BIKANER TECHNICAL UNIVERSITY, BIKANER

SCHEME AND SYLLABUS

OF 2 YEAR

Master of Computer Application

PROGRAMME

Effective From Session: 2020-21

Bridge Course

Course Code	Course Title	Type of Paper	Contact Hours Per Week	Exam Hrs	Internal Assessment	End Term Exam	Total
MCA-BC-110	Computer Fundamentals and Programming in C	Theory	03	03	20	80	100
MCA-BC-111	C Programming Lab	Practical	02	03	60	40	100

- For Bridge course students are required to score at least the minimum marks i.e40% marks both in theory and practical separately. These marks however will not be added to the final score of semester / programme.
- For Bridge course, only cleared or not cleared will be mentioned in the mark sheet. No separate certificate will be issued.
- Total Duration of Completion of MCA Program will be **Four** Semester with maximum attempt of Four more semester and same applies for the Bridge course
- No Grace marks for the bridge course
- Grace marks for MCA program subjects will be given as per university examination system likewise other PG program/s
- Exam paper pattern will be as follows
  10 very small questions (2 marks each) of 20 marks (2 questions from each Unit)
  5 small questions (4 marks each) of 20 marks (1 questions from each Unit)
  5 big questions of (8 marks each) of 40 marks (2 questions from each Unit with an OR option)

FIRST YEAR

TEACHING SCHEME

Semester I

Course Code	Course Title	Type of Paper	Contact Hours Per Week	Exam Hrs	Internal Assessment	End Term Exam	Total	Credits
MCA 121	Object Oriented Programming through C++ / Java	Theory	03	03	20	80	100	03
MCA 122	Database Management Systems	Theory	03	03	20	80	100	03
MCA 123	Web Application Development	Theory	03	03	20	80	100	03
MCA 124	Software Engineering	Theory	03	03	20	80	100	03
MCA 125	Mathematical Foundations of Computer Science	Theory	03	03	20	80	100	03
MCA 126	Object Oriented Programming Lab	Practical	03	03	60	40	100	03
MCA 127	Database Management Systems Lab	Practical	03	03	60	40	100	03
MCA 128	Mini Project in Web Design	Practical	03	03	60	40	100	03
MCA 129	Communication & Soft Skills Lab	Practical	02	02	30	20	50	02
Total Credits for I Semester							**850**	**26**

Semester II

Course Code	Course Title	Type of Paper	Contact Hours Per Week	Exam Hrs	Internal Assessment	End Term Exam	Total	Credits
MCA 221	Programming through Python	Theory	03	03	20	80	100	03
MCA 222	Operating Systems	Theory	03	03	20	80	100	03
MCA 223	Data Structures and Algorithm Design	Theory	03	03	20	80	100	03
MCA 224	Computer Networks & Internet Architectures	Theory	03	03	20	80	100	03
MCA 225	Cloud Computing	Theory	03	03	20	80	100	03
MCA 226	Python Programming Lab	Practical	03	03	60	40	100	03
MCA 227	Linux Programming Lab	Practical	03	03	60	40	100	03
MCA 228	Data Structures and Algorithm Design Lab	Practical	03	03	60	40	100	03
MCA 229	Human Values& Professional Ethics	Practical	02	02	30	20	50	02
Total Credits for II Semester							**850**	**26**

Course Code: MCA-BC-110
Course Code: Computer Fundamentals and Programming in C

Unit	Contents
I	**Introduction to Computers** Introducing and Interacting with Computers, Computer Organization, Number System & Computer codes, Computer Arithmetic, Boolean Algebra and IO Devices.
II	**Introduction to Memory and Languages** Processor And Memory,Types of Storage Devices, Computer Software and types, Basics of Programming, Programming Languages. Language Elements, Algorithms and Flowcharts.
III	**Problem Solving with C Programming** History, Execution of C Program, Constants, Variables and Keywords, Data types, Expressions, constants, variables, Operators, Operator Precedence and associativity, data input and output, Formatted Console I/O Functions, Conversion Specifications, assignment statements, conditional statements, Looping Statements, Storage Classes
IV	**Array and Modular Programming** Introduction to Function, Functions with Simple Output Parameters, Passing Values between Functions, Multiple Calls to a Function, Parameter Passing by Value v/s Parameter Passing by Reference, Recursion **Arrays:** Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Multidimensional Arrays, Passing arrays as arguments
V	**Structures , Unions , Strings and Pointers** Structures & Unions- definition, Processing structures – Passing structures to a function.Pointers: Operations on Pointers – Pointers to Functions, Functions Returning Pointers, Arrays of pointers.String handling

Text Books:
- Peter Norton," Introduction to Computers", 6th Edition,2009.
- YashvantKanetkar,"Let Us C", BPB Publications, 13th edition, 2012.
- S Prasad, K.R Venugopal, "Mastering C", Tata McGraw Hill, 2006.
- E.Balaguruswamy, "Programming in ANSI C", Tata McGraw Hill, 6th edition, 2012.

Reference Books:
- Pradeep K Sinha ,PritiSinha, "Computer Fundamentals", 6th Edition, 2003.
- Bayron Gottfried, "Schaum's Outline of Programming with C", 4th Edition, 2018 (Paper Back).
- Kernighan and Ritchie, "The C Programming Language", Prentice Hall, 2015 (Paper Back).

Course Code: MCA-BC-111
Course Code: C Programming Lab

Contents
Simple C Programs to Learn • Data types & Expressions, Constants & Variables • Operators, Operator Precedence and associativity • Keywords & Identifiers • Storage Classes • Conditional statements • Looping Statements
Array and Modular Programming • Basic Array programs using for loop • User defined functions • Recursion • Programs on Two dimensional Arrays , Passing arrays as arguments
String handling • Programs based on String Functions and Character Operation • Programs based on an array of Pointers to Strings
Structure and Pointers • Programs based on Structures & Unions • Programs based on pointers (arithmetic operations on Pointer, arrays with pointers). • Programs of Pointers to structures and Array of structures

Course Code: MCA 121
Course Title: Object Oriented Programming through C++ / Java

Unit	Contents
I	Evolution of OOP, OOP Paradigm, advantages of OOP, Comparison between functional programming and OOP Approach, characteristics of object oriented language. Introduction to C++, Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, input and output.
II	Conditional expression, loop statements, breaking control statements,Classes and objects, constructors and destructors, function and operator overloading, inheritance, Virtual Function, friend function, this pointer, dynamic type information and polymorphism
III	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, Exception handling, dynamic memory allocation.
IV	OOP in Java – Characteristics of Java – The Java Environment – Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers – static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages – JavaDoc comments.
V	Inheritance – Super classes- sub classes, abstract classes and methods- final methods and classes – Interfaces, Exception Handling, Threads, Thread Life-Cycle, Basics of event handling

Text Books:
- K.R.Venugopal, Raj KumarBuyya, "Mastering C++", McGraw-Hill, 2017.
- Rajaram R, Object Oriented Programming and C++", 2nd Edition, New Age International, 2013.
- Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw-Hill, 2019.
- E. Balagurusamy, "Programming with Java: A Primer", 6th Edition, Tata McGraw-Hill, 2019.

Reference Books:
- John R. Hubbard, AtulKahate , "Programming with C++", TMH, 2017.
- SouravSahay, "Object Oriented Programming with C++", 2nd Edition, Oxford University Press, 2012

Course Code: MCA 122
Course Title: Database Management Systems

Unit	Contents
I	**Introduction:** Overview of DBMS, Advantages of DBMS, Basic DBMS terminology, Database System v/s File System, Data Independence, Architecture of DBMS, Introduction to data models: Relational Model, Network Model, Hierarchical Model, Entity-Relationship Model.
II	**Data modeling using the Entity Relationship Model:** ER model concepts, Types of Relationships, notation for ER diagram, Reduction of ER-Diagrams to Relational Model, mapping constraints, Generalization, Aggregation, Specialization, Extended ER model, relationships of higher degree.
III	**Relational model:** Storage Organizations for Relations, Relational Algebra, Set Operations, Relational Calculus, Concepts of Alternate key, Candidate key, Primary key, Foreign key, Integrity Rules, Data Dictionary.
IV	**Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design. Transactions: Transaction Concept, State, ACID properties, basic understanding of Concurrency & Recovery.
V	**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands: DDL, DML, TCL, DCL, SQL operators, Tables, Views and Indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Aggregate Functions, Numeric Functions, String Functions, Date & Time Functions, Insert, Update and Delete operations, Unions, Intersection, Minus, Joins: Equi-Join, Natural Join, Self Join, Inner Join, Outer Join.

Text Books:
- Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley, 7th Edition, 2016.
- Korth, Silberschatz, Sudarshan, "Database Concepts", McGraw Hill, 6th Edition, 2010.

Reference Books:
- Thomas Connolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management, Addison Wesley, 6th Edition, 2014.
- Ramakrishnan, Gehrke, "Database Management System", McGraw Hill, 3rd Edition, Jan 2007
- Date C J, "An Introduction to Database System", Addision Wesley, 8th Edition 2003
- Bipin C. Desai, "An Introduction to Database Systems", Galgotia Publication, Revised Edition, 2010
- Majumdar& Bhattacharya, "Database Management System", TMH, 2005.
- Paul Beynon Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003

Course Code: MCA 123
Course Title: Web Application Development

Unit	Contents
I	**HTML:** Internet standards, WWW Architecture, Generation of dynamic web pages, Generation of static webpages using HTML, Elements of HTML syntax, Head and Body sections, Building HTML documents, Inserting text, images, hyperlinks, Backgrounds and Color Control, meta tags, ordered and unordered lists, Table Handling: Table layout & presentation, constructing tables in a web page, Frames: Developing Web pages using frames, IFrames. Forms and its elements, special tags.
II	**Cascading Style Sheet (CSS):** Introduction to CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, Manipulating text, Margins and Padding, Border, Positioning using CSS, Selectors, Tag selectors, class selectors, ID Selector, Styling Groups within tags, Formatting Tables and Forms, CSS3 Specific Properties: Alpha Color Space, Opacity, Box Shadow & Border Radius.
III	**JavaScript:** JavaScript Variables and Data Types, Statement and Operators, Control Structure, Functions, Executing deferred scripts, Objects, Messaging in a JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Events Handlers, Forms, Forms array, Forms Handling and Validations.
IV	**Ajax and jQuery:** Introduction to Ajax, Cross-Browser DOM, Advantages and Disadvantages, Ajax the jQuery way: using load, post, get functions, jQuery: jQuery Basics, Selecting Element with jQuery, Managing Events, Hiding and Showing Elements, Toggling visibility using jQuery.
V	**PHP:** Introduction, How web works, setting up the environment (XAMPP Server), Programming Basics, Print/echo, Variables and Constants, Strings and Arrays, Operators, Control Structures and Looping Structures, Functions, Embedding PHP with HTML, Establishing connectivity with MySQL database, **WordPress:** Introduction & Installations

Text Books:
- Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.
- Achyut S Godbole and AtulKahate, "Web Technologies", Second Edition, Tata McGraw Hill, 2012.
- PHP and MySQL Web Development (Developer's Library) 5th Edition, Luke Welling Laura Thomson,2016
- Anthony T. Holdener III, Ajax: The Definitive Guide, O'Reilly Media, First edition, 2008. Mike McGrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.

Reference Books:
- Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
- David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
- Steven Holzner, "The Complete Reference - PHP", Tata McGraw Hill, 2008
- David Sawyer McFarland, CSS3- The Missing Manual, O'Reilly Media, Third Edition, 2013
- David Sklar and Adam Trachtenberg, PHP Cookbook, Third Edition, O'Reilly Media, 2014.

Course Code MCA 124
Course Title: Software Engineering

Unit	Contents
I	**Introduction to Software and Software Engineering** Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Agile Process Model, Component-Based Development.
II	**Software Project Requirement Analysis and Specification** Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning, Project Scheduling & Tracking, Basic idea of behavioral modeling in UML. State diagrams, Interaction diagrams, Use case diagrams. Understanding the Requirement, Requirement Modeling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation.
III	**Project Planning & Scheduling** Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, Risk Identification and Projection: Project scheduling and Tracking. Object-oriented concepts and principles.software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management.
IV	**Software Design & Quality Management** Design Concepts and Design Principal, Design Documentation, Design Methods: Data Design, Architectural Design, Interface Design, Component Level Design ,User Interface Design, Web Application Design. **Quality Planning**: Quality Concepts, Procedural Approach to Quality Management, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances.
V	**Software Testing** Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging. **Software Maintenance and Configuration Management:** Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering, The SCM Process, Identification of Objects in the Software Configuration, Risk-Related Monitoring.

Text Books:
- Roger S Pressman, Bruce R Maxim, "Software Engineering: A Practitioner's Approach", 8th edition, Tata McGraw Hill, 2014.
- Ian Sommerville, "Software engineering", 9th edition, Addison Wesley Longman, 2014.
- James Rumbaugh. MichealBlaha, "Object oriented Modeling and Design with UML", 2nd Edition, 2007.

Reference Books:
- Simon Bennett, Steve McRobb and Ray Farmer, " Object-Oriented Systems Analysis and Design Using UML" 4thEdition,McGraw Hill Education, 2010
- Charles Ritcher, "Designing Flexible Object Oriented systems with UML", Tech Media, 2008.
- Grady Booch, James Rumbaugh, IvarJacobson., "The Unified Modeling Language User Guide", 2nd Edition, Pearson, 2007.

Course Code: MCA 125
Course Title: Mathematical Foundations of Computer Science

Unit	Contents
I	**Interpolation**: Forward and Backward differences, Newton's formulae for interpolation, Gauss's Central Difference formulae, Stirling's formula. Newton divided difference formula and Lagrange's formula.
	Numerical Differentiation and Integration: Numerical differentiation, Numerical integration by Trapezoidal , Simpson's 1/3 rule and Simpson's 3/8 rule.
II	**Numerical Solution Algebraic and Transcendental equations**: Bisection Methods, Method of false position, Iteration Method and Newton-Raphson Method (convergence of these methods without proof)
	Linear Systems of Equation: Consistent, independent and ill condition equations; Gauss elimination method, Gauss elimination with pivoting, Gauss-Jordan elimination method, Gauss-Seidel Method, LU decomposition method, inverse of a matrix using LU decomposition.
III	**Numerical Solution of Ordinary Differential Equation**: Taylor's series method, Euler and Euler modified methods, Runge-kutta second and fourth order methods.
	Curve fitting and Approximation: Scatter Diagram, Correlation, Correlation coefficient, Least square method, curve fitting for polynomial, exponential, power and logarithmic curves, Linear Regression.
IV	**Treatment of data**: Classification, frequency distribution, Measure of central tendency, Measure of dispersion, moments, Measure of Skewness & Kurtosis
	Probability: Classical & Axiomatic approach of probability, Additive theorem conditional probability, multiplication theorem, independent events, Baye's theorem.
	Basic concept of Random variable and their probability distribution: Binomial, Poisson & Normal distribution.
V	**Testing of hypothesis**: Type I and II error. Large sample tests, application of t and $\chi 2$ sampling distribution in testing.
Books:	

Books:

1. S.R.K Iyenger and R.K. Jain and, Numerical Methods, New Age International Publishers.
2. S.P. Gupta, Statistical Methods, S. Chand & Sons.
3. William W. Hines, Douglas C. Montgomery, David M. Goldsman, Probability and Statistics for Engineering, Wiley Student Edition.

Course Code: MCA 126
Course Title: OOPS Lab

LIST OF EXPERIMENTS:
C++: 1. program using functions • functions with default arguments • implementation of call by value, address, reference 2. simple classes for understanding objects, member functions & constructors • classes with primitive data members, • classes with arrays as data members • classes with pointers as data members • classes with constant data members • classes with static member functions 3. compile time polymorphism • operator overloading • function overloading 4. run time polymorphism • inheritance • virtual functions • virtual base classes • templates 5. file handling • sequential access • random access
JAVA: 6. simple java applications • for understanding references to an instant of a class • handling strings in JAVA 7. simple package creation • developing user defined packages in java 8. interfaces • developing user defined interfaces • use predefined interfaces 9. threading • creation of threading in java applications • multi threading 10. exception handling mechanism in java • handling predefined exceptions • handling user defined exceptions

Course Code: MCA 127
Course Title: DBMS LAB

Contents
1.   SQL data types, Operators, Literals, Constraints
2.   DDL Commands: Create Tables/Create Synonym /Create index /Views / Alter / Drop/Truncate/Comment/Rename/DBCC (Database Console Commands)
3.   DML Commands: Insert / Update / Delete / Merge/Lock Table
4.   TCL Commands: Commit / Rollback / Save-Points /Set Transaction
5.   DCL Commands: Grant / Revoke/Deny
6.   Simple Queries: Select / From / Where
7.   Group By/Having Clause/ Order By clause
8.   SQL Operators: Arithmetic / Logical /In / Like / Between
9.   Functions: Aggregate / Numeric / String / Date & Time / Logical
10. Joins: Equi-Join / Natural Join / Self Join / Inner Join / Outer Join
11. Unions / Intersection / Minus
12. Subqueries or Nested Queries
13. PL/Sql : Basic/Cursor/Trigger

Course Code: MCA 128
Course Title: Mini Project in Web Design

Project Evaluation:

Continuous Assessment Evaluation for Mini Project:
- Regularity
- Software Design Specification
- Midterm Assessment Presentation (to be filled in by the Project Guide)

Semester End Evaluation for the Mini Project:
- Project Demo
- Project Presentation
- Project Report
- Viva-voce
- Adherence to Specifications
- System Knowledge and Understanding
- Innovation and Originality

General instructions for preparation of project report

1. Introduction
   1.1 Cover Page
   1.2 Title Page
   1.3 Certificate
   1.4 Acknowledgement
   1.5 Table of Contents

2. Project Specifications
   2.1 Project Overview
   2.2 Project Need

3. Specific Requirements
   3.1 External Interface Requirements
   3.2 Hardware Interfaces
   3.3 Software Interfaces
   3.4 Communications Protocols
   3.5 Security / Maintainability / Performance

4. Software Product Features
   4.1 System Architecture
   4.2 Database Requirements
   4.3 ER Diagram
   4.4 Data Flow Diagram
   4.5 User Interfaces
   4.6 Report Formats

5. Drawbacks and Limitations

6. Proposed Enhancements

7. Conclusion

8. Bibliography

9. Annexure:
   9.1 User Interface Screens (Optional)
   9.2 Output Reports with Data (if any)
   9.3 Program Code

Course Code: MCA 129
Course Title: Communication and Soft Skills Lab

Contents
Verbal & Non-verbal Communication   Listening, Speaking, Reading and Writing. Verbal and Non-verbal Communication. Intra, inter-personal and group communication skills. Gestures, postures, Proxemics, Kinesics. Listening to Lectures, Discussions, Talk Shows, News Programs.
Writing Skills   Formal & Informal writings, report writing, creative writing. Composition, Resume Writing, Cover letters, Business Letter Writing, Persuasive Letters, Job Applications and Official Correspondence, E-Mail etiquette, Precise writing.
Presentation Skills   Elements of effective presentation, structure of presentation, external factors and content.Debates, Seminar, Speeches, Lectures, Interviews, Mock Interviews, Commonly asked questions in interviews.
Group Discussion   Structure of GD, Moderator led and other GDs, Strategies in GD, Team work body language, Mock GD, Problem solving, Reflective thinking, Critical thinking, Negotiation skills.
Career Skills   SWOT Analysis, IQ, EQ and SQ, Art of giving feedback, Decision making, Time Management, Team Management and Leadership Skills, 8 habits of successful people.

Course Code: MCA 221
Course Title: Programming through Python

Unit	Contents
I	**Introduction and overview** Introduction to Python, Origin, Comparison, Comments, Operators, Variables, Classes, Modules Syntax and Style Statements, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management,
II	**Python Objects** Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types.Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings
III	**Lists and Dictionaries** Operators, 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, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, Conditionals and Loops: if statement, else Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement
IV	**Files, Regular Expression and Exception Handling** 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 Modules. 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
V	**Database Interaction** 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

Text Books:
- Core Python Programming, R. NageswaraRao, Dreamtech Press, Second Edition, 2018
- Python Programming, Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, Notion Press, First Edition, 2020
- The Complete Reference Python, Martin C. Brown, McGraw Hill Education, Fourth Edition, 2018

References:
- Think Python, Allen B. Downey, O'Reilly Media, 2016
- Programming and Problem Solving with Python, Amit Ashok Kamthane, Ashok NamdevKamthane, McGraw Hill HED, First Edition, 2017
- Advanced Python Programming, SakisKasampalis, Quan Nguyen,Dr Gabriele Lanaro, Ingram short title, 2019

Course Code: MCA 222
Course Title: Operating Systems

Unit	Contents
I	**Introduction to Operating System & Process Management**: Definition and types of operating systems,Operating system components and services, System calls. Process and Thread Management: Process concept, Process scheduling, operations on processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and evaluation.
II	**Memory Management**: Swapping, Contiguous Allocation, Paging, Segmentation with paging virtual Memory, Demand paging , Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery.
III	**Concurrency Control**: The Critical-Section problem, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Dining philosopher and producer consumer problem using semaphores or monitors. Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Banker's Algorithm.
IV	**Disk Management:** Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, Disk scheduling methods, Disk management, Swap-Space management. Protection and Security-Goals of protection. **UNIX/LINUX Operating System:** Introduction, Features of UNIX/LINUX operating system, Structure: Kernel and Shell, Basic commands, Accessing help options, Filenames and using wild cards, Types of files, File systems: four block of file systems, directory hierarchy, Operations and utilities for directory and files. User & Group file access permissions.
V	**Shell Programming**: Introduction to vi and Emacs editor. Basic of shell programming, meta characters, shell variable: predefined variables and user defined variable, storing value in variable and accessing it, unsetting variables, storing filenames, content and command in variable, Input: reading word by word, line by line and from file, Expression, Decisions and repetition, Special parameters and variables, shell programming in bash, read command, conditional and looping statements, case statements, changing positional parameters and argument validation, string manipulation. **Simple filter commands** – pr, head, tail, cut, paste, sort, uniq, tr, Regular expressions: atoms and operators, grep.

Text Books:
- Silberschatz and Galvin, "Operating System Concepts", 10th edition, Wiley India, 2018.
- Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems Design & implementation", 3rd edition, Pearson Education, 2006.
- Sumitabha Das, "UNIX – Concepts & Applications", Tata McGraw Hill Publications, 4th edition, 2006.
- Graham Glass & King Ables, "Linux for programmers and users", Pearson Education India, 3rd edition, 2006.

Reference Books:
- William Stallings, "Operating Systems Internals and Design Principles", 5th edition, Prentice Hall, 2000.
- Fadi P. Deek, James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press, 1st edition, 2008.
- Forouzan B. A., Gilberg R. R., "UNIX and Shell Programming", TMH, 2nd edition, 2008.

Course Code: MCA 223
Course Title: Data Structure and Algorithm Design

Unit	Contents
I	**Introduction** - algorithm definition and specification – Design of Algorithms, and Analysis of Algorithms, Asymptotic Notations. **Linked lists** – Searching, Insertion, Deletion, Sorted Linked List, Circular List, Two wayList.
II	**Stacks** – Array representation & Implementation, Operations on Stacks: Push & Pop, Linked representation of stack, Conversion of infix to prefix and postfix expressions, Evaluation of postfix expression using stack, **Queues** - Array and linked representation and implementation, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, **Searching:** Linear and Binary Search Methods **Sorting:** Bubble Sort, Selection Sort, Insertion Sort
III	**Trees:** Binary tree, Terminology & Representation, Binary Search Trees (BST)-Insertion and Deletion **Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Elementary Graph algorithms, Representation of Graphs, BFS, DFS. **Divide and Conquer Method:** Merge Sort, Quick Sort
IV	**The Greedy Method:-** Knapsack Problem, Minimum Cost Spanning Tree, Single Source Shortest Path **Dynamic Programming**: Multistage Graphs, All Pair Shortest Path, Optimal Binary Search Trees , 0/1 Knapsack Problem, Traveling Salesman Problem
V	**Backtracking:-** general method – 8-Queens Problem, Sum of Subsets, Hamiltonian Cycles **Branch and Bound :-** The Method– Knapsack Problem

Text Books:

- AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
- Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Course Private Limited, 2012.
- Thomas H Coremen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to Algorithms", Mc-Graw Hill, 2006
- D.S Malik, "Data Structures using C++", Cengage Learning, 2nd edition, 2009
- A. Tannenbaum, "Data Structure Using C", Pearson Education, 2019.

Reference Books:

- Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education,2009.
- Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
- E. Horowitz &Sahni, "Fundamental Data Structure", Galgotia Book Source, 1983.

Course Code: MCA 224
Course Title: Computer Networks & Internet Architectures

Unit	Contents
I	Introduction:Overview of Computer Networks, Categories of Computer Networks, Physical Topologies, SevenLayerArchitecture, TCP/IP Protocol Suite, Network Models. Transmission media: Fiber Optics; Wireless Transmission:Radio, Microwave, Infrared, Millimeter Waves, Light wave; Satellite; Mobile Telephone System
II	Data link layer: Multiple Access and LAN Technologies: Random Access, ALOHA,CSMA, CSMA/CD,CSMA/CA, Ethernet, IEEE Standards, IEEE802.11:Architecture, MAC Sublayer. Wireless LANs, Broadband Wireless, Bluetooth, Bridges. Network Layer:Routing: Broadcast, Multicast, Routing for Mobile Hosts, AdHoc Networks; Congestion;Quality of Service.IP Addressing: Network layer level protocols:IPv4,IPv6.
III	Advanced Internet working and Routing:CircuitSwitching, PacketSwitching,Routing Protocols, Address Mapping:ARP,RARP,ICMP,IGMP.TransportLayer: User Data gramProtocol(UDP),TransmissionControlProtocol(TCP),WirelessTCPandUDP.CongestionCo ntrol,Quality of Service(QOS),Integrated Services.
IV	Network Applications: Electronic Mail Representation and Transfer, World Wide Web; Multimedia: Digital Audio; Audio Compression; Streaming IP Telephony (VoIP),Video Compression; Video on Demand; Multicast Backbone; File Transfer and Remote File Access, Network Management (SNMP).
V	Internet Architectures-Flow of traffic and routing behavior within Internet, Application of Qos models, application of new resilient designs. Understanding of control and data planes in high end Internet core routers, CEF, hardware packet flows. MPLS, labels, label stacking, packet analysis, RSVP, label allocation, distribution models. MPLS-VPNs-Detailed understanding of MPLS L3 VPNS, routing model employed, forwarding of mplsvpn packets, VRF tables, application scenarios

Text Books:

1. Forouzan, B.A, 2009, Data Communications and Networking, 4thEdition, Tata McGraw Hill Education.
2. Tanenbaum, A.S , 2010,ComputerNetworks, 3rd Edition, Pearson Education.
3. Douglas E. Comer, Internet Workingwith TCP/IP Volume –I,Fifth Edition, PrenticeHall,2008.
4. W. Richard Stevens, Bill Fenner and Andrew M.Rudoff, Unix Network Programming, Vol.1: The Sockets Networking API, Third Edition, Addison-Wesley Professional, 2003.

Course Code: MCA 225
Course Title: Cloud Computing

Unit	Contents
I	**Introduction of Cloud Computing**: Nutshell of cloud computing, Enabling Technology, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. , Layer and Types of Clouds, Services models, Cloud Reference Model.
II	**Cloud Computing Architecture:** Data center Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Features of cloud programming, Parallel and distributed programming paradigms-MapReduce, Hadoop , High level Language for Cloud. Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish Subscribe Model
III	**Virtualization Technology**: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server , Desktop, Network, and Virtualization of data-center.
IV	**Securing the Cloud**: 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
V	**Cloud Platforms in Industry**: Amazon web services, Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM and ERP, Social networking. Cloud Application- Scientific Application, Business Application.

Text Books:
- Cloud Computing ,Principle and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley-2016
- Kumar Saurabh, "Cloud Computing" , Wiley Pub 2016
- Distributed and Cloud Computing, Kai Hawang , GeofreyC.Fox, Jack J. Dongarra Pub: Elservier, 2013

Reference Books:
- Krutz , Vines, "Cloud Security " , Wiley Pub,2010
- Velte, "Cloud Computing- A Practical Approach" ,TMH Pub,2009
- Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer,2010

Course Code: MCA 226
Course Title: Python Programming Lab

Sr. No.	Contents
1	Installation of Python, and learning interactively at command prompt and writing simple programs.
2	Learning the conditions and iterations in Python by writing and running simple programs.
3	Random number generations, and problems based on random numbers.
4	Handling tuples and exercises based on tuples.
5	Functions and files
6	Linear and binary search
7	Handling tokens
8	Finding unique, and duplicate items of a list.
9	Matrix addition, multiplications, and unity matrix.
10	Text processing using python
11.	Programs related to python libraries like Numpy, Pandas, Scipy etc.

Course Code: MCA 227
Course Title: Linux Programming Lab

Contents

Compilation and Execution of C Programs through Linux/UNIX

Shell Programs:

1. Implementation of Shell Programming Concepts:
   - Shell programming in bash
   - Shell Variables Input concepts
   - Expression
   - Decisions and repetition
   - Special parameters and variables
   - Command line arguments
   - Case statements
   - Changing positional parameters and argument validation
   - String manipulation
   - File Operations
   - Base conversion
2. User defined functions.

Administration:
1. Installing Linux through bootable media/ through NFS
2. Creating & Managing User Accounts
3. Creating & Managing Groups.

Course Code: MCA 228
Course Title: Data Structure and Algorithm Design Lab

Contents

1. Linear search & binary search , Sorting Techniques

2. Stacks and queues operations (with arrays and pointers)

3. Link List and Trees operations (with arrays and pointers)

4. graphs – basic traversal and search techniques

5. Greedy method:-knapsack problem

6. Greedy method minimum cost spanning tree

7. Dynamic Programming – 0/1 Knapsack

8. Dynamic Programming – traveling salesman problem

9. Backtracking 8-Queens problem

10. Backtracking Sum of Subsets

11. Branch and Bound -0/1 Knapsack problem

12. Sequential and Dynamic Implementations

Course Code: MCA 229

Course Title: Human Values & Professional Ethics

Need, Basic Guidelines, Content And Process For Value Education:

Understanding the need, basic guidelines, Self Exploration-its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity-
Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly-Acriticalappraisalofthecurrentscenario.Methodtofulfilltheabov human aspirations: understand in gland living in harm on yet various levels

Understanding Harmony in the Human Being- Harmony in Myself:

Understanding human being as ace-existence of the sent isn't 'I 'and thematerial'Body' Understanding the needs of Self ('I') and 'Body'-Sukh and Suvidha Understanding the Body as an instrument of 'I', Understanding the characteristics and activities of 'I'and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship:

Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect(Samman),meaning of Vishwas; Difference between in tention and competence, meaning of Samman, Difference between respect and differentiation; the other salient value sin relationship, harmony in the society,Samadhan,Samridhi,Abhay,Sah-astitva as comprehensive Human Goals,Visualizing a universal harmonious order in society-Undivided Society (AkhandSamaj),Universal Order(SarvabhaumVyawastha)-from family to world family.

Understanding Harmony in the Nature and Existence- Whole Existence as Coexistence:
Understanding the harmony in the Nature. Inter connectedness and mutual fulfillment among the four order so fnature-recyclability and self-regulation in nature. Understanding Existenceas Co-xistence (Sah-astitva) of mutually in teracting units in all pervasive Space. Holistic perception of harmony at all levels of existence

Implications of the Above Holistic Understanding of Harmony on Professional Ethics – Natural Acceptance of Human Values:
Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a)Ability to utilize the professional competence for augmenting universal human order,b)Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers. Case studies related to values in professional life and individual life.

SuggestedReadings:

1. R.R.Gaur, RSangal, GP Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2009.ISBN: 978-9-350-62091-5
2. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press.
3. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
4. MGovindrajran, SNatrajan & V.S.Senthil Kumar,Engineering Ethics (includingHuman Values), Eastern Economy Edition, Prentice Hall of India Ltd.
5. BP Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
6. BL Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.