ORDINANCES,

OUTLINES OF TESTS,

SYLLABI AND COURSES OF READINGS

FOR

M.Sc. (IT) FIRST YEAR (SEMESTER SYSTEM)

(Programme code: **MITSSD**)

SEMESTER 1 & 11

(Session 2024-2025)

DEPARTMENT OF COMPUTER SCIENCE,

SHRI SANATAN DHARAM GIRLS' COLLEGE, BATHINDA,

An Autonomous College

Re-Accredited 'A' Grade by NAAC

(Under aegis of SSD Sabha (regd.), Bathinda)

ORDINANCES OF

MASTER OF SCIENCE (I.T.)

UNDER

DEPARTMENT OF COMPUTER SCIENCE

Notwithstanding the integrated nature of a course spread over more than one semester, the ordinances in force at the time, a student joins a course shall hold good only for the examination held during or at the end of the semester. Nothing in these ordinances shall be deemed debar the College from amending the ordinances subsequently and the amended ordinances, if any, shall apply to all the students whether old or new.

1. Structure and Duration or the Programme:

i. The course for the Degree of Master of Science shall be spread over two academic years to be called M.Sc. Part-1 and M.Sc. Part-11. Each part shall consist of two semesters. The examination for the first semester and third semester shall be held in the month of December/ January and the examination for the second semester and fourth semester shall be held in the month of April May or other dates as may be fixed by the College.

ii. The programme of instruction will consist of:

- Core theory courses
- Laboratory courses

The nomenclature, modalities and other details of the core theory courses and the laboratory work will be as decided by the concerned academic bodies of the College.

iii The outlines of tests and syllabi and the evaluation shell be such as prescribed by the concerned Board of Studies from time to time.

iv The medium of instructions as well as examination shall be English.

2. Number of Seats:

Total number of seats in course shall be as decided by College authorities from time to time. The distribution of seats and other additional seats will be as per college norms as decided upon from time to time.

3. Eligibility of Admission:

(a)The admission to M.SC(IT) two year degree course shall be open to candidates who are eligible under the following conditions:

(i) BCA with 50% marks or PGDCA with 50% marks (with 3-years graduation) or 3-year graduation degree with 50% marks with one of the following major elective subject in each year: Computer Sciences/Information Technology/Computer Application or any equivalent subject.

(b) The admission to M.SC(IT) Lateral Entry (LE) one year course shall be open to candidates who have passed PGDCA with 50% marks (with 3-years graduation). Candidates shall follow the syllabi of M.SC(IT) part II.

4. Basis for Admission:

Admission to two-year Degree course will be made purely on the basis of the merit of the qualifying examination and/or entrance test to be determined by Board of Studies authorities.

5. Attendance:

Attendance is taken compulsorily by the teacher.

A candidate admitted to the Degree Course must fulfil the following requirements:

i. Has been on the rolls of the Department throughout the academic terms preceding the semester examination.

ii. Every candidate will be required to attend a minimum of 75% of the delivered number of periods in each paper. For Teaching Seminars' Tutorials and Lab Practical* period of one hour's duration shall be counted as one attendance.

iii. For late admission, the counting of lectures will be considered from the date of deposit of fee.

iv. In case of students, whose names are struck off on account of non-payment of fee, their periods, for the time they were not on the rolls, shall not be accounted for.

v. The shortage in the attendance of lectures by the candidate will be condoned as per College rules applicable from time to time.

6. Schedule for Examination Fees:

Candidates shall submit their Examination forms for admission to the examination duly countersigned by the Head of the Department/ Principal of the College. The candidate will be required to pay examination fees as per the schedule prescribed by the College from time to time.

7. Minimum Requirements to Continue the Programme:

i. (a) In each theory paper and laboratory practical paper, 30% of the total marks are assigned to the continuous assessment and 70% marks to the External examination. The minimum number of marks required to pass each theory and practical examination shall be 40% in each paper in aggregate, provided the candidate gets minimum 40% marks individually in the continuous assessment as well as minimum marks individually in the external examination.

(b) When a candidate has failed or is placed under 'reappear' in the External examination but passes in the continuous assessment, the marks of continuous assessment shall be carried forward for subsequent examinations. if a candidate hasfailed or is placed under 'reappear' in the continuous assessment, but passes in the External examination, the marks in the External examination shall be carried forward for subsequent examinations. in that case, the candidate will have to improve his/her score in the continuous assessment by taking only a single test covering entire syllabus for that subject. Which will Consist Of total marks assigned to Internal assessment for that paper (theory or practical). Such candidate will have to inform the Department in writing and in turn the test Will be scheduled by the Department. The grace marks Shall be allowed to the student as per general ordinances of College.

ii. (a) There will be no condition of passing papers for promotion from odd semester to even semester in an academic session.

(b) To qualify for admission to 2nd year for the Course, the Candidate must have passed

50% of total papers of the two semesters of the Ist year taken together.

(c) A candidate placed under re-appear in any paper, will be allowed two chances to clear the reappear which should be availed within consecutive two years/chances, i.e. to pass in a paper, the candidate will have a total of three chances, one as regular student and two as a reappear candidate.

iii The examination the reappear papers of odd semester be held with regular examination of the odd semester and reappear examination of even semester will be held with regular examination of even semester. But if a candidate is placed under reappear in the last semester of the course. he/she will be provided chance to pass the reappear with the examination of the next semester, provided his/her reappear of lower semester does not go beyond next semester, provided for the award of the M.Sc. degree he/she shall have to qualify in all papers prescribed for the M.Sc. course within a period of four years from the date he/she joined the course. Option of re-evaluation shall be available to the candidates as per the general ordinances of the College.

8. System of Tests and Weightage:

The system of tests will comprise of Internal assessment and External examination for theory papers and laboratory papers for part 1 and part 2 for two-year Degree course. The following will be the criteria of weightage for each theory paper/ practical lab.

Continuous Assessment (Theory Papers)	**Continuous Assessment (Practical Lab)**
1. Two test will be conducted during the semester. Both the tests will be considered for assessment: 60% of the marks allotted for continuous assessment 2. Assignments/Quizzes: 20% of the marks allotted for continuous assessment. 3. Attendance: 10% of the marks allotted for continuous assessment. 4. Class Participation and behaviour: 10% of the marks allotted for continuous assessment.	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. Lab Assignments: 30% of the marks allotted for continuous assessment. 3. Attendance: 10% of the marks allotted for continuous assessment.
External examination theory papers	**External examination practical labs**
Maximum marks for end semester theory examination:70. End semester examination for theory papers will be of 3 hours duration. The question paper will consist of three Sections: A,B and C. Section A and B will have four questions each from the respective section of the syllabus and each portion will carry 12 marks. Section C will consist of 11 short answer type questions of two marks each covering the entire syllabus uniformly and will carry 22 marks in all. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.	Maximum marks for end semester practical examination:70. The evaluation will be done jointly by the team of internal and external examiners. The examiners will give due weightage to logic development/program execution. Lab records and viva-voce of the student while awarding marks to the student during end semester final practical examination.

9. Declaration of Results:

Three weeks after the termination of examination or as soon thereafter as possible the Registrar shall publish a list of candidates who have passed the examination. Each successful candidates in Part-I examination shall receive a certificate of having passed that examination. A list of successful candidates in Part-II examination be arranged in three Divisions according to Ordinance heading no 10 and the division obtained by the candidate will be stated in his certificate

I0. Award for Division and Distinction:

(a) Successful candidate who obtain 60% or more of the aggregate marks in Part-1 & Part-II examination taken together shall be placed in the first division. Those who obtain 50% or more but less than 60% shall be placed in the second division and all below 50% shall be placed in the third division. Successful candidates who obtain 75% marks or more in aggregate in a single attempt without any reappear in any subject/paper shall be placed in
First division with distinction.

(b) A candidate who has passed M.Sc. examination from this College shall have two chances within a period of two years after passing the examination to improve division 55% marks. Improvement shall be allowed in not more than 50% of total theory papers offered in Part-1 & Part-II examination. However, previous marks of Practical/ Project will be carried forward in the paper(s) in which he appear both in annual & or supplementary examinations.

SYLLABI, OUTLINES OF PAPERS AND TESTS FOR

	M.Sc. (IT) Semester I (Programme code MITSSD) Session 2024-2025			
Code No.	**Title of Paper**	**Credits**	**External Exam. Marks**	**Int. Ass. Marks**
MIT11IT	Introduction to Information Technology and E-Commerce	6	70	30
MIT112T	Computer Programming Using C	6	70	30
MIT113T	Web Technology	6	70	30
MIT114T	Mathematical Foundation of Computer Science	6	70	30
MIT112P	Programming Lab - I (Based on MIT112T)	4	70	30
MIT113P	Programming Lab-II (Based on MIT113T)	4	70	30
	M.Sc. (IT) Semester 11 (Programme code MITSSD) Session 2024-2025			
Code No.	**Title of Paper**	**Credits**	**External Exam. Marks**	**Int. Ass. Marks**
MIT121T	Database Management System	6	70	30
MIT122T	Programming with Python	6	70	30
MIT123T	Operating System	6	70	30
MIT124T	Computer Organization and Architecture	6	70	30
MIT121P	Programming Lab — Ill (Based on MIT121T)	4	70	30
MIT122P	Programming Lab — IV (Based on MIT122T)	4	70	30

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	Assignment/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,

MIT111T: Introduction to Information Technology and E-Commerce

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

Course Objective: This course is meant to prepare students for work in industry in the information processing fields as well as prepare students for business and computer-related Courses. On completion of this course, the students will be able to:

- Have basic knowledge of computer hardware and software;
- Understand business areas to which computers may be applied;
- Provide an introduction to business organisation and information systems;
- Develop the skills in communication, verbal and written, which play an important part in business computing and information processing;

Course Content

SECTION A

Computer Fundamentals: Block structure of a computer. characteristics of computers, problem solving with computers, generations of computers, Classification of computers on the basis of capacity, purpose, and generation.
Number System: Decimal. hexadecimal, and octal systems, conversion from one system to the other.
Binary Arithmetic.: Addition. subtraction and multiplication.
Memory types: Magnetic core. RAM. ROM, Secondary, Cache, Input and Output Units: functional characteristics; Overview of storage devices: floppy disk, hard disk, compact disk, tape; Printers: Impact. non-impact. Graphical I/O devices: Light pen, joystick, Mouse, Touch screen; OCR. OMR, MICR

SECTION B

Computer languages: Machine language, assembly language, high level language, 4GL. Compiler, Interpreter, Assembler. System Software. Application Software.
Data Network and Communication: Network types, Transmission Modes. Network topologies,
Internet: Evolution of Internet. E-mail WWW. FTP, TELNET, IRC, Video Conferencing.
E-Commerce: The scope of E commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, Benefits and limitations of E-Commerce, Produce a generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E Commerce Architecture.

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:

- P. K. Sinha and P. Sinha, "Foundation of Computers ", BPB.
- D. H. Sanders, "Computers Today", McGraw Hill.
- SatishJain, "Information Technology". BPB.
- David Cyganski, John A. Orr, "Information Technology Inside and Outside" Pearson Education.
- V. Rajaraman. "Fundamentals Of Computers" Prentice Hall of India.
- B. Ram, "Computer Fundamentals", Wiley.
- Elias. M, Awad, " Electronic Commerce". Prentice-Hall of India Pvt Ltd.
- Ravi Kalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison Wesley .

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 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.

MIT112T: Computer 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 programming using 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.

Course Content

SECTION A

Problem Solving with Computers. c character set, identifier, constants, variables, rules for defining variables, Data types, operators: arithmetic, relational, logical, comma, conditional, assignment, arithmetic expressions, input and output statements, assignment statements.

Decision statement: if, if else, nested if, switch statement, break statement, continue statement, go to statement.
Loops and control statements: While loop. for loop and do-while loop, nested loops.
Arrays: one dimensional array. multi-dimensional arrays, array initialization.

SECTION B

Pointers: Pointer data type, pointers and arrays, pointers and functions.
Functions: definition, declaration, function prototype, types of functions, call by value, call by reference, recursion, processing character strings.

Structures: Using structures, arrays of structures and arrays in structures, union
Files in C: Sequential files, random access files, Unformatted files, Text files, binary files.

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 ease.

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:

- E, Balagurusamy, "Programming in C", Tata McGraw Hill.
- Kamthane, "Programming with ANSI and Turbo C", Pearson Education
- Rajaraman, V, "Fundamentals of Computers", PHI
- Kanetkar. "Let Us C", BPB Publications.

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 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.

MIT113T: Web Technology

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 the features of web technology and its significance in developing web-based applications. Students will be able to learn and understand the concepts of web programming.
On completion of this course. the students will be able to

- Understand the basics of HTML for creation of web pages
- Create forms for interactive applications
- Integrate HTML and CSS
- Understand the design of applets

Course Content

SECTION A

Internet Basics: Networks, Protocols, TCP/IP, Internet Addresses, Ports. Sockets, Name Resolution, Firewalls, Protocol Tunneling, Proxy Servers, Internet Standards. governing the web HTTP, MIME, Inside URLs, Web applications, Overview of clients/servers web communication, comparison of web servers, Common Gateway Interface CGI.
Web Page Designing: introduction to markup languages; HTML: list, table, images, frames, forms, pages style sheets CSS;XML: DTD, XML Namespaces, XML schemes, Presenting XML with CSS and XSLT, XML-DOM. What is XHTML?

SECTION B

Client Side Scripting: Java script: Introduction, documents, forms, statements, functions, objects; Event and event handling; Browsers and the DOM, JQuery: Syntax, Selectors. Events and AJAX methods.
Server Side Programming: PHP: Introduction, requirements, PHP syntax, data type, variables. strings, operators, if-else, control structure, switch, array. function, file handling, form, sending email, file upload, session/state management, error and exception, PHP Database for dynamic Web pages.
Introduction to Servlets: Servlet Basic Servlet Structure. Servlet Lifecycle, Servlet APIs. Writing thread safe Servlets. Setting Cookies and Session Management with Servlet API.

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 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:

- Jeffrey C Jackson, "Web Technology — A computer Science perspective", Peterson Education, 2007.
- Chris Bates. "Web Programming — Building Internet Applications, "Wiley India, 2006.
- Xavier, C. " Web Technology and Design", New Age International
- Ivan Bayross," HTML, DHTML, Java script, Perl & CGI", BPB Publication.
- Ramesh Bangia, "Internet and Web Design", New Age International
- Bhave, "Programming with Java", Pearson Education
- Ullman,"PHP för the Web: Visual QuickStart Guide", Pearson Education
- Deitel, "Java for programmers", Pearson Education
- Dustin R. Callaway, "Inside Servlets" 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 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.

MlT114T : Mathematical Foundation of Computer Science

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

Course Objective: The purpose of this course is to provide a clear understanding of the concepts that underlying fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science. It emphasizes mathematical definitions and proofs as well as applicable method. On completion of this course. the students will be able to

- Be familiar with the basic terminology of functions, relations. and sets and demonstrate knowledge of their associated operations.
- Master to solve advanced mathematical problems. apply various methods of mathematical proof, and communicate solutions in writing
- Master to comprehend advanced mathematics, and present the material orally and in writing
- Utilize the knowledge of computing and mathematics appropriate to the discipline.
- Evaluate mathematical principles and logic design

Course Content

SECTION A

Logic: Propositions, Implications, Precedence of Logical Operators, translating English Sentences, System Specifications. Propositional Equivalences. Predicates and Quantifiers, Nested Quantifiers, Order of Quantifiers. Sets. Power Set. Set Operations. Functions. One-to-One Functions and Onto Functions. Inverse and Composition of Functions, Floor Function, Ceiling Function.

Algorithms, Searching Algorithms. Sorting, Growth of Functions, Big-O Notation, Big-Omega and Big-Theta Notation, Complexity of Algorithms. Mathematical Induction, The Basic of counting, The Pigeonhole Principle.

SECTION B

Recurrence Relations. solving recurrence relations. Divide and Conquer Algorithms and Recurrence Relations, Generating functions for sorting recurrence relations. Inclusion-Exclusion.
Relations and their properties. n-any relations and their applications. representing relations, closure of relation, equivalence relations. partial ordering.

Graphs: Introduction, terminology. Representing Graphs and Graph Isomorphism. Connectivity, Euler and Hamiltonian Paths. Shortest Path Problems, Planar Graphs.

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 ease 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:

- Rosen, K.H: Discrete Mathematics and Its Applications, TMH Publications.
- Discrete and Combinational Mathematics, Ralph P. Grimaldi, Pearson Education.
- Elements of Discrete Mathematics, C. L. Luie, TMH Publications.
- Discrete Mathematics, Richard Johnson, Baugh, Pearson Education.
- Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay& R. P. Manohar, MGH Publications,
- Discrete Mathematical Structures, B.Kotman, R.C. Busbay, S.Ross, PHI.

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 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.

MIT112P: Programming Lab-I

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 MIT112T (Computer Programming Using C)

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

MIT113P: Programming Lab-Il

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 MIT113T (Web Technology)

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

MIT121T: Database Management System

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 design and creation of relational databases. On completion of this course. the students will be able to

- Gain the knowledge and understanding of Database analysis and design.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Gain the knowledge of the processes of Database Development and Administration using SQL and PL/SQL.
- Understand the functional dependencies and design of the database
- Understand the concept of Transaction and Query processing

Course Content

SECTION A

Introduction: Database Approach. Characteristics of a Database Approach, Database System Environment. Roles in Database Environment: Database Administrators, Database Designers, End Users, Application Developers, Database Management Systems: Definition, Characteristics, Advantages of Using DBMS Approach, Classification of DBMSs Architecture: Data Models. Database Schema and Instance, Three Schema Architecture, Data Independence — Physical and Logical data Independence. Database Conceptual Modelling by E-R model: Concepts, Entities and Entity Sets, Attributes, Mapping Constraints, E-R Diagram, Weak Entity Sets, Strong Entity Sets,
Relational Data Model: Concepts and Terminology. Constraints: Integrity Constraints, Entity and Referential Integrity constraints. Keys: Super Keys, Candidate Keys, Primary Keys, Secondary Keys and Foreign Keys. Relational Algebra: Basic Operations, Additional Operations, Example Queries. Relational Calculus: Tuple and Domain Relational Calculus. Example Queries.
Database Design: Problems of Bad Database Design. Normalization: Functional Dependency, Full Functional Dependency. Partial Dependency, Transitive Dependency, Normal Forms— INF, 2NF, 3NF, BCNF, Multi-valued Dependency, Join Dependency and Higher Normal Forms- 4NF, 5NF.

SECTION B

Transaction Processing Systems: Batch, On-line, Real time. Transaction ACID Properties. Database Protection: Security Issues. Discretionary Access Control-Granting and Revoking Privileges. Database Concurrency: Problems Of Concurrent Databases, Serializability and Recoverability, Concurrency Control Methods-Two Phase Locking, Time Stamping, Database Recovery: Recovery Concepts, Recovery Techniques-Deferred Update, Immediate Update, Shadow Paging, Overview of the following: Data Mining, Data Warehousing and OLAP, Mobile Databases, Multimedia Databases. Temporal Database, Spatial Database. Technical Introduction to Oracle: Structure of Oracle, Background Processes. Data Objects: Tables, Views. Synonyms, Indexes. Snapshots, Sequences, Creation and Manipulation of Data Objects. SQL Queries. Applying Integrity Constraints. Functions, Procedures and Packages. Using Cursors and Triggers.

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 in the 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:

- ElmasryNavathe, "Fundamentals of Database System". Pearson Education.
- Oracle SQL Complete Reference". Tata McGraw-Hill,
- T. Connolly, C Begg, "Database Systems". Pearson Education.
- Jeffrey D. Ullman, "Principles of Database Systems". Galgotia Publications.
- Henry F. Korth. A. Silberschhatz, "Database Concepts," Tata McGraw Hill.
- C.I. Date, "An Introduction to Database Systems". Pearson Education.
- Naveen Parkash, "Introduction to Database Management", Tata McGraw Hill.
- Bobrowski, "Client Server Architecture and Introduction to Oracle 7".

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 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.

MIT122T: Programming with Python

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 and Understand programming using python concepts for writing good programs. On completion of this course, the students will be able to

- Understand the basics of Python programming language
- Use different data types and control structures
- Explore the use Of Python functions
- Create programs to access files in Python

Course Content

SECTION A

Introduction to Python: History of Python. Strength and Weakness, Different Versions. Installing Python, Setting up in local environment. IDLE, Executing from file, command line from interactive mode, Python Identifiers and reserved keywords.

Python syntax: Variables and Variables type. Data types. Data Types Conversion. Operators (Arithmetic, Comparison. Assignment, Bitwise, Logical, Membership, Identity), Operators Precedence, Python Decision making (if, el if, else, nested if). Python loops (while, for, nested loops). Break and continue statements.

Python Collections or Sequence: Sequence introduction, Number operations, String Operations, List, Tuple, Dictionary. Set.

Python Functions: Function introduction. User defined functions. Functions with parameters. Keywords and optional parameters, Scope of variables (Global and Local), Anonymous function — Lambda, In-build function, List comprehension.

SECTION B

Python Modules: Modules. Standard Modules (Sys, Math, Time), Import Statement, from statement. Dir () functions.
Python File handling: Sending Output to ST DOU T Using the print() Method, Reading Input with the input() Method, Creating File Objects with the open() Method. Controlling File Access Modes, Working with File Object Attributes, Closing File Objects with the close() Method. Reading and Writing to File Objects with read() and write(), Using File Processing Functions from the OS Module.

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 work in groups 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:

- Paul Gries. Jennifer Campbell, Jason Montojo, Practical Programming- An Introduction to Computer Science Using Python 3.6. Shroff Publications and Distributors
- John V Guttag, Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013
- Robert Sedgewick, Kevin Wayne, Robert Dondero. —Introduction to Programming in Python: An Interdisciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd, Exploring Python, Me-Graw Hill Education (India) Private Ltd.,2015.
- Paul Gries, Jennifer Campbell and Jason Montojo, Practical Programming: An Introduction to Computer Science using Python 3. Second edition, Pragmatic Programmers. LLC, 2013.
- Rossum, Introduction To Python ,Shroff Publications and Distributors
- Downey, Think Python 2/ED, Shroff Publications and Distributors
- Lutz, Learning Python, 5/ED. Shroff Publications and Distributors
- Campbell, Practical Programming: An Introduction to Computer Science Using Python, 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 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.

MIT122T: Operating System

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 the unifying concept of the operating system as a collection of cooperating sequential processes. On completion of this course, the students will be able to

- Learn the mechanisms of OS to handle processes and threads and their communication. Use different data types, operators and console I/O function in a computer program,
- Learn the mechanisms involved in memory management in contemporary OS.
- Gain knowledge on distributed operating system concepts that includes architecture, deadlock detection algorithms and agreement protocols.
- Understand different approaches to memory management.
- Understand the structure and organization of the file system

Course Content

SECTION A

Introduction to Operating System Definition. Types of Operating system. Operating system components, Operating system services.

Process Management: Process concept, Process vs. threads, CPU scheduling criteria, Scheduling algorithms, and Algorithm evaluation

Deadlocks: Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, avoidance, detection and recovery.

File Management: Files concept, Access methods. directory structure, Allocation methods — contiguous. linked and indexed.

SECTION B

Memory Management: Background, logical vs. physical address space, Contiguous memory management schemes using Multi partition memory allocation using fixed number of tasks and variable number of tasks, paging and segmentation.
Virtual Memory management: Concept. demand paging and demand segmentation.
Mass storage structure: Disk structure. disk scheduling algorithms.
Protection: Goals of protection. Access matrix.
Security: Security problem, Program threats, system threats, User Authentication, Cryptography.

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 ease 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 up to four to prepare a brief write-up due before the start of each class covering the ease 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:

Text Book:

- Silberschatz and Galvin, "Operating System Concepts". Addison-Wesley publishing.
- Nutt Gary, "Operating Systems" Addison Wesley Publication.
- Hansen, Per Brinch, "Operating System Principles". Prentice-Hall.
- N. Haberman, "Introduction to Operating System Design", Galgotia Publications.
- Hansen. Per Brich, "The Architecture of Concurrent Programs", PHI.
- Shaw, "Logical Design of Operating System", PHI.

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 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 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.

MIT124T: Computer Organization and Architecture

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

Course Objective: This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. On completion of this course, the students will be able to

- Understand the basics of computer hardware and how software interacts with computer hardware
- Analyze and evaluate computer performance
- Understand how computers represent and manipulate data
- Understand computer arithmetic and convert between different number systems
- Assemble a simple computer with hardware design including data format, instruction format, instruction set, addressing modes, bus structure. input/output, memory. Arithmetic/Logic unit. control unit, and data, instruction and address flow
- Use Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits

Course Content

SECTION A

Concepts about bits. bytes and word, Number System: Number conversions, Arithmetic operations, Integer and floating-point representation. Character codes (ASCII, EBCDIC, BCD. 8421. Excess-3). Boolean expression - Minimization of Boolean expressions - Minterm - Maxterm - Sum of Products (SOP) - Product of Sums (POS) - Karnaugh map Minimization - Don't care conditions - Quine-McCluskey method of minimization.

Basic Gates. Combinational logic design: half-adder, full-adder, half-subtractor, full subtractor. binary parallel adder, Multiplexer/ Demultiplexer. decoder. encoder.
Sequential circuits: concept. flip-flops (D, RS, JK, JK-Master-Slave, T), counters (Ripple, Asynchronous, Synchronous, Decade. Mod-5). Instruction codes, Instruction formats, Instruction cycle, Addressing modes,

SECTION B

Register Transfer Language. Arithmetic, Logic and Shift micro-operations, Arithmetic Logic Shift unit,
Control Memory: Design of' control unit, Microprogrammed and Hardwired control unit (overview only), Features of RISC and CISC.

Memory organization: Concepts of semiconductor memory, CPU- memory interaction, organization Of memory modules. Cache memory and related mapping and replacement policies, Virtual memory.
I/O organization: I/O interface, Modes of data transfer: Programmed I/O. Interrupt initiated I/O, DMA.

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 up to four to prepare a brief write-up due before the start of each class covering the ease 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:

- M. M. Mano, "Computer System Architecture", Prentice-Hall of India.
- A.S. Tanenbaum "Structured Computer Organisation", Prentice- Hall of India.
- William Stallings, "Computer Organization and Architecture". 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 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.

MIT121P: Programming Lab-Ill

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 exercises based on subject MIT121T (Data Base Management System)

*Maximum Marks for Continuous Assessment: 30

Maximum Marks for External Examination: 70

MIT122P: Programming Lab-IV

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 exercises based on subject MIT122T (Programming Using Python)

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

OUTLINES OF TESTS, SYLLABI AND COURSES OF READING

FOR

M.Sc. (IT) SECOND YEAR (SEMESTER SYSTEM)

M. Sc. (IT) / M.Sc. (IT) (LE)
(Programme Code: **MITSSD**)

(Semester 111 & IV)

(Session: 2024-25)

DEPARTMENT OF COMPUTER SCIENCE,
SHRI SANATAN DHARAM GIRLS' COLLEGE, BATHINDA,

An Autonomous College
Re-Accredited 'A' Grade by NAAC
(Under aegis of SSD Sabha (regd.), Bathinda)

SYLLABI, OULINES OF PAPERS AND TESTS

M.Sc. (IT) / M.Sc. (IT) (LE) Semester 111
(Programme Code MITSSD)
(Session: 2024-25)

Code No.	Title of the Paper	Credits	Univ. Exam. Marks	Int. Ass. Marks	Time Total Allowed
MIT231T	Object Oriented Programming using C++	6	70	30	3 Hrs
MIT232T	Data and File Structure	6	70	30	3 Hrs
MIT233T	Software Engineering	6	70	30	3 Hrs
MIT234T	Computer Networks	6	70	30	3 Hrs
MIT231P	Programming Lab-V (Based on MIT231T)	4	70	30	3 Hrs
MIT232P	Programming Lab-VI (Based on MIT232T)	4	70	30	3 Hrs

M.Sc. (IT) Semester IV
(Programme Code MITSSD)
(Session:2024-25)

Code No.	Title of the Paper	Credits	Univ. Exam. Marks	Int. Ass. Marks	Time Total Allowed
MIT241T	Algorithm Design and Analysis	6	70	30	3 Hrs
MIT242T	Computer Graphics	6	70	30	3 Hrs
MIT243T	Artificial Intelligence	6	70	30	3 Hrs
MIT244T	Minor Project	6	100		3 Hrs
MIT241P	Programming Lab-VII (Based on MIT241T)	4	70	30	3 Hrs
MIT242P	Programming Lab-VIII (Based on MIT242T)	4	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.

MIT231T: 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++ Programming Language", Addition- Wesley Publication Co.
- Stanley B. Lippman, Josee Lajoie, "C++ Primer", Pearson Education.
- E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw-Hill.

Scheme of Examination

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- 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.

MIT232T: 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, Applications 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.

MIT233T: 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 modelling, 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.

MIT234T: 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, 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. Bertsekas and R. 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.

MIT231P: 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 MIT231T (Object Oriented Programming using C++)

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

MIT232P: 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 MIT232T (Data and File Structure)

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

MIT241T: 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++, Pearson Education.

- Goodman S.E. and Hedeniemi: Introduction to the Design and Analysis and Algorithms, TMH Publications.
- Sara Baose, GelderA.V.: Computer Algorithms: Introduction to Design and Analysis, Pearson Education.
- Ellis Horowitz, Sartaj Sahni 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.

MIT242T: 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, R.L Phillips, "Introduction to Computer Graphics", Addison Wesley 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.

MIT243T: 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.

MIT244T: 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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MIT241P: 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 MIT241T (Algorithm Analysis and Design).

*Maximum Marks for Continuous Assessment: 30

Maximum Marks for External Examination:70

MIT242P: 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 MIT242T (Computer Graphics).

*Maximum Marks for Continuous Assessment: 30

Maximum Marks for External Examination:70