MASTER OF SCIENCE IN INFORMATION TECHNOLOGY
(A Choice Based Credit System Effective from 2020-22)

1. Duration of the Course

The Master of Science in Information Technology programme will be of four semesters duration under Choice based Credit system which will be conducted in two years. Each semester will be of approximately 5 months (minimum 90 working days in a semester) duration.

2. Eligibility:

Candidates seeking admission to the first semester of M.Sc.(CBCS) Information Technology must have a B.Sc. or equivalent/B.C.A degree (10+2+3 scheme) with minimum 48% marks and also must have studied Mathematics in their degree programme from a recognized university.

3. Admissions:

Admissions to the first year of M.Sc.(IT) will be made as per admission rules for M.Sc.(CBCS)

4. Medium of Instruction

The medium of instruction and examination shall be English.

5. No. of Seats: As given in the Information bulletin

6. Curriculum

6.1 M.Sc.(IT) programme has a two year , four semester prescribed course structure which in general terms is known as curriculum. It prescribes courses to be studied in each semester as given below

6.2 M.Sc.(IT) programme shall have a curriculum and course contents (syllabi) for the courses recommended by the committee courses in Informatics and Computational Sciences and approved by the academic council of the university.

6.3 The programme shall follow Choice Based Credit System (CBCS) and will be governed by the Common Rules and Regulations of Masters programme under CBCS approved by the Academic Council of the University.

7. Courses of Study and Examination (2020-22)

Semester – I

course	Paper Name	L-T-P	No. of credits	Max. Marks		Total
				University Exam.	Internal Assessment	
M1MIT01-CT01	Computer Architecture	3-1-0	4	80	20	100
M1MIT02-CT02	Introduction to Programming	3-0-2	4	80	20	100
M1MIT03-CT03	Data Structure	3-1-0	4	80	20	100
M1MIT04-CT04	Discrete Mathematics	3-1-0	4	80	20	100
M1MIT05-CP01	Practical-I Data Structure Programming	0-0-8	4	80	20	100
M1MIT06-CP02	Practical-II Web Development Using HTML & CSS	0-0-8	4	80	20	100
M1MIT07-SP01	Communication & Presentation Skill	0-0-4	2AC	80	20	100
	TOTAL		24(26)			

Courses of Study and Examination (2020-22)

Semester – II

course	Paper Name	L-T-P	No. of credits	Max. Marks		Total
				University Exam.	Internal Assessment	
M2MIT01-CT05	Database Systems	3-0-2	4	80	20	100
M2MIT02-CT06	Operating System	3-0-2	4	80	20	100
M2MIT03-CT07	Algorithms	3-0-2	4	80	20	100
M2MIT04-CT08	Object Oriented Programming using C++	3-0-2	4	80	20	100
M2MIT05-CP03	Practical-I: Algorithm Implementations	0-0-8	4	80	20	100
M2MIT06-EP01X	Practical-II: **Elective Lab-I : Web Application Development** A. Web Development using Dot NET B. Web Development using PHP& MYSQL	0-0-8	4	80	20	100
M2MIT07-EP02X	Elective skill Enhancement Course- I A. Financial and Accounting Tools B. Computer Animation	0-0-6	3	80	20	100
	Total		27			

Courses of Study and Examination (2020-22)

Semester – III

course	Paper Name	L-T-P	No. of credits	Max. Marks		Total
				University Exam.	Internal Assessment	
M3MIT01-CT09	Computer Networks	3-1-0	4	80	20	100
M3MIT02-CT10	Java Programming	3-0-2	4	80	20	100
M3MIT03-ET01X	Elective -1 A. Introduction to Data Science B. Computer Graphics	3-0-2	4	80	20	100
M3MIT04-ET02X	Elective-2 A. Software Engineering B. Image Processing	3-0-2	4	80	20	100
M3MIT05-EP03X	Practical-I: **Elective Lab-II** A. Android Programming B. Microprocessor & Micro-controller Programming	0-0-8	4	80	20	100
M3MIT06-EP04X	Practical-II: **Elective Lab-III** A. Big Data Analytics B. Cloud Computing C. Web Application Development	0-0-8	4	80	20	100
M3MIT07-EP05X	Elective Skill Enhancement Course- II A. Data Mining B. Numerical Analysis Techniques using MATLAB	0-0-6	3	80	20	100
	Total		27			

Courses of Study and Examination (2020-22) Semester – IV

course	Paper Name	L-T-P	No.of credits	Max. Marks		Total
				University Exam.	Internal Assessment	
M4MIT01-PW01	Project Work	0-0-36	18	80	20	100
Total Credits: Final Semester Project External Examination will be conducted at the University Department/Computer Centre by a Committee						

<u>Elective Technology Courses</u>

Elective Lab-I : Web Application Development (Semester II)

A. Web Development using Dot NET

B. Web Development using PHP& MYSQL

Elective Lab-II(Semester III)

A. Android Programming
B. Microprocessor & Micro-controller Programming

Elective Lab-III(Semester III)

A. Big Data Analytics
B. Cloud Computing
C. Web Application Development

Extra Credit Courses

A. Summer Project
B. Internship
C. IT Industry Certification Courses

Course Code

Course codes are written in the following format

Masters programme (M)+Semester (1,2,34)+MIT(Information Technology Discipline)+Serial Number of Course in the Semester(01,02,03 etc)+ hyphen("-") +Course type [Core Theory (CT), Core Practical(CP), Discipline Specific Theory (ET), Discipline Specific Practical (EP), Skill Practical(SP)]+Group Code (A,B,C etc)

For example the Course code M1MIT01-CT01 should read as Master Programme First Semester Information Technology First Course-Core Theory Course-01

In the Course code M3MIT06- EP01A should read as Master Programme Third Semester Information Technology Sixth Course-Discipline Specific Elective Practical Course-01 Group-A

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

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SYLLABUS

First Semester

M1MIT01-CT01: Computer Architecture

Unit I

Processor Basics: CPU Organization: Fundamentals, additional features. Data representation: Basic formats, fixed point numbers, floating-point numbers. Instruction sets: Instruction formats, instruction types, programming considerations.

Unit II

Data path Design: Fixed point arithmetic: Addition and subtraction, multiplication, division. Arithmetic Logic Unit: Combinational ALUs, sequential ALUs. Advanced topics: Floating-point arithmetic, pipeline processing.

Unit III

Control Design: Basic concepts: Introduction, hardwired control, design examples. Micro-programmed control: Basic concepts, multiplier control unit, CPU control unit. Pipeline control: Instruction pipelines, pipeline performance, super-scalar processing.

Unit IV

Memory Organization: Memory technology: Memory device characteristics, random-access memories, serial-access memories. Memory systems: Multilevel memories, address translation, memory allocation. Caches: Main features, address mapping, structure versus performance.

Unit V

System Organization: IO and System Control: Programmed IO, DMA and interrupts, IO processors. Parallel processing: Processor-level parallelism, multiprocessors.

Recommended Books:

1. J.P. Hayes: Computer Architecture and Organization, McGraw-Hill International editions.

M1MIT02-CT02: Introduction to Programming

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students carry out the computer implementation of the algorithm/program in the laboratory as a part of this course

UNIT - I

Algorithm development: problem identification, algorithms, flow charts, testing and debugging, algorithms for searching (linear and binary), sorting (selection, bubble & insertion), merging of ordered list, analysis of algorithm.

UNIT – II

Programming in C: history, structure of C programs, compilation and execution of C programs, debugging techniques, character set, keywords, data type and variables, expressions, operators, operator precedence and their order of evaluation.

Control statements: if-else, switch, break, continue, coma operator, goto statement. Loops - for, while, do-while.

UNIT – III

Functions: built-in and user-defined functions function declaration, parameter passing- call by value & call by reference, recursive functions. Storage classes - auto, extern, global and static.

Array: one dimensional and multi-dimensional array, array handling, passing arrays to functions, arrays and strings, string-handling functions.

UNIT – IV

Pointers: pointer variable and its importance, pointer arithmetic, array of pointers, function of pointers, structure of pointers, dynamic memory allocation functions, pointer to pointer.

Structures and Union :declaration of structures, pointer to structure, array of structure, pointer to function, self-referential structure, unions, enumeration, macro.

UNIT – V

File handling: opening and closing data file, creating a data file, read and write functions, formatted and unformatted data files, command line arguments.

Recommended books:

1. How to solve it by computer -G. Dromey
2. Programming with C – Schaum's outline Series

M1MIT03-CT03: Data Structure

UNIT-I

Data Type - Data Object - Data Structure: Data abstraction and abstract data type; Notion of an algorithm - Complexity measures: Rate of growth, basic time analysis of an algorithm; ordering notion - detailed timing analysis - space complexity.

Arrays: Arrays and their representation-Single and multidimensional arrays-row major and column major ordering-address calculation.

Linked lists: Pointers and their uses- Continuous vs linked storage. Singly and doubly linked lists-Operations on lists-representation of sparse matrices and polynomials using lists-Circular lists-generalized lists

UNIT-II

Storage management: Dynamic storage management-Reclamation and compaction-Boundary Tag method.
Stacks and Queues: Stacks and Queues-representation and Manipulation-Uses of stacks and Queues-Recursion, polish expressions

UNIT-III

Trees: Trees-Binary and N-ary trees-Representation of trees-Tree traversal algorithms-Threaded trees and advantages-Conversion of general trees to Binary trees-B trees-Applications: Decision trees, Game trees and expression parsing.

UNIT-IV

Graphs: Graphs and their representations**:** Matrix representation-List structure-Graph traversal algorithm, Application of graphs.

Strings and their features: Strings-Representation and Manipulation using Arrays and lists-String matching algorithms. Brute force, Knuth-Morris-Pratt and Boyer-Moore strategies.

UNIT-V

Sorting and Searching: Searching and sorting-Sequential, Binary and hashed Searching-Bubble sort, Insertion sort, shell sort, Merge sort and Quick sort-Comparison.

Tables: Decision tables-Symbol tables-Hash Tables-Examples of representation and implementation-Applications.

Reccomended Books :

1. Aho A.V. & Ullman J.E. : Data Structure & Algorithms
2. Aron M. Tannenbaum & Others : Data Structures using C
3. Mary E.S. Loomis : Data Management & File Structures
4. Bhagat Singh & Thomas Naps : Intrioduction to Data Structures
5. Trembley & Sorenson : An Introduction to Data Structures with Applications

M1MIT04-CT04: Discrete Mathematics

UNIT-I

Set Theory: Introduction, sets and elements, universal set and empty set, subsets, venn diagram, set operations, algebra of sets and duality, finite sets, counting principle, classes of sets, power sets, partitions, mathematical induction.

Relations: Introduction, product set, relations, pictorial representation of relations, composition of relations, types of relations, closure properties, equivalence relations, partial ordering relations, n-ary relations.

UNIT-II

Functions: One-to-one onto and invertible functions, mathematical functions, exponential and logarithmic functions, sequences, indexed classes of sets, recursively defined functions, cardinality.

Logic and Propositional calculus: Propositions and compound propositions, basic logical operations, propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of proposition, conditional and bi-conditional statements, arguments, logical implication, propositional functions, quantifiers, negation of quantified statements.

UNIT-III

Matrices: Matrix addition and scalar multiplication, matrix multiplication, transpose, square matrices, invertible matrices, inverse, determinants, elementary row operations, Gaussian elimination, boolean matrices.

UNIT-IV

Counting: Basic counting principles, factorial notation, binomial coefficient, permutations, combinations, the pigeon-hole principle, the inclusion-exclusion principle, ordered and unordered partition.

Probability Theory: Introduction, Sample space and events, finite probability space, conditional probability, independent events, independent repeated trials, binomial distribution, random variables.

UNIT-V

Property of Integers: Order and inequalities, absolute value, mathematical induction, division algorithm, divisibility, primes, greatest common divisor, Euclidean algorithm, fundamental theorem of arithmetic, congruence relation, congruence equations.

Recommended Books:

1. Lipschutz S., Lipson M.: Discrete Mathematics
2. Kolman B.,Robert C.B., Sharon R.: Discrete Mathematical Structures
3. Trembley J.P. and Manohar R.P.: Discrete Mathematical Structures with Applications o Computer Science.

4. Lew: Computer Science: A mathematical introduction

M1MIT05-CP01: Practical-I: Data Structure Programming

Programming Exercises using C language based on Algorithm for data structures

M1MIT06 CP02: PRACTICAL -II: Web Development Using HTML & CSS

This course will be taught through practical training to prepare Web pages using HTML and CSS.

M1MIT07-SP01: Communication & Presentation Skill

Basic Language Skills, Comprehension of an unseen passage, Phonology and Stress Marking , Social and Official Correspondence, Interpretation of Short Unseen Literary Prose Pieces (fiction and non-fiction), Making presentations, public speaking.

Second Semester

M2MIT01-CT05: Database Systems

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students carry out the computer implementation of the database concepts using MY SQL or MS Access in the laboratory as a part of this course

UNIT – I

Introduction : Database system applications, database systems versus file systems, views of data, data models, database languages, database users and administrators, transaction management, database system structure, application architecture.

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, unique key, generalization, aggregation, reduction of an ER diagram to tables.

UNIT – II

Relational model: Structure of relational databases, relational algebra, tuple relational calculus, domain relational calculus.

SQL : Characteristics of SQL, advantages of SQL, types of SQL commands, SQL operators and their procedure, tables, views and indexes, queries and sub-queries, aggregate functions, insert, update and delete operations, joins, union, intersection, minus, cursors in SQL. domain constraints, referential integrity, assertions, triggers, authorization and authentication.

UNIT - III

Relational database design & normalization: Functional dependencies, normal forms- First, second, third, BCNF, fourth and fifth normal forms, decomposition.
Indexing and Hashing: Basic concepts, ordered indices, B-tree, B+ tree, static hashing, dynamic hashing, comparison of ordered indexing and hashing, index definition in SQL, multiple-key access.

UNIT – IV

Query Processing & Optimization : Measure of query cost, selection operation, sorting, join operation, other operations, evaluation of expressions, estimating statistics of expression results, transformation of relational expression, evaluation plans, materialized views.

Transactions: Transaction concept, atomicity and durability, concurrent execution, serializability – conflict and view, testing of serializability.

UNIT - V

Concurrency Control : Concurrency Control, Locking Techniques for Concurrency control, Time stamping protocols for concurrency control, validation based protocols, multiple granularity, multi-version schemes, deadlock handling, insert and delete operations.

Recovery System : Failure classification, storage structure, recovery and atomicity, log based recovery, shadow paging, recovery with concurrent transactions, buffer management, backup systems.

Recommended Book :

1. Database Systems Concepts - Korth
2. Fundamental of database system - Elmasiri and Navathe

M2MIT02-CT06: Operating systems

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students are capable of setting up a Linux server computer , learn commands and server management during the course so that computer implementation of the some of the topics can be tested by them in the laboratory as a part of this course

Unit I

Introduction to Operating Systems: What is an operating system? Mainframe systems, desktop systems, multiprocessor systems, distributed systems, clustered systems, real-time systems, handheld systems. Feature migration and computing Environments.

Computer System Structures: Computer system operation. I/O structure, storage structure, storage hierarchy, hardware protection, network structure.

Operating System Structures: System components, operating system services. System calls, system programs, system structure, virtual machines.

Unit II

Processes: Process concept, process scheduling, operations on processes, cooperating processes, inter-process communication, communication in client-server systems.

Threads: Overview, multithreading models, threading issues.

Unit III

CPU Scheduling: Basic Concepts, scheduling criteria, scheduling algorithms, multiple-processor scheduling, real-time scheduling, algorithm evaluation.

Process Synchronization: The critical section problem, synchronization hardware, semaphores, classical problems of synchronization, monitors.

Deadlocks: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Unit IV

Storage Management :- Memory Management: Swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory: Demand paging, process creation, page replacement, allocation of frames, thrashing.

File System Interface: File concept, access methods, directory structure, file system mounting, file sharing, protection.

File-System Implementation: File system structure, file-system implementation, directory implementation, allocation methods, free space management, efficiency and performance.

Unit V

Protection: Goals of protection, domain of protection, access matrix, implementation of access matrix, revocation of access rights.

Security: The security problem, user authentication, program threats, system threats, security systems and facilities, intrusion detection, cryptography.

M2MIT03-CT07: Algorithms

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students carry out the computer implementation of the algorithm/program in the laboratory as a part of this course

UNIT-1

Algorithms Analysis: Algorithms and structured programming. Analyzing algorithms, Asymptotic behavior of an algorithm, Order notations, time and space complexities (polynomial, logarithmic and exponential), average and worst case analysis, lower and upper bounds.

UNIT-2

Algorithm design strategies: Divide and conquer (Merge sort, Quick sort, matrix multiplication). Greedy method (knapsack problem, job sequencing with deadlines, minimum spanning trees). Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs).

UNIT-3

Dynamic programming: 0/1 knapsack, Travelling salesman problem
Backtracking: 8-queen problem, sum of subsets, Graph coloring, 0/1 Knapsack **Branch & Bound**: 0/1 knapsack, Travelling salesman.
Algorithms on Graphs: Minimum cost spanning trees, depth-first search, bi-connectivity, strong connectivity, path finding problem, transitive closure algorithm

UNIT-4

Matrix algorithms: Basics, Strassen's matrix-multiplication algorithm, LU and LUP decomposition, inversion of matrices

Data structures for set manipulation problems: Fundamental operation on sets, a simple disjoint-set union algorithm, tree structures for UNION-FIND problem, applications and extensions of the UNION-FIND algorithm.

UNIT-5

Pattern matching algorithms: Finite automata and regular expression, recognition of regular expression, patterns, recognition of substrings, Conversion from NFA to DFA
Taxonomy of Classes: Problem classes P, NP, NP-hard and NP-complete, Theorems for some NP-complete problems

Text/Reference Books:
1. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications,1985.
2. Design & Analysis of Computer Algorithms, Av. Aho, J.E. Hopcroft, & J.D. Ullman, Addition Wesley, 1974.
3. Design and Analysis of algorithms, S.K. Basu, PHI Publications

M2MIT04-CT08: Object Oriented Programming using C++

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students carry out the computer implementation of the algorithm/program in the laboratory as a part of this course

UNIT – I

Different paradigms for problem solving, need for OOP, differences between OOP and procedure oriented programming, abstraction, overview of OOP principles- encapsulation, inheritance and data binding polymorphism,abstraction.

C++ basics: structure of a C++ program, data types, declaration of variables, expressions, operators, type conversions, pointers and arrays, strings, structures, references, flow control statement, functions-scope of variables, parameter passing, recursive functions, default arguments, inline functions, dynamic memory allocation and deallocation operators.

UNIT – II

C++ classes and data abstraction: class definition, class structure, class objects, class scope, this pointer, static class members, constant member functions, constructors and destructors, dynamic creation and destruction of objects, friend function and class, static class member.
Overloading : function overloading, operator overloading – unary, binary operators.

UNIT - III

Inheritance: defining a class hierarchy, different forms of inheritance, defining the base and derived classes, access to the base class members, base and derived class construction, destructors, virtual base class.
Polymorphism: static and dynamic bindings, base and derived class virtual functions, dynamic binding through virtual functions, virtual function call mechanism, pure virtual functions, abstract classes, implications of polymorphic use of classes, virtual destructors.

UNIT - IV

Templates - function templates and class templates, overloading of function template, static class member in class template.

Exception handling: benefits of exception handling, throwing an exception, the try block, catching an exception, exception objects, exception specifications, re-throwing an exception, catching all exceptions.

UNIT-V

File handling : stream classes hierarchy, stream I/O, file streams, opening and closing data file, creating a data file, read and write functions, error handling during file operations, formatted I/O, sequential and random file processing.

Standard template library (STL): component of STL, containers, iterartors, algorithms, application of container classes.

Recommended book : Object Oriented Programming with C++ : E. Balagurusamy

M2MIT06-CP03 : Practical-I: Algorithm Implementations

Practical exercise to implement various algorithms using C++.

M2MIT06-EP01X: Elective Lab-I

Students will be required to select one course from following

EP01A. Web Development using Dot NET
EP01B. Web Development using PHP& MYSQL

These courses will be taught through practical training to develop web applications using the technologies. Each student will be required to select independent applications and web contents.

M2MIT07-EP02X: Elective skill Enhancement Course- I

Students will be required to select one course from following

M2MIT07-EP02A: Financial and Accounting Tools

M2MIT07-EP02A: Computer Animation

Third Semester

M3MIT01-CT09: Computer Networks

UNIT-I

Protocol Architecture: Overview: Communication model, Communication Tasks, Data Communication Networking: WAN, LAN, Wireless Networks. Basics of Network Software: Protocol and protocol architecture, Protocol functions, Design Issues for the layers, interfaces &Services, Connection oriented and connectionless services, service primitives, relationship of services to protocols , ISO REF Models, TCP/IP Model.

Data Communications: Data Transmission: Concepts of Frequency, Spectrum, bandwidth, Electromagnetic spectrum and frequencies for data communication, Fourier analysis , Data and signal, Transmission impairments, channel capacity, Nyquist bandwidth, Shannon capacity formula ,decibels and signal strength, Transmission media: Coaxial, twisted pair, Comparative study of Categories of cables, Coaxial, Optical Fibers, Wireless transmission: Terrestrial Microwave, satellite, Broadcast Radio, Infrared,.

UNIT-II

Data Encoding: BCA (NRZ,Bipolar AMI, B8ZS, HDB3,ASK,FSK,PSK,PCM,AM,FM,PM), Spread Spectrum. Asynchrous and Synchronous transmission, Full and Half duplex, Interfacing, Functional and Procedural aspects of V.24,

Data Link Control: Flow control: Stop and Wait, Sliding window, Error detection: Parity Check,CRC. Error control: Stop and Wait ARQ, Go back-N ARQ, Selective-Reject ARQ, Brief idea of HDLC and other Data Link control protocols

UNIT-III

Circuit Switching: Simple switching Network, Circuit Switching Networks, Circuit Switching Concepts: Space Division switching, Time Division Multiplexing, Routing in circuit switching Networks, Contrl Signalling, Inchannel & common channel signaling, Brief idea of SS7. Packet Switching: Packet switching principles, Routing,X.25

UNIT-IV

LAN Technology: LAN architecture, IEEE 802 standards, Ethernet (CSMA/CD): Medium Access Control, 10, 100, Gigabit Ethernet. Brief survey of other LAN systems (Token ring,FDDI,ATM, Fiber channel). Wireless LANS, Bridges, Latest trends in LAN technologies

LAN Devices: Study of specifications of L2 and L3 switches, Structured cabling, Passive components.

UNIT-V

Principles of Internetworking, connection less Internetworking, IP, IPv6, IP multicasting. Routing protocols, TCP, UDP, SNMP, SMTP and MIME, HTTP

Recommended Books :

1. William Stallings: Data & Communications,Sixth Edition
2. A. S. Tanenbaum : Computer Networks

M3MIT02-CT10: JAVA Programming

UNIT-I

Introduction to Java: Bytecode, features of Java, data types, variables and arrays, operators, control statements.

Objects & Classes: Object Oriented Programming, defining classes, static fields and methods, object construction

UNIT-II

Inheritance: Basics, using super, method overriding, using abstract classes, using final with inheritance.

Packages and Interfaces: Defining a package, importing package, defining an interface, implementing and applying interfaces.

UNIT-III

Exception Handling: Fundamentals, exception types, using try and cache.

Multithreaded Programming: Creating a single and multiple threads, thread priorities, synchronization.

UNIT-IV

Applets: Applets basics, applets architecture, applets skeleton, the html applet tag, passing parameters in applets.

Event Handling: Event classes and event listener interfaces.

UNIT-V

Graphic Programming Introduction to swings.

Recommended Books :

1. P. Naughton and H. Schildt: The complete reference to Java, Tata Mc-Graw Hill.

2. Deitel and Dietel: How to program in Java

M3MIT03-ET01A: Introduction to Data Science

UNIT-1

Data Manipulation at Scale Databases and the relational algebra, Parallel databases, parallel query processing, in-database analytics

MapReduce, Hadoop, relationship to databases, algorithms, extensions, languages
Key-value stores and NoSQL; tradeoffs of SQL and NoSQL

UNIT-II

Analytics Topics in statistical modeling: basic concepts, experiment design, pitfalls
Topics in machine learning: supervised learning (rules, trees, forests, nearest neighbor, regression), optimization (gradient descent and variants), unsupervised learning

UNIT-III

Communicating Results
Visualization, data products, visual data analytics,P rovenance, privacy, ethics, governance

UNIT-IV

Special Topics
Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries, semantic web

Unit-V

Review of Basic Data Analytic Methods Using R 63

Introduction to R, R Graphical User Interfaces, Data Import and Export , Attribute and Data Types,Descriptive Statistics,Exploratory Data Analysis,Visualization Before Analysis , Dirty Data ,Visualizing a Single Variable,Examining Multiple Variables, Data Exploration Versus Presentation , Statistical Methods for Evaluation, Hypothesis Testing,Difference of Means,Wilcoxon Rank-Sum Test,Type I and Type II Errors , Power and Sample Size , ANOVA

M3MIT03-ET01B: Computer Graphics

UNIT-1

Geometry and Line generation: Lines, Line segments and perpendicular lines, distance between a point and a line, vectors, pixels, frame buffers, vector generation, Bresenham's algorithm, anti-aliasing of line, thick line segments, character generation, display the frame buffer.

Graphics Primitives: Display devices, primitive operations, Display file interpreter, Normalized device co-ordinates, Display file structure and display file algorithms, Display control, text, Line style primitives.

UNIT-2

Polygons: Polygon representation, Entering polygons, Polygon interfacing algorithms, filling polygons, filling with a pattern, Initialization, Antialiasing.

Segments: Creation of segment, Closing, deletion and renaming segments, visibility, image transformations, saving and showing segments.

UNIT-3

2D and 3D Transformations: Matrices, Scaling transformations, Rotation, Homogeneous co-ordinates and Translations, Co-ordinate transformations, Rotation about an arbitrary point, Inverse transformations, Transformation routines, Transformation and patterns, Initialization, Display procedures. 3D geometry, 3D primitives and transformations.

UNIT-4

Windowing and Clipping: The viewing transformation and its implementation, Clipping, Cohen Sutherland Outcode algorithm, Clipping of polygons, generalized clipping, Multiple windowing, Parallel projection, Viewing projections and special projections, Conversion to view plane co-ordinates, Clipping in three dimensions, Clipping planes.

UNIT-5

Hidden surfaces and Lines: Back-face algorithm, Z-buffers, Scan line algorithm, Franklin algorithm, Illumination, Transparency, Reflection, Shadows, Ray tracing, halftones, Color Models

Text/Recommended Books:

1. Steven Harrington:- Computer Graphics: A programming Approach

M3MIT04-ET02A: Software Engineering

Unit I

Software Engineering Fundamentals: Definition of Software, Software characteristics, Software Applications.
Software Process: Software Process Models - Waterfall model, prototyping model, spiral model, incremental model, concurrent development model.
Project management Concepts: The Management Spectrum - The People , The Product , The Process , The Project.

Unit II

Software Process and Project Metrics : Measures , Metrics and Indicators , Software measurement : Size - Oriented Metrics , Function - Oriented Metrics , Extended Function point metrics
Software Project Planning : Project Planning Objectives , Software Project Estimation , Decomposition Techniques - Problem Based Estimation , Process Based Estimation ,Empirical Estimation Models- The COCOMO Model
Risk Analysis and Management: Software risks, Risk identification, Risk Projection, Risk Refinement, Risk Mitigation , Monitoring and Management.

Unit III

Software Quality Assurance: Basic concepts- Quality, Quality Control, Quality Assurance, Cost of Quality , Software Quality Assurance (SQA) , Formal Technical Review
Software Configuration Management: Baselines, Software Configuration Items, SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting.
Analysis Concepts and Principles: Requirements Elicitation for Software**,** Analysis Principles - The Information Domain, Modeling, Partitioning, Essential and Implementation Views, Specification: Specification Principles, Representation, The Software Requirement Specification (SRS)

Unit IV

Design Concepts and Principles: Design Principles , Design Concepts – Abstraction, Refinement, Modularity, Software Architecture, Control Hierarchy, Structural Partitioning, Data Structure, Software Procedure, Information Hiding , Effective Modular Design- Cohesion , Coupling
Software Testing: Testing Objectives & principles, Unit Testing, Integration Testing (Top Down Integration , Bottom Up Integration , Regression Testing, Smoke Testing), Validation Testing (Alpha and Beta Testing), System Testing (Recovery Testing, Security Testing, Stress Testing, Performance Testing).

Unit V

Reengineering: Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering
CASE Tools: What is CASE, Building Blocks of CASE, A Taxonomy of CASE Tools, Integrated CASE Environments, The Integration Architecture, The CASE Repository.
Recommended Books:
1. R. Pressman: Software Engineering, McGraw-Hill.
2. K.K. Agrawal and Y. Sing: Software Engineering, New Age International.
3. P. Jalote: Software Project Management in Practice, Pearson.

M3MIT04-ET02B: Image Processing

UNIT - I

Image presentation and transform : Elements of visual perception, colour representation, Image capture, representation and storage. gray level transformation, histogram equalization, multi-image operations.
Image transform : Discrete Fourier transforms (DFT), Discrete cosine transform (DCT), Walsh-Hadamard transform, Haar transform, Karhunen-Loeve transform, singular value decomposition.

UNIT - II

Image enhancement : Contrast Intensification – linear stretching, Non-linear stretching, histogram specification, modifying gray level co-occurrence matrix, smoothing – image averaging, mean filter, order statistic filter, edge preserving smoothing, low pass filtering, Image sharpening – high pass filtering, homomorphic filtering.

UNIT - III

Image restoration: Mean square error restoration, least-square error restoration, restoration by singular value decomposition, restoration by maximum a posterior estimation, restoration by homomorphic filtering – distortion model and range of parameter, filtering procedure and related problems.

UNIT - IV

Image compression: Fidelity criteria, run length coding, Huffman coding, LZW, arithmetic coding, JPEG encoder and decoder , vector quantization compression.

UNIT - V

Image segmentation: Region extraction, pixel based approach, multilevel thresholding, local thresholding, region based approach – growing, splitting, merging, split and merge techniques.

Recommended books :

1. Digital Image processing and analysis - B. Chandra and D. Majumder
2. Fundamental of digital image processing - Anil K. Jain

M3MIT05-EP03X: Practical-I: Elective Lab -II

M3MIT05-EP03A: Android Programming
M3MIT05-EP03B: Microprocessor and Microcontroller Programming

These courses will be taught through practical training to develop applications using the technologies. Each student will be required to select independent applications.

M3MIT06-EP04X: Practical II: Elective Lab –III

Students have to select one of the following technologies

M3MIT06-EP04A: Big Data Analytics
M3MIT06-EP04B: Cloud Computing
M3MIT06-EP04C: Web application Development

M3MIT07-EP05X: Elective Skill Enhancement Course II

Students have to select one of the following technologies

M3MIT07-EP05A: Data Mining
M3MIT07-EP05B: Numerical Analysis Techniques using MATLAB

Fourth Semester

M4MIT01-PW01: Project Work

Only the projects submitted by the candidates as per following guidelines will be evaluated
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1. Project to be selected by the student at the end of fifth Semester
2. The project must be of approximately 400 man hours and so certified by the supervisor of the project
3. The project must be submitted in the form in consonance with the format enclosed
4. Monthly progress report must be submitted through supervisor in the enclosed format.
5. Project must be submitted before the prescribed last date .
6. Candidates are required to make a presentation of their project work during their project examination
7. Students whose Projects graded as unsatisfactory will given one more chance to undertake another project under another supervisor /organization.
8. The project work of the candidates whose monthly progress report is not submitted will be considered as incomplete and may be terminated within two weeks from the prescribed due date.
9. Students will be allowed to undertake project works only at the bonafide organizations.
10. Students are required to give two seminars during the project work, one at the end of 2nd month and another at the end of 4th month. However, candidates working for their project in organizations outside the state need to give only one seminar during the entire project period.
11. Examination of the project work will be conducted by a committee consisting of at least two internal examiners and one external examiner.

Guidelines for Project in partial fulfillment of the requirement of M.Sc.(IT)course

(a) The project will consist of two parts:

- Documentation; and

-Viva-voce

(b) The source-code and the executable code have to be submitted on CD and student must demonstrate working of the software.

(c) Project shall be original and not copied from the existing material from any source and a certificate, as per format given will be provided with the Project, duly countersigned by the supervisor.

(d) Project will be submitted only when the candidate completes all papers though he or she may start the projects earlier.

(e) Presentation of the Project will be in the accepted norms; as laid down in various text-books; IEEE standard/ ISO standards etc., are some models to follow.

(f) As far as possible, the Project should be of real life value.

(g) Though the Project is given 400 hours, the student is expected to use his/her discretion to ensure that it is large enough to be of practical value.

(h) The number of hours will not include the hours for writing and documentation of the Project.

(i) During the presentation of the Project at viva-voce, the candidate is advised to have a computer based or an overhead project presentation material handy.

PERFORMA FOR CERTIFICATE

This is to certify that this is a bonafide record of the Project entitled _____ was done satisfactory at _____by Mr./Ms_____

in partial fulfillment of M.Sc.(IT) course. He/ She has successfully completed all the subjects.

This report had not been submitted for any other examination and does not form part of any other course undergone by the candidate.

PLACE:

DATE: SIGNATURE

NAME:
DESIGNATION:

(Name & Seal of organization of Supervisor)

PROFORMA FOR THE PROJECT REPORT

1. Title of the Project
2. Objectives
3. Input to the Project
4. Output generated
5. Details of Hardware Platform used
6. Details of Software Tools used
7. Implementation Issues (Clearly defining the area of Application).
8. Miscellaneous
9. Signature of the Candidature.

GUIDELINES FOR THE CHAPTERS AND SECTIONS

1. Microscopic Summary

2. Details of candidate and Supervisor along with certificates of :

- Original Work;
- Assistance if any;
- Credits.

3. Aims and Objectives

4. Approach to Project and Time Frame

5. Project Design Description with Appendices to cover:

- Flow Charts/Data Flow Diagram-Macro/Micro level
- Source Code
- Hardware Platform
- Software Tools
- Security measures
- Quality Assurance
- Auditability

6. Test Data and Result.

The project report must be prepared for the external examination. Monthly report of the students must be taken to monitor progress and must be placed for evaluation by external examiner. Projects submitted by the students shall be evaluated during external evaluation to ensure independent contribution and proficiency acquired by the students

Note: Students must be allotted projects in the beginning of the session. Candidates submitting readymade projects/copied/ projects developed by professionals in the market etc shall be awarded zero marks.

Two copies of the project report and the software developed must be submitted to the external examiner. One copy of the project shall be returned to the student with the signature of external examiner.