsonEducation, 7th Edition
2	Ivan Bayross, SQL, PL/SQL the Programming Language of Oracle, 4th Edition, BPB Publications
3	Nilesh Shah, Database Systems Using Oracle, 2nd edition, PHI.
REFERENCE BOOKS / MOOCs	
1	Silberschatz, Korth, Sudarshan, "Database System Concepts", McGraw Hill Publication. 5th Edition
2	S K Singh, "Database Systems : Concepts, Design and Applications", Pearson Education
3	Peter Rob, Carlos Coronel, "Database Systems : Design, Implementation and Management", Cengage Learning
4	C J Date, A Kannan, S Swaminathan, "An Introduction to Database Systems", Pearson Education, 8th Edition

5	Steve Suehring, Tim Converse, Joyce Park, PHP 6 and MySQL Bible, Wiley
6	Andrea Tarr, PHP and MySQL 24-Hour Trainer, Wiley

COURSE DESCRIPTION

Course Code	M23DE0104	**Course Credit: 4**
Course Name	**Software Engineering**	
L–T–P	3-1-0	
Pre-requisite	Basic programming skills and understanding of software process, Innovative thinking, and Enthusiasm to learn the management concepts.	
Year of Introduction	**2023**	

COURSE OBJECTIVES

1	To provide the knowledge of basic software engineering methods and practices.
2	To provide an understanding of Software requirements and requirements documents.
3	To familiarize the students to identify the functionalities and system architecture in a step-by-step manner and represent the conceptual framework using the suitable diagrams.
4	To introduce the approaches of software testing, evolution process and quality control to provide a good quality software.

COURSE OUTCOMES (COs)

At the end of the course students will be able to:

CO1	Ability to apply software engineering principles and techniques to develop good software systems.
CO2	Identify and define the different requirements for the given problem and present in the IEEE Format.
CO3	To design, develop and implement a solution with proper analysis.
CO4	Design a software system to meet the desired needs within realistic constraints.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	M	L	M	M	M	M	L	L	L
CO2	M	M	M	M	H	M	M	L	L	L	L	L
CO3	M	M	H	M	M	M	M	M	M	M	M	M
CO4	M	H	H	M	M	L	L	H	H	H	H	H

SYLLABUS

Introduction to Software Engineering and Software Process Models, Software Requirement Engineering, **Software Modelling and Implementation,** Software Quality Management and Advanced Topics

COURSE CONTENT

Unit -I		COs	Hrs.	SEE Marks
Introduction to Software Engineering and Software Process Models		COs	Hrs.	SEE Marks
	Professional Software Development, Software Development Myths, Attributes of good software, Software Engineering Diversity, IEEE/ACM code of Software Engineering Ethics, Case Studies. Software Process, and **Software Process Models**, Process, Activities, coping with the changes.	1	13	25%
Unit -II		COs	Hrs.	SEE Marks
Software Requirement Engineering		COs	Hrs.	SEE Marks
Functional and Non-Functional Requirements (IEEE standard), The Software Requirements Document, Requirements Specification, Requirements Engineering Processes, Requirement Elicitation and Analysis, Requirements Validation, Requirements Management, Software Cost Estimation, Requirements Modelling, Design concepts, Function Oriented Design, Detailed Design, Architectural design.		2	13	25%
Unit -III		COs	Hrs.	SEE Marks
Software Modelling and Implementation		COs	Hrs.	SEE Marks
	Process Planning, Effort Estimation, Project Scheduling and Staffing, Software Configuration Management Plan, Quality Plan, Risk Management, Project Monitoring Plan, Verification, Metrics, Agile Methods, and Agile Development, Extreme Programming, Agile Project Management, Scaling Agile Methods.	3	13	25%

Unit –IV Software Quality Management and Advanced Topics	COs	Hrs.	SEE Marks
Software Quality Management Process-Testing Strategies (Test Cases and Test Plans), Quality Concepts, Software Quality Assurance, Security Engineering, Software Configuration Management Process, Software Process Improvement, The SPI Process, Trends and Return of Investment, Technology Directions.	4	13	25%

TEXTBOOKS	
1	*Software Engineering A Practitioner's Approach*, 8th edition, Roger S Pressman, Bruce R. Maxim. McGraw Hill Education, 2015.
2	*Software Engineering*, Ian Somerville, 9th edition, Pearson education.
REFERENCE BOOKS / MOOCs	
1	Stephen Schach, *Software Engineering* 7th ed, McGraw-Hill, 2007
2	Pankaj Jalote, *Software Engineering*, Wiley India Pvt Ltd (2010) Paul C Jorgensen Software Testing A Craftsman's Approach, 2nd edition, CRC Press.

COURSE DESCRIPTION		
Course Code	M23DE0105	Course Credit: 04
Course Name	Operating System Using Linux	
L-T-P	3-0-1	
Pre-requisite	Digital Logic, Computer organization and computer architecture.	
Year of Introduction	2023	

COURSE OBJECTIVES	
1	Define the fundamentals of Operating Systems.
2	Illustrate distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
3	Expose the design of the LINUX operating system.
4	Demonstrate the different types of filters used in LINUX.

	COURSE OUTCOMES (COs)
	At the end of the course students will be able to:
CO1	Identify the basic principles adopted in the design of modern operating systems.
CO2	Explain the objectives and functions of modern operating systems.
CO3	Describe how computing resources are used by application software and managed by system software.
CO4	Analyze, Design and Interpret the concepts of shell programming.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	L	H	L	H	H	H	M	M	L
CO2	H	H	H	L	H	L	H	H	H	M	H	M
CO3	H	M	L	L	H	L	H	H	H	M	H	M
CO4	H	H	H	L	H	L	H	H	H	M	H	M

SYLLABUS (Brief)
Introduction – Process Management – Dead locks – Introduction with shell and Desktop to Linux– Basic Linux Administration

COURSE CONTENT

Unit –I		COs	Hrs.	SEE Marks
Unit Title				
Introduction: Batch Systems, Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems, Operating System Structures, Components & Services, System calls,. Process Management: Process Concept, Process Scheduling, Threads, Inter process communication, CPU Scheduling Criteria, Scheduling algorithm, Multiple Processor Scheduling,. The Critical Section Problem, Synchronization hardware, Semaphores, Classical problems of synchronization		1	13 Hours	25%

Unit -II		COs	Hrs.	SEE Marks
Unit Title				
Dead locks: system model, Characterization, Dead lock prevention, avoidance and detection, Recovery from dead lock.		2	13 Hours	25%
Memory Management: Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging, Virtual memory -Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing.				

Unit -III		COs	Hrs.	SEE Marks
Unit Title				
Introduction and interacting with shell and Desktop to Linux: History, salient features, Linux system architecture, Linux command format, Linux internal and external commands, Directory commands, File related commands, Disk related commands.		3	13 Hours	25%
The Linux Shell Basic command cls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, Introduction to Shell Scripting, read, Command Line Arguments, Exit Status of a Command.				
shell types, shell script features, executing a shell script, system and user-defined variables, expr command, command substitution, escape sequence characters, shell script arguments, positional parameters, test command, file test, string test, numeric test				

Unit -IV		COs	Hrs.	SEE Marks
Unit Title				
Conditional Control Structures-if statement, case statement, Looping Control Structure-while, until, for, statements.		4	13 Hours	25%
Filters, Stream editor SED and AWK, Linux System Communication: Introduction, write, read, wall commands, sending and handling mails. System Administration: Roles of a System Administrator.				

TEXT BOOKS	
1	Abraham Silberschatz and Peter Baer Galvin, "OPERATING SYSTEM CONCEPTS", 8th Edition, Pearson Education. [chapter : 1,2,3,4,5,6,7,8,]

2	M.G.Venkateshmurthy, "INTRODUCTION TO UNIX & SHELL PROGRAMMING", First Edition, Pearson Education, 2004. [chapter 8,9,12]
3	Richard Petersen, "THE COMPLETE REFERENCE LINUX " sixth Edition Petersen Tata McGraw Hill [chapter 1]

REFERENCE BOOKS / MOOCs	
1	H.M.Deitel, "OPERATING SYSTEMS", Pearson Learning Solutions, 3rd Edition, 2003.
2	William Stallings, "OPERATING SYSTEMS", 6th Edition, Pearson Education, 2010.
3	Sumithaba Das, "UNIX: CONCEPTS AND APPLICATIONS"
4	ArchanaVerma, "UNIX AND SHELL PROGRAMMING", Firewall Media.
5	Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", O'Reilly Media, 6th Ed., 2009.

List of Laboratory Programs

Sl. No.	Part A (Minimum 80% of programs are mandatory)	Hrs	Cos
1	To count the number of characters in a given string		1
2	To find the factorial of a given number		1
3	To count the number of vowels and consonants in a given string.		1
4	To print all prime numbers between m and n (m<n).		1
5	To check whether a given string is a palindrome or not.		1
6	To generate the Fibonacci series.		2
7	To find the sum of series of n numbers.		2
8	To find the maximum and minimum from the list of given n numbers		1
9	Write a Shell script to perform basic arithmetic operations.		2

Sl. No	Part B	Hrs	Cos
10	Write a shell script to find the reverse of a given number.		2
Sl. No	**Part B** (Minimum 80% of programs are mandatory)	**Hrs**	**Cos**
1	Write a non-recursive shell script which accepts any number of arguments and prints them in the reverse order		1
2	Write a shell script that accepts two files names are arguments ,checks if the permissions for these files are identical and if the permissions are identical ,output common permissions and otherwise output each file name followed by its permissions		1
3	Create a script called file-properties that reads a file name entered and outputs it properties		2
4	Write a shell script that accept one or more filenames as arguments and convert all of them to uppercase , provided they exist in current directory		1
5	Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message		3
6	Write a shell script to display the calendar for current month with current date replaced by * or ** depending on whether the date has one digit or two digits.		3
7	Write a shell script to find smallest of three numbers that are read from Keyboard		3
8	Write a shell script to compute the sum of number passed to it as argument on command line and display the result.		3
9	Write a shell script that gets executed displays the message either "Good Morning" or "Good Afternoon" or "Good Evening " depending upon time at which the user logs in .		4
10	Write a shell script that accept a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other arguments files		4

COURSE DESCRIPTION		
Course Code	M23DE0106	Course Credit: 4
Course Name	Python Programming	

L–T–P	3 – 0 – 1
Pre-requisite	Basic knowledge in Computer Science, Programming, Algorithms, Flow charts and programming Logic
Year of Introduction	2023

COURSE OBJECTIVES

1	To learn Syntax and Semantics of Python language and understand and apply the various data structures in solving computational problems
2	To understand usage of NumPy and Pandas libraries
3	To learn handling files, functions and exceptions
4	To understand OOPs concepts in python and be able to draw various kinds of data visualization techniques using PyLab, matplotlib and Pandas

COURSE OUTCOMES (COs)

At the end of the course students will be able to:

CO1	Create, execute and manipulate Python Programs using core data structures like Lists, Dictionaries etc.
CO2	Use NumPy and Pandas for handling data
CO3	Develop applications to use functions, handle files, exception handling
CO4	Interpret the concepts of Object-Oriented Programming as used in Python and create visualizations using python matplotlib

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	M		M	M			M	L
CO2	H	H	H	H	M		M	M			M	L
CO3	H	H	H	H	M		M	M			M	L
CO4	H	H	H	H	M		M	M	M		M	L

SYLLABUS (Brief)

Python is a programming language that lets you work more quickly and integrate your

systems more effectively. The Python programming syllabus comprises of various data structures such as List, Dictionary, Sets etc., Using NumPy and Pandas for handling data, Creating functions, handling files and object oriented programming concepts and visualization using matplotlib.

COURSE CONTENT

Unit -I			COs	Hrs.	SEE Marks
Unit Title	**INTRODUCTION TO PYTHON**				
Introduction to Python, Python History, Introduction to Object-oriented Programming, features of OOPs, Features of Python, "Hello world" program in Python, Keywords, Identifiers, Reading input			1	3	25%
Data Types: Numeric data types - int, float, complex, Strings: Understanding string in build methods and Operations[slicing], Lists and its operations, Tuples and its operations, Dictionaries and Sets operations.			1	5	
Operators in Python - Conditional blocks using if, else and elif, Simple for loops in python, For loop using ranges, Use of while and do while-loop in python, Loop manipulation using pass, continue, break and else.			1	5	

Unit -II		COs	Hrs.	SEE Marks
Unit Title	USING NUMPY & PANDAS			
Basics of NumPy-Computation on NumPy-Aggregations-Computation on Arrays- Comparisons, Masks and Boolean Arrays-Fancy Indexing-Sorting Arrays-Structured Data: NumPy's Structured Array.		2	7	25%
Introduction to Pandas Objects-Data indexing and Selection-Operating on Data in Pandas- Handling Missing Data-Hierarchical Indexing - Combining Data Sets.		2	6	

Unit -III		COs	Hrs.	SEE Marks
Unit Title	**FUNCTIONS, EXCEPTION, AND FILES**			
Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion and Lambda functions. Function Decorators, Generators		3	6	

Content	COs	Hrs.	SEE Marks
Structured Programming, Exceptions, Exception Handling, Types of Exceptions, The Except Block, the assert Statement, UserDefined Exceptions, Logging the Exceptions	3	3	25%
Files: Files, Types of Files in Python, Opening a File, Closing a File, Working with Text Files Containing Strings, Knowing Whether a File Exists or Not, Working with Binary Files, The with Statement, Pickle in Python, The seek() and tell() Methods	3	4	

Unit -IV		COs	Hrs.	SEE Marks
Unit Title	OOPS and VISUALIZATION			
Object-oriented Programming in Python: Classes, Objects, Instances, Abstract Data Types and classes, Inheritance, Encapsulation and Information hiding, Polymorphism		4	4	25%
Basic functions of matplotlib-Simple Line Plot, Scatter Plot-Density and Contour Plots- Histograms, Binning and Density-Customizing Plot Legends, Colour Bars-Three- Dimensional Plotting in Matplotlib		4	5	
Multithreaded Programming: Introduction, Threads and Processes, Python Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules		4	4	

TEXT BOOKS	
1	Wesley J. Chun, - Core Python Programming, Second Edition, Pearson.
2	Jake Vander Plas, Python Data Science Handbook – Essential Tools for Working with Data, O'Reily Media, Inc, 2016
3	Zhang.Y ,An Introduction to Python and Computer Programming, Springer Publications,2016
REFERENCE BOOKS / MOOCs	
1	Joel Grus, Data Science from Scratch First Principles with Python, O'Reilly Media,2016.
2	T.R. Padmanabhan, Programming with Python, Springer Publications,2016
3	"Python for Data Science",Cognitive Class, 2019. [Online]. Available: https://cognitiveclass.ai/courses/python-for-data-science/. [Accessed: 20- Jun-2019].
4	Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python, Pearson

5	Daniel Y Chen, Pandas for Everyone: Python Data Analysis, 1st Edition, Pearson
6	Doug Hellmann, The python 3 standard Library by example, Pearson Education

COURSE DESCRIPTION

Course Code	M23DE0107	**Course Credit: 2**
Course Name	Data Structures Lab using C	
L–T–P	**0-0-2**	
Pre-requisite	Fundamentals of C Programming and Basic Logic building skills	
Year of Introduction	**2023**	

COURSE OBJECTIVES

1	To get practical exposure on basic data structures like arrays, stack, queue, linked list, and its variants.
2	To get acquainted with the implementation of various Searching and Sorting techniques.
3	To implement the concepts of nonlinear data structures such as trees and its variants, graphs etc.

COURSE OUTCOMES (COs)

At the end of the course, students will be able to:

CO1	Familiarize with the implementation of linear data structures such as Array and Stack
CO2	Familiarize with the implementation of linear data structures such as Queue and Linked List
CO3	Familiarize with the implementation of various Searching, Sorting techniques
CO4	Acquire the practical aspects of Tree and Graph structures.

CO-PO MAPPING Font Size 11

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	H	M	M		L	-	-	-	-	-	-	-
CO2	M	M	H	M	L	-	L	-	-	-	-	-
CO3	H	H	M	L	M	-	L	-	-	-	-	-
CO4	H	M	M	M	M	-	L	-	-	-	L	-
Correlation levels: L– Low; M-Medium; H-High; No Correlation– "–"												

List of Laboratory Programs

Sl. No.	Part A (Minimum 80% of programs are mandatory)	Hrs	COs
1	Develop a program to insert and delete an element at desired position in an array.	1	1
2	Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked	1	1
3	Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.	1	1
4	Develop a program to swap two variable value using call by value and call by reference.	1	1
5	Implement recursive functions for Binary to Decimal Conversion	1	1
6	Queue operations	2	2
7	Develop a program to sort a list of N elements using a quick sort	1	3
8	Develop C Program to Implement the search techniques of a. Linear Search b. Binary Search	2	3
Sl. No	Part B (Minimum 80% of programs are mandatory)	Hrs	COs
1	Develop a program to Simulate the working of STACK providing the following operations– Insert, Delete and Display.	2	1
2	Develop a program to convert infix arithmetic expression to	2	1

		post fix expression		
3		Develop a program to Simulate the working of Circular Queue providing the following operations–Insert, Delete and Display.	2	2
4		Develop a program to Simulate the working of a linked list providing the following operations a. Insert at the beginning b. Insert at the end c. Delete at the beginning d. Delete at the end e. Display	2	2
5		Develop a program to sort a list of N elements using Insertion Sort	1	3
6		Develop a program to create a binary search tree and implement the tree traversal techniques of inorder, preorder, and postorder.	2	4
7		B trees and its operations	2	4
8		Graph traversal techniques (DFS and BFS)	2	4

REFERENCE BOOKS / MOOCs	
1	G S Baluja, Data Structures – Through C, Dhanpat Rai & CO, ISBN: 9786500092332.
2	Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan (2008), Fundamentals of Data structure in C, 2nd Edition, University Press, India.

COURSE DESCRIPTION	
Course Code	M23DE0108	**Course Credit: Font Size 11**
Course Name	**RDBMS LAB**
L–T–P	**0–0–2**
Pre-requisite	Basic Knowledge Of Working With Computers And Databases
Year of Introduction	**2024**

COURSE OBJECTIVES	
1	To understand the fundamental concepts of Database Management Systems.
2	To understand the concepts necessary for designing, using and implementing databasesystems and applications.
3	To present SQL and procedural interfaces to SQL comprehensively
4	To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design.

COURSE OUTCOMES (COs)	
At the end of the course students will be able to:	
CO1	Understand, appreciate and effectively explain the underlying concepts of database technologies.
CO2	Design and implement a database schema for a given problem-domain.
CO3	Populate and query a database using SQL DML/DDL commands.
CO4	Programming PL/SQL including stored procedures, stored functions, cursors, packages.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	H	L	H	M	M	L	M	M
CO2	H	H	M	M	H	L	H	H	M	L	M	M
CO3	M	H	H	H	M	L	H	H	M	L	M	M
CO4	M	H	H	H	M	L	H	H	M	L	M	M
Correlation levels: L- Low; M-Medium; H-High; No Correlation- "-"												

List of Laboratory Programs

Sl. No.	Part A (Minimum 80% of programs are mandatory)	Hrs	Cos
1	DEPARTMENT (dept_no, dept_name, location)		

1. Create the Simple DEPARTMENT Table.
2. Display structure of department table.
3. Insert below records into Department Table

Dept_no	Dept_name	Location
10	Account	NY
20	HR	NY
30	Production	DL
40	Sales	NY
50	EDP	MU
60	TRG	
110	RND	AH

4. Display all records of Department table
5. Display all department belonging to location 'NY'
6. Display details of Department 10
7. List all department names starting with 'A'
8. List all departments whose number is between 1 and 100
9. Delete 'TRG' department
10. Change department name 'EDP' to 'IT

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EMPLOYEE (emp_id, emp_name, birth_date, gender, dept_no, address, designation, salary,experience, email)

DEPARTMENT (dept_no, dept_name, location)

Create the EMP Table with all necessary constraints such as

In EMP TABLE: Employee id should be primary key, Department no should be Foreign key, employee age (birth_date) should be greater than 18 years, salary shouldbe greater than zero, email should have (@ and dot) sign in address, designation of employee can be "manager", "clerk", "leader", "analyst", "designer", "coder","tester".

1. Create DEPT table with necessary constraint such as
2. Department no should be primary key, department name should be unique.
3. After creation of above tables, modify Employee table by adding the constraints as
4. 'Male' or 'Female' in gender field and display the structure.
5. Insert proper data (at least 5 appropriate records) in all the tables.
6. Describe the structure of table created
7. List all records of each table in ascending order.
8. Delete the department whose loction is Ahmedabad.

	9. Display female employee list 10. Display Departname wise employee Names 11. Find the names of the employee who has salary less than 5000 and greater than 2000. 12. Display the names and the designation of all female employee in descending order. 13. Display the names of all the employees who names starts with 'A' ends with 'A'. 14. Find the name of employee and salary for those who had obtain minimum salary. 15. Add 10% raise in salary of all employees whose department is 'IT'. 16. Count total number of employees of 'IT' department. 17. List all employees who born in the current month. 18. Print the record of employee and dept table as "Employee works in department'MBA'. 19. List names of employees who are fresher's (less than 1 year of experience). 20. List department wise names of employees who has more than 5 years of experience. 21. Create Sequence to generate department ID 22. List department having no employees		
3	**STUDENT (rollno, name, class, birthdate)** COURSE (courseno, coursename, max_marks, pass_marks) SC (rollno, courseno, marks) 1. Create the above three tables along with key constraints. 2. Write an Insert script for insertion of rows with substitution variables and insertappropriate data. 3. Add a constraint that the marks entered should strictly be between 0 and 100. 4. While creating SC table, composite key constraint was forgotten. Add the composite keynow. 5. Display details of student who takes 'Database Management System' course. 6. Display the names of students who have scored more than 70% in ComputerNetworksand have not failed in any subject. 7. Display the average marks obtained by each student. 8. Select all courses where passing marks are more than 30% of average maximum mark. 9. Display details of students who are born in 1980 or 1982. 10. Create a view that displays student courseno and its corresponding marks		
4	Create the database COMPANY and create given tables with all necessary constraints such asprimary key, foreign key, unique key, not null and check constraints.		

EMPLOYEE (emp_id, emp_name, birth_date, gender, dept_no, address, designation, salary, experience, email)

DEPART (dept_no, dept_name, total_employees, location)
PROJECT (proj_id, type_of_project, status, start_date, emp_id)

Insert proper data (at least 5 appropriate records) in all the tables.

1. Delete the department whose total number of employees less than 1.
2. Display the names and the designation of all female employee in descending order.
3. Display the names of all the employees who names starts with 'A' ends with 'A'.
4. Find the name of employee and salary for those who had obtain minimum salary.
5. Add 10% raise in salary of all employees whose department is 'CIVIL'.
6. Count total number of employees of 'MCA' department.
7. List all employees who born in the current month.
8. Print the record of employee and dept table as "Employee works in department 'CE'.
9. List names of employees who are fresher's(less than 1 year of experience).
10. List department wise names of employees who has more than 5 years of experience.

5

Create the database STUD and create given tables with all necessary constraints such as primary key, foreign key, unique key, not null and check constraints.

HOSTEL (HNO, HNAME, HADDR, TOTAL_CAPACITY, WARDEN)

ROOM (HNO, RNO, RTYPE, LOCATION, _STUDENTS, STATUS)CHARGES (HNO, RTYPE, CHARGES)

STUDENT (SID, SNAME, MOBILE-NO, GENDER, FACULTY, DEPT, CLASS,HNO, RNO)

FEES (SID, FDATE, FAMOUNT)

The STATUS field tells us whether the room is occupied or vacant. The charges represent the term fees to be paid half yearly. A student can pay either the annual fees at one time or the half yearly fees twice a year.

Insert proper data (at least 5 appropriate records) in all the tables.

1. Display the total number of rooms that are presently vacant.
2. Display number of students of each faculty and department wise staying in eachhostel.
3. Display hostels, which have at least one single-seated room.
4. Display the warden name and hostel address of students of Computer Sciencedepartment.
5. Display those hostel details where single seated or double -seated rooms are vacant.
6. Display details of hostels occupied by medical students.
7. Display hostels, which are totally occupied to its fullest capacity.
8. List details about students who are staying in the double-seated rooms of Chanakya Hostel.
9. Display the total number of students staying in each room type of each hostel.
10. Display details about students who have paid fees in the month of Nov. 2017.
11. For those hostels where total capacity is more than 300, display details of studentsstudying in Science faculty.
12. Display hostel details where there are at least 10 vacant rooms.
13. Display details of students who have still not paid fees.
14. Display those hostels where single-seated room is the costliest.

6	Consider the DUAL and data dictionary tables/views to solve the following Queries.		

1. Find out the names of all the tables, views and constraints associated with currenttables in the system.
2. Write a query to add 15 days to the current date.
3. Write a query to Add and subtract 5 months from the current month.
4. Find out the ASCII equivalent of character 'M'.
5. Find out the character equivalent of ASCII 67, 65 and 84.

	6. Write a query to find the last day of the month. 7. Find out how many days are left in the current month. 8. Write a query to calculate the Date difference between current date and 20/05/2023. 9. Write a query to Calculate the number of months between current date and 03/03/2023. 10. Find out the second occurrence of 'or' from third position in the string 'corporate floor. 11. Find out log to the base 3 of 81. 12. Convert the string 'gujarat technological university' so that first character of eachwork is in capital. 13. Convert the string 'jack and jue' Into 'black and blue'. 14. Round off the date 27-July-2016 to the current year. 15. Find out the user name and user id off currently logged on user.		
Sl. No	**Part B** (Minimum 80% of programs are mandatory)	**Hrs**	**Cos**
1	Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block.		
2	Write a PL/SQL to split the student table into two tables based on result (One table for —Pass‖ and another for —Fail‖). Use cursor for handling records of student table. Assume necessary fields and create a student details table.		
3	Create a database trigger to implement on master and transaction tables which are based on inventory management system for checking data validity. Assume the necessary fields for both tables.		
4	Write a PL/SQL to raise the following Exception in Bank Account Management table when deposit amount is zero.		
5	1. Write a PLSQL block which will print Employee list (Empno and Name) EMP (empno, empnm, empadd, salary, date_birth, joindt, deptno) 2. Write a function that returns total number of incomplete jobs, using tableJOB (jobid, type_of_job, status) 3. Write a function which displays the number of items whose weight fall between agiven ranges for a particular color using table ITEM (itemno, name, color, weight)		

	Write a procedure to display top five highest paid workers who are specialized in 'PAINTING" using table WORKER (workerid, name, wage_per_hour, specialized_in,manager_id)		

REFERENCE BOOKS / MOOCs	
1	Silberschatz, Korth, Sudarshan, "Database System Concepts", McGraw Hill Publication. 5th Edition
2	S K Singh, "Database Systems : Concepts, Design and Applications", Pearson Education
3	Peter Rob, Carlos Coronel, "Database Systems : Design, Implementation and Management", Cengage Learning
4	C J Date, A Kannan, S Swaminathan, "An Introduction to Database Systems", Pearson Education, 8th Edition
5	Steve Suehring, Tim Converse, Joyce Park, PHP 6 and MySQL Bible, Wiley