S.S.D GIRLS' COLLEGE, BATHINDA

OUTLINES OF TESTS,
SYLLABI AND COURSES OF READING

FOR

M. sc. (IT)
(Programme Code MITM2SSD)

(SEMESTER SYSTEM)

SECOND YEAR (Semester 111 & IV)

(2024-25 Sessions)

(As per RUSA Guidelines)

DEPARTMENT OF COMPUTER SCIENCE,

S.S.D GIRLS' COLLEGE, BATHINDA,

An Autonomous College

NAAC Accredited 'A' Grade

SYLLABI, OULINES OF PAPERS AND TESTS

M.Sc. (IT) Semester 111
(Programme Code MITM2SSD)
(2024-25 Session)

Code No.	Title of the Paper	Lecture Per week	Univ. Exam. Marks	Int. Ass. Marks	Time Total Allowed
MITM2101T	Object Oriented Programming using C++	5	70	30	3 Hrs
MITM2102T	Data and File Structure	5	70	30	3 Hrs
MITM2103T	Software Engineering	5	70	30	3 Hrs
MITM2104T	Computer Networks	5	70	30	3 Hrs
MITM2105L	Programming Lab-V(Based on MITM2101 T)	8	70	30	3 Hrs
MITM2106L	Programming Lab-VI(Based on MITM2102T)	8	70	30	3 Hrs

M.Sc. (IT) Semester IV
(Programme Code MITM2SSD)

(2024-25 Session)

Code No.	Title of the Paper	Lecture Per week	Univ. Exam. Marks	Int. Ass. Marks	Time Total Allowed
MITM2201T	Algorithm Design and Analysis	5	70	30	3 Hrs
MITM2202T	Computer Graphics	5	70	30	3 Hrs
MITM2203T	Artificial Intelligence	5	70	30	3 Hrs
MITM2204T	Minor Project	4	100		3 Hrs
MITM2205L	Programming Lab-Vll (Based on MITM2201 T)	8	70	30	3 Hrs
MITM2206L	Programming Lab-Vlll (Based on MITM2202T)	8	70	30	3 Hrs

CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during the Semester. Both the tests will be considered for assessment.		60% of the marks allotted for Continuous Assessment
2.	Assessment/Quizzes		20% of the marks allotted for Continuous Assessment
3.	Attendance		10% of the marks allotted for Continuous Assessment.
4.	Class Participation and behavior		10% of the marks allotted for Continuous Assessment.

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MITM2101T:Object Oriented Programming Using C++

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective: This course is designed to explore computing and to show students the art of computer programming. Students will be able to learn Understand object oriented programming and advanced C++concepts for writing good programs. On completion of this course, the students will be able to

- Write, compile and debug programs in C++language.
- Use different data types, operators and console I/O function in a computer program.
- Design programs involving decision control statements, loop control statements and case control structures.
- Understand the implementation of arrays, pointers and functions and apply the dynamics of memory by the use of pointers.
- Comprehend the concepts of structures and classes: declaration, initialization and implementation.
- Apply basics of object oriented programming, polymorphism and inheritance.
- Use the file operations, character I/O, string I/O, file pointers, pre-processor directives and create/update basic data files.

Course Content

SECTION A

Evolution of OOP: Procedure Oriented Programming, OOP Paradigm, Advantages and disadvantages of OOP over its predecessor paradigms. Characteristics of Object Oriented Programming.
Introduction to C++: Identifier, Keywords, Constants. Operators: Arithmetic, relational, logical, conditional and assignment. Size of operator, Operator precedence and associativity. Type conversion, Variable declaration, expressions, statements, manipulators. Input and output statements, stream I/O, Conditional and Iterative statements, breaking control statements. Storage Classes, Arrays, Arrays as Character Strings, Structures, Unions, Bit fields, Enumerations and User defined types.
Pointers: Pointer Operations, Pointer Arithmetic, Pointers and Arrays, Multiple indirections, Pointer to functions. Functions: Prototyping, Definition and Call, Scope Rules. Parameter Passing by value, by address and by reference, Functions returning references, Const functions, recursion, function overloading, Default Arguments, Const arguments, Pre-processor, Type casting.

SECTION B

Classes and Objects: Class Declaration and Class Definition, Defining member functions, making functions inline, Nesting of member functions, Members access control. THIS pointer. Objects: Object as function arguments, array of objects, functions returning objects, Const member. Static data members and Static member functions, Friend functions and Friend classes.
Constructors: properties, types of constructors, Dynamic constructors, multiple constructors in classes.
Destructors: Properties, Virtual destructors. Destroying objects, Rules for constructors and destructors. Array of objects. Dynamic memory allocation using new and delete operators, Nested and container classes, Scopes: Local, Global, Namespace and Class.
Inheritance: Defining derived classes, inheriting private members, single inheritance, types of derivation, function redefining, constructors in derived class, Types of inheritance, Types of base classes, Code Reusability.
Polymorphism: Methods of achieving polymorphic behavior.
Operator overloading: overloading binary operator, overloading unary operators, rules for operator overloading, operator overloading using friend function. Function overloading: early binding, Polymorphism with pointers, virtual functions, late binding, pure virtual functions and abstract base class. Difference between function overloading, redefining, and overriding.
Templates: Generic Functions and Generic Classes, Overloading of template functions. Exception Handling catching class types, handling derived class exceptions, catching exceptions, restricting exception

Pedagogy:

The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:

Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- Herbert Schildt, "The Complete Reference C++", Tata McGraw-Hill.
- Deitel and Deitel, "C++ How to Program", Pearson Education.
- Robert Lafore, "Object Oriented Programming in C++", Galgotia Publications.
- Bjarne Strautrup, "The C-H- Programming Language", Addition- Wesley Publication Co.
- Stanley B. Lippman, JoseeLajoie, "C++ Primer", Pearson Education.
- E. Balagurusamy, "Object Oriented Programming with C#", Tata McGraw-Hill.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours. The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The question paper will consist of three Sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks for each question. Section C will consist of 11 short answer type questions covering the entire syllabus uniformly and will carry a total of 22 marks.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

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MITM2102T: Data and File Structure

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 40-45**

Course Objective: This course is designed to explore computing and to show students the art of practical implementation and usage of Algorithms and Data Structures. On completion of this course, the students will be able to

- Be familiar with basic data structure of algorithms.
- Design and analyze programming problem statements
- Choose appropriate data structures and algorithms and use it to design algorithms for a specific problem.
- Handle operations like searching, insertion, deletion and traversing mechanism
- Come up with analysis of efficiency and proofs of correctness Course Content

SECTION A

Data Structure: Introduction to data structure and algorithm, Algorithm analysis: Time space trade off algorithms and Big O notation. Arrays: Introduction, one dimensional and multidimensional arrays, memory representation of arrays, operations on arrays, sparse arrays and sparse matrices and their implementation, Advantages and limitation of arrays.
Stacks: Introduction; Operation on stacks; Implementation of stacks, Application of stacks: matching parenthesis, evaluation of arithmetic expressions, conversion from infix to postfix, recursion.
Queues: Introduction, operation on queues, circular queue, memory representation of queues, dequeues, priority queues, application of queues.
Linked List: Introduction; operation on linked list, circular linked list, doubly linked list, header linked list, implementation of linked list, application of linked lists.
Trees: Introduction; Binary Tree; Threaded Binary Trees; Binary Search Tree; Balanced Trees; B-Trees; Heap

SECTION B

Graphs: Introduction Graph: Graph terminology, Memory Representation of Graphs: adjacency matrix representation of graphs, adjacency list or linked representation of graphs, Operations performed on graphs, Application of graphs
Sorting: Selection Sort, Insertion Sort, Merge Sort, Bucket Sort, Radix Sort, Quick Sort and Heap Sort
Hashing: Hashing techniques; Collision resolution; Deleting items from a hash table; Application of hashing
File Organization: Introduction, External Storage Device: Sequential Access Storage Device (SASD), Direct Access Storage Device (DASD) Sequential File Organization: processing sequential files, operations on sequential files, advantages and disadvantages of sequential file organization Direct File Organization: introduction, processing of direct files, advantages and disadvantages of direct organization Indexed Sequential Organization: introduction, processing of indexed sequential files, advantages and disadvantages of indexed sequential organization

Pedagogy:

The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:

Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- A. Tanenbaum, Y. Lanhgsam and A.J. Augenstein, "Data Structures Using C", PHI.
- Loomis, Marry,"Data Management and File Structures", PHI
- Seymour Lipschultz, "Theory and Practice of Data Structures", McGraw-Hill.
- E. Horowitz and S. Sahni, "Data Structures with Pascal", Galgotia.
- M. J. Folk, B. Zoellick, G Riccardi, "File Structures", Pearson Education.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours. The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The question paper will consist of three Sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks for each question. Section C will consist of 11 short answer type questions covering the entire syllabus uniformly and will carry a total of 22 marks.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

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MITM2103T: Software Engineering

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 40-45**

Course Objective: This course is designed to understand the basics of software product development activity and to gain the knowledge of different phases of software development and associated challenges.
On completion of this course, the students will be able to

- Understand the traditional approach and models of software development
- Conduct systematic design process using structured and object-oriented design methodology
- Create test data to perform testing activity
- Explore tools/techniques to aid the software development

Course Content

SECTION A

Software Engineering: History, Definition, Goal; The role of the Software Engineer, The Software Life Cycle, The relationship of Software Engineering to other areas of Computer Science, Classification of Software Qualities, Representative Qualities, Software process models: Waterfall model, prototyping, spiral; Tools and techniques for process □odelling, Management of software engineering management functions, project planning and organization.
Requirement Analysis: The requirement process, types of requirements, Characteristics and components of SRS, Data flow Diagrams, Data Dictionary, UML diagrams for specifying behaviors,metrics, verification of SRS.
Design and Software architecture: The Software design activity and its objectives, Abstraction, Modularity, Coupling-Cohesion criteria, Object-Oriented Design: generalization and specialization, associations and aggregations.

SECTION B

Coding: Programming standards and procedures, programming guidelines, documentation, and Code verification techniques.
Verification and validation: Approaches to verification, testing goals, principles,
Equivalence class partitioning, Boundary value analysis, mutation testing, graph based testing, cyclomatic complexity, test planning ,automated testing tools, features of Object-Oriented testing.
Software maintenance: The nature of maintenance, maintenance problems, maintenance techniques and tools.
Software re-engineering, reverse engineering, forward engineering: forward Engineering for Object oriented and client/server architecture, Building blocks for CASE, CASE tools and applications.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:

Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, " Fundamentals of Software Engineering", 2nd edition Pearson Education. 2003.
- Shari Lawrence Pfleeger, " Software Engineering : Theory and Practice", 2nd edition, Pearson Education, 2003.
- P. Jalota, "An Integrated Approach to Software Engineering", Narosa Publications.
- Roger. S. Pressman," Software Engineering-A practitioner's Approach", 3rd edition,McGraw-Hill.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The question paper will consist of three Sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks for each question. Section C will consist of 11 short answer type questions covering the entire syllabus uniformly and will carry a total of 22 marks.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

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MITM2104T: Computer Networks

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 40-45**

Course Objective: This course serves as a general introduction for students seeking to acquire a foundation in current network technologies for local area networks (LANs), wide area networks (WANs) and the Internet. Network concepts such as the OSI model, topologies, and major protocols, as well as the basic functions of system administration and operation are also included. Upon completion of this course, students will:

- Learn how computer network hardware and software operate
- Investigate the fundamental issues driving network design
- Learn about dominant network technologies

Course Content

SECTION A

Computer networks: uses of computer networks, Goals and applications of networks, computer network structure and architecture, reference models: OSI model, TCP/IP model, Comparison of TCP/IP and OSI models, Introduction to Novell Netware, and ARPANET.
Medium Access Sublayer : Static and dynamic channel allocation for LAN and MAN ALOHA Protocols, LAN Protocols : CSMA, CSMA/CD, Collision Free protocol, BRAP, MLMA, Binary countdown, Limited contention protocol, Urn Protocol, Adaptive tree walk protocol.
Networking and Internetworking devices: Repeater, bridges, routers, gateways, switches.

SECTION B

High speed LAN: FDDI, Fast Ethernet, HIPPI, Fiber channel.
LAN IEEE 802.x standards.
Routing: Static vs. Dynamic Routing, various Routing Algorithms.
Congestion Control: Causes of Congestion, Various Congestion Control Strategies and Algorithms Mobile telephone, mobile telephone switching office.
Internet protocols: Principles of Internetworking, connectionless internetworking, Internet protocols, IPv6.
Network Security: Security requirements and attacks, encryption Public key encryption and digital Signatures.
distributed applications: SNMP, SMTP, HTTP.

Pedagogy:

The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- A.S. Tannenbaum, "Computer Networks", 3rd Edition, Prentice Hall, 1999.
- Data Communications & Networking by Forouzan, Tata McGraw Hills.
- D.E. Cormer," Computer Networks and Internet", 2nd Edition, Addison Wesley Publication, 2000. • D.E. Cormer and D.L. Stevens," Inter-networking with TCP-IP: Design, Implementation and Internals", Vol. Il, Prentice Hall, 1990.
- D. BertsekasandR.Gallagar, "Data Networks", 2nd Edition, Prentice-Hall, 1992.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours. • The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The question paper will consist of three Sections: A, B and C. Sections A and B will have four questions each from the respective section Of the syllabus and will carry 12 marks for each question. Section C will consist of 11 short answer type questions covering the entire syllabus uniformly and will carry a total of 22 marks.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

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MITM2 105L : Programming Lab-V

Maximum Marks: 100* **Max. Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical sessions to be conducted: 60-70**

This laboratory course will mainly comprise of exercise based on subject MITM2 101T

*Maximum Marks for Continuous Assessment: 30
Maximum Marks for External Examination: 70

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MITM2 106L : Programming Lab-VI

Maximum Marks: 100* **Max. Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical sessions to be conducted: 60-70**

This laboratory course will mainly comprise of exercise based on subject MITM2 102T

*Maximum Marks for Continuous Assessment: 30
Maximum Marks for University Examination: 70

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MITM2 201T: Algorithm Design and Analysis

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 40-45**

Course Objective: The objective of this course is to introduce the concept of algorithm development, programming and program validation. It includes a special emphasis on the analysis of various algorithms. Upon completion of this course, students will:

- Be familiar with basic of complexity of algorithms
- Be familiar with development of sorting techniques
- Master the concepts of dynamic programming and hashing technique

Course Content

SECTION A

Introduction to algorithm analysis: Introduction to algorithms, Algorithm Specifications, performance analysis, case study on analysis of algorithms.
Divide and conquer technique of problem solving: Quick sort and Merge Sort Algorithms and their Performance Analysis.
Greedy algorithms: General Method, Case Study based on Greedy Algorithm (Knapsack Problem, Single source shortest paths, transitive closure and APSP problem)

SECTION B

Dynamic Programming: General Method, Multistage graphs, All Pair Shortest Paths, Optimal Binary Search Trees, String Editing.
Hashing: Introduction to hash table, hash function, resolving collision by chaining and open addressing, deleting items from a hash table.
Intractable Problems: Nondeterministic Algorithms, NP Hard and NP complete Problems, NP Hard Graph Problem (Travelling Salesman problem), NP Hard Scheduling Problems (Job Shop Scheduling)

Pedagogy:

The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:

Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- Mark A. Weiss: Data Structures and Algorithm Analysis in C-H-, Pearson Education.
- Goodman S.E. and Hedeniemi:lntroduction to the Design and Analysis and Algorithms, TMH Publications.
- Sara Baose, GelderA.V. :Computer Algorithms: Introduction to Design and Analysis, Pearson Education.

- Ellis Horowitz,SartajSahni and SanguthevarRajasekaran: Fundamentals of Computer Algorithms, Universities Press.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours. The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The question paper will consist of three Sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks for each question. Section C will consist of 11 short answer type questions covering the entire syllabus uniformly and will carry a total of 22 marks.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

MITM2 202T: Computer Graphics

Maximum Marks: 70 **Maximum Time: 3 Hrs.**

Minimum Pass Marks: 40% **Lectures to be delivered: 40-45**

Course Objective: The objective of this course is to familiarize the students the concept of graphics and its significance in various applications. It includes implementation of a algorithms for scan conversion and 2-D transformations. Upon completion of this course, students will:

- Be familiar with components of an interactive graphic system
- Be familiar with working of graphics monitors
- Be able to perform different 2-D and 3-D transformations on objects
- Be able to implement scan conversion algorithms for line, circle and ellipse

Course Content

SECTION A

Introduction to computer Graphics systems, components of interactive computer graphics system, Application areas.
Video Display Devices: Refresh cathode -ray tube, raster scan displays, random scan displays, colour CRT-monitors, direct view storage tube, flat-panel displays, 3-D viewing devices, virtual reality, raster scan systems, random scan systems, graphics monitors and workstations.
Scan conversion algorithms for line, circle end ellipse, Bresenham's algorithms, area filling techniques, character generation.

SECTION B

2-dimensional Graphics: Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, affine transformation, Two dimensional viewing transformation and clipping (line, polygon and text).
3-dimensional Graphics: Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, Mathematics of Projections (parallel & perspective). 3-D viewing transformations and clipping.
Hidden line and surface elimination algorithms, z-buffer, scan-line, sub-division, Painter's algorithm.

Pedagogy:

The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:

Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- D. Hearn and M.P. Baker, "Computer Graphics", PHI New Delhi; Second Edition, 1995.
- J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes, Phillips, "Introduction to Computer Graphics", AddisonWesley Publishing company, N.Y.; Second Edition, 1994.
- R.A. Plastock and G. Kalley, "Computer Graphics", McGraw Hill, 1986.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance.
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours. The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The question paper will consist of three Sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks for each question. Section C will consist of 11 short answer type questions covering the entire syllabus uniformly and will carry a total of 22 marks.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

MITM2203T: Artificial Intelligence

Maximum Marks: 70 **Maximum Time: 3 Hrs.**

Minimum Pass Marks: 40% **Lectures to be delivered: 40-45**

Course Objective: The objective of the course is to familiarize the students with the knowledge of Al and its applications in various domains. It includes special emphasis on data science and its exploration. Upon completion of this course, students will:

- Be familiar with basic of knowledge representation, reasoning and planning
- Be familiar with Al applications in different domains
- Understand the concepts of Data visualization, exploration, representation and transformation

Course Content

SECTION A

Introduction to Artificial Intelligence: Definitions of Al, Intelligent Agents, Problem solving. Knowledge, Reasoning and Planning: Logical Agents, Classical Planning, Knowledge Representation and Reasoning.

Learning: Learning from examples, Knowledge in learning.

Communicating, Perceiving and Acting: Communication, Natural Language Processing, Perception, Computer Vision, Robotics.

Al Applications (General): Speech Recognition, Image Recognition, Natural Language Processing, Autonomous Transportation. Natural Language understanding, Recognizing objects and describing images, Dimensionality reduction, feature selection and feature extraction.

Al Applications (Specific): Virtual Personal Assistants/ Chatbots, Gaming, Smart Cars, Drones, Fraud Detection, Software Testing and Development, Business, Health Care, Education, Finance.

SECTION B

Introduction to Data Science: Data Science-a discipline, Landscape-Data to Data science, Data Growth-issues and challenges, data science process. Foundations of data science.

Data Exploration and Preparation: Structured vs unstructured data, Quantitative vs qualitative data. Four levels of data — nominal, ordinal, interval, ration. Messy data, Anomalies and artifacts in datasets. Cleaning data.

Data Representation and Transformation: Forms of data-tabular, text data, graph-based data. Modern databases- text files, spreadsheets, SQL databases, NoSQL databases, distributed databases, live data streams.

Representation of data of special types-acoustic, image, sensor and network data.

Computing with Data: Overview of various tools

Data Modeling: Basics of Generative modeling and Predictive modeling.

Data Visualization and Presentation: Charts-histograms, scatter plots, time series plots etc. Graphs,

3D Visualization and Presentation

Applications of Data Science in Business, Insurance, Energy, Health care, Biotechnology, Manufacturing, Utilities, Telecommunication, Travel, Governance, Gaming, Pharmaceuticals, Geospatial analytics and modelling

Pedagogy:

The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:

Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- S.J. Russell and P.Norving: "Artificial Intelligence: A Modern Approach", Pearson.
- Sinan Ozdemir, "Principles of Data Science", Packt Publishing.
- E.Rich, K.Knight, S.B. Nair: "Artificial Intelligence", Tata McGraw Hill Ed Pvt Ltd.
- Artificial Intelligence and Soft Computing for Beginners, AninditaDas (Bhattacharjee), Shroff Publications and Distributors.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours. The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The question paper will consist of three Sections: A, B and C. Sections A and B will have four questions each from the respective section of the syllabus and will carry 12 marks for each question. Section C will consist of 11 short answer type questions covering the entire syllabus uniformly and will carry a total of 22 marks.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

MITM2204T•. Minor Project

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 35-45**

This course will mainly comprise of developing a minor project using any of the different technologies learnt during the course.

- **There will not be any marks for internal assessment of the student.**

Guidelines for the Minor Project:

1. The students are required to undertake a minor software development project during the fourth semester of M.Sc(IT) course along with the regular classes. The project should be done preferably using the programming languages taught in the earlier semesters of the course.
2. The students will complete systems analysis, design, coding and testing of the software project assigned to them by the teacher. The students are required to complete the minor project in the Department given by the concerned teacher of the Department. No outside training/ project work will be allowed.
3. Joint projects may be allowed and joint project reports will also be accepted, with the permission of the teacher concerned. However, the students should highlight their individual contributions in a joint project. The quantum of individual contribution of particular students in joint projects should be such which can be accepted as equivalent to individual minor project. The same must also be reflected in joint reports.
4. Each student should submit one project report of his/her project to the teacher concerned, as per the format decided by the Department.
5. The students are required to give live demo of the software developed by them and there will be viva-voce of the students during the end-semester practical examination.
6. There will not be any marks for internal assessment of the student. The external teacher along with the internal teacher will evaluate the student and marks out of 100 will be awarded to each student according to the following marks distribution.

Project Report	25
Working Demonstration	30
Presentation	25
Viva Voce	20

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MITM2 205L: Programming Lab-VII

Maximum Marks: 100* **Max. Time: 3 Hrs.**

Minimum Pass Marks: 40% **Practical sessions to be conducted:60-70**

This laboratory course will mainly comprise of exercise based on subject MITM2201 T.

*Maximum Marks for Continuous Assessment: 30

Maximum Marks for External Examination:70

L T PC

MITM2 206L: Programming Lab-VIII

Maximum Marks: 100* **Max. Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical sessions to be conducted:60-70**

This laboratory course will mainly comprise of exercise based on subject MITM2202T.

*Maximum Marks for Continuous Assessment: 30

Maximum Marks for External Examination:70