Scheme & Syllabus of
Master of Science in Information Technology
M. Sc. (IT)
Batch 2019 onwards

By

Board of Study Computer Applications

Department of Academics
IK Gujral Punjab Technical University

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Master of Science in Information Technology (M. Sc (IT))
It is a Post Graduate Programme of 2 years duration (4 semesters)

Eligibility: All those candidates who have passed any recognized bachelor's degree of minimum three years duration with Mathematics / Statistics / Business Mathematics / Business Statistics / Quantitative Techniques / Computer Science/ Information Technology as compulsory / Optional / additional paper as one of the subjects either at 10+2 or at graduation level. OR PGDCA / BCA / B.Sc. (IT)

or

M.Sc. (IT) (Lateral Entry): It is a Post Graduate Programme of 1 year duration (2 semesters)

Eligibility: All those candidates who have passed PGDCA or equivalent with 50% Marks (45% marks in case of candidate belonging to Reserved Category) in aggregate from a University recognized by UGC.

I. K. Gujral Punjab Technical University
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PROGRAM OUTCOMES (POs)

1. **Computational Knowledge:** Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

2. **Problem Analysis:** Identify, formulate, research literature, and solve computing problem searching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

3. **Design /Development of Solutions:** Design and evaluate solutions for computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

4. **Conduct investigations of Computing problems:** User research-based knowledge and research methods including design of experiments, analysis and interpretation of data ,and synthesis of the information to provide valid conclusions.

5. **Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to computing activities, with an understanding of the limitations.

6. **Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

7. **Life-long Learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

8. **Communication Efficacy:** Communicate effectively with the computing community, and with society at large, about computingactivitiesbybeingabletocomprehendandwriteeffectivereports, design documentation, make effective presentations, and give and understand clear instructions.

9. **Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

10. **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

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First Semester

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
PGCA1901	Core Theory	Mathematics	4	0	0	30	70	100	4
PGCA1902	Core Theory	Fundamentals of Computer and Programming in Python	4	0	0	30	70	100	4
PGCA1903	Core Theory	Operating System	4	0	0	30	70	100	4
PGCA1904	Core Theory	Relational Database Management System	4	0	0	30	70	100	4
PGCA1905	Ability Enhancement Compulsory Course (AECC)	Technical Communication	3	0	0	30	70	100	3
PGCA1906	Core Practical/Laboratory	Fundamentals of Computer and Programming in Python Laboratory	0	0	4	70	30	100	2
PGCA1907	Core Practical/Laboratory	Relational Database Management System Laboratory	0	0	4	70	30	100	2
PGCA1908	Ability Enhancement Compulsory Course (AECC)	Technical Communication Laboratory	0	0	2	30	20	50	1
	TOTAL		19	0	10	320	430	750	24

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Second Semester

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
PGCA1909	Core Theory	Web Technologies	4	0	0	30	70	100	4
PGCA1910	Core Theory	Computer Networks	4	0	0	30	70	100	4
PGCA1911	Core Theory	Object Oriented Programming using C++	4	0	0	30	70	100	4
PGCA1912	Core Theory	Software Engineering	4	0	0	30	70	100	4
PGCA1913	Core Theory	Data Structures	4	0	0	30	70	100	4
PGCA1914	Core Practical/Laboratory	Web Technologies Laboratory	0	0	4	70	30	100	2
PGCA1915	Core Practical/Laboratory	Object Oriented Programming using C++ Laboratory	0	0	4	70	30	100	2
PGCA1916	Core Practical/Laboratory	Data Structures Laboratory	0	0	4	70	30	100	2
	TOTAL		20	0	12	360	440	800	26

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Course Code: PGCA1901
Course Name: Mathematics

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits:** 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: Student must have the knowledge of Basic Mathematics.
Co requisite: Students should have the fundamental knowledge of logical decisions.
Additional material required in ESE: Minimum two exercises of each concept will be recorded in the file and the file will be submitted in End Semester Examinations.

Course Outcomes: After studying this course, students will be able to:

CO#	Course outcomes
CO1	Represent data using various mathematical notions.
CO2	Explain different terms used in Basic Calculations
CO3	Describe various Operations and Formulas used to solve variety of Mathematical Problems.

Detailed contents	Contact hours
Part-A **Number System:** Introduction to (Natural number, Integer Number, Real Number, Rational Number and Irrational number), Sum and Products of Rational numbers, Multiplying & Dividing Powers (Integer Exponents), Powers of Products & Quotients (Integer Exponents), Radicals (Introduction to Square Root, Simplifying Square Root, Introduction to Cube Root, Simplifying Cube Root). **Set:** Set Introduction, Objectives, Representation of Sets (Roster Method, Set Builder Method), Types of Sets (Null Set, Singleton Set, Finite Set, Infinite Set, Equal Set, Equivalent Set, Disjoint Set, Subset, Proper Subset, Power Set, Universal Set) and Operation with Sets (Union of Set, Intersection of Set, Difference of Set, Symmetric Difference of Set), Universal Sets, Complement of a Set.	22 hours

Part-B	
Logic Statement: Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.	22 hours
Matrices : Matrices Introduction, Objectives, Meaning, Types of Matrix (Row Matrix, Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix, Unit Matrix, Triangular Matrix, Null Matrix, Comparable Matrix, Equal Matrix) Algebra of Matrices (Scalar Multiplication, Negative of Matrix, Addition of Matrix, Difference of two Matrix, Multiplication of Matrices, Transpose of a Matrix).	

Text Books:

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen, Mc Graw Hill, 6th Edition.
2. College Mathematics, Schaum's Series, TMH.

Reference Books:

1. Elementary Mathematics, Dr. RD Sharma
2. Comprehensive Mathematics, Parmanand Gupta
3. Elements of Mathematics, ML Bhargava

E Books/ Online learning material

1. www.see.leeds.ac.uk/geo-maths/basic_maths.pdf
2. www.britannica.com/science/matrix-mathematics
3. www.pdfdrive.com/schaums-outline-of-discrete-mathematics-third-edition-schaums-e6841453.html

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Course Code: PGCA1902

Course Name: Fundamentals of Computer and Programming in Python

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.
CO2	Understand an operating system and its working, and solve common problems related to operating systems
CO3	Familiar with Python environment, data types, operators used in Python.
CO5	Compare and contrast Python with other programming languages.
CO6	Learn the use of control structures and numerous native data types with their methods.
CO7	Design user defined functions, modules, and packages.
CO8	Identify and handle the exceptions in programs through appropriate exceptions handling methods

Detailed contents	Contact hours
Part A **Functional Units of Computer System:** Concepts of Hardware and Software; Data and Information, CPU, registers, system bus, main memory unit, cache memory, Motherboard, Ports and Interfaces, expansion cards, memory chips, processors. **Devices:** Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. **Memory:** Primary, secondary, auxiliary memory, RAM, ROM, cache memory, storage disks.	10 hours

Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) **Concept of Computing:** Types of Languages: Machine, assembly and High level Language; Operating system as user interface, utility programs. **Applications of IT and Impact of Internet on Society** Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, Mobile Computing and Internet of Things (IoT) **Introduction to Python Programming Language:** Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages. **Python Data Types & Input/Output:** Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. **Operators and Expressions:** Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators. **Control Structures:** Decision making statements, Python loops, Python control statements. **Python Native Data Types:** Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).	12 hours
Part-B **Python Functions:** Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. **Python Modules:** Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.	22 hours

Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python.

File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python.

Classes and Objects: The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education

2. Fundamentals of Computers, P. K.Sinha & P. Sinha, BPB Publishers.

3. Computer Fundamentals, A. Goel, 2010, Pearson Education.

4. Programming in Python, Pooja Sharma, BPB Publications, 2017.

5. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.

6. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

Reference Books:

1. "Introduction to Computers", Peter Norton

2. Computers Today, D. H. Sanders, McGraw Hill.

3. "Computers", Larry long & Nancy long, Prentice Hall.

4. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.

E Books/ Online learning material:

1. www.sakshat.ac.in

2. https://swayam.gov.in/course/4067-computer-fundamentals

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1903
Course Name: Operating System

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** core

Prerequisite: Basic understanding of computer system.
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes: After completing this course, students will be able to:

CO#	Course outcomes
CO1	Identify the role of different components of operating systems.
CO2	Implement various strategies for task management in operating systems.
CO3	Explain various implementation issues in operating systems.
CO4	Discuss how various resource managements are implemented in operating systems.

Detailed contents	Contact hours
Part-A **Fundamentals of Operating system**: What is Operating system? Functions of an operating system. Operating system as a resource manager. Structure of operating system (Role of kernel and Shell). Views of operating system. Evolution and types of operating systems. **Process management**: Definition of process, process states, Process Control Block, Scheduling Queues, Schedulers, context switch. **Inter Process Communication:** Communication/message passing mechanisms, threading, multithreading models, multicore programming, Fundamental concepts of OpenMP. **Process Synchronization**: Cooperating process, critical section problem, mutex locks, semaphores, deadlock and starvation, bounded buffer problem, reader-writer problem. **CPU scheduling**: Basic concepts, Scheduling criteria, single processor scheduling, multiprocessor scheduling, real time scheduling, Algorithm Evaluation. **Deadlock**: Definition, necessary conditions, Resource Allocation Graph, Prevention, Avoidance, Detection and Recovery.	22 hours

Part-B	22 hours
Memory Management: Address binding, Dynamic linking and loading, Contiguous memory allocation techniques (fixed and variable sized partitions), Fragmentation and its types, Non-Contiguous memory allocation techniques, Paging, Segmentation, paging with segmentation, Need of Virtual memories, Demand paging, performance measuring of demand paging, Page replacement Algorithms, allocation of frames, Concept of Thrashing **Device Management**: Secondary storage structure, disk scheduling, Disk management, RAID structure, Role of I/O traffic controller, scheduler. **File Management**: File concepts, access methods, directory and disk structure, file system structure, file system and directory implementation, Protection and Security.	

Case Studies:
LINUX Operating System and Windows Operating System.
* These cases studies can be taken as part of tutorial and assignment work. Case studies will not be considered while setting up the end semester examination.

Text Books:

1. Operating System Principles by Abraham Silberschatz and Peter Baer Galvin, Seventh Edition, Published by Wiley-India.

2. Operating Systems by Stuart E. Madnick, John J. Donovan, Published by Mac-Graw-Hill.

Reference Books:

1. Principals of Operating System by Naresh Chauhan, Published by OXFORD University Press, India.

2. Operating Systems by Sibsankar Haldar and Alex A. Aravind, Published by Pearson Education.

3. Operating system by Stalling, W., Sixth Edition, Published by Prentice Hall (India)

Course Code: PGCA1904
Course Name: Relational Database Management System

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Understand the basic concepts of RDBMS.
CO2	Formulate, using SQL, solutions to a broad range of query and data update problems.
CO3	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO4	Apply the concept of Transaction Management in RDBMS.

Detailed contents	Contact hours
Part A **Introduction:** Purpose of Database Systems, Database-System Applications, Database Management System (DBMS) Fundamentals (View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators), Relational Database Management System (RDBMS) Fundamentals (Structure of Relational Databases, Database Schema, Keys, Relational Query Languages, Relational Operations). **SQL:** Types of SQL (DCL- DDL- DML)- SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization, Accessing SQL From a Programming Language, Functions and Procedures, Triggers, Introduction	22 hours

to Database Application Development (Embedded SQL, Dynamic SQL, JDBC, SQLJ).	
Part B	22 hours
Database Design: The Entity-Relationship Model, Entity-Relationship Diagrams, Features of Good Relational Designs, Atomic Domains and First Normal Form, Functional-Dependency and Second Normal Form, Transitive Dependency and Third Normal Form, Boyce–Codd normal form (BCNF), Multivalued Dependency and Fourth Normal Form, join dependency and Fifth normal form (5NF), Domain-key normal form (DKNF). **Transaction Management:** Query Processing, Concurrency Control, Database Security, Database Recovery.	

Text Books:

1. Database System Concept, Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Sixth Edition, 2013, McGraw-Hill

Reference Books:

1. An Introduction to Database System, Bipin C. Desai, Revised Edition, 2012, Galgotia Publications Pvt Ltd-New Delhi;

2. Database Management Systems, Raghu Ramakrishnan, Third Edition, 2014, McGraw-Hill;

3. SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross, 4th Revised Edition,2009, BPB Publications;

4. An Introduction to Database Systems, C.J.Date, A.Kannan, S.Swamynathan, 8th Edition, 2006, Pearson Education.

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Course Code: PGCA1905
Course Name: Technical Communication

Program: M.Sc. (IT)	**L:** 3 **T:** 0 **P:** 0
Branch: Computer Applications	**Credits:** 3
Semester: 1st	**Contact hours:** 33 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Ability Enhancement

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	The objective of the course is to help the students become the independent users of English language.
CO2	Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.
CO3	Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.
CO4	They will be able to converse fluently.
CO5	They will be able to produce on their own clear and coherent texts.

Detailed contents	Contact hours
Part A **Basics of Technical Communication:** Functions of Communication-Internal & External Functions, Models-Shannon & Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7C's and other principles), Non-verbal Communication. **Basic Technical Writing:** Paragraph writing (descriptive, Imaginative etc.), Precise writing, reading and comprehension, Letters– Format &various types.	17 Hours
Part B **Advanced Technical Writing:** Memos, Reports, E-Mails & Net etiquettes, Circulars, Press Release, Newsletters, Notices. Resume Writing, Technical Proposals, Research Papers, Dissertation and Thesis, Technical Reports,	16 Hours

Instruction Manuals and Technical Descriptions, Creating Indexes, List of References and Bibliography.

Verbal Communication: Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences.

Technical Communication: MS-Word, Adobe Frame maker and ROBO Help
* Lab Exercises based on Listening and Speaking skills

Text Books:

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi.
2. K K Ramchandran, et al Business Communication, Macmillan, New Delhi.
3. Swati Samantaray, Business Commnication and Commnicative English, Sultan Chand, New Delhi.
4. S.P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD).

I. K. Gujral Punjab Technical University
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Course Code: PGCA1906

Course Name: Fundamentals of Computer and Programming in Python Laboratory

Program: M.Sc. (IT)	**L**: 0 **T**: 0 **P**:4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contact hours**: 4 hours per week
Internal max. marks: 70	**Theory/Practical**: Practical
External max. marks: 30	**Duration of end semester exam (ESE)**: 3hrs
Total marks: 100	**Elective Status:** Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: - Maintain practical note book as per the instructions given by the instructor.

Course Outcomes:

CO#	Course outcomes
CO1	Solve simple to advanced problems using Python language.
CO2	Develop logic of various programming problems using numerous data types and control structures of Python.
CO3	Implement different data structures using Python.
CO4	Implement modules and functions using Python.
CO5	Design and implement the concept of object oriented programming structures.
CO6	Implement file handling

Instructions: All programs are to be developed in *Python* programming language.

1.	Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.
2.	Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram.
3.	Compute volume of following 3D shapes: cube, cylinder, cone and sphere.
4.	Compute and print roots of quadratic equation $ax^2+bx+c=0$, where the values of a, b, and c are input by the user.
5.	Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,….
6.	Write a program to determine whether a triangle is isosceles or not?
7.	Print multiplication table of a number input by the user.
8.	Compute sum of natural numbers from one to n number.
9.	Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13…..n
10.	Compute factorial of a given number.
11.	Count occurrence of a digit 5 in a given integer number input by the user.
12.	Print Geometric and Harmonic means of a series input by the user.
13.	Evaluate the following expressions:

	a. $x - x^2/2! + x^3/3! - x^4/4! + \ldots x^n/n!$
	b. $x - x^3/3! + x^5/5! - x^7/7! + \ldots x^n/n!$
14.	Print all possible combinations of 4, 5, and 6.
15.	Determine prime numbers within a specific range.
16.	Count number of persons of age above 60 and below 90.
17.	Compute transpose of a matrix.
18.	Perform following operations on two matrices. 1) Addition 2) Subtraction 3) Multiplication
19.	Count occurrence of vowels.
20.	Count total number of vowels in a word.
21.	Determine whether a string is palindrome or not.
22.	Perform following operations on a list of numbers: 1) Insert an element 2) delete an element 3) sort the list 4) delete entire list
23.	Display word after Sorting in alphabetical order.
24.	Perform sequential search on a list of given numbers.
25.	Perform sequential search on ordered list of given numbers.
26.	Maintain practical note book as per their serial numbers in library using Python dictionary.
27.	Perform following operations on dictionary 1) Insert 2) delete 3) change
28.	Check whether a number is in a given range using functions.
29.	Write a Python function that accepts a string and calculates number of upper case letters and lower case letters available in that string.
30.	To find the Max of three numbers using functions.
31.	Multiply all the numbers in a list using functions.
32.	Solve the Fibonacci sequence using recursion.
33.	Get the factorial of a non-negative integer using recursion.
34.	Write a program to create a module of factorial in Python.
35.	Design a Python class named *Rectangle,* constructed by a length & width, also design a method which will compute the area of a rectangle.
36.	Design a Python class named *Circle* constructed by a radius and two methods which will compute the area and the perimeter of a circle.
37.	Design a Python class to reverse a string 'word by word'.
38.	Write a Python program to read an entire *text file*.
39.	Design a Python program to read first n lines of a *text file*.
40.	Construct a Python program to write and append text to a file and display the text.

Text Books:

1. Core Python Programming, R. Nageswara Rao, 2nd Ediiton, Dreamtech.

2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

Reference Books:

Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.

I. K. Gujral Punjab Technical University
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Course Code: PGCA1907

Course Name: Relational Database Management System Laboratory

Program: M.Sc. (IT)	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits: 2**
Semester: 1st	**Contact hours:** 4 hours per week
Internal max. marks: 70	**Theory/Practical:** Practical
External max. marks: 30	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Out comes:

CO#	Course outcomes
CO1	Able to understand various queries and their execution
CO2	Populate and query a database using SQL DML/DDL commands.
CO3	Declare and enforce integrity constraints on a database
CO4	Programming PL/SQL including stored procedures, stored functions, cursors
CO5	Able to design new database and modify existing ones for new applications and reason about the efficiency of the result

Assignments:

1.	Implementation of DDL Commands to perform creation of table, alter, modify and drop column operations.
2.	Implementation of Constraint • Check Constraint • Entity Integrity Constraint • Referential Integrity Constraint • Unique Constraint • Null Value Constraint
3.	Implementation of DML and DCL Commands.
4.	Implementation of Data and Built in Functions in SQL.
5.	Implementation of Nested Queries and Join Queries.
6.	Implementation of Cursors.
7.	Implementation of Procedures and Functions.
8.	Implementation of Triggers.
9.	Implementation of Embedded SQL.
10.	Database design using E-R model and Normalization: • Pay Roll System • Banking System

	• Library Management System
11.	For the following University Database applications, Design and Develop Conceptual Data Model (E-R Diagram) with all the necessary entities, attributes, constraints and relationships. Design and build Relational Data Model for application specifying all possible constraints. *University Database* - The IKGPTU is a University with several campuses scattered across Punjab. Academically, the university is divided into a number of Departments, such as Department of CSE, Department of Architecture, Department of Management etc. Some of the Departments operate on a number of campuses. Each Department is headed by a Head and has a number of teaching and non-teaching staff. Each Department offers many courses. Each course consists of a fixed core of subjects and a number of electives from other courses. Each student in the University is enrolled in a single course of study. A subject is taught to the students who have registered for that subject by a teacher. A student is awarded a grade in each subject taken.

Reference Books:

1. SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross, 4th Revised Edition, 2009, BPB Publications;

2. Oracle PL/SQL Programming, Steven Feuerstein and Bill Pribyl, 5th Edition, 2009, O'Reilly Media;

3. Database System Concept, Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Sixth Edition, 2013, McGraw-Hill.

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1908
Course Name: Technical Communication Laboratory

Program: M.Sc. (IT)	**L**: 0 **T**: 0 **P**: 2
Branch: Computer Applications	**Credits**: 1
Semester: 1st	**Contact hours:** 2 hours per week
Internal max. marks: 30	**Theory/Practical:** Practical
External max. marks: 20	**Duration of end semester exam (ESE):** 3hrs
Total marks: 50	**Elective status:** Ability Enhancement

Prerequisite: --
Co requisite: --
Additional material required in ESE: --

Course Outcomes:

CO#	Course outcomes
CO1	The objective of the course is to help the students become the independent users of English language.
CO2	Students will acquire basic proficiency in listening and speaking skills.
CO3	Students will be able to understand spoken English language, particularly the language of their chosen technical field.
CO4	They will be able to converse fluently
CO5	They will be able to produce on their own clear and coherent texts.

Assignments:

Interactive practice sessions in Language Lab on Oral Communication	
1.	Listening Comprehension
2.	Self-Introduction, Group Discussion and Role Play
3.	Common Everyday Situations: Conversations and Dialogues
4.	Communication at Workplace
5.	Interviews
6.	Formal Presentations

Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1909
Course Name: Web Technologies

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: Student must have the basic knowledge of any text editor like Notepad, Notepad++ and Edit plus etc.

Co requisite: Student must know the background of Markup Language.

Additional material required in ESE:
➢ Demonstration of the website of college/ specific department/specific cells etc. will be presented by the students during the final practical.
➢ Developed Website/s must be made online by the student/s.
➢ Printouts of the Main Page of the website must be arranged on Practical file during daily lab work and must be submitted in the final examinations.

Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Understand the basics of Internet and Web Services.
CO2	Describe and differentiate Programming Language and Markup Language.
CO3	Connect various web pages and web sites together.
CO4	Capture user input from the remote users.
CO5	Learn connectivity concepts of Front End and Back End.

Detailed Contents	Contact hours
Part-A **Internet Basics:** Basic concepts, communicating on the internet, internet domains, internet server identities, establishing connectivity on the internet client IP address, How IP addressing came into existence? A brief overview TCP/IP and its services, transmission control protocol. **Introduction To HTML:** Information Files Creation, Web Server, Web Client/Browser, Hyper Text Markup Language (HTML Tags, Paired Tags, Singular Tags), Commonly Used HTML Commands (Document Head, Document Body), Title and Footer, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines).	24 hours

Basic Formatting Tags: HTML Basic Tags, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines), Text Styles (Bold, Italics, Underline), Other Text Effects (Centering (Text, Images etc.), Spacing (Indenting Text), HTML Color Coding.

Basic Formatting Tags: HTML Basic Tags, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines), Text Styles (Bold, Italics, Underline), Other Text Effects (Centering (Text, Images etc.), Spacing (Indenting Text), HTML Color Coding.
Lists

Type of Lists (Unordered List (Bullets), Ordered Lists (Numbering), Definition Lists.

Adding Graphics To HTML Documents: Using The Border Attribute, Using The Width And Height Attribute, Using The Align Attribute, Using The Alt Attribute.

Tables: Introduction (Header, Data rows, The Caption Tag), Using the Width and Border Attribute, Using the Cell padding Attribute, Using the Cell spacing Attribute, Using the BGCOLOR Attribute, Using the COLSPAN and ROWSPAN Attributes
Tag.

Part-B

Linking Documents: Links (External Document References, Internal Document References), Image As Hyperlinks.

Frames: Introduction to Frames: The<FRAMESET> tag, The <FRAME> tag, Targeting Named Frames. DHTML: Cascading Style Sheets, Style

Introduction to JavaScript: Introduction to JavaScript: JavaScript in Web Pages (Netscape and JavaScript, Database Connectivity, Client side JavaScript, Capturing User Input); The Advantages of JavaScript (an Interpreted Language, Embedded within HTML, Minimal Syntax -Easy to Learn, Quick Development, Designed for Simple, Small Programs, Performance, Procedural Capabilities, Designed for Programming User Events, Easy Debugging and Testing, Platform Independence/Architecture Neutral); Writing JavaScript into HTML.

Forms Used by a Web Site: The Form Object, The Form Object's Methods (The Text Element, The Password Element, The Button Element, The Submit (Button) Element, The Reset (Button) Element, The Checkbox Element, The Radio

20 hours

Element, The Text Area Element, The Select and Option Element, The Multi Choice Select Lists Element) Other Built-In Objects in JavaScript (The String Object, The Math Object, The Date Object), User Defined Objects (Creating a User Defined Object, Instances, Objects within Objects).

Text Books:

1. Internet for EveryOne: Alexis Leon, 1st Edition, Leon Techworld, Publication, 2009.
2. Greenlaw R; Heppe, "Fundamentals of Internet and WWW", 2nd Edition, Tata McGraw-Hill, 2007.
3. RajKamal, "Internet& Web Technologies",edition Tata McGraw-Hill Education.2009.
4. Chris Payne, "Asp in 21 Days", 2nd Edition, Sams Publishing, 2003 PDCA.
5. A Beginner's Guide to Html Http://www.Ncsa.Nine.Edit/General/Internet/Www/Html.Prmter

E-Books/ Online learning material:

1. https://www.tutorialspoint.com/html/html_tutorial.pdf

2. https://www.w3schools.com/js/

3. https://www.w3schools.com/html/

4. https://www.cs.uct.ac.za/mit_notes/web_programming.html

5. http://www.pagetutor.com/table_tutor/index.html

Course Code: PGCA1910
Course Name: Computer Networks

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits:** 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes: Students will be able to

CO#	Course outcomes
CO1	Familiar with the different Network Models.
CO2	Understand different protocols working at Medium Access Sublayer.
CO3	Learn the concept of network routing through algorithms.
CO4	Learn and understand Internet protocols and network security.

Detailed contents	Contact hours
Part 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. **Medium Access Sublayer:** Static and dynamic channel allocation for LAN and MAN ALOHA Protocols, LAN Protocols: CSMA, CSMA/CD, Collision Free protocol **Networking and Internetworking devices:** Repeater, bridges, routers, gateways, switches.	22 Hours
Part 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	22 Hours

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.

Text Books:

1. A.S. Tannenbaum, "Computer Networks", 3rd Edition, Prentice Hall, 1999.

2. Data Communications & Networking by Forouzan, Tata McGraw Hills.

Reference Books:

1. D.E. Cormer," Computer Networks and Internet", 2nd Edition, Addison Wesley Publication, 2000.

2. D. Bertsekas and R.Gallagar, "Data Networks", 2nd Edition, Prentice-Hall, 1992.

3. Stevens W.R.," UNIX Network Programming," Prentice Hall, 1990.

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1911

Course Name: Object Oriented Programming using C++

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Understand Object oriented approach for finding solutions to various problems with the help of C++ language.
CO2	To understand Object oriented approach for finding Solutions to various problems with the help of C++ language.
CO3	Create computer based solutions to various real-world problems using C++

Detailed contents	Contact hours
Part A **Fundamentals of Object Oriented Programming:** Introduction to Object Oriented Programming (OOP) and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Difference between Procedure oriented Language (C) and Object Oriented Language. **Fundamentals of C/C++:** I/O statements, Assignment Statements, Constants, Variables, Operators and Expressions, Standards and Formatted statements, Keywords, Data Types and Identifiers. **Control Structures:** Introduction, Decision making with if – statement, if – else and Nested if, while and do-while, for loop. Jump statements: break, continue, switch Statement. **Arrays:** Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Matrices, Strings and String handling functions. Structures and Union.	22 hours

<u>**Part B**</u>	
Classes & Objects: Classes & Functions, Scope Resolution Operator, Private, Protected and Public Member Functions, Nesting of Member Functions. Creating Objects, accessing class data members, Accessing member functions. **Concept of Constructors:** Introduction to constructors, Parameterized constructors, Copy Constructor, Multiple constructors in class, Dynamic initialization of objects, Destructors. **Inheritance:** Constructors/ destructors under inheritance, Types of inheritance: - Single inheritance, Multiple inheritance, Multilevel inheritance, Hierarchical inheritance and Hybrid inheritance. **Operator Overloading:** Function, Unary and Binary operators. Binding, Friend and Virtual Functions. **Introduction to file handling:** Opening and Closing files, Various modes, Various methods on files.	22 hours

Text Books:

1. Object Oriented Programming with C++, E. Balaguruswami, Fourth Edition, Tata Mc-Graw Hill

2. Programming using C++, D. Ravichandran, Tata Mc-Graw Hill

3. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing

Reference Books:

1. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia Publications.

2. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing Company.

E Books/ Online learning material:

1. www.sakshat.ac.in

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1912
Course Name: Software Engineering

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Aware about the engineering approach to analysis, design and built the software
CO2	Understand the phases and activities involved in the software life cycle models
CO3	Analyse problems, and identify and define the computing requirements appropriate to its solution.
CO4	Apply design and development principles in the construction of software systems of varying complexity
CO5	Apply current techniques, skills, and tools necessary for computing practice.
CO 6	Apply various testing techniques to test a software
CO7	Measure various characteristics of software.
CO8	Compare and choose between maintenance and reengineering of software, when there is requirement to make changes in the software.

Detailed contents	Contact hours
Part A Introduction to the Discipline, The Software Process, Software Engineering Practice, Software Development Myths. Prescriptive Process Models (The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models), Specialized Process Models (Component-Based Development, The Formal Methods Model, Aspect-Oriented Software Development), The Unified Process, Phases of the Unified Process, Personal and Team Process Models (Personal Software Process, Team Software Process). Requirements Engineering, Understanding of Software Requirements, Building the Analysis Model, The Design Process, Design Concepts, The	22 hours

Design Model (Data Design Elements, Architectural Design Elements, Interface Design Elements, Component-Level Design Elements, Deployment-Level Design Elements).	
Part B Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging, Software Testing Fundamentals, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing. A Framework for Product Metrics, Metrics for the Requirements Model, Metrics for the Design Model, Metrics in the Process and Project Domains, Software Measurement. Software Maintenance, Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering, The Economics of Reengineering.	22 hours

Text Books:

1. Software Engineering–A Practitioner's Approach, Roger S. Pressman and Bruce R. Maxim, Eighth Edition, 2015, McGrawHill.

Reference Books:

1. An Integrated Approach to Software Engineering, Pankaj Jalota, Third Edition, 2005, Narosa Publishing House;
2. Software Engineering, Ian Sommerville, Ninth Edition, 2011, Addison-Wesley.

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1913
Course Name: Data Structures

Program: M.Sc. (IT)	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours**: 44 hours
Internal max. marks: 30	**Theory/Practical**: Theory
External max. marks:70	**Duration of end semester exam (ESE)**: 3hrs
Total marks: 100	**Elective status**: Core

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes: Student will be able to

CO#	Course outcomes
CO1	Choose appropriate data structure as applied to specified problem definition.
CO2	Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO3	Apply concepts learned in various domains like DBMS, compiler construction, computer graphics etc.
CO4	Use linear and non-linear data structures like stacks, queues , linked list etc.
CO5	Develop his/her logics and programming skills

Detailed contents	Contact hours
Part-A **Stack and Queue:** contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another-using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue; linked implementation of stack and queue- operations	11 hours
General List and Trees: list and it's contiguous implementation, it's drawback; singly linked list-operations on it; doubly linked list-operations on it; circular linked list; linked list using arrays. Tree definitions-height, depth, order, degree, parent and child relationship etc; Binary Trees- various theorems, complete binary tree, almost complete binary tree; Tree traversals-preorder, in order and post order traversals, their recursive and non recursive implementations; expression tree- evaluation; linked representation of binary tree-operations. Threaded binary trees; forests, conversion of forest into tree. Heap-definition.	11 hours

Part-B	11 hours
Searching, Hashing and Sorting: requirements of a search algorithm; sequential search, binary search, indexed sequential search, interpolation search; hashing-basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort on linked and contiguous list, shell sort, heap sort, tree sort.	
Graphs: related definitions: graph representations- adjacency matrix, adjacency lists, adjacency multilist; traversal schemes- depth first search, breadth first search; Minimum spanning tree; shortest path algorithm; kruskals & dijkstras algorithm.	11 hours

Text Books

1. Brijesh Bakariya. Data Structures and Algorithms Implementation through C, BPB Publications.
2. Data Structures, Schaum Series, TMH.
3. Kruse R.L. Data Structures and Program Design in C; PHI
4. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", AddisonWesley

Reference Books:

1. Horowitz & Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.
2. Yashwant Kanetkar, Understanding Pointers in C, BPB Publications.
3. Horowitz, S. Sahni, and S. Rajasekaran, Computer Algorithms, Galgotia Pub. Pvt. Ltd., 1998.

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1914
Course Name: Web Technologies Laboratory

Program: M.Sc. (IT)	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 2ⁿᵈ	**Contact hours:** 4 hours per week
Internal max. marks: 70	**Theory/Practical**: Practical
External max. marks: 30	**Duration of End Semester Exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: Students must have the knowledge of editors like Notepad etc. and basic understanding of Scripting Language/s.

Co requisite: Knowledge of Networking, Internet, Client Server concepts, Static & Dynamic environment of the websites etc.

Additional material required in ESE:
➢ Demonstration of the website of college/ specific department/specific cells etc. will be presented by the students during the final practical.
➢ Developed Website/s must be made online by the student/s.
➢ Printouts of the Main Page of the website must be arranged on Practical file during daily lab work and must be submitted in the final examinations.

Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Understand Static and Dynamic concepts of web designing.
CO2	Develop ability to retrieve data from a database and present it online.
CO3	Design web pages that apply various dynamic effects on the web site.
CO4	Solve complex and large problems using Scripting Language & Markup Language.

Instructions: Instructor can increase/decrease the experiments as per the requirement.
 Assignments:

1.	Design index page of a book Titled Web Designing.
2.	Create a simple HTML page to demonstrate the use of different tags.
3.	Display Letter Head of your college on a web page & it must be scrolling Right to Left.
4.	Create a link to move within a single page rather than to load another page.
5.	Display "Name of University" using different Text formatting Tags.
6.	Design Time Table of your department and highlight most important periods.
7.	Use Tables to provide layout to your web page.
8.	Embed Audio and Video into your web page.
9.	Divide a web page vertically and display logo of your college in left pane and logo of university in right pane.
10.	Create Bio- Data of an employee.

11.	Design front page of a hospital with different styles.
12.	Design a web page and display horizontally two different web pages at a time.
13.	Write a program to create a login form. On clicking the submit button, the user should get navigated to a profile page.
14.	Write a HTML code to create a Registration Form. On submitting the form, the user should be asked to login with the new credentials.
15.	Write a HTML code to create website in your college or department and create link for Tutorial of specific subject.
16.	Write a program to perform following operations on two numbers input by the user: Addition 2) Subtraction 3) Multiplication 4) Division.
17.	Design a program to solve quadratic equations.
18.	Write a program to determine greatest number of three numbers.
19.	Write a script to compute, the Average and Grade of students marks.
20.	Design a scientific calculator and make event for each button using scripting language.
21.	Write a script to check whether a number is even or odd?
22.	Write a program to show whether a number is prime or not?
23.	Write a program to show multiplication table of any number.
24.	Write a program to find the factorial of any number.
25.	Write a program to show Fibonacci Series between 0 to 74.

Reference Books:

1. Greenlaw R; Hepp E, "Fundamentals of Internet and www", 2nd Edition, Tata. McGraw-Hill, 2007.

2. A Beginner's Guide to HTML Http://www.Ncsa.Nine.Edit/General/Internet/www/ html.prmter.

Online Experiment material:

1. https://www.w3schools.com/html/html_examples.asp

2. https://www.cs.uct.ac.za/mit_notes/web_programming.html

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1915
Course Name: Object Oriented Programming using C++ Laboratory

Program: M.Sc. (IT)	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 2nd	**Contact hours:** 4 hours per week
Internal max. marks: 70	**Theory/Practical:** Practical
External max. marks: 30	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	To learn programming from real world examples.
CO2	To understand Object oriented approach for finding solutions to various problems with the help of C++ language.
CO3	To create computer based solutions to various real-world problems using C++
CO4	To learn various concepts of object oriented approach towards problem solving

Assignments:

	Internet and its Applications
The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines
1.	To learn to setup an e-mail account and send and receive e-mails
2.	To learn to subscribe/post on a blog and to use torrents for accelerated downloads
3.	Hands on experience in online banking and Making an online payment for any domestic bill

Note: The instructor needs to give an overview of Editor for C++.
Write programs in C++

4.	To display input values using cin and cout statement with formatting.
5.	To display prime, even and odd numbers
6.	To display Fibonacci Series of 'n' numbers.
7.	To input marks and display result using nested if statement.
8.	to find the factorial of a number using interactions and recursion.
9.	To display days of week using SWITCH statement.
10.	To find largest and smallest number from three elements.
11.	To display the address and the content of a pointer variable.
12.	Using reference variables as arguments to swap the values of pair of integers.
13.	To add all ODD numbers between 10 to 100 and divisible by given number 'n'.
14.	To find number is palindrome.

Write programs in C++ using Strings	
15.	To sort the names in ascending order
16.	
17.	To copy the contents of one string to another string.
Write programs in C++ using array	
18.	To sort the elements (integers) in ascending order
19.	To sort the Names of Students in descending order
20.	To display the contents of a two dimensional array using pointer arithmetic.
Write programs in C++ using Class	
21.	to perform simple arithmetic operations using class.
22.	to assign value to the members of a class objects using a pointer structure operator (->).
Write programs in C++ using Functions	
23.	to show the use of friend function.
24.	to show the use of copy constructor.
25.	to show the use of function overloading.
26.	to show the use of abstract classes.
27.	to show the use of virtual function.
Write programs in C++ using Inheritance	
28.	to implement the concept of Single inheritance.
29.	to implement the concept of multilevel inheritance.
Write programs in C++ using Polymorphism and File handling	
30.	To show concept of unary operator overloading.
31.	To show concept of Binary operator overloading.
32.	To compute area of right angle triangle, equilateral triangle, isosceles triangle using function overloading concept.
Write programs in C++ using Files	
33.	To convert a lower case character to an upper case character of a text file.
34.	To copy the contents of a file into another.
Prepare a Mini Project (menu driven program) **using in C++**	
35.	• Mensuration with different shapes (Circle, triangle, Cone, Sphere) • Library System • Examination System • Payroll System • Any other

Reference Books:

1. IT Tools, R.K. Jain, Khanna Publishing House

2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education

3. Introduction to information technology, Turban, Rainer and Potter, John Wiley and Sons

4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen F Monk, Thomson Learning C++

I. K. Gujral Punjab Technical University
Master of Science in Information Technology (M.Sc. (IT))

Course Code: PGCA1916

Course Name: Data Structures Laboratory

Program: M.Sc. (IT)	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 2nd	**Contact hours:** 4 hours per week
Internal max. marks: 70	**Theory/Practical:** Practical
External max. marks: 30	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -na-

Course Outcomes:

CO#	Course outcomes
CO1	Student will be able to apply appropriate constructs of Programming language, coding standards for application development
CO2	Students will be able to programming skills for solving problems.
CO3	Select appropriate searching and/or sorting techniques for application development.
CO4	Students will be able to learn graphs and its techniques.

Instructions: Programs may be developed in C/C++/JAVA/PYTHON.

1	Write an algorithm and program to search an element using linear search.
2	Write a program to implement Binary search tree.
3	Write Quick Short algorithm and program in language C.
4	Implement the Polynomial representation using Array.
5	Create a program to sort it in ascending order using heap sort (Min Heap and Max Heap both). Given an array of 6 elements: 15 | 19 | 10 | 7 | 17 | 16
6	Write programs for finding the element in the array using the binary search method using iteration and recursion concepts.
7	Write a program to create a link list and perform operation such as insert, delete, update and reverse.
8	Write a program to insert value in a Linear Array at Specified Position.
9	Write a program to swap two number using calls by value and call by reference.
10	Write a C program to simulate the working of a circular queue of integers using an array. Provide the following operations, Insert, Delete.
11	Write a program to sort elements using Merge Sort method.
12	Write a program to design a priority queue which is maintained as a set of queues (maximum of three queues). The elements are inserted based upon the given priority; the

	deletion of an element is to be done starting from the first queue, if it is not empty. If it is empty then second queue will be deleted and so on.
13	Write a program to support the following operations on doubly link list where each node consists of integers.

14	Write a program to construct a stack of integers and to perform the following options on it
	    PUSH
	    POP
	The program should print appropriate messages for stack overflow, stack underflow and stack empty.

15	Write a program to find shortest path using Dijkstra's Algorithm

16	Write a C program using dynamic variables and pointers to construct a queue of integers using singly link list and perform the following operations.
	    Insert
	    Delete

17	The program should print appropriate messages for queue full and queue empty conditions
18	Write a program to arrange words in dictionary order using Binary Search Tree (In order Traversal) and implement binary search tree for word representation and make in order traversal for sorting in dictionary order
19	Write a program to implement Breadth First Search and Depth First Search Algorithm.
20	Write a program to implement any one hashing techniques in c and also measure its complexity.

Reference Books:

1. Brijesh Bakariya. Data Structures and Algorithms Implementation through C, BPB Publications.

2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", AddisonWesley

3. Horowitz & Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.