

Subject Name: Database Management System

Subject Code: TMI201

Course Name: Master of Science in Information Technology
(M.Sc. IT)

1 Contact Hours: 45 **L** 3 **T** 0 **P** 0

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 2

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 3

5 Semester: ☐ ☒ ☐
Autumn Spring Both

6 Pre-Requisite: Basic knowledge of computer fundamentals

7 Subject Area: Computer Applications

8 Objective: Understand and implement concepts of DBMS

9 Learning Outcome: A student who successfully fulfills the course requirements will be able to

CO 1 Understand the concepts of database management and can differentiate the database approach with the file system approach.

CO 2 Sketch and develop Entity Relationship Diagrams for real world problems and design databases.

CO 3 Apply and analyze Relational database queries with the help of Structured Query Language (SQL) and construct simple and moderately advanced database queries in SQL/PL-SQL.

CO 4 Understand the basics of NoSQL and differentiate it with relational databases.

CO 5 Evaluate and Apply logical database design principles, including keys, constraints and database normalization and design normalized databases.

CO 6 Understand and defend the importance of concurrency control in Transaction Processing Systems.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Introduction to DBMS: An overview of database management system, Database System Vs File System, Database system concepts, data models. Advantages of DBMS, Schema and instances, Three schema architecture, data independence. Data base languages and interfaces, Disadvantages of DBMS.	5

2	Data Modeling and Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree, ER Case Studies. Relational Data Base Model (RDBMS): Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra: operations and queries.	9
3	Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, DDL,DML,DCL, and DQL statements, SQL operators and their use, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus. Overview of PL/SQL, Variables, Datatypes, Conditions, Loops, Procedures, Functions, Triggers and cursors. Introduction to NoSql Database, Comparison of NoSql with Relational Database, Types of NoSql Databases.	12
4	Database Design & Normalization: Functional dependencies, normal forms, first, second third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs.	8
5	Transaction processing concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict and view serializable schedule, recoverability, Recovery from transaction failures, deadlock handling. Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control.	8
TOTAL		42

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	Elmasri and Navathe: Fundamentals of Database Systems, 5 th Edition, Pearson Education.	2007
2	Silberschatz, Korth and Sudharshan: Data base System Concepts, 5 th Edition, Mc-GrawHill.	2006
3	C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, 8th Edition, Pearson education.	1996
4	Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3 rd Edition, McGraw-Hill.	2003

Subject Name: Data structure & File Organization Using C Language

Subject Code: TMI 202

Course Name: Master of Science in Information Technology
(M.Sc. IT)

1 Contact Hours: 45 **L** 3 **T** 0 **P** 0

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 2

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 3

5 Semester: ☐ ☒ ☐
Autumn Spring Both

6 Pre-Requisite: Basic knowledge of Computer Fundamentals

7 Subject Area: Computer Applications

8 Objective: To familiarize students with the different Data Structures and their applications

9 Learning Outcome: A student who successfully fulfills the course requirements will be able to

CO 1 Understand various algorithms and data structures.

CO 2 Understand and define the strengths and weaknesses of different data structures.

CO 3 Select an appropriate data structure and algorithm design method for a specified application.

CO 4 Understand and implement data structures effectively in application programs.

CO 5 Develops skills in implementations and applications of data structures.

CO 6 Evaluate algorithm efficiency

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Introduction: Basic Terminology, Pointer and dynamic memory allocation, Elementary Data Organization, Algorithm Complexity and Time-Space trade-off. Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, Sparse Matrices. Recursion: Definition, Tail recursion.	8
2	Stack : Array Representation of stack, Linked Representation of Stack, Infix, Prefix and Postfix Expressions. Queues: Array and linked representation and of	8

	<p>queues, Circular queue, D-queue, and Priority Queue.</p> <p>Linked list: Representation of Singly Linked Lists, Two-way Header List, Doubly linked list, Generalized linked list.</p>	
3	<p>Trees: Binary Trees, Binary Search tree, algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Threaded Binary trees, AVL Tree, Huffman algorithm & Huffman tree.</p> <p>Searching and Hashing: Sequential search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies.</p>	10
4	<p>Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort.</p> <p>Graphs-BFS, DFS. Spanning tree: Minimum Spanning tree, Kruskal's Algorithm, Prim's Algorithm, Applications of graph.</p>	9
5	<p>File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.</p>	10
	TOTAL	45

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	R. Kruse etal, "Data Structures and Program Design in C" Pearson Education	2003
2	Horowitz and Sahani, "Fundamentals of data Structures", Galgotia	2002
3	A M Tenenbaum, "Data Structures using C & C++", PHI	2005

NAME OF DEPARTMENT: Computer Applications

Subject Name: Shell Scripting using Open Source Software **Subject Code:** TMI 203

Course Name: Master of Science in Information Technology
(M.Sc. IT)

1 Contact Hours: 45 **L** 3 **T** 0 **P** 0

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 4

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 3

5 Semester: ☐ ☒ ☐
Autumn Spring Both

6 Pre-Requisite: Basic knowledge of Computers

7 Subject Area: Computer Applications

8 Objective: To familiarize students with the fundamentals of operating systems, LINUX and shell scripting.

9 Learning Outcome: A student who successfully fulfills the course requirements will be able to

CO 1 Understand and experience Open source software and the LINUX environment

CO 2 Understand and demonstrate the file system used by Linux Operating system.

CO 3 Evaluate the usages of CUI based and GUI base text editors.

CO 4 Apply AWK utility to filter records from a file, which contains multiple records.

CO 5 Create a shell script to automate various system administrative tasks.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Overview of Operating System Introduction, Functions of Operating System, Types of Operating System, Open source software, Closed Source Software, Brief history of UNIX and Linux Operating System, GNU General Public License, Linux Architecture, System calls, Virtual Machine. Linux desktop environment, X- Window system, Display Managers (XDM, GDM and KDM). Understanding Linux Commands: Linux directory structure, Absolute and Relative pathnames, Command Structure, Internal Command and External Command, Seeking help (man command). General Purpose Utilities: pwd, clear, lock, tput, uname, cal, date, echo, printf, bc, script, passwd, who, tty. Directory and File Related Commands: cd, mkdir,	10

	rm, rmdir, touch, cat, cp, rm, mv, more, file, wc, od, cmp, comm, head, tail, cut, compressing and archiving files, gzip and gunzip, tar, zip and unzip, umask, chmod, chown, chgrp, find, hard link vs soft link.	
2	File System: File and Directory, Linux File System, Types of files in Linux, Components of File System, Structure of inode, extended file system. The vi editor: The three mode, Basic navigation, Moving to a specific line number, Repeat factor, The command mode commands, Saving and quitting, Text deletion, Using operators in deleting and copying text, Undoing and repeating commands, Pattern search and substitution, Moving text. Configurations file of “vi” editor. Graphical User Interface (GUI) based editors. The Stream Editor (sed), Line Addressing, Using Multiple Instructions (-e and -f), Context addressing, writing selected lines to a file, Text editing, Substitution.	8
3	Shell Programming: Types of Shells, The Shell’s interpretive cycle, Shells and sub-shells, pattern matching (grep command), Three Standard Files and Redirection, /dev/null and /dev/tty files, pipe, tee, command substitution, Shell Variable, environment variables, exporting Shell Variables, aliases, command history. Shell scripts, Making Scripts Interactive, Running a Script in the current Shell, Using Command line arguments, exit status of a command, Shell metacharacters, arithmetic and logical operators. conditional statements, conditional execution of a command, the case conditional, Iterative statements, functions and arrays, set and shift command, the here document, debugging shell scripts, filters, pr, paste, sort, tr commands.	9
4	Process basics, displaying process attributes, system process, zombie process, orphan process, operation on the process, parent-child relationship, process creation basics (fork(), exec() and wait()), running jobs in background(& and nohup), “init” process, priority of the process (nice command), terminating process with signals, kill and trap command, job control, suspending current process, running program remotely using telnet. awk: Introduction, Selection criteria and action, Splitting a line into fields and using printf, using regular expression, Computation using decimal number, using variables, Storing awk program in a file, The Begin and End Sections.	9
5	Essential System Administration: root, role and power of the system administrator, becoming super user, user administration. Understanding /etc/passwd, /etc/shadow and /etc/fstab files. Booting and shutdown. Set-user-id and sticky bit. Mounting file systems. Creating Partitions and File System, File system checking. Checking free space and disk usage. Backup Management: local, network backup. Setting up printers. Software management,	9

	installation of software. Red Hat Package Manager (.rpm) and Debian (.deb) packages. Protection and Security, Security Enhanced Linux (SELinux).	
	TOTAL	45

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	Richard Petersen, "Linux: The Complete Reference", Sixth Edition, McGraw Hill Education, 2017.	2010
2	Mark G. Sobell, "A practical guide to Linux commands, Editors and Shell programming", Third Edition, Pearson Education, 2016.	2013
3	Machtelt Garrels, "Introduction to Linux: a hands on guide", Edition 2007, UNIX Academy publications	2007

NAME OF DEPARTMENT: Computer Applications

Subject Name: Software Engineering & Project Management

Subject Code: TMI204

Course Name: Master of Science in Information Technology
(M.Sc. IT)

1 Contact Hours: 45 **L** 3 **T** 0 **P** 0

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 0

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 3

5 Semester: ☐ ☒ ☐
Autumn Spring Both

6 Pre-Requisite: Basic knowledge of Computer Fundamentals

7 Subject Area: Computer Applications

8 Objective: Understand the concepts of Software Engineering & Project Management

9 Learning Outcome: A student who successfully fulfills the course requirements will be able to:

CO 1 Understand and apply software engineering principles and development life cycle models in real life projects.

CO 2 Understand and analyze the importance of quality and reliability in software projects.

CO 3 Develop software requirement specification and design documents for software projects.

CO 4 Evaluate software in terms of size, cost and schedule using project management principles.

CO 5 Create and develop test cases using black box and white testing techniques.

CO 6 Understand and differentiate various development methodologies including Agile development, Component-Based development, and Cleanroom development.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Introduction: Introduction to Software, Software Crisis, Software Processes & Characteristics, Introduction to Software engineering, Software life cycle models, Process Models. Software quality. Software Quality and Reliability: Introduction, Importance of Software Reliability, Failure and Faults, Reliability Models, Software Quality Models, compression of CMM and ISO 9001, Six-Sigma, just in time, total quality management.	8

2	Software Project Management: Software Project Management life cycle, Software Project Planning Project Estimation: Size Estimation: Lines of Code & Function Count, Cost Estimation Models, Risk Estimation and Management, Effort estimation, Project monitoring and control. Project Scheduling: Basic Concepts, Project Scheduling- Basic Principles, Relationship between People and Effort, Task Network, Scheduling, Gantt and PERT charts, Staffing.	9
3	Software Requirements Analysis & specifications: Requirement Engineering, Elicitation techniques, Requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Characteristics & organization of SRS, IEEE Standard for SRS. Software Design: Design Concepts, Cohesion & Coupling, Function Oriented Design, Object Oriented Design, Software coding techniques and guidelines.	9
4	Software Testing: Objectives, lifecycle, Testing process, Design of test cases, Levels of Testing, Debugging, testing techniques, Blackbox testing techniques, Whitebox testing techniques, Introduction to functional testing & Structural testing, Object oriented testing and web-based software testing.	8
5	Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Software Configuration Management. Software Configuration Management vs Software maintenance. Advanced Software Development Methodologies: Agile method Methodology; Extreme programming; Rapid application development; Clean Room Software Development; Component Based Software Development.	8
TOTAL		42

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	R. S. Pressman, "Software Engineering – A Practitioner's Approach", McGraw Hill Int. , 7 th Ed.	2010
2	Stephen R. Schach, "Classical & Object Oriented Software Engineering", 7 th Ed., TMH	2007
3	Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa, 3 rd Ed.	2005
4	K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International, 4 th Ed.	2009
5	Carlo Ghizzi , Mehdi Jazayeri and Dino Mandrioli, "Fundamental of	2009

	Software Engineering”, PHI, 3 rd Ed.	
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Subject Name: Object Oriented Programming Using C++

Subject Code: TMI 205

Course Name: Master of Science in Information Technology
(M.Sc. IT)

1 Contact Hours: 45 **L** 3 **T** 0 **P** 0

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 2

3 Relative Weightage: **CWE:** 25 **MTE:** 25 **ETE:** 50

4 Credits: 0 3

5 Semester: ☐ ☒ ☐
Autumn Spring Both

6 Pre-Requisite: Basics of Programming Language.

7 Subject Area: Programming.

8 Objective: To familiarize students with the Object-Oriented Programming Language.

9 Learning Outcome: A student who successfully fulfills the course requirements will be able to

CO 1 Understand the differences between procedure-oriented programming and object-oriented programming.

CO 2 Implement basis concepts of the object-oriented programming language like encapsulation, abstraction, inheritance, polymorphism etc.

CO 3 Create Unified Modeling Language (UML) Models using its different types.

CO 4 Apply inheritance at various levels incorporating virtual and pure virtual functions.

CO 5 Define the object-oriented approach by implementing various streams, classes, member functions and objects.

CO 6 Implement virtual functions, basic file I/Os and Exception handling .

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Introduction to OOPS: Introduction to object-oriented programming concepts and its applications in real life. Key concepts and uses of OOP, Input and Output in C++. Member functions of iostream class, unformatted console I/O operations. Introduction to all the basic features of OOP like class, object, data abstraction, encapsulation, inheritance, polymorphism, message passing etc. Introduction to C++ programming: Tokens, keywords, identifiers, variables, operators, expression and control structures, If, If..Else, Switch - Repetitive Statements- for, while, do..while; Variable definition, strict type checking, arrays, strings, pointers etc. Default arguments, structure, runtime memory management.	10
2	Operators & Access Specifiers : Scope resolution, memory management, manipulators; Access Specifiers and its types. Classes & Objects: Class Specification, Objects, Arrays of objects,	10

	Dynamic objects, Pointers to objects, Access specifiers, defining member functions, Data hiding, Constructors with its types, Destructors, Static members, Functions with class: Friend functions, passing objects as arguments, Returning objects, friend class. Functions in C++ : parameters passing in functions, values return by functions, function overloading, operator overloading, Default Arguments, Inline Functions, Implicit Derived class object to base class object conversion.	
3	Operator overloading: Operator overloading, limitations of increment/decrement operators, overloading using friend functions. Inheritance and Polymorphism : Inheritance and protected members, protected base class inheritance, Inheriting multiple base classes; Inheritance with Constructors, Destructors, Passing parameters to base class constructors, Granting access, Virtual base classes. Polymorphism and its types, Early and late binding. Virtual Functions: Virtual function, calling a Virtual function through a base class reference, Pure virtual functions, Abstract classes, Using virtual functions; Generic Programming with template: Function template, overloading function templates, class template, inheritance of class templates.	9
4	Introduction to UML with UML diagrams: Concept of UML, building blocks of UML : Things : structural, behavioral and grouping things, UML relationships : Association, Generalization, Realization and Composition , UML Diagrams : class, object, use case, sequence, activity, state chart etc. with all its components & examples.	8
5	I/O System Basics, File I/O: C++ stream classes, Formatted I/O, I/O manipulators, file stream and the File classes, File operations Exception Handling, STL: Exception handling fundamentals, Exception handling options STL: An overview, containers, vectors, lists, maps.	8
	TOTAL	45

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	Schildt, Herbert: The Complete Reference C++, 4th Edition, Tata McGraw Hill.	2003
2	G. Booch, Object Oriented Analysis and Design, Addison-Wesley.	2004
3	Rumbaugh, J., Object Oriented Modeling and Design, Prentice Hall of India,	2006
4	Stanley B.Lippmann, Josee Lajore: C++ Primer, 5th Edition, Addison Wesley,	2012
5	Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2 nd edition.	2013
6	K R Venugopal, Rajkumar Buyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 2 nd edition.	2017

Subject Name: Professional Communication & Career Skill-II **Subject Code:** TMI 206

Course Name: Master of Science in Information Technology
(M.Sc. IT)

1 Contact Hours: 45 **L** 3 **T** **P**

2 Examination Duration(Hrs): **Theory** 0 3 **Practical** 0 0

3 Relative Weightage: **CWE** 25 **MTE:** 25 **ETE:** 50
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4 Credits: 0 3

5 Semester:
Autum **Spring** **Bot**
n **h**

6 Pre-Requisite: Professional Communication I

7 Subject Area: Professional Communication.

8 Objective: To enhance the personality and the communication skills of the students

9 Course Outcome:

A student who successfully fulfills the course requirements will be able to:

CO 1. Apply the properties of numbers and the other concepts to solve different problems on number theory.

CO 2. Apply the concepts of Ratio and Proportion to solve the different types of questions in mixtures and solutions.

CO 3. Analyze the relation between speed, distance and time to effectively solve the problems of relative speed, boats and streams and trains. Understand the concept of Permutation, Combination and Probability to apply and practice the different types of questions.

CO 4. Demonstrate the ability to critically assess the statements & and draw inferences after critical analysis and evaluation of the text.

CO 5. Demonstrate a literal, inferential and evaluative comprehension of readings, through identification and analysis of main ideas and supporting details both implied and inferred.

10 Details of the Course:

Unit No.	CONTENT	CONTACT HOURS
1	Classification of numbers, rules of divisibility, properties of remainders, LCM-HCF and their applications, concept of the last digit, concept of alpha numerals. Practice of questions based on number system concepts.	10

	<p>Concept of percentage and percentage equivalent of fractions, multiplication factor, importance and understanding of the base in calculations, concept and application of the successive percentage change rule.</p> <p>Concept of profit, loss and discount and its application. Understanding and practice of questions based on addition of impurity and unequal quantity buying and selling concept.</p>	
2	<p>Concept and understanding of simple and compound interest and their difference, understanding CI as an application of the successive percentage change rule, concept of effective rate of interest and practice of all the types of problems in SI and CI.</p> <p>Concept and understanding of average, weighted average and its application. Practice of problem based on age related concepts.</p> <p>Concept of ratio proportion and its application. Concept, understanding and practice of mixtures and solutions including alligation and replacement of part of a solution.</p>	9
3	<p>Concepts of time, speed and distance, understanding the direct and inverse relations in the topic, average speed and its application. Understanding the concept and application of relative speed and practice of problems based on trains and boats and streams.</p> <p>Concepts of time and work and its application based problems using the LCM method for individual efficiencies and practice of problems based on group efficiencies.</p> <p>Concept, understanding and practice of questions based on permutation and combination, difference in the approach for different things and identical things.</p> <p>Concept, understanding and practice of questions based on probability.</p> <p>Understanding the concept of set theory, clocks, calendar, logarithms, mensuration, basic algebra and practice of various types of questions based on the applications.</p>	11
4	<p>Applied Grammar and Verbal Reasoning: Parallel construction. Pronoun and Antecedant based errors</p> <p>Introduction to Parajumbles, techniques to solve, types of questions and practice of parajumble questions. (Include 4 statement parajumbles and 6 statement parajumbles).</p> <p>Introduction to critical reasoning using statement assumption, statement conclusion, strengthen, weaken and drawing inference.</p>	9
5	Reading Skills:	6

	1. Practice of Advanced Level Reading Comprehension with respect to a) central idea, b) tone and c) types. 2. Resume Writing and Mock Interview Practice	
	TOTAL	45

11 Suggested Books:

Sl. NO.	NAME OF AUTHERS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1	Advanced Technical communication by Malti Agarwal	2011
2	Business Communication by Galgotia Publishers.	2011
3	Technical Communication by Rizvi.	2011