RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COMPLETE SYLLABUS BOOK

MCA

Branch: MCA

Batch: 2026-28

Framework: RTU-NEP 2020 Compliance

PHASED IMPLEMENTATION: YEAR 1 ONLY

Generated on: 9/30/2026

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC101 - OBJECT ORIENTED PROGRAMMING WITH C++

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 1 | Slot: 1

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **OOP Paradigm** **(8 Hrs)**	Characteristics of OOP, Comparison between functional programming and OOP approach, characteristics of object oriented language - objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading.	Explain the fundamental concepts, characteristics, and principles of Object-Oriented Programming and distinguish them from functional programming
Unit 2 **Introduction to C++** **(8 Hrs)**	Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, input and output, conditional expression loop statements, break control statements, Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors Inline member functions, static class member, friend functions, and dynamic memory allocation	Develop C++ programs using classes, objects, constructors, destructors, pointers, static members, friend functions, and dynamic memory allocation
Unit 3 **Polymorphism and Inheritance** **(8 Hrs)**	Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions. Single inheritance, types of inheritance, types of base classes, types of derivations, multiple inheritances, container classes, member access control	Implement polymorphism, function/operator overloading, virtual functions, and different forms of inheritance in C++.
Unit 4 **Exceptions and Templates** **(8 Hrs)**	Exception Syntax, Multiple Exceptions, Function Templates, Function Templates with multiple argument templates	Apply exception handling and function templates to develop robust, reusable, and generic C++ programs
Unit 5 **File Handling in C++** **(8 Hrs)**	C++ Streams, Console Stream Classes, Formatted And Unformatted Console I/O Operations, manipulators, File Streams, Classes File Modes, File Pointers and Manipulations File I/O.	Implement stream-based input/output and file handling techniques for storing, retrieving, and manipulating data using C++.

Standard Text Books

- 1. K.R. Venugopal, Raj Kumar Buyya, “Mastering C++", McGraw-Hill, 2017
- 2. Rajaram R, Object Oriented Programming and C++”, 2nd Edition, New Age International, 2013
- 3. E Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill, 2006
- 4. Yahwant Kanetkar, ”C++ Programming”, BPB Publication

Reference Materials

- 1. Kamthane," Object Oriented Programming with ANSI and Turbo C++", Pearson Education, 2006
- 2. Robert Lafore,” Object Oriented Programming in C++ ”,4th Edition, 2002
- 3. Bjarne Stroustrup,” C++ Programming Language”, Addison-Wesley, 2013.
- 4. Andrei Alexandrescu,” Modern C++ Design: Generic Programming and Design Patterns Applied

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC102 - OPERATING SYSTEM

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 1 | Slot: 2

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 Introduction (8 Hrs)	Definition and types of operating systems, Batch Systems, multi programming, timesharing, parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, system boot. Process Management : Process concept, Process scheduling, Cooperating process, Threads, Inter process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling and Algorithm evaluation	Explain operating system concepts, structures, services, processes, threads, interprocess communication, and CPU scheduling algorithms
Unit 2 Process Synchronization and Deadlocks (8 Hrs)	The Critical-Section problem, synchronization hardware, Semaphores , Classical problem of synchronization, Critical regions, Monitors, Deadlock-system model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling. Storage Management: Memory Management –Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing , Page Size and other considerations	Analyze process synchronization and deadlock problems using synchronization mechanisms, deadlock handling techniques, and memory management concepts
Unit 3 Introduction to concept of Open Source Software (8 Hrs)	Introduction to Linux , Evolution of Linux, Linux vs. UNIX, Different Distributions of Linux, Installing Linux, Linux Architecture, Linux file system (inode, Super block, Mounting and Unmounting), Essential Linux Commands (Internal and External Commands), Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals	Explain Linux architecture, file systems, processes, signals, system calls, distributions, and essential Linux commands
Unit 4 Shell Programming (8 Hrs)	Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta characters Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging, Filters	Develop and execute shell scripts using shell commands, variables, control statements, redirection, piping, filters, and basic C programming tools
Unit 5 Linux System Administrations (8 Hrs)	File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down (Boot Loaders, LILO, GRUB, Bootstrapping, init Process, System services).	• Apply Linux system administration concepts for managing files, directories, users, permissions, boot processes, and system services

Standard Text Books

• 1. Silberschatz and Galvin, “Operating System Concepts”, 10thedition, Wiley India, 2018

• 2. Andrew S. Tanenbaum, Albert S. Woodhull, “Operating Systems Design & implementation”, 3rd edition, Pearson Education, 2006

• 3. UNIX: Concepts and Applications, Sumitabha Das, McGraw-Hill, 4th Edition, 2008

Reference Materials

- 1. Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson, 2nd Edition, 2010.
- 2. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, Pearson, 5th Edition, 2010
- 3. Forouzan B. A., Gilberg R. R., “UNIX and Shell Programming”, TMH, 2nd edition, 2008

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC103 - COMPUTER ARCHITECTURE

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 1 | Slot: 3

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Basic Building Blocks** **(8 Hrs)**	Gates, Boolean Functions and Expressions Designing Gate Networks, K-map simplification, Useful Combinational Parts, Programmable Combinational Parts, Timing and Control, Latches, Flip-flops, Registers and Counters, Sequential Circuits. Arithmetic/Logic Unit: Numbers Representation, Arithmetic Operations, Floating-Point Arithmetic.	Explain and apply fundamental concepts of digital logic, Boolean algebra, logic gates, combinational and sequential circuits, and arithmetic operations
Unit 2 **Register Transfer Language and Micro-operations** **(8 Hrs)**	Concept of bus, data movement among registers, a language to represent conditional data transfer, data movement from/ to memory. Design of Arithmetic & Logic Unit and Control Unit Control design hardwired control, micro programmed arithmetic and logical operations along with register transfer, timing in register.	Analyze register transfer operations, micro-operations, ALU, and control unit, including hardwired and microprogrammed control techniques
Unit 3 **Instruction and Addressing** **(8 Hrs)**	A simple computer organization and instruction set, instruction formats, addressing modes, instruction cycle, instruction execution in terms of microinstructions, interrupt cycle, concepts of interrupt and simple 1/O organization, Synchronous & Asynchronous data transfer, Data Transfer Mode: Program Controlled, Interrupt driven, DMA (Direct Memory Access). Implementation of processor using the building blocks.	Explain instruction formats, addressing modes, instruction cycles, interrupts, I/O organization, and data transfer techniques in computer systems
Unit 4 **Memory System Design** **(8 Hrs)**	Memory Origination, Memory Hierarchy, Main Memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache Memory, Virtual Memory. Assembly Language Programs, Assembler Directives, Pseudo Instructions, Macroinstructions, Linking and Loading.	Analyze and describe memory organization and hierarchy, including cache, virtual, associative, main and auxiliary memory, along with basic assembly language concepts
Unit 5 **Vector and Array Processing** **(8 Hrs)**	Shared-Memory, Multiprocessing, Distributed Mufti Computing. Microprocessor Concepts: Pin Diagram of 8085, Architecture of 8085, Addressing Mode of 8085, functional block diagram of 8085 assembly language, instruction set of 8085.	Explain vector/array processing, multiprocessing, distributed computing, and the architecture, addressing modes, and instruction set of the 8085 microprocessors

Standard Text Books

• 1.M. Morris Mano "Computer System Architecture" Prentice Hall, 2017

• 2.David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

• 3.Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012

Reference Materials

• 1. William Stallings, Computer Organization and Architecture – Designing for Performance, 8thEdition, Pearson Education, 2010

• 2. John P. Hayes, Computer Architecture and Organization, 3rdEdition, Tata McGraw Hill, 2012

• 3. John L. Hennessey and David A. Patterson, Computer Architecture – A Qu
Elsevier Publishers, 5th Edition, 2012.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC104 - DATABASE MANAGEMENT SYSTEMS

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 1 | Slot: 4

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Introduction** **(8 Hrs)**	Overview of DBMS, Database System v/s File System, Architecture of DBMS, Data models, Entity Relationship Diagram, Types of Keys, Integrity Rules, Data Dictionary, Normalization (1NF, 2 NF, 3NF, BCNF, 4NF, 5NF), inclusion dependencies, loss less join decompositions, Codd's Rules	Explain DBMS concepts, data models, ER diagrams, keys, integrity constraints, normalization, and Codd's rules
Unit 2 **Transaction Management** **(8 Hrs)**	Transactions: Concepts, ACID Properties, States Of Transaction, Serial vs Non-Serial Schedule, Serializability, Conflict & View Serializable Schedule, Conflicting operations, View Equivalent, Checkpoints, Deadlock Handling.	Analyze transactions, ACID properties, schedules, serializability, and deadlock handling in database systems.
Unit 3 **Database Querying & Concurrency Control** **(8 Hrs)**	Relational Algebra, Set Operations, Steps in Query Processing, Sorting and Join Operations, Concept of Query Optimization, Query Evaluation Plans Concurrency Control: Concurrency control problem, Locks Based Protocols, Types of Lock based protocols, Time Stamp Based Protocols, Validation Based Protocol, Multiple Granularity, Multi-version Schemes	Apply relational algebra, query processing, query optimization, and concurrency control techniques to database problems
Unit 4 **Recovery System & Security** **(8 Hrs)**	Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Failure with Loss of Non-Volatile Storage, Introduction to Security & Authorization, Introduction to emerging Databases-OODBMS, ORDBMS, Distributed database, Multimedia database, Special database-limitations of conventional databases, advantages of emerging databases.	Explain database recovery, security, authorization, and emerging database technologies such as OODBMS, ORDBMS, distributed and multimedia databases
Unit 5 **SQL and PL/SQL** **(8 Hrs)**	Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Functions, PL/SQL basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, conditional and sequential control statements, cursors, exceptions, triggers, functions, procedures and packages	Develop and execute SQL and PL/SQL programs using queries, constraints, views, functions, procedures, cursors, triggers, exceptions, and packages

Standard Text Books

- 1. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley, 6th Edition, 2011
- 2. Korth, Silberschatz, Sudarshan, "Database Concepts", McGraw Hill, 6thEdition, 2010.

Reference Materials

- 1. Thomas Connolly, Carolyan Begg,, "Database Systems,: A Practical Approach to Design, Implementation and Management, Addison Wesley, 2014.
- 2. Simon AR, "Strategic Database Technology: Management for the year 2000", Morgan Kaufmann, 1995
- 3. Gray J and Reuter A, "Transaction Processing: Concepts and Techniques", Morgan Kaufmann, 1993.
- 4. S.K.Singh," Database System: Concept ,Design and Application" PEARSON,2006
- 5. Raghu Ramkrishnan, Johannes Gehrke , "Database Management Systems", McGraw Hill International, 2007
- 6. C.J.Date, Longman, "An Introduction to Database System", Pearson Education, 2003

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC105 - WEB TECHNOLOGIES

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 1 | Slot: 5

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Introduction to HTML** **(8 Hrs)**	The internet: history of the World Wide Web, hardware and software trend, object technology – java script object, scripting for the web-browser portability. Introduction of HTML: introduction, markup language, editing HTML : common tags, headers, text styles, linking, images, formatting text, horizontal rules and more line breaks, unordered lists, nested and ordered lists, basic HTML tables : intermediate HTML tables and formatting : basic HTML forms, more complex HTML forms, HTML5: Input Types & Attributes, internal linking, creating and using image maps.	Develop web pages using HTML/HTML5 with text, links, images, tables, forms, and multimedia elements
Unit 2 **Java Script** **(8 Hrs)**	Introduction to scripting: introduction- memory concepts- arithmetic-decision making. Java script control structures, Java script functions: introduction – program Units in java script - function definitions, duration of identifiers, scope rules, recursion, java script global functions. Java script arrays: introduction, array-declaring and allocating arrays, references and reference parameters – passing arrays to functions, multiple subscripted arrays. Java script objects: introduction, math, string, date, Boolean and number objects.	Apply JavaScript concepts, including functions, arrays, objects, control structures, and event handling, to create interactive web pages
Unit 3 **Dynamic HTML** **(8 Hrs)**	CSS: introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, text flow and the CSS box model, user style sheets, Filter and Transitions, HTML DOM, Browser BOM Event model : introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event, more DHTML events	Design dynamic web pages using CSS, DOM, BOM, and DHTML with appropriate styling, positioning, transitions, and events
Unit 4 **Introduction to PHP &Web Server Architecture** **(8 Hrs)**	Overview of PHP Capabilities, PHP HTML embedding tags & syntax, Simple script examples, PHP & HTTP Environment variables. PHP Language Core-Variables, Constants, Data Types, PHP: Operators, Flow Control & Loops, Arrays, String, Functions Include & require statements, Simple File & Directory Access Operations	Develop basic PHP scripts using variables, data types, operators, functions, arrays, file handling, and control structures
Unit 5 **Database-driven web applications** **(8 Hrs)**	Error handling, Processing HTML form using GET, POST, REQUEST, SESSION, COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db, building & Sending Query, retrieving, updating & inserting data, CMS: Wordpress. Note: XAMMP is used for PHP	Create database-driven web applications using PHP, MySQL, sessions, cookies, form processing, and basic CMS tools such as WordPress

Standard Text Books

- 1. Jennifer Robbins , “Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web graphics”,O’reilly, 2018
- 2. Adrian W. West ,” Practical Web Design for Absolute Beginners”, 2016.
- 3. Harvey M. Dietel, Paul Dietel& Tem R. Nieto, “, Internet& World Wide Web How to Program”, Pearson, 2011

• 4. Ivan Bayross. “Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI”, BPB Publications, 2010.

Reference Materials

• 1. Hofstetter, Fred, “Internet Technology at work”, Osborne, 2004.

• 2. Steven Holzner, “PHP: The Complete Reference”, McGrawHill, 2008

• 3. Elizabeth Naramore, Jason Gerner, Jeremy Stolz, and Timothy Boronczyk Beginning PHP, Apache, MySql web development.Wrox Publication, 2009

• 4. Ivan Bayross, Sharanam Shah, Shroff ,”PHP 5.1 for Professionals”, Publishers and Distributers Pvt. Ltd., 2007.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: RTLM101 - MATHEMATICAL FOUNDATIONS

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: MDC
Semester: 1 | Slot: 6

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 Matrices (8 Hrs)	Introduction, Rank of Matrix, Solving System of Equations, Inverse of a Matrix, Set theory, Principle of inclusion and exclusion, partitions, Permutation and Combination, Relations, Properties of relations, Matrices of relations, Closure operations on relations, Functions-injective, subjective and objective functions.	Apply matrices, set theory, permutations, combinations, relations, and functions to solve mathematical and computational problems
Unit 2 Probability (8 Hrs)	Probability Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence problems. Introduction to Statistics- Population, Sample, Variable, Descriptive Statistics-Mean, Mode, Median, Measures of Spread- Range, Inter Quartile Range, Variance, Standard Deviation.	Apply probability and statistical measures to analyze and interpret data and solve real-world problems
Unit 3 Propositions & Propositional Calculus (8 Hrs)	Propositions and logical operators, Truth table, Propositions generated by a set, Equivalence and implication, Basic laws, Functionally complete set of connectives, Normal forms, Proofs in Propositional calculus, Predicate calculus.	Use propositional and predicate logic to construct truth tables, logical expressions, normal forms, and mathematical proofs
Unit 4 Data Representation (8 Hrs)	Data Representation - Floating point Arithmetic – Addition, Subtraction, Multiplication and Division operation. Pitfall of floating point representation, Errors in numerical computation Iterative Methods, Measurement of Accuracy by using Absolute Error and Relative Error	Analyze floating-point representation and numerical errors and apply iterative methods using absolute and relative error measures
Unit 5 Graphs & Trees (8 Hrs)	Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Spanning Trees	Represent and analyze graphs and trees using matrices, paths, circuits, spanning trees, and graph properties for computational applications

Standard Text Books

- 1. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 7thEdition, 2017
- 2. Seymour Lipschutz, Marc Laras Lipson, Varsha H. Patil, " Discrete Mathematics (Schaum's Outlines) (SIE)", Revised 3rd Edition, 2017
- 3. Murray Spiegel John Schiller, R. AluSrinivasan, DebasreeGoswami, " Probability and Statistics", 3rd Edition, 2017
- 4. Salaria, R.S.: "Computer Oriented Numerical Methods", Khanna Book Publishing Co. (P.) Ltd., New Delhi. 5th Edition, 2012

Reference Materials

- 1. A. Tamilarasi & A.M. Natarajan, "Theory of Automata and Formal Languages", New Age International Pvt. Ltd Publishers, 2008
- 2. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.
- 3. Edgar Goodaire ,"Discrete Mathematics with Graph Theory" Pearson Education
- 4. Bernard Kolman. Robert Busby. Sharon C. Ross," Discrete Mathematical Structures (Classic Version), 6th Edition", Pearson Education.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCPC101 - OBJECT ORIENTED PROGRAMMING LAB

Credit Distribution:
L-T-P: 0-0-4
Total Credits: 2

Academic Details:
Category: DSC
Semester: 1 | Slot: A

Practical Experiments/Activities

Experiment & Title	Procedure / Description	Course Outcome
Experiment 1 C++ Basics and Classes, Object programs (4 Hrs)	1. C++ Basics: Variables, operators, type conversion, I/O, conditional and looping statements 2. Classes and Objects: Classes, objects, member functions, arrays o objects, pointers and nested classes 3. Constructors & Destructors: Constructors, copy constructors, destructors, inline and static members	Develop C++ programs using classes, objects, constructors, and destructors
Experiment 2 Inheritance and Polymorphism (6 Hrs)	1.Function & Operator Overloading: Function overloading and unary/binary operator overloading. 2.Inheritance: Single, multilevel, multiple, hierarchical and hybrid inheritance. 3.Polymorphism: Virtual functions, pointers, late binding, pure virtual functions and abstract classes	Implement function/operator overloading, inheritance, and polymorphism
Experiment 3 Exception Handling (6 Hrs)	1.Exception Handling: try, throw, catch and multiple exception handling	Implementation Of Error Handling
Experiment 4 Templates (6 Hrs)	1. Templates: Function templates and templates with multiple arguments.	Develop reusable programs using function templates and generic programming
Experiment 5 File Handling (6 Hrs)	1. C++ Streams & I/O: Console streams, formatted/unformatted I/O ar manipulators 2. File Handling: File streams, file modes, file pointers, reading, writing and file manipulation.	Perform console and file handling operations and develop basic OOP applications

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCPC102 - SQL-PL/SQL LAB

Credit Distribution:
L-T-P: 0-0-4
Total Credits: 2

Academic Details:
Category: DSC
Semester: 1 | Slot: B

Practical Experiments/Activities

Experiment & Title	Procedure / Description	Course Outcome
Experiment 1 Basic Queries (4 Hrs)	1 Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions	Develop SQL queries using clauses, operators, joins, and built-in functions
Experiment 2 PL/SQL Programming (6 Hrs)	1. Basic PL/SQL Programming 2. Conditional Statements 3. Iterations: Simple Loops, For Loop, While Loop, Nested Loops	Develop PL/SQL programs using variables, conditional statements, and loops.
Experiment 3 PL/SQL Cursor (6 Hrs)	1. Exception Handling 2. PL/SQL Programming with Record Variables & Implicit Cursors 3. PL/SQL Programming with Explicit Cursors, Cursor-For Loop	Implement exception handling, record variables, and cursors in PL/SQL
Experiment 4 PL/SQL Procedures and Functions (6 Hrs)	1. PL/SQL Procedures 2. PL/SQL Functions	Develop and execute PL/SQL procedures and functions for database applications
Experiment 5 Triggers Programming (6 Hrs)	1. Triggers	Create and implement database triggers for automated database operations

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCPC103 - WEB TECHNOLOGIES LAB

Credit Distribution:
L-T-P: 0-0-4
Total Credits: 2

Academic Details:
Category: DSC
Semester: 1 | Slot: C

Practical Experiments/Activities

Experiment & Title	Procedure / Description	Course Outcome
Experiment 1 **HTML** **(8 Hrs)**	1. Basics Elements & Attributes, HTML Formatting tags, Links, 2. Images, Tables, Forms Elements 3. HTML5 Audio and Video, HTML5 Input Types & Attributes 4. CSS Syntax, CSS Attribute Selectors 5. CSS properties: Fonts, Background, Colors, Links, Lists, 6. CSS Box Model, Display, Opacity, Float, Clear 7. CSS Layout, CSS Navigation Bar 8. CSS Rounded Corners, CSS Border Images, CSS Animations	Develop web pages using HTML/HTML5 elements, forms, tables, multimedia, and input controls
Experiment 2 **JavaScript** **(8 Hrs)**	1. Strings and String Methods 2. Numbers and Number Methods, Math, JavaScript Dates: Formats a Methods 3. JavaScript Events, JavaScript, JavaScript Forms (API and Validatio Objects, 4. JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM	Apply CSS for styling, layout, navigation, animations, and responsive web design. Develop interactive web pages using JavaScript functions, objects, events, DOM, BOM, and validation
Experiment 3 **PHP** **(8 Hrs)**	1. Installing XAMMP 2. Variables, Data Types, Constants, Operators, Programming Loops 3. PHP Functions 4. Arrays 5. Strings Functions 6. PHP Form Handling, Require & Include 7. PHP with MySQL	Develop basic PHP programs using variables, arrays, functions, loops, strings, and form handling

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLS101.1 - BASIC MATHEMATICS

Credit Distribution:
L-T-P: 0-0-0
Total Credits: 0

Academic Details:
Category: SEC
Semester: 1 | Slot: -

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Sets and Relations** **(8 Hrs)**	Definition of sets, representation of sets, Operations of sets, Sub sets, power set, Universal set, Complement of a sets, Union and Intersection of sets, Venn diagrams, De-Morgan's law, Partition of sets, Principles of Inclusion and Exclusion, Ordered pair &Cartesian product of two sets. Definition of relation, Types of relation – reflexive, symmetric, anti-symmetric, transitive, Equivalence Relation	Apply set theory and relations to represent and solve basic mathematical problems
Unit 2 **Matrices** **(8 Hrs)**	Definition and types of matrices, Addition, subtraction & multiplication of matrices, Transpose of a matrix, Inverse of Matrices, Determinants, Solution of linear equations using matrices	Perform matrix operations, calculate determinants and inverses, and solve systems of linear equations using matrices
Unit 3 **Basics of permutations and combinations** **(8 Hrs)**	Fundamental principle of counting, factorial representation of permutations, factorial representation of combination, permutation and combinations under certain conditions.	Apply the principles of permutations and combinations to solve basic counting and arrangement problems
Unit 4 **Data Interpretation** **(8 Hrs)**	Measure of central Tendency Arithmetic Mean ungrouped & grouped data, Median, Mode, Measures of Dispersion – Range Mean deviation, Variance & standard deviations, Analysis of frequency distribution. Correlation and Regression.	Calculate and interpret measures of central tendency, dispersion, correlation, and regression for data analysis
Unit 5 **Data representation and visualization** **(8 Hrs)**	Statistics, Statistical data, Classification of data, Data representation, Visualization of data (Bar graph, Pie Diagrams), Graphical representation of frequency distribution-(Histogram, Frequency polygon, Cumulative frequency polygon).	Classify, represent, and visualize statistical data using appropriate graphical methods such as bar graphs, pie charts, histograms, and frequency polygons.

Standard Text Books

• 1. Elements of Mathematics Bhargava, M. L. (2023). Elements of Mathematics (33rd rev. ed.). Jeevan sons Publications.

• 2. Discrete Mathematics and Its Applications Rosen, K. H. (2017). Discrete Mathematics and Its Applications (6th ed.). McGraw-Hill Education.

• 3. Comprehensive Mathematics Gupta, P. (2021). Comprehensive Mathematics. Arihant Publications.

• 4. Schaum's Outline of College Mathematics Spiegel, M. R., Lipschutz, S., & Spellman, D. (2017). Schaum's Outline of College Mathematics (4th ed.). McGraw-Hill Education.

• 5. Fundamentals of Mathematical Statistics Gupta, S. C., & Kapoor, V. K. (2020). Fundamentals of Mathematical Statistics (12th ed.). Sultan Chand & Sons.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLS101.2 - C PROGRAMMING LAB

Credit Distribution:
L-T-P: 0-0-0
Total Credits: 0

Academic Details:
Category: SEC
Semester: 1 | Slot: -

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Basic C Programming** **(8 Hrs)**	1. Basic C Programming:-Data types, Tokens, Keywords, Operators	Develop basic C programs using data types, tokens, operators, and keywords.
Unit 2 **Control Statements** **(8 Hrs)**	1. Control Statements:-Programs on if, if-else, ladder,Switch, iterative statements-for, while, do-while.	Implement decision-making and iterative control statements to solve programming problems
Unit 3 **Array and Functions** **(8 Hrs)**	1. Functions: - Programs on Functions. 2. Arrays:-Programs on Arrays.	• Develop modular programs using functions and arrays.
Unit 4 **Structure and Unions** **(8 Hrs)**	1. Structures and Union programs	Apply pointers, structures, unions, and dynamic memory allocation in C programs
Unit 5 **File Handling** **(8 Hrs)**	1. Dynamic Memory allocation Programs on File Handling.	Implement basic file-handling operations and develop C programs for practical problem-solving.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLS101.3 - FUNDAMENTAL OF COMPUTER SCIENCE

Credit Distribution:
L-T-P: 0-0-0
Total Credits: 0

Academic Details:
Category: SEC
Semester: 1 | Slot: -

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Introduction to Computers** **(8 Hrs)**	Characteristics of computers, Evolution of computers, generation of computers, classification of computers, applications of computers. Input and Output Devices: Keyboard, pointing devices, speech recognition, digital camera, scanners, optical scanners. Classification of output devices, Hard copy output devices- printers, plotters, computer output microfilm (COM), Classification of output devices, Soft copy output devices- monitors, audio output, projectors, and terminals. Computer System: Central processing unit (CPU), Memory, instruction format, instruction set.	Explain the fundamentals, characteristics, evolution, classification, and applications of computers along with various input/output devices and CPU components.
Unit 2 **Primary and Secondary Memory** **(8 Hrs)**	Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk. Number Systems: Introduction to number system, Binary, Octal, Hexadecimal, conversion between number bases, Alphanumeric-EBCDIC and ASCII, Sets Theory, Types of Sets, Multi Sets, Operations on Sets	Apply knowledge of memory organization, number systems, data representation, and set operations to solve basic computational problems
Unit 3 **Computer Program** **(8 Hrs)**	Introduction, developing a program, algorithm, flowchart, pseudo code. Computer Languages: Introduction, classification of programming languages, generations of programming languages, features of a good programming language. Computer Software: Software definition, relationship between software and hardware, software categories, system software, application software, utility software	Develop basic algorithms and flowcharts, and differentiate programming languages and categories of computer software.
Unit 4 **Operating System and Network** **(8 Hrs)**	Introduction of operating system, types of operating system, functions of an operating system, modern operating systems. Data Communication and Computer Network: Introduction, data communication, transmission media, multiplexing, switching, computer network, network topologies, communication protocols, network devices. Internet Basics: Introduction, evolution of Internet, basic Internet terms, getting connected to Internet, Internet applications, electronic mail and other Internet Services, searching the web (search engines), languages of Internet, viruses. Use of Anti-Virus software.	Describe the functions of operating systems, data communication, computer networks, Internet services, and basic cybersecurity practices
Unit 5 **Office Management Tools** **(8 Hrs)**	MS-Word: Creating Saving documents, Entering, Editing, Page formatting, Finding and replacing text, Spell checking and Grammar checking, Indexing, Columns, Tables and feature there in, Inserting (Objects, picture, files etc.), Using Graphics, using Mail Merge, using Word Art, customizing MS Word. MS Excel: Spreadsheet terminology, organization of the worksheet area, editing cells using commands and functions, formatting worksheet, creating & editing charts, naming range and using statistical, mathematical and financial functions, multiple worksheets and Macros, working with objects, Worksheet printing options. MS Power Point: Anatomy of a power Point Presentation, Creating and Viewing a presentation, Managing Slide Shows, Using hyperlinks, advanced navigation with action setting and action buttons, organizing formats with Master Slides, adding graphics, multimedia and special effects, creating presentation for the web. MS Access: Planning a database (tables, queries, forms, reports), Creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure, maintaining	Use MS Word, MS Excel, MS PowerPoint, and MS Access to create, organize, analyze, present, and manage information for academic and professional applications.

Unit & Title	Topics	Course Outcome
	database, Sorting and Indexing database, Querying a database and generating Reports, modifying a Report.	

Standard Text Books

- 1. Computer Fundamentals by P.K. Sinha, BPB Publication.
- 2. Fundamental of Computers Anita Goel, Pearson Education.
- 3. RajaramanV. – Fundamentals of Computers, Prentice Hall of India Pvt. Ltd.
- 4. MS-Office, Dr. S.S. Shrivastava, Published by Laxmi Publication.

Reference Materials

- 1. Computer Fundamentals and Programming in C, Reema Thareja, OXFORD University Press.
- 2. Introduction to Computer, Peter Norton's, Tata McGraw Hill Publication.
- 3. Office 2019: In Easy Steps, Michal Price, BPB Publication.
- 4. Windows 8 & Office 2010, Andy Rathbone , Dummies

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC106 - JAVA TECHNOLOGIES

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 2 | Slot: 1

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Introduction to Java** **(8 Hrs)**	OOP in Java, Characteristics of Java, Fundamental Programming Structures in Java, Abstract Class, Interfaces, Defining Methods, Inheritance, Overloading, Overriding, Packages, Exception Handling, Threads, Thread Life-Cycle.	Explain core Java programming and OOP concepts, including inheritance, interfaces, abstract classes, packages, exception handling, and threads.
Unit 2 **J2EE Overview** **(8 Hrs)**	Need of J2EE, J2EE Architecture, J2EE APIs, J2EE Containers. Web Application Basics, Architecture and Challenges of Web Application, Servlet Life Cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml), Handling Request and Response, Initializing a Servlet. Servlet Chaining, Session Tracking and Management	Describe J2EE architecture and APIs and explain Servlet architecture, life cycle, request-response processing, and session management.
Unit 3 **JDBC** **(8 Hrs)**	The JDBC Connectivity Model, Types of JDBC Drivers., Basic steps to JDBC, setting up a connection to database, Creating and executing SQL statements, ResultSet and ResultSet Metadata Object, Accessing Database.	Explain and apply the JDBC connectivity model, drivers, database connections, SQL statements, and ResultSet processing.
Unit 4 **Java Server Pages** **(8 Hrs)**	Basic JSP Architecture, Life Cycle of JSP, JSP Tags & Expressions, JSP Implicit Objects, JSP Directives, Tag Libraries ,Using JDBC with JSP , Accessing a Database, Adding a Form, Updating the Database.	Explain JSP architecture and life cycle and apply JSP components, implicit objects, directives, tag libraries, and database integration
Unit 5 **Introduction to Spring** **(8 Hrs)**	Overview of Spring Framework- Inversion of Control / Dependency Injection Concepts, Aspect Oriented Programming - concept ,Spring MVC Architecture , Bean Factory and Application Context, Attaching and Populating beans, Injecting data through setters and constructors , Listening on events, Publishing events, Spring MVC Layering, Dispatcher Servlet, Writing a Controller, DAO, Models, Services, Spring Configuration File, Error handling Strategy.	Explain Spring Framework concepts, including IoC/DI, AOP, beans, Spring MVC architecture, controllers, DAO, services, configuration, and error handling.

Standard Text Books

- 1. Herbert Schildt, “Java: The Complete Reference”, 10th Edition, McGraw-Hill, 2017.
- 2. Marty Hall and Larry Brown, “Core Servlets and Java Server Pages”, 2nd Edition, 2003.
- 3. MertCaliskan, KenanSevindik, Rod Johnson, Jurgen Holler, “Beginning Spring”, Wrox publication, Feb 2015.

Reference Materials

- 1. Bruce Eckel, “Thinking in Java”, 4th Edition, Prentice Hall, 2006.
- 2. Cay S. Horstmann, “Core Java, Volume I: Fundamentals”, 9th Edition, Pearson Education, 2014.
- 3. Santosh Kumar K, “JDBC, Servlet, and JSP: Black Book”, Kogent Solutions Inc., 2008.
- 4. Madhusudhan Konda, “Just Spring”, 1st edition, O’Reilly, 2011.
- 5. E. Balagurusamy, “Programming with Java: A Primer”, Tata McGraw-Hill, 2010.
- 6. Bryan Basham, Kathy Sierra & Bert Bates , “Head First Servlets and JSP” Paperback, 2008

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC107 - DATA STRUCTURES& ALGORITHM DESIGN

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 2 | Slot: 2

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Introduction and Stack** **(8 Hrs)**	Basic data structures such as arrays, linked list, stack, trees and queues and their applications, linked and sequential representation Basic Terminology, Elementary Data organization, Data Structure operations. Preliminaries of algorithm, Algorithm analysis and complexity. Stack Implementation of stack, operations on stack. Applications of stack: Conversion of infix-expressions to prefix and postfix expressions, evaluation of postfix expression.	Explain fundamental data structures, operations, algorithms, and complexity analysis and apply stacks to solve problems
Unit 2 **Queues and Linked List** **(8 Hrs)**	Implementation of queues, Operations on Queue, Types of Queues - Circular queue, Dequeue and Priority Queue. Linked List Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, insertion and deletion to/from Linked Lists, insertion and deletion Algorithms, Doubly linked list, Header lists, circular lists, sorted lists.	Implement and analyze queues and linked lists, including their different types and operations.
Unit 3 **Trees** **(8 Hrs)**	Basic terminology and definitions. Array and Linked Representation of Binary trees, Traversing Binary trees. Binary Search Trees: Binary Search Tree (BST), Traversal, Insertion and Deletion in BST, and Introduction to balanced BST (AVL Trees)	Explain and implement binary trees, BSTs, and basic AVL tree concepts with appropriate traversal and operations.
Unit 4 **Searching and Sorting** **(8 Hrs)**	Sequential search, binary search, comparison and analysis. Sorting Insertion Sort, Bubble Sort, Quick Sort, Two-Way-Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for internal Sorting.	Apply and analyze searching and sorting algorithms based on their performance and practical considerations
Unit 5 **Graphs** **(8 Hrs)**	Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.	Represent and analyze graphs using appropriate representations, traversals, connected components, spanning trees, and minimum-cost spanning trees.

Standard Text Books

- 1. A. Tannenbaum, “Data Structure Using C”, Pearson Education, 2019.
- 2. AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012
- 3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Course Private Limited, 2012.

Reference Materials

- 1. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009.
- 2. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.
- 3. D.S Malik, “Data Structures using C++”, Cengage Learning, 2nd edition, 2009
- 4. E. Horowitz &Sahni, “Fundamental Data Structure”, Galgotia Book Source, 2007.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC108 - PYTHON PROGRAMMING

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 2 | Slot: 3

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Introduction and Overview** **(8 Hrs)**	Introduction, What is Python, Origin, Comparison, Comments, Variables and Assignment, Identifiers, Basic Style Guidelines, Python Objects, Standard Types, Other Built-in Types, Internal Types, Operators, Built-in Functions, Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Sequences: Strings, Sequences, Strings, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings, Memory Management, Python Application Examples.	Explain Python fundamentals, variables, data types, operators, built-in functions, numbers, strings, and memory management.
Unit 2 **Lists and Dictionaries** **(8 Hrs)**	Built-in Functions, List type built in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples, Introduction to Dictionaries, Built-in Functions, Built-in Methods, Dictionary Keys, Conditionals and Loops: if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement	Apply lists, tuples, dictionaries, conditional statements, and looping constructs to solve programming problems.
Unit 3 **Object, Classes and Files** **(8 Hrs)**	Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Class variables, Inheritance, Polymorphism, Type Identification, File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Units.	Develop Python programs using classes, objects, instance methods, inheritance, polymorphism, file handling, and command-line arguments.
Unit 4 **Regular Expression and Exception Handling** **(8 Hrs)**	Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python. What Are Exceptions? Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.	Apply regular expressions and exception-handling techniques to identify, raise, and manage errors in Python programs
Unit 5 **Database Interaction** **(8 Hrs)**	SQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections, Python Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading.	Develop Python applications using SQL database connectivity and multithreading with thread creation and synchronization

Standard Text Books

- 1. R. Nageswara Rao, “Core Python Programming”, Dreamtech Press, 2nd Edition, 2018
- 2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, “Python Programming” , Notion Press, 1stEdition, 2020
- 3. Martin C. Brown, “The Complete Reference Python”, McGraw Hill Education, 4thEdition, 2018

Reference Materials

- 1. Allen B. Downey, “Think Python”, O’Reilly Media, 2016
- 2. Amit Ashok Kamthane, Ashok NamdevKamthane, “ Programming and Problem Solving with Python” , McGraw Hill HED, 1st Edition, 2017.
- 3. Sakis Kasampalis, Quan Nguyen, Dr Gabriele Lanaro, Ingram, “Advanced Python Programming”, short title, 2019.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC109 - ARTIFICIAL INTELLIGENCE

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 2 | Slot: 4

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 General Issues and overview of AI (8 Hrs)	Concept of AI, AI technique, Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving, Production systems, and Control strategies, forward and backward chaining Exhaustive searches: Depth first and Breadth first search	Explain fundamental concepts of Artificial Intelligence, problem-solving approaches, production systems, control strategies, and uninformed search techniques.
Unit 2 Heuristic Search Techniques (8 Hrs)	Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs,Problem reduction and AO* algorithm, Constraint Satisfaction problems, Game Playing Min Max Search procedure	Apply heuristic search techniques such as Hill Climbing, Branch and Bound, Best-First Search, A*, AO*, CSP, and Min-Max for problem solving
Unit 3 Knowledge Representation (8 Hrs)	First Order Predicate Calculus, Resolution Principle and Unification, Inference Mechanisms Horn's Clauses, Semantic Networks, Frame Systems , Scripts, Conceptual Dependency AI Programming Languages	Explain and apply knowledge representation techniques using predicate logic, resolution, unification, semantic networks, frames, scripts, and conceptual dependency
Unit 4 Natural Language Processing (8 Hrs)	Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Tokenization, Part-of- Speech Tagging, Issues in Part-of-Speech tagging. Semantics and pragmatics-Requirements for representation, Syntax-Driven Semantic analysis, Introduction to syntactic analysis.	Explain fundamental concepts of Natural Language Processing, including language models, regular expressions, finite-state automata, morphology, tokenization, POS tagging, syntax, semantics, and pragmatics
Unit 5 Expert Systems (8 Hrs)	Introduction to Expert Systems, Architecture of Expert Systems, Expert System Shells, Knowledge Acquisition, Case Studies of Expert System	Explain the architecture, knowledge acquisition, and applications of Expert Systems and describe the concept and types of machine learning

Standard Text Books

- 1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3 rd edition, 2009
- 2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1st edition, 1997
- 3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3 rd edition, 2004
- 4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and Distributors Pvt.LTD., 1 st Edition, 2016

Reference Materials

- 1. Nils J. Nilsson, "Principles of Artificial Intelligence (Symbolic Computation / Artificial Intelligence)", reprint edition, 2014
- 2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3 rd edition, 2010.
- 3. Daniel Jurafsky, James H. Martin Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCLC110 - SOFTWARE ENGINEERING

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: DSC
Semester: 2 | Slot: 5

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Software Engineering Fundamentals** **(8 Hrs)**	Software Engineering - A layered Technology, The importance of software, software myths, software engineering paradigms, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model Evolutionary Software Process Models: Incremental Model, Spiral Model Component Assembly Model, Formal Methods, Fourth-Generation Techniques	Explain the fundamentals of software engineering, software process models, and their applicability to different software development projects.
Unit 2 **Analysis Concepts and Principles** **(8 Hrs)**	Analysis Concepts and Principles, the Elements of the Analysis Model Data Modifying, Functional Modeling and Information Flow and Behavior Modeling, Mechanics of Structured Analysis, Data Dictionary. Requirement analysis, tasks, analyst, software prototyping, specification principles, representation and the software requirements specification.	Apply requirements analysis and modeling techniques to identify, document, and specify software requirements using appropriate analysis models and SRS.
Unit 3 **Software Project Planning** **(8 Hrs)**	Software Project Planning, Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model, Risk Identification and Projection: RMMM, Project scheduling and Tracking. Software Design Process, Design Principles, and Design Concepts: Effective Modular Design, Design Heuristics, Design Documentation, Design Methods: Data Design, Architectural Design, Interface Design, Human Computer Interface Design, Procedural Design. Case Study for Design of any Application Project.	Apply software project planning, estimation, risk management, scheduling, and software design principles to develop a structured software solution.
Unit 4 **Software Testing** **(8 Hrs)**	S/W Testing Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging. Software Maintenance Maintainability – maintenance Tasks, Characteristics of a good quality software. Case Study for Testing Techniques.	Apply appropriate software testing, verification, validation, debugging, and maintenance techniques to ensure software quality and maintainability
Unit 5 **Unified Modeling Language (UML)** **(8 Hrs)**	Unified Modeling Language, Basic structures and modeling classes, common modeling techniques, relationships, common mechanism, class diagrams. Advanced structured modeling, advanced classes and relationships, interfaces, types and roles, instances and object diagram. Basic idea of behavioral modeling. State diagrams, Interaction diagrams, Use case diagrams Object- oriented concepts and principles. Identifying the elements of an object model. Object oriented projects metrics and estimation.	Develop and interpret UML models and object-oriented designs, including class, object, use-case, state, and interaction diagrams, along with basic project metrics and estimation.

Standard Text Books

- 1. Roger S Pressman, Bruce R Maxim, “Software Engineering: A Practitioner’s Approach”, 8th Edition, 2019.
- 2. Ian Sommerville,” Software engineering”, Addison Wesley Longman, 9th Edition, 2017.

Reference Materials

- 1. Grady Booch, James Rumbaugh, Ivar Jacobson.,” The Unified Modeling Language User Guide”, 2nd Edition, 2017.
- 2. James Rumbaugh. Micheal Blaha “Object oriented Modeling and Design with UML”, 2011.
- 3. Ali Behforooz, Hudson, “Software Engineering Fundamentals”, Oxford, 2009.
- 4. Charles Ritcher, “Designing Flexible Object Oriented systems with UML”, TechMedia , 2008.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: RTLA101 - CLOUD COMPUTING FOR SMART APPLICATIONS

Credit Distribution:
L-T-P: 3-1-0
Total Credits: 4

Academic Details:
Category: AEC
Semester: 2 | Slot: 6

Course Content & Outcomes

Unit & Title	Topics	Course Outcome
Unit 1 **Introduction to Cloud** **(8 Hrs)**	Cloud Computing at a Glance, Vision of Cloud Computing, Defining a Cloud, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments, Risks and Approaches of Migration into Cloud ,Types of Clouds, Services models, Cloud Reference Model.	Explain the fundamental concepts, characteristics, benefits, challenges, service models, deployment models, and reference models of cloud computing.
Unit 2 **Cloud Architecture** **(8 Hrs)**	Cloud architecture, features and benefits of Survive Models: Software as a Service (SaaS),Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.	Analyze cloud architecture and evaluate SaaS, PaaS, IaaS, and different cloud deployment models for organizational requirements
Unit 3 **Virtualization** **(8 Hrs)**	Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V. Virtualization of CPU, Memory, I/O Devices, Virtual Cluster ,datacenterand Resources Management.	Explain virtualization concepts, techniques, virtualized resources, and their role in cloud computing and resource management.
Unit 4 **Securing the Cloud** **(8 Hrs)**	Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in cloud Computing. Data Security in Cloud: Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	Analyze cloud security threats, risks, security architecture, data protection, SLA, trust management, and legal issues in cloud computing.
Unit 5 **Defining the Clouds for Enterprise** **(8 Hrs)**	Storage as a service, Database as a service, Process as a service, Information as a service, Integration as a service and Testing as a service. Disaster Management in Cloud: Disasters in the Cloud, Disaster Recovery Planning.	Explain cloud-based enterprise services and apply disaster recovery and management concepts for ensuring business continuity

Standard Text Books

- 1. San Murugesan, Irena Bojanova, “Encyclopedia of Cloud Computing”, Wiley , 2016
- 2. Kai Hawang , GeofreyC.Fox, Jack J. Dongarra, “Distributed and Cloud Computing: From Parallel Processing to the Internet of Things”, Morgan Kaufmann, 2013
- 3. RajkumarBuyya, JemesBroberg, A. Goscinski, “Cloud Computing : Principal and Paradigms”, Wiley, 2011
- 4. Dr.Mahaveer Kumar Sain, Dr.Navneet Sharma, Dr.Dharmveer Yadav, “Cloud Computing a Guide for Tnking Human”, Book Rivers, ISBN No.: 978-93-5515-661-7.

Reference Materials

- 1. Krutz , Vines, “Cloud Security “ , Wiley Pub, 2014
- 2. Velte, “Cloud Computing- A Practical Approach” ,TMH Pub, 2015

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCPC104 - JAVA TECHNOLOGIES LAB

Credit Distribution:
L-T-P: 0-0-4
Total Credits: 2

Academic Details:
Category: DSC
Semester: 2 | Slot: A

Practical Experiments/Activities

Experiment & Title	Procedure / Description	Course Outcome
Experiment 1 Basic Java Programming (4 Hrs)	1. Simple java applications for understanding references to an instant a class 2. Handling strings in JAVA 3. Package creation 4. Developing user defined packages in java 5. Use of Interfaces	Develop Java programs using classes, object references, strings, packages, and interfaces.
Experiment 2 Threads and Exceptional Handling (6 Hrs)	1. Threads, Multithreading 2. Exception Handling	Implement multithreading and exception-handling techniques in Java applications
Experiment 3 Servlets (6 Hrs)	8. Dynamic HTML using Servlet 1. Use of get() and Post() methods 2. Cookies in Servlet 3. Session tracking and Management	Develop Servlet-based web applications using HTTP methods, cookies, and session tracking.
Experiment 4 JDBC (6 Hrs)	1. JDBC 2. JSP Actions elements 3. Directives elements in JSP 4. JSP Tags	Implement database connectivity using JDBC with Servlets and JSP, including JSP actions, directives, and tags.
Experiment 5 Web Application using JSP, JDBS (6 Hrs)	1. Implement JDBC with JSP 2. Implement JDBC with Servlet 3. Applications using Spring Web MVC	Develop basic enterprise web applications using JSP, Servlets, JDBC, and Spring Web MVC.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCPC105 - DATA STRUCTURES & ALGORITHM DESIGN LAB

Credit Distribution:
L-T-P: 0-0-4
Total Credits: 2

Academic Details:
Category: DSC
Semester: 2 | Slot: B

Practical Experiments/Activities

Experiment & Title	Procedure / Description	Course Outcome
Experiment 1 **Linear Data Structure Implementation** **(6 Hrs)**	1. Array implementation of Stack and Queue 2. Linked list implementation of List, Stack Queue 3. Array implementation of QUEUE 4. Applications of List, Stack and Queue ADTs	Implement and manipulate linear data structures such as arrays, linked lists, stacks, queues, and their ADT applications.
Experiment 2 **Binary Tree** **(6 Hrs)**	1. Implementation of Binary Trees and operations of Binary Trees 2. Implementation of Binary Search Trees	Implement binary trees, binary search trees, and AVL trees with fundamental tree operations.
Experiment 3 **Queues** **(4 Hrs)**	Implementation of Heaps using Priority Queues.	Implement heaps and priority queues and apply them to solve computational problems.
Experiment 4 **Graphs** **(6 Hrs)**	1. Graph representation and Traversal algorithms 2. Applications of Graphs	Represent graphs and implement graph traversal algorithms and their applications.
Experiment 5 **Searching and Sorting** **(6 Hrs)**	1. Implementation of searching and sorting algorithms	Implement and analyze searching and sorting algorithms for solving data organization and retrieval problems.

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

COURSE CODE: MCPC106 - PYTHON PROGRAMMING LAB

Credit Distribution:
L-T-P: 0-0-4
Total Credits: 2

Academic Details:
Category: DSC
Semester: 2 | Slot: C

Practical Experiments/Activities

Experiment & Title	Procedure / Description	Course Outcome
Experiment 1 Basic Operations (4 Hrs)	1. Implement a sequential search 2. Create a calculator program 3. Explore String Functions	Develop basic Python programs using sequential search, calculator operations, string functions.
Experiment 2 Stack and Sort (4 Hrs)	1. Implement Selection Sort 2. Implement Stack	Implement and analyze selection sorting and basic data manipulation techniques in Python.
Experiment 3 File operations (6 Hrs)	1. Read and Write into a file	Perform file handling operations and process data using lists, dictionaries, and CSV files.
Experiment 4 Regular Expression (6 Hrs)	1. Demonstrate usage of basic regular expression 2. Demonstrate use of advanced regular expressions for data validatio 3. Demonstrate use of List	Apply basic and advanced regular expressions for pattern matching and data validation.
Experiment 5 Python Scripts with Internal Data Structues (6 Hrs)	1. Demonstrate use of Dictionaries 2. Create Comma separate files(CSV), Load CSV files into internal da structure 3. Write script to work like a SQL SELECT statement for internal data structure	Develop Python scripts to search, filter, and retrieve data from internal data structures using SQL-like SELECT operations.