PUNJABI UNIVERSITY, PATIALA

OUTLINES OF TESTS, SYLLABI AND COURSES OF READINGS

FOR

M.Sc. (IT)
(SEMESTER SYSTEM)

FIRST YEAR (SEMESTER I & II)

(Sessions 2018-19 & 2019-20)

(As per RUSA Guidelines)

PUNJABI UNIVERSITY,
PATIALA 147002

SYLLABI, OUTLINES OF PAPERS AND TESTS FOR

M.Sc. (IT) Semester I Sessions 2018-19 & 2019-2020				
Code No.	**Title of Paper**	**Lectures per Week**	**Univ. Exam. Marks**	**Int. Ass. Marks**
MS-111	Introduction to Information Technology	5	70	30
MS-112	Computer Programming using C	5	70	30
MS-113	Computer Organization and Architecture	5	70	30
MS-114	Mathematical Foundation of Computer Science	5	70	30
MS-115	Operating Systems	5	70	30
MS-116	Programming Lab – I	8	70	30
M.Sc. (IT) Semester II Sessions 2018-19 & 2019-2020				
Code No.	**Title of Paper**	**Lectures per Week**	**Univ. Exam. Marks**	**Int. Ass. Marks**
MS-121	Object Oriented Programming Using C++	5	70	30
MS-122	Data and File Structures	5	70	30
MS-123	Visual Basic	5	70	30
MS-124	RDBMS and Oracle	5	70	30
MS-125	Programming Lab – II	8	70	30
MS-126	Programming Lab – III	8	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.

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MS-111 : Introduction to Information Technology

Maximum Marks: 70 | **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% | **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.
Operating system: Functions of an operating system, Batch, multi-programming, time sharing, multi-processor, Multi-tasking.
Data Network and Communication: Network types, Transmission Modes, Network topologies,
Internet: Evolution of Internet, E-mail WWW, FTP, TELNET, IRC, Video Conferencing.
Information Technology and Society : Applications of Information Technology in Railway, Airline, Banking, Insurance, Inventory Control, Hotel Management, Education, Mobile Phones, Information Kiosks, Weather Forecasting, Scientific Application,
E-Commerce: Meaning, its advantages & limitations, Types of E-Commerce.
Multimedia: Concepts, Components and Application, Entertainment Marketing.

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.

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 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-112 :Computer Programming using C

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% **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.
- 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

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 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:

- 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 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 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-113 :Computer Organization and Architecture

Maximum Marks: 70 | **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% | **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 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:

- 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 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 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-114 :Mathematical Foundation of Computer Science

Maximum Marks: 70 | **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% | **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 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:

- 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 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 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-115 :Operating Systems

Maximum Marks: 70 | **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% | **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 cs. threads, CPU scheduling criteria, Scheduling algorithms, and Algorithm evaluation
Deadlocks: Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, avoidance, detection and recovery.
File Management: File 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 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:

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 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 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-116 : Programming Lab-I

Maximum Marks: 100* **Max. Time: 3 Hrs.**
Minimum Pass Marks: 35% **Practical sessions to be conducted: 60-70**

This laboratory course will mainly comprise of exercises based on subject MS-112: Computer Programming Using C.

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

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MS-121 : Object Oriented Programming Using C++
Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% **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.
- BjarneStrautrup, "The C++ Programming Language", Addition- Wesley Publication Co.
- Stanley B. Lippman, JoseeLajoie, "C++ Primer", Pearson Education.
- E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw-Hill.

Scheme of Examination
- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance

- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

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

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MS-122 :Data and File Structures

Maximum Marks: 70 | **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% | **Lectures to be delivered: 45-55**

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

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

Course Content

SECTION A

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

SECTION B

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

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

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

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the

case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class
Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

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

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 30 marks shall be reserved for internal assessment and the remaining 70 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-123 : Visual Basic

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% **Lectures to be delivered: 45-55**

Course Objective: This course is designed to explore computing and to show students the art of computer programming using Visual BASIC.NET. The main emphasis of this course is on the fundamentals of structured design, development, testing, implementation, and documentation. On completion of this course, the students will be able to

- Design, create, build, and debug Visual Basic applications.
- Explore Visual Basic's Integrated Development Environment (IDE).
- Write and apply decision structures for determining different operations.
- Understand and identify the fundamental concepts of object-oriented programming.
- Perform tests, resolve defects and revise existing code.

Course Content

SECTION A

Introduction to Visual Basic: Creating User Interfaces with Windows Common Controls, Creating Menus for Programs, Advance Design Features, Working with Collections, Creating Classes in a Program, Working with Active Data Objects.

Working with forms, drawing with VB, Multiple document interface, basic Active X controls, advanced active X controls.
Extending the Capabilities of Visual Basic: - Declaring and using External Functions,
Creating ActiveX Control with Visual Basic
Communicating with Other Programs**:** Using ActiveX Server, Creating ActiveX Client Applications.

SECTION B

Integrating Visual Basic with the Internet: - Writing Internet Application with Visual Basic, Web Browsing objects, using document object, Active Server Pages, using web browser controls, using history objects.

Creating Database Applications: - Accessing Data with Data Control
Using visual data manager, validating data, selected data with SQL, advanced data bound controls, active data objects, ADO data objects.

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:

Text Book:

- Visual Basic 6: The Complete Reference, Noel Jerke, Osborne Publications.
- Mastering Visual basic 6.0 by BPB Publications
- Mastering Visual Basic 6.0 by Petroutsos.
- Visual Basic 6 Complete by Sybex.
- Mastering Database Programming with Visual Basic 6 by Petroutsos

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 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-124 : RDBMS and Oracle

Maximum Marks: 70 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 35% **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– 1NF, 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:

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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:

- Elmasry Navathe, "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.J. 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 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 35% in aggregate as well as a minimum of 35% 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 10.5 marks for each question. Section C will consist of 7-15 short answer type questions covering the entire syllabus uniformly and will carry a total of 28 marks.

Instructions for candidates

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

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MS-125 : Programming Lab-II

Maximum Marks: 100* **Max. Time: 3 Hrs.**
Minimum Pass Marks: 35% **Practical sessions to be conducted: 60-70**

This laboratory course will mainly comprise of exercise based on subject MS-121: Object Oriented Programming Using C++ and MS-122: Data & File Structures.

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

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MS-126 Programming Lab-III

Maximum Marks: 100* **Max. Time: 3 Hrs.**
Minimum Pass Marks: 35% **Practical sessions to be conducted: 60-70**

This laboratory course will mainly comprise of exercise based on subjects MS-123: Visual Basic and MS-124: RDBMS & Oracle.

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