**Course Structure& Syllabus of MCA-LE**
**Applicable for Batch: 2018-2020**

# DIT UNIVERSITY
# Dehradun


## Detailed Course Structure& Syllabus
## of
## MCA-LE

**Amended by the BoS and approved by the Academic Council at its 9th Meeting held on 14.04.2018**

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020
# Course Structure

**Year: 2nd** **Semester: III**

| Course Category | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | CA701 | Unix & Shell Programming | 3 | 0 | 2 | 4 |
| DC | CA702 | Database Management Systems | 3 | 0 | 2 | 4 |
| DC | CA703 | Object Oriented Concepts with Java | 3 | 0 | 2 | 4 |
| DC | CA704 | Design and Analysis of Algorithms | 3 | 1 | 0 | 3.5 |
| DC | CA705 | Computer Organization and Architecture | 3 | 1 | 0 | 3.5 |
| DC | CA706 | Combinatorics and Graph Theory | 3 | 1 | 0 | 3.5 |
| HE | HS103 | Professional Communication | 2 | 0 | 2 | 3 |
| AC | CA708 | Aptitude Building–I | 0 | 0 | 2 | 0 |
| | | **Total** | | | | **25.5** |

**Year:2nd** **Semester: IV**

| Course Category | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | CA711 | Advance Java | 3 | 0 | 2 | 4 |
| DC | CA712 | Computer Graphics & Animation | 3 | 0 | 2 | 4 |
| DC | CA713 | Microprocessor and System Design | 3 | 1 | 0 | 3.5 |
| DC | CA714 | Theory of Computation | 3 | 1 | 0 | 3.5 |
| DE | CA74* | Department Elective 1 | 3 | 1 | 0 | 3.5 |
| DE | CA74* | Department Elective 2 | 3 | 1 | 0 | 3.5 |
| DC | CA715 | Aptitude Building-II | 0 | 0 | 2 | 0 |
| AC | CA716 | Value Added Training | 0 | 0 | 2 | 0 |
| AC | CA717 | Industrial Tour | 0 | 0 | 2 | 0 |
| | | **Total** | | | | **22** |

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

## Year: 3rd Semester: V

| Course Category | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | CA801 | .Net Framework and C# Programming | 3 | 0 | 2 | 4 |
| DC | CA802 | Mobile and Adhoc Computing | 3 | 1 | 0 | 3.5 |
| DC | CA803 | Cloud Computing | 3 | 0 | 2 | 4 |
| DE | CA8** | Department Elective 3 | 3 | 1 | 0 | 3.5 |
| DE | CA8** | Department Elective 4 | 3 | 1 | 0 | 3.5 |
| DE | CA8** | Department Elective 5 | 3 | 1 | 0 | 3.5 |
| DC | CA804 | Project | 0 | 0 | 2 | 1 |
| DC | CA805 | MATLAB | 0 | 0 | 2 | 1 |
| AC | CA806 | Industrial Training Presentation* | 0 | 0 | 2 | 0 |
| DC | CA807 | Employment Enhancement Program | 0 | 0 | 2 | 0 |
| | | **Total** | | | | **24** |

## Year: 3rd Semester: VI

| Course Category | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | CA811 | Industrial Project (Project Report & Comprehensive Viva-voce) | One Semester | | | 16 |
| | | **Total** | | | | **16** |

**Electives IV Sem DE:1**

| Course Code | Course Title | Credit |
|---|---|---|
| CA741 | Advance Database Management Systems | **3-1-0/3.5** |
| CA742 | Data Compression & encryption | **3-1-0/3.5** |
| CA743 | Data Warehouse & Data Mining | **3-1-0/3.5** |
| CA744 | Distributed Database Systems | **3-1-0/3.5** |

**Electives IV Sem DE:2**

| Course Code | Course Title | Credit |
|---|---|---|
| CA745 | Artificial Intelligence | **3-1-0/3.5** |
| CA746 | Advance Computer Networks | **3-1-0/3.5** |
| CA747 | Cryptography and Network Security | **3-1-0/3.5** |
| CA748 | Parallel Computing | **3-1-0/3.5** |

# Course Structure& Syllabus of MCA-LE
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**Electives V Sem DE:3**

| Course Code | Course Title | Credit |
|---|---|---|
| CA851 | Principles of Compiler Design | 3-1-0/3.5 |
| CA852 | Real Time and Embedded Systems | 3-1-0/3.5 |
| CA853 | Operations Research | 3-1-0/3.5 |
| CA854 | Modeling & Simulation | 3-1-0/3.5 |

**Electives V Sem DE:4**

| Course Code | Course Title | Credit |
|---|---|---|
| CA855 | Wireless Sensor Networks | 3-1-0/3.5 |
| CA856 | Fault Tolerance Computing | 3-1-0/3.5 |
| CA857 | Big Data Analytics | 3-1-0/3.5 |
| CA858 | Digital Image Processing | 3-1-0/3.5 |

**Electives V Sem DE:5**

| Course Code | Course Title | Credit |
|---|---|---|
| CA861 | Multimedia Systems | 3-1-0/3.5 |
| CA862 | Ethical Hacking | 3-1-0/3.5 |
| CA863 | Genetic Algorithm and Neural Networks | 3-1-0/3.5 |
| CA864 | Fuzzy Systems | 3-1-0/3.5 |

## Summary of the Credit

| Year | Semester | Credit |
|---|---|---|
| 2 | 3 | 25.5 |
| | 4 | 22 |
| 3 | 5 | 24 |
| | 6 | 16 |
| **Total** | | **87.5** |

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA701 | Subject Title | UNIX AND SHELL PROGRAMMING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Deptt. core | Year | 2nd | Semester | III |

**Objectives:** This course provides an intensely practical introduction to UNIX operating systems. In addition to this, system administration and use of shell scripting languages will be introduced.

Unit I

**Introduction to UNIX operating system :** History, characteristics of UNIX operating system, System structure – user perspective, Operating system services, kernel architecture, UNIX Shell, types of shell, utilities in UNIX, Notation of UNIX command, general purpose commands, commands for file system, process management and administrations, UNIX directory hierarchy.

Unit II

**UNIX Shell Programming:** Shell types and Shell features: standard streams, redirection, pipes, and Command execution process. Shell variables: predefined variables and user defined variable, environmental variables Writing scripts: basic concept, expression, decision and repetition, Special parameters, variables and argument processing Filter utilities: head, tail, cut, paste, tr, sort, uniq, wc, comm, diff, grep and awk utilities.

Unit III

**The UNIX file system: The** file system structure, type of files, Internal representation of files: inodes, structure of a regular file. Directories, conversion of path name to an inode, inode assignment to new file, allocation of disk blocks, System calls for the file system: open, read, write, adjusting, position of the file I/O, close, file creation, creation of special files, change directory, change root, change owner and change mode, stat and fstat etc.

Unit IV

**The UNIX Process Management:** The structure of processes, process states and transition, Layout of system memory, the context of process, manipulation of process address spaces, Process control: process creation, process termination, Awaiting process termination, Invoking other programs, User id of a process, System boot and init process, Login process and the shell process.

Unit V

**Introduction to System Administration:** Define system Administration, Booting the system, Maintaining User Accounts, File System, and special files, Backup and Restoration, introduction to Linux platform.

**List of practicals:**

1. use of general purpose commands: mkdir, cd, pwd,ls,cat,less,cp, mv,rm,man,input and output redirection(< and >),pipe (|),grep,chmod,passwd,ps,kill,gzip,tar,find.
2. Use Vi editor to create a file which contain some text. Correct typing errors during creation, Save the file & Logout of the file.
3. Open the file created in Exp 1, Add, Change, delete & Save the changes.
4. Use the cat command to create a file containing the following data. Call it mutable use tabs to separate the fields 1425 ravi 15.65, 4320 ramu 26.27, 6830 sita 36.15, 1450 raju 21.86.
5. Use the cat command to display the content of file, use vi command to correct any errors in the file, use the sort command to sort the file according to the first field. Call the sorted file & print the file
6. Use the cut & paste commands to swap columns of file.
7. Use the date and who commands in sequence?(in one line) such that the output of date will display on the screen and the output of who will be redirected to a file .Use the more command to check the contents of file.
8. Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.

9. Write shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
10. Write a shell script that accepts one or more file name as a arguments and converts all of them to uppercase,provided they exist in the current directory.
11. Write a shell script that determines the period for which a specified user is working on the system

**Learning Outcomes:**

After studying this course, you should be able to:

- Demonstrate knowledge of the role and responsibilities of a Unix system administrator
- Install and configure the Linux operating system
- Manage the resources and security of a computer running Linux at a basic level

**Text Book:**

1. **Unix Concepts and applications**, Sumitabh Das, Tata Mc-Graw Hills, 4th edition, 2008.
2. **Unix Shell Programming,** YashwantKanitkar, BPB, 2nd edition, 2009.

**Reference Book:**

1. **UNIX Programming: The First Drive,** Saurabh, Wiley India, 3rd edition, 2010.
2. **BeginningShell scripting,** Johnson, Wiley,India, 1st edition, 2010.
3. **Introducing Unix and Linux,** Mike Joy, Stephen Jarvis, Michael Luck, Palgrave Macmillan, 1st edition, 2010.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA702 | Subject Title | DATA BASE MANAGEMENT SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Deptt. core | Year | 2nd | Semester | III |

**Objectives:**the courses provides an introduction to data base management system. Student will be able to do structure query language and designing the database for the system. It enable the students to generate the query and to the transaction of data to perform various task of the different management system.

Unit I

**Introduction:** History of Data base Systems, Database System Vs File System, Database System concepts and architecture, data models schema and instances, data independence, interfaces, Database Languages,DDL, DML, Overall Database Structure, data base Users and Administrator.ER model concepts, notation for ER diagram, Mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of An ER diagrams to tables, extended ER model, relationships of higher degree.

Unit II

**Introduction to the Relational Model:** Relational data model concepts, integrity constraints: entity integrity, Referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus **Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL Commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate Functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.PL/SQL, Triggers and clusters

Unit III

**Data Base Design & Normalization:** Role of Normalization, Schema refinement, Problems Caused by redundancy, 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

Unit IV

**Transaction Processing Concepts:** Transaction system, Transaction concepts : Transaction execution and Problems, Transaction execution and control with SQL, Transaction properties, Transaction log, testing of serializability, Serializability of schedules, Conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, Checkpoints, Deadlock handling– detection and resolution.

Unit V

**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multiversion Schemes, Need of Database backup, Database backup techniques, Types of Database failures, Recovery with concurrent transaction.

**List of Practicals:**

1. To implement Data Definition language
2. To implement Data Manipulation language
3. To implement Constraints
4. To implement Insert, Select commands, update and delete commands.
5. To implement SET OPERATORS (Union, Intersect, Minus).
6. To implement Nested Queries & Join Queries.
7. To implement GROUP functions (avg, count, max, min, Sum).
8. Write programme by the use of PL/SQL
9. To implement Views

10. To implement Triggers
11. To implement Cursors
12. Create FORMS and REPORTS

**Learning Outcomes**:
At the end of this class, the successful student will:

- Have a broad understanding of database concepts and database management system software
- Have a high-level understanding of major DBMS components and their function
- Be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
- Be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.

**Text Book:**

1. **Data base System Concepts,**Silberschatz, Korth, McGraw Hill,USA, 6th edition, 2011.
2. **Fundamentals of Database Systems,** ElmasriNavate, Pearson Education, India, 6th edition, 2010

**Reference Book:**

1. **Introduction to Database Systems,** C.J.Date, Pearson Education, India, 8th edition, 2003.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA703 | Subject Title | OBJECT ORIENTED CONCEPTS WITH JAVA | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Deptt. core | Year | 2nd | Semester | III |

**Objectives:** Objective of this course is to introduce fundamentals of programming such as variables, conditional and iterative execution, methods, etc. In addition to this, features of java like applet programming, event based programming, multithreaded application development, collection are also introduced.

Unit I

**Introduction and Evolution of Java:** Concepts of class, objects, encapsulation, polymorphism, abstraction, inheritance. Evolution of Java, Byte Code, JDK, JVM, JRE, Data types, Variables, Arrays, Operators, Operator precedence, associativity, object equality and reference equality, Command line arguments.

**Control Statements**: switch with Strings, for each loop.

**Classes & Objects** - Constructor, super() and this() constructor calls, constructor call hierarchy, Methods, this, super keyword, Inheritance, static blocks, multiple static block, instance initializer block, variable arity method.

Unit II

**Packages:** Defining Packages, Using Packages, import and static import, jar utility, classes modifiers: abstract, final; member modifiers.

**Interface:** Defining Interfaces, abstract methods declarations, implementing interfaces, extended Interfaces, interface references and constants in interfaces
**Fundamental Classes:** Object class, Wrapper classes, String class, immutability, String Buffer

Unit III

**Exception handling:** Exception Types, Exception class, Runtime Exception Class, Error Class, Defining new exceptions; Handling exceptions.
**Thread:** Overview of threads, thread Creation; implementing the runnable interfaces, extending the thread class, Thread States. Synchronized and static synchronized threads.Synchronized blocks.

Unit IV

**The File class**: File name Filter, Byte Streams: Input and Output streams, Character streams: readers and writers; object serialization
**Applet**: Applet Life cycle; Event Handling: Event handling mechanisms, the Delegation Event Model, Event classes, sources of events, Event Listener Interfaces, Adapter classes
**AWT**: AWT Controls, Layout Managers, Frame, Images, Graphics, Fonts, Cursors, Colors, File Dialog box, Menus
**Swing-** Introduction**,** Advantages over AWT, Swing applications.

Unit V

**Networking:** Networking Basics, Java and the Net, TCP/IP Client sockets, URL, URL Connection, TCP/IP Server sockets, Datagram
**Introduction to Generic Classes and Collection (List, Set, Map)**

**List of practiclas:**

1. Write a program in JAVA to be familiar with class, object, instance, reference, methods and fields.
2. Write a program in JAVA to show working of overloaded constructors and methods
3. Write a program in JAVA to show how to pass arrays to methods, also show that array are passed as references.
4. Write a program in JAVA to illustrate the working of for each loop, labeled break and labeled continue
5. Write a program in JAVA to illustrate exception handling. Show how exceptions can be caught and thrown, show the handling of checked and unchecked exceptions

6. Write a program in JAVA to show the significance of inheritance, this, super and overriding
7. Write a program in JAVA to illustrate the methods of String and StringBuffer
8. Write a program in JAVA to execute two loop simultaneously using threads
9. Write a program in JAVA using command line arguments to copy the contents of one file into another. Handle exceptions wherever necessary.
10. Using Applets or Frames develop the "Paint Brush" tool in Java. Compare with Paint Brush and exactly develop the same working only for free form sketching using a brush.
11. Develop a client server application using TCP/IP according to the following requirements.
    a. A client logs in by issuing a command **LOGIN@** followed by his/her name.
    b. As soon as a client logs in, server presents him/her with a list of all other clients which are online.
    **c.** A client logs out by issuing a command **LOGOUT**

**Learning Outcomes:**
After studying this course, you should be able to:

- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.

Text Book:

1. **The Complete Reference: Java,**HerbertSchieldt, TMH,India, 8th edition, 2006
2. **Programming in JAVA:A Primer,** E. Balagurusamy, TMH,India,4th edition, 2009

Reference Book:

1. **A Programmer's guide to Java SCJP certification,**Khalid A. Mughal – Rolf W Rasmussen,Addison-Wesley,USA,3rd edition, 2009

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA704 | Subject Title | DESIGN AND ANALYSIS OF ALGORITHMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. core | Year | 2nd | Semester | III |

**Objectives:** Objective of this course is to study and analyze the algorithms. It provides us with the mathematical and technical approaches of solving problems in various ways. This course enables the students to design the algorithm to solve the problems and to find out the complexity of the program. It enables the students to check how the worst case complexity of an algorithm is defined.

Unit I

**Introduction:** Algorithms, Pseudo code for expressing algorithms, Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Introduction of Recurrences: Substitution, recursion tree and master method.

**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort Analysis of Insertion Sort, Trees: Binary Search Trees Insertion, Deletion.

Unit II

**Dynamic Programming:** Matrix Chain multiplication, Longest Common subsequence,0/1 knapsack problem, optimal binary search trees.

**Greedy Algorithm**:Activity Selection problem, Theoretical foundation of greedy algorithm, Task Scheduling problem, Comparison of dynamic programming and Greedy algorithm with Knapsack as case study.

Unit III

**Branch and Bound:** Traveling sales man problem, Linear programming.

**Backtracking:** General method, applications-n-queen problem, sum of subset problem.

Unit IV

**Introduction to Graph Algorithm:** BFS, DFS, Kruskal, Prim, Single source shortest path : Bellman Ford, Dijkstra's algorithm, All Pair Shortest Path, Floyd Warshall, Flow Networks, Residual Network, Augmenting Path, Ford Fulkerson method.

Unit V

**Introduction to Computational Geometry**: Convex Hull, Graham Scan, Overview of NP Completeness, Introduction to various NP Complete problems-Vertex Cover Problem, Traveling Salesman Problem

**Learning outcomes:**

- Know the big O, omega, and theta notations and their usage to give asymptotic upper, lower, and tight bounds on time and space complexity of algorithms.
- Know how to determine the worst time complexity of algorithms
- Know how to design algorithms using the divide-and-conquer, dynamic programming, greedy strategy, and recite algorithms that employ this strategy

**Text Book:**


1. **Introduction to Algorithms**, T.H.Cormen,C.E.Leiserson, R.L.Rivest,andC.Stein, PHI Pvt.Ltd./ Pearson Education, India, 2nd edition, 2001.
2. **Fundamentals of Computer Algorithms**, Ellis Horowitz,SatrajSahni and Rajasekharam, Galgotia publications Pvt. Ltd,New Delhi India, 2nd edition, 2007.


**Reference Book:**


1. **Introduction to Design and Analysis of Algorithms A strategic approach**, .C.T.Lee, S.S.Tseng, Chang and T.Tsai, Mc GrawHill,USA, 2/e, 2007.
2. **Data structures and Algorithm Analysis in C++**, Allen Weiss, Wesley,USA, 2/e, 1997.
3. **Design and Analysis of algorithms**, Aho, Ullman and Hopcroft, Pearson education,India, 4/e, 2009
4. **Algorithms,** Richard Johnson baugh and Marcus Schaefer, Pearson Education, India, 3/e, 2006

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA705 | Subject Title | COMPUTER ORGANIZATION AND ARCHITECTURE | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. core | Year | 2nd | Semester | III |

**Objectives:** This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design.

Unit I

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Microoperation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.

Unit II

**Control Design:** Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a wordin memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control,Micro programmed control(Microinstruction, Microprogram sequencing, Wide-Branch addressing,Microinstruction with Next-address field, Prefetching Microinstruction).

Unit III

**Processor Design:** Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

**Input-Output Organization:** I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication.

Unit IV

**Memory Organization:** Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and 21/2D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

Unit V

Introduction to parallel processing– Pipelining, , Architectural classification schemes. Principles of pipelining & Vector processing – Principles of Linear pipelining, Classification of pipeline processors, General pipelines and reservation tables, interleaved memory Organizations, Instruction and Arithmetic pipelines, Principles of designing pipelined processors, Vector processing Requirements. Structures for array processors: SIMD Array processor, SIMD Interconnection networks.

**Learning Outcomes:**

By the end of this course, students should be able to:

- understand the basics of computer hardware and how software interacts with computer hardware
- analyze and evaluate computer performance
- understand how computers represent and manipulate data
- use Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits

**Text Book:**


1. **Computer System Architecture**, M. Morris Mano, PHI/Pearson Education, India, 3rdedition, 2006
2. **Digital Computer Fundamentals**, Thomas C. Bartee **,**Tata McGraw Hill,India, 6thedition ,2010(RePrint)


**Reference Books:**


1. **Computer Organization**, Vravice, Zaky&Hamacher , TMH,INDIA, 5th edition ,2010.
2. **Structured Computer Organization**, Tannenbaum, Prentice Hall, 6th edition,2013.
3. **Computer Organization and Architecture**, Stallings, PHI,INDIA, 7th edition ,2009.
4. **Computer Architecture and Organization**, John P.Hayes,McGrawHill,USA, 3rdedition, 1998

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA706 | Subject Title | COMBINATORICS AND GRAPH THEORY | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. core | Year | 2nd | Semester | III |

**Objectives:** This course will introduce students to the fundamental concepts of combinatory like permutations and combinations, generating functions etc. In addition to this, fundamentals of graph theory like graphs, sub graphs, cut sets, network flow, and matrix representation are also introduced.

Unit I

**Fundamental principles of counting** : permutations and combinations - binomial theorem -combinations with repetition - combinatorial numbers - principle of inclusion and exclusion -derangements - arrangements with forbidden positions - Generating functions - partitions of integers -the exponential generating function - the summation operator - recurrence relations - first order and second order – non homogeneous recurrence relations - method of generating functions.

Unit II

**Graphs:** Graphs, sub-graphs, some basic properties, Walks, Path & circuits, Connected graphs, Disconnected graphs and component, Euler and Hamiltonian graphs, The traveling sales man problem, Various operation on graphs.

Unit III

**Cut Sets:**Cut-sets and cut vertices, some properties, All cut sets in a graph, Fundamental circuit and cut sets, Connectivity and seperatability, Network flows, mincut theorem, Planar graphs, Combinatorial and geometric dual, Kuratowski to graph detection of planarity, Geometric dual, Some more criterion of planarity, Thickness and Crossings.

Unit IV

**Vector space:** Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set verses subspaces, orthogonal vectors and subspaces, incidence matrix of graph, sub matrices of A(G), circuit matrix, cut set matrix, path matrix and relationships among Af, Bf, and Cf, fundamental circuit matrix and rank of B, adjacency matrices, rank- nullity theorem .

Unit V

**Coloring:** Coloring and covering partitioning of graph, Chromatic number, Chromatic partitioning, Chromatic polynomials, Matching, covering, Four color problem.

**Learning Outcomes:**

By the end of this course, students should be able to:

- understand the basics of combinatory and graph theory
- understand the applications of graph theory in solving various computer science problems

**Text Book:**

1. Graph Theory with Applications to Engineering and Computer Science, NarsinghDeo, Courier Dover Publications, Reprint, 2017

**Reference Books**

1. **Discrete And Combinatorial Mathematics: An Applied Introduction**, Grimaldi R. P., Addison Wesley,USA, 5thed, 2006

2. **A First Look at Graph Theory**, Clark J. & Holton D. A., Allied Publishers (World Scientific), Singapore, 1/e 2008(RePrint)

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | HS103 | Subject Title | PROFESSIONAL COMMUNICATION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 2 1 1 | Credit | 3 | Subject Category | Humanities Elective | Year | 2nd | Semester | III |

**Objectives**

- To introduce to students to the business & corporate environment and its expectations.
- To help students to identify and sharpen their personal and professional skills.
- To ensure employability of students through a perfect blend of hard & soft skills.

**Unit I**

**Business Communication8hrs**

Importance & Features of Business Communication, Flow of Communication: Channels &Networks
Communication: E mails & E- Tools
Business Presentation
Business Etiquette, Telephonic Etiquette
Business Letter Writing
Job Application Letter & Resume
Interview Skills, Impression Management

**Unit II**

**Personal Skills for Corporate Communication:**

SWOT Analysis: Self-Assessment, Identifying Strength & Weakness Self-Awareness, Self-Disclosure & Self-Management (Stress, Anger) Goal Setting: Personal & Professional Goals, SMART-ER Goals
Human Perception: Understanding People, Perceptions, Attitudes Personality (Personality Test)

**Unit III**

**Professional Skills for Corporate Communication**

Decision Making: Techniques, Six Thinking Hats Creative Thinking, Lateral Thinking Team Building & Leadership Skills Time Management: Planning Organizing, Time Wasters Conflict Resolution Skills Negotiation Skills

**Learning Outcomes**

- Students identify their goals and through enhanced soft skills work towards achieving them.
- Greater self-confidence and knowledge of life skills helps them to develop healthier interpersonal relationships.
- Prepares the students to face future challenges and excel in their personal and professional lives.

**TEXT BOOKS**


1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005.
2. Gulati, Sarvesh. Corporate Softskills, Rupa& Company, 2006


**REFERENCE BOOKS**


1. Steven R. Covey. The Seven Habits of Highly Effective People, Simon and Schuster, London, 2007.
2. Robbins, Stephen. Management, Pearson Prentice Hall. 2009
3. Carnegie, Dale.How to win Friends and influence People,Simon and Schuster, London, 2009.
4. Dr. Alex. Soft Skills : Know Yourself & Know the World, S. Chand Publications, 2001.
5. Gopalswamy, Ramesh. The ACE of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson, New Delhi, 2008.
6. Ghosh, B. N. Managing Soft skills for Personality development,Laxmi Publications Ltd., New Delhi, 2013.
7. Elizabeth B. Hurlock. Personality Development , TMH Publication, 2010.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA711 | Subject Title | ADVANCE JAVA | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Deptt. core | Year | 2nd | Semester | IV |

**Objectives:** This course covers the implementation of advanced program designs with the tools available in the Java programming language. After a detailed review of the fundamentals, advanced topics will include the servlets, JSP, Java Beans and client-server models for networking and database connectivity.

Unit I

**J2EE Architecture:** J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier architectures.

**JDBC:** Concept of JDBC, JDBC Architecture, JDBC Driver Types, JDBC Packages, Database Connection, Associating the JDBC/ODBC Bridge with the Database, JDBC URL.

Unit II

**JDBC:**Statement Objects, ResultSet, Establing connection with different databases**,** Transaction Processing, commit, savepoint, rollback, Metadata, Data Types, SQLException, Prepared Statement, CallableStatement, Batch updates.Storing and Retrieving images via JDBC**.**

Unit III

**Servlets:** Advantages of Servlets over CGI, Installing Servlets, The Servlet's Life Cycle, Servlet API, Handling HTTP GET and POST Request, Servlet Config, Servlet Context, Requests and Responses, Generic Servlet, Http Sevlet, Http Servlet Request, Http Servlet Response, Deployment Descriptor, Request Dispatcher

**Session:** Cookies, Session Tracking, Filter API.

Unit IV

**Java Server Pages (JSP):** Problems with Servlets and Advantages of JSP, JSP Scripting Elements- (Directives, Declaratives, Scriplets, Expressions, Implicit Variables), Page Directives, Standard Action, expression language (EL), JSTL in detail, introduction to Custom Tags.

Unit V

**Java Beans:** Java Bean, Advantages, usebean and other tags, scope of beans.A servlet/JSP based download/upload application.

**Enterprise Java Beans:** EJB, benefits, EJB Architecture, EJB Roles, Types of EJB, Building small session bean application, Home Interface, Remote Interface, Session bean: stateless, stateful session bean.

**List of practicals:**

1. Establish connection to your local MySQL Database, create a table and insert few records.
2. Try creating a connection to a variety of databases – MySQL, Oracle, Microsoft SQL Server, MS Access, MS Excel e.t.c
3. Using **execute()** method execute a SELECT statement and traverse the rows by obtaining **ResultSet** from the **getResultSet()** method
4. A table "Employee" contains a field "children", if an employee has no children the getInt() method returns zero (0), it also returns zero (0) when the field contains NULL. Write a program to show how to distinguish between 0 and NULL
5. Write a program to implement two methods which depict the working of inbuilt methods **absolute()** and **relative()**
6. Write a program to show the working of following methods next(), previous(), first(), last(), beforeFirst(), afterLast(), absolute(), relative(), isFirst(), isLast(), isBeforeFirst(), isAfterLast(), getRow()

7. Execute a SELECT statement which retrieves all columns e.g. SELECT * FROM <table-name>, write a program to print the total number of rows, columns and name of each column in the **ResultSet**
8. Create a connection to database and print all tables in it.
9. Oracle and MS Access are not compatible with each other. Write an application which create connection to Oracle and export data from a database then imports that data into a MS Access database.
10. Implement the Servlet interface and present user a form to enter roll number of a student. The form should be submitted to another Servlet where it establishes connection to a database and retrieves the marks and name of the student. Show error message if roll number is invalid.
11. Create a Servlet by extending the HttpServlet class and solve the above problem definition using only one Servlet i.e. present the form in the doGET method and display name and marks in the doPOST method.
12. Write a JSP to show the working of all four scripting tags.
13. Write a JSP to show the working of errorPage and isErrorPage i.e. exceptions generated in a JSP must be handled by specified error page JSP.
14. Write a JSP to show the working of jsp:forward, jsp:include and include directive.
15. Using jspInit method and implicit objects write a JSP to prompt user to enter last name of a student and display a list of students matching that last name, each name should be a hyperlink which should display the detail of student. **Note**: Connection should be established only once.
16. Segregate the presentation logic and business logic by using beans along with JSP and solve the same roll number and marks problem as in Q.14. Connection should be established in bean and only once. JSP should be not contain any business logic.
17. Develop an application like picassa using servlets/jsp which have a feature of login (using session and cookies) and user can upload and download pictures. Use JSTL and expression language where ever necessary.
18. Develop a struts and hibernate chat server application where chat history are stored and can be retrieved.
19. Develop a struts based application to demonstrate the working of validation framework.

**Learning Outcomes:**

Upon successful completion of the course, the student

- Will be able to understand J2EE architecture
- Will be able to create database connection with oracle using JDBC.
- Will be able to deploy servlets
- Design and implement user interfaces based on the AJAX technology

**Text Books:**

1. **Collaborative Web Development**, JassicaBurdman, Addison Wesley, UK, 1st Edition, 1999.
2. **Professional JAVA Server Programming**, Allamaraju and Buest, SPD Publication, India, 3rd Edition 2001
3. **Beginning J2EE 1.4**, Ivor Horton, SPD Publication, 3rd edition 2005.

**Reference Books:**

1. **Internet & Java Programming**, Krishnamoorthy& S. Prabhu, New Age Publication, Latest Edition 2010.
2. **Advanced Programming for JAVA 2 Platform**, Austin and Pawlan, Pearson Publication, Latest Edition 2000.
3. **Web Programming Building Internet Applications**, Chris Bates, WILEYDreamtech publication, India, 2nd Edition, 2006.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA712 | Subject Title | COMPUTER GRAPHICS & ANIMATION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 4 | Subject Category | Deptt. core | Year | 2nd | Semester | IV |

**Objectives:** This course enable student to have a foundation in graphics, how image is drawn and various shape are created. This will also enable how various transformations in 2D and 3D take place.

Unit I-**Introduction and LineGeneration:** Types of Computer graphics, Graphic Displays-Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms,Circlegeneratingalgorithms,Mid-pointcirclegeneratingalgorithm,and parallel version of these algorithms.

Unit II-**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewingtransformations,2-DClippingalgorithms-LineclippingalgorithmssuchasCohenSutherland lineclipping algorithm, Liang Barsky algorithm, Line clipping against non-rectangular clip windows; Polygon clipping Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit III-**ThreeDimensional:**3-Dgeometricprimitives,3-DObjectrepresentation,3-DTransformation,3-D viewing, projections, 3-DClipping.

Unit IV-**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductoryconcepts of Spline, Bspline and Bezier curves and surfaces. Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basicilluminationmodels – Ambient light, Diffuse reflection, Specular reflection and Phongmodel, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

Unit V - **Computer Animations:** Conventional and computer assisted animation, design of animation sequences,interpolation,simpleanimationeffects,animationlanguages(KeyFrameSystem, Parameterizedsystems),motionspecifications,methodsofcontrollinganimation.

**List of practicals:**

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.
2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).
6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scalind and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms such as

**Learning Outcomes:**

Upon successful completion of the course, the student

- Will be able to gain proficiency to write basic graphics program.
- Will be able to implement various transformations in 2D and 3D.
- Will be able to implement curve generation and line clipping

**Text Book:**

1. **Computer Graphics C Version**, D. Hearn and M.P. BakerPearson Education, ,Lates Edition, 2002.

**Reference Books:**

1. **Computer Graphics: Principles and Practice**, James D. Foley, A. Van Dam, S.K. Feiner, and J.F. Hughes, Addision-Wesley Publishing Company, 3rd edition , 2014.
2. **Schaum's outlines Computer Graphics**, Z. Xiang, R. Plastock, , TMH, 2nd Ed. 2003
3. **Principles of Interactive computer Graphics**, W. M. Newman, R. F. Sproull, , TMH, Latest Edition, 2009.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA713 | Subject Title | MICROPROCESSOR AND SYSTEM DESIGN | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. core | Year | 2nd | Semester | IV |

**Objectives:** This course will enable the student to understand basic architecture of 16 bit and 32 bit microprocessors, interfacing of 16 bit microprocessor with memory and peripheral chips involving system design. This will also enable understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors. The concept of multi core processors has also been discussed.

Unit I

**Introduction to Microprocessors**: microcomputers and Assembly language, Microprocessor architecture and microcomputer systems.8085 architecture and memory interfacing, Interfacingl/O devices.

Unit II

**Programming8085:**Introduction to 8085 Instructions: Programming Techniques, Counters and Time Delays, Stacks and Subroutines, Interrupts, General purpose programmable peripheral devices

Unit III

**Introduction to system software:** definition, feature of system programming, system programming vs. application programmingandt type of system programmers.Assembler: single pass assembler, two-pass assembler, and general design procedure of an assembler.

Unit IV

**Macroprocessor:** macro language and its features, macro instructions, features of macro facility, implementation, one pass macroprocessor, two pass macroprocessor, Implementation.

**Loaders and linkers:** simple linker vs. loaders, and design and implementation of direct linking loader, subroutine linkage & other loader schemes

Unit V

**Compilers:**overview of compilation process, lexical analysis, syntax analysis, semantic analysis and intermediate code generation and code optimization techniques, compiler vs. interpreter. Introduction to device driver, functions and structure of text editor.

**Learning Outcomes:**

Upon successful completion of the course, the student

- Will be able to understand able to analyze, specify, design, write and test assembly language
- Will be able to select an appropriate 'architecture' or program design to apply to a particular situation;

**Text Books:**


1. "**Systems Programming**",John J Donovan , McGraw-Hill Edition ,USA,10/e,2010,


**Reference Books:**


1. ,"**Microprocessorarchitecture,programmingandapplicationwiththe 8085**",R.SGoankar,PenRamInternational,India,5th ed,2011
2. "**PrinciplesofCompilers**",AhoandUlman,NarosaPublishingHouse, IndiaNew Delhi,2/e,2006

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA714 | Subject Title | THEORY OF COMPUTATION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Dept. core | Year | 2nd | Semester | IV |

**Objectives:** The goal of this course is to provide students with an understanding of basic concepts in the theory of computation. At the end of this course students will be able to construct finite state machines and the equivalent regular expressions. Be able to prove the equivalence of languages described by finite state machines and regular expressions

Unit I

**Introduction to defining language:** Kleene Closure, Arithmetic expressions, Chomsky Hierarchy,
Regular expressions, Generalized Transition graph. Finite Boolean algebra, functions of Boolean algebra. Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with our Moore machine, Mealy machine, Conversions.

Unit II

**Regular expressions and finite Automata:** Regular languages, Finite automata, Union, Intersections & complements. Non deterministic Finite automata, Kleene's theorem. Regular & Non regular languages: Criterion for regularity, minimal Finite Automata, Pumping lemma, Decision problems, languages & computers.

Unit III

**Context-free grammars:** Derivation Trees & Ambiguity, An Unambiguous CFG for algebraic expressions, simplified forms and normal forms. Pushdown Automata: Definition, Deterministic pushdown automata, A PDA corresponding to a given context-free grammar, context-free grammar corresponding to a given PDA, parsing.

Unit IV

**Context-free and Non-Context-free languages:** The pumping lemma for context-free languages, Intersections & complements of context-free languages, decision problems involving context-free languages.

Unit V

**Turing Machines:** Definitions, computing partial functions, combining Turing machine, variation of Turing machines, Non-Deterministic Turing Machines, Universal Turing Machine

**Learning outcomes:**:

Upon successful completion of the course, the student will be able to:

- Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
- Demonstrate their understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving.

**Text Books:**


1. "**Introduction to languages & the theory of computation**" , John C Martin, Tata McGraw Hill publication,3rd edition, 2004.
2. "**Introduction to Automata theory, Languages and Computation**",John E Hopcroft and Jefrey D Ullman, Narosa Publication House, 2004.
3. "**Theory of Computer Science**",K.L.P Mishra & N. Chandrasekharan,PHI, Latest Edition, 2006.


**Reference Books:**


1. "**Introduction to the Theory of Computation**",Michael Sipser,Thomson,2nd edition, 2008.
2. "**The Theory of Computation**",Bernard M. Moret, Pearson Education,Latest Edition, 2014.
3. "**Automata and Computability**",Dexter C. Kozen, Springer,Latest Edition, 2007.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA741 | Subject Title | ADVANCED DATABASE MANAGEMENT SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objectives:** This course is meant to understand the various approach to handle database system. Database systems are important to business, industry and science. Distributed database, Object Oriented DBMS and web enabled databases are discussed.

Unit I

**Distributed DBMS Concepts and design:** Introduction, functions and architecture of a DDBMS, distributed relational database design, Transparencies in a DDBMS, Twelve rules for a DBMS. Advanced concepts: Distributed transaction management, distributed concurrency control, distributed deadlock management, distributed database recovery, X/open distributed Transaction processing model, Replication servers, Distributed query optimization, Mobile databases.

Unit II

**Object-Oriented DBMS**: Introduction, advanced database applications, weakness of RDBMS, storing objects in a relational database, next-generation database systems. Concepts and design: OODBMS perspectives, persistence, issues in OODBMS, advantages and disadvantages of OODBMS, Object- oriented database design.

Unit III

**Standards and systems:** object management group, object database standard ODMG 3.0 1999, Object store. Object relational DBMS: Introduction, third generation database manifestos, SQL8, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS.

Unit IV

**Web technology and DBMS, Web as a database Application Platform:** Requirements for web-DBMS integration, web-DBMS architecture, advantages and disadvantages of web-DBMS approach, approaches to integrating the web and DBMS, Oracle Internet Application Server(IAS).

Upon successful completion of the course, the student will be able to:

- Explain and evaluate the fundamental theories and requirements that influence the design of modern database systems
- Assess and apply database functions and packages suitable for enterprise database development and database management

**Text Books:**

1. "**Database Systems:Concept Design and Applications**",Shio Kumar Singh ,1st ed.,Pearson Education,India,2011

**Reference Books:**

1. "**An Introduction to Database Systems**",Bipin C Desai, West Publishing Company ,USA,2nd ed.,1997

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA742 | Subject Title | DATA COMPRESSION AND ENCRYPTION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objective:** This course will cover the concept of security, types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression.

Unit I

**Need for Data Compression**: Lossy / lossless compression, symmetrical compression and compression ratio, run length encoding (RLE) for text and image compression, relative encoding and its applications in facsimile data: compression and telemetry, scalar quantization .Statistical modeling of information source, coding redundancy, variable size codes prefix codes, Shannon-Fano coding, Huffman coding, adaptive Huffman coding, arithmetic coding a adaptive arithmetic coding, text compression using PPM method.

Unit II

**String compression:** sliding window compression, LZ77, LZ78and LZW algorithms and applications in text compression, Zip and Gzip, ARC and Redundancy code.Loss less techniques of image compression, gray codes, two dimensional image transform, discrete cosine transform and its application in lossy image compression, quantization, zig-zag " coding sequences, JPEG and JPEG-LS compression standards, pulse code modulation and differential pulse code modulation methods of image compression, video compression and MPEG industry standard.

Unit III

Digital Audio, Lossy sound compression, M-Iaw and A-law compounding, DPCM and ADPCM audio compression, MPEG audio standard, frequency domain coding, format of compressed data.

Unit IV

Security of information, security attacks, classical techniques, Caesar cipher, block ciperprinciples,data encryption standard, key generation for DES, block cipher principle, design and modes of operation, S-box design, triple DES with two three keys, introduction to international data encryption algorithm, key distribution.

Unit V

Number Theory and public encryption: Modular arithmetic, Fermat's and Euler's theorems, Chinese remainder theorem, discretelogarithm, principles of public key cryptosystems, RSA algorithm, key management, Diffie-Hellman key exchange, elliptic curve cryptography.

**Learning Outcome:**

Upon successful completion of the course, the student will be able to:

- Explain and evaluate the fundamental theories and requirements that influence the data compression techniques.
- Understand the basics of cryptography and its mathematical foundation.

**Text Books:**

1. "**Introduction to Data Compression**" ,Khalid Sayood , Morgan Kaufmann Publication,USA,3rd edition., 2005

**Reference Books:**

1."**Handbook of Data Compression**",David Salomon , Springer VerlagPublication,USA,5th edition., 2010
2. "**The Data Compression Book**", Mark-Nelson, M & T Books,USA,2nd edition.,1996

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA743 | Subject Title | DATA WAREHOUSE AND DATA MINING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objectives:**

This course will coversthe basic concepts of Data Warehouse and Data Mining techniques, Examine the types of the data to be mined and apply preprocessing methods on raw data. It also discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms

Unit I:

**Overview:** Motivation (for Data Mining), Data Mining-Definition & Functionalities. Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. ROLAP, MOLAP, HOLAP.

Unit II

**Data Pre-Processing:** Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit III

**Concept Description:** Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases

Unit IV

**Classification:** What is Classification, Issues regarding Classification, Decision tree, Bayesian Classification, Classification by Back propagation.

Unit V

Cluster Analysis: Data types in cluster analysis, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Outlier Analysis

.

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Explain and evaluate the various data mining algorithms
- Discover and measure interesting patterns from different kinds of databases.
- Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.

**Text Book:**

1. **"Data Mining Concepts and Techniques",** Jiawei Han and Micheline Kamber, Elsevier, Third Edition, 2012.

**Reference Books:**

1. "**Data-Mining. Introductory & Advanced Topics**", Margaret H.Dunham, Pearson Education, India, 3rdedition, 2008.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA744 | Subject Title | DISTRIBUTED DATABASE SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objectives:** This course is intended to provide you with an understanding of the current theory and practice of distributed database management systems. It further provides a solid technical overview of distributed database management systems design and implementation using a current database product as a case study.

Unit I

**Distributed Databases:** Distributed Databases: What and Why? ; The Distributed Database Management Systems. The Distributed Transparency - - the Reference Architecture for Distributed Databases, Data Fragmentation, Distributed Transparency for Read-Only and Applications, Distributed Database Access Primitives, Integrity Constraints in Distributed Databases.

Unit II

**Design Framework for Distributed Database Design**: the Database Fragmentation Design, Allocation of Fragments. Translation of Global Queries to Fragment Queries The Equivalence Transformation for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

Unit III

Optimization Of Access Strategies, Framework for Query Optimization, Join Queries - - use of Semi-Join Programs for Join Queries, the SDD-l Algorithm, the AHY approach, Use of Join as Query Processing Tactic; General Queries - - Effect of Commuting Joins and Unions, Methods for the Optimization of General Queries. The Management of Distributed Transactions The Framework for Transaction Management; Atomicity of Distributed Transactions; Concurrency Control for Distributed
Transactions; Architectural Aspects of Distributed Transactions.

Unit IV

**Concurrency Control:** Foundations of Distributed Concurrency Control; Distributed Deadlocks; Concurrency Control based on Timestamps; Optimistic Methods for Concurrency Control. Distributed Database Administration Catalog Management in Distributed Databases, Authorization and Protection. The System R * The Architecture of System R*; Compilation, Execution and Recompilation of Queries; Protocols for Data Definition and Authorization in R*, Transaction and Terminal Management.

Unit V

**Object Oriented Databases:** Object Oriented Databases - What and Why? , the Object Oriented Database Management Systems; Evolution of Object Oriented Concepts; Characteristics of an Object Oriented Data Model; Object Schema; Inter- object Relationships; Late and Early Binding; Similarities and differences between object Oriented Database Models and other Data models. Object Oriented DBMS Architectural Approaches The Extended Relational Model Approach; Semantic Database Approach; Object Oriented Programming Language Extension Approach; DBMS Generator Approach; the Object Definition Language and the Object Query Language.

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Explain techniques used for data fragmentation, replication and allocation during distributed databse design process.
- Discover and measure executing a distributed query to select the strategy that minimizes the amount of data transfer.

**Text Books:**

1. "**Distributed Databases - Principles and Systems**"; Stefano Ceri, GuiseppePelagatti; Tata McGraw Hill; 3rd edition,1985.
2. "**Database Systems- Design, Implementation and Management**"; Peter Rob, Carlos Coronnel;

**Reference Books:**

1. "**Principles of Distributed database systems**" by M.T. Ozsu/S. Sridhar, 3rd edition Pearson education, 2006.
2. "**Database Management Systems**" by Raghu Rama Krishnan, JohnaasGehrke; 5thedition TataMcGrawHill; 2000.
3. "**Fundamentals of Database Systems**" Elmasri, Navathe; Addison-Wesley;3rd Edition;2002.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA745 | Subject Title | ARTIFICIAL INTELLIGENCE | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objectives:** This course is meant to provide students with comprehensive and in-depth knowledge of AI principles and techniques by introducing AI's fundamental problems, and the state-of-the-art models and algorithms used to undertake these problems. This course is also designed to expose students to the frontiers of AI-intensive computing and information systems, while providing a sufficiently strong foundation to encourage further research.

Unit I

**Introduction:** History of AI, Intelligent agents and its functions, Problem spaces and search - Heuristic Search techniques – Best-first search, Problem reduction - Constraint satisfaction - Means Ends Analysis.

Unit II

**Knowledge Representation:** Approaches and issues in knowledge representation, Propositional Logic, Predicate logic – clause form conversion – Unification – Resolution, Semantic Nets, Partitioned Nets, Minskey frames, scripts.

Unit III

**Reasoning under uncertainty:** Logics of non-monotonic reasoning, Implementation, Basic probability notation, Bayes rule, Certainty factors and rule based systems, Bayesian networks, Introduction to Fuzzy Logic.

Unit IV

**Planning and Learning:** Planning with state space search, conditional planning, continuous planning, Multi-Agent planning. Forms of learning - inductive learning – Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning

Unit V

**Expert System:** Representation - Expert System shells - Knowledge Acquisition, domain exploration meta knowledge, inference engine, self explaining system, Application and Working of Ant Colony System. case study of MYCIN and DENDRAL.

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Explain basics and mathematical concepts of A.I
- Discover and measure AI with human intelligence and discuss its strength and limitations.

**Text Books:**


1. "**Artificial Intelligence**", Elaine Rich, Kevin Knight and ShivashankarB.Nair,Tata McGraw-Hill, Third edition, 2009. (UNITs I, II, III & V)
2. "**Artificial Intelligence: A Modern Approach**", Stuart J. Russell and Peter Norvig,Pearson Education Asia, Second edition, 2003.
3. "**Artificial Intelligence and Intelligent System**",N. P. Padhy, Oxford University Press, Second edition, 2005.


**Reference Books:**


1. "**Artificial Intelligence**", Patrick Henry Winston, Pearson Education Inc., Third edition, 2001.
2. "**Introduction to Artificial Intelligence**",EugeneCharniak and Drew Mc Dermott, Addison-Wesley,ISE Reprint, 1998.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA746 | Subject Title | ADVANCE COMPUTER NETWORKS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objectives:** This course is meant to study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues. Further to debate the current trends and leading research in the computer networking area.

Unit I

**Internetworking:** IP Addressing, Sub netting, Address Resolution Protocols, Routing Protocols- Interior Router Protocols & Exterior Router Protocols, Congestion Control at Network layer, Next Generation IP protocol, ICMPv6. IP Multicasting, Multicasting Routing Protocols, Multicast Congestion Control

Unit II

**Wireless Internet:** IP Limitations, Mobile IP &its working, Issues in Mobile IP. TCP over Wireless- Mobile TCP. TCP extensions for high speed network, Security related issues, Transaction-oriented application, TCP Congestion Control. Network Performance Analysis, High Performance Networks, Overlay Network, Peer-to-Peer,

Unit III

**Wireless Networks:** WLANs & WLLs IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Unit IV

Network Security at Various Layers. Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols. Digital signatures, Digital certificates.

Unit V

Issues of Network Programming, BSD Sockets, TCP/IP programming, Network performance analysis using NS2

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Explain basics of Internetworking and its associated protocols.
- Discover various networking security approach at various layer of TCP/IP

**Text Books:**


1. "**Mobile Communication**",JSchiller, Pearson Education Ltd.,India,2nd edition.,2003
2. "**Computer Network**",Andrew S. Tanenbaum,Pearson Education Ltd.,India,5th edition.,2010
3. "**Computer Networking with Internet Protocols and Technology**",W. Stallings, Pearson Education Ltd.,India,1st edition., 2004.


**Reference Books:**


1. "**AdhocNetworking**",Charles E. Perkins,Addison-Wesley,USA,1st edition ,2001
2. "**TCP/IP Protocol Suite**",BehrouzForouzan, TMH,India,4th edition ,2009
3. "**Internetworking with TCP/IP Volume One**",Douglas E. Comer, Addison-Wesley,USA,6th edition ,2013
4. "**Mobile IP, Design Principles and Practices**",C.E.Perkins, B.Woolf and S.R.Alpert, AddisionWesley,USA,1st edition, 1997

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA747 | Subject Title | CRYPTOGRAPHY AND NETWORK SECURITY | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objectives:**This course enable the students to learn fundamental concepts of security attack and cryptography. Various conventional algorithms used in cryptography are disused.

Unit I

**IntroductiontoCryptography:**IntroductionTo Security: Attacks, Services &Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential &Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

Unit II

**Conventional Encryption Algorithms**: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128,RC2Placement&Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function.

Unit III

**Public Key Encryption:** Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's &Euler'sTheorem, Primality, The Chinese Remainder Theorem.

Unit IV

**Hash Functions:** Message Authentication &Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function &MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, AuthenticationProtocol,DigitalSignatureStandard(DSS),ProofOfDigitalSignatureAlgorithm.

Unit V

**Network &System Security:** Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer &Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Explain basics and mathematical concepts of Cryptography
- Discover and measure various algorithms of cryptography and discuss its strength and limitations.

**Text Books:**


1. **"Cryptogrphy and Network Security"**,Behrouz A Frorouzan, ,TMH,India,Special Edition,2008


**Reference Books:**


1. **"Introduction to cryptography"**,JohannesA.Buchmann, ,Springer-Verlag,USA,2/e,2004
2. **"Cryptography and Network Security",**AtulKahate,,TMH, New Delhi,2/e 2005

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA748 | Subject Title | PARALLEL COMPUTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 2nd | Semester | IV |

**Objectives:** The objective of the course is to provide the knowledge and basic applications of parallel processing concepts, parallel environments and architectures, parallel algorithms and parallel programming.

Unit I

Principles of parallel algorithm design: decomposition techniques, mapping & scheduling computation templates, Programming shared-address space systems: Cilk Plus, Open MP,P-threads, Parallel computer architectures: shared memory systems and cache coherence, distributed-memory systems, interconnection networks and routing

Unit II

Computational demands, advantages of parallel systems. Flynn's classification, controlled parallelism and scalability. Topologies: Mesh, binary tree, Hyper tree, Cube Connected cycles, shuffle-Connected Exchange; Uniform Memory Access (UMA & Non uniform Memory Access (NUMA) Multi processor System.

Unit III

PARAM Model of Parallel Computation, PARAM Algorithms; Parallel Reductions, Prefix sum, List Ranking, Merging of Two Sorted List.

Unit IV

Mapping and Scheduling; mapping of Data from Topology to other (Ring to 2-D Mesh, Binomial trees to 2-D mesh, Rings & mesh into 2-D Mesh, Ring & Mesh into Hypercubes), Load balancing,

Unit V

Static scheduling on UMA multi-processor systems. Applications of parallel computing: Matrix Multiplication, Sorting (bitonic Merge sort, parallel quick sort, hyper quick sort), Searching a Graph (P-depth search, Breadth-Depth Search, Breath firstsearch), parallel branch and bound algorithms.

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Describe different parallel processing architectures based on relationships between processing elements, instruction sequence, memory and interconnected network
- Identify algorithms, which require parallelization as part of system design or performance enhancement

**Text Books:**


1. **"Introduction to Parallel Computing"**,AnanthGrama,PearsonEducation,England,, 2/e 2003


**Reference Books:**


1. **" Parallel Computing: Theory and Practice"**,Michel J. Quinn,TMH,India,2/e 2002
2. **"Advanced Computer Architecture"**,Kai Hwang, TMH,India, 2/e 2011
3. **"An Introduction to Parallel Programming"**,PeterPacheco,MorganKaufmann,USA, 1/e 2011

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA716 | Subject Title | VALUE ADDED TRAINING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 0 0 2 | Credit | 3.5 | Subject Category | Deptt.Core | Year | 2nd | Semester | IV |

**Objectives:** This course is to aware student with how Python is a useful scripting language for developers and how to design and program Python applications.

**Unit I**

**Introduction to Python:** Installation and Working with Python Understanding Python Variables Python basic Operators Understanding python blocks, Python Data Types: Declaring and using Numeric data types: int, float, complex Using string data type and string operations Python Program Flow Control: Conditional blocks using if, else and elif Simple for loops in python For loop using ranges, string, list and dictionaries Use of while loops in python Loop manipulation using pass, continue, break and else Programming using Python conditional and loops block

**Unit II**

**Python Functions, Modules and Packages:** Organizing python codes using functions, organizing python projects into modules, Importing own module as well as external modules, Understanding Packages, Powerful Lamda function in python Programming using functions, modules and external packages,

**Unit III**

**Python Object Oriented Programming –** Oops Concept of class, object and instances Constructor, class attributes and destructors Real time use of class in live projects Inheritance , overlapping and overloading operators Adding and retrieving dynamic attributes of classes Programming using Oops support, Python Exception Handling Avoiding code break using exception handling, Safe guarding file operation using exception, handling and helping developer with error code, Programming using Exception handling

**Unit IV**

**Python Multithreading** Understanding Threads, Forking Threads, Synchronizing the threads, Programming using multithreading, Python CGI Introduction Writing python program for CGI applications, creating menus and accessing files, Server client program, Sample Project

**Learning Outcomes:**

- Upon successful completion of the course, the student will be able to :
    - Student can deploy various application based on android python

**Text book:**

1. Python programming using solving approach, ReemaThareja, Oxford University Press, 2nd Edition, 2017
2. Text processing in python by David Mertz

**Reference book**

1. Learning to program with python by Richard L. Halterman
2. Python for everybody exploring data using python 3 by Charles R. Severance

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Student can deploy various application based on android SDK.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA801 | Subject Title | NET FRAMEWORK AND C# PROGRAMMING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 3.5 | Subject Category | Deptt.Core | Year | 3rd | Semester | V |

**Objective** :- This course provides an exhaustive coverage of C# programming language features like Object-oriented Programming, Inheritance, Interfaces, Exception Handling, Reflection, Standard I/O programming, File Handling, Generics, Windows Application using Winforms, File I/O, XML in .NET, ADO.NET, Web Services and Deployment.

Unit I

**The .Net framework:** Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

Unit II

**C -Sharp Language (C#):** Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion

Unit III

**C# Using Libraries:** Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

Unit IV

**Advanced Features Using C#:** Web Services(WSDL,UDDI,SOAP),Asp.net Web Form Controls: Server Control, HTML controls, **ADO.Net:**Connection(OleDBConnection and SqlConnection),Command, Data Readers,DataAdapters and DataSet , Unsafe Mode

Unit V

.**Net Assemblies and Attribute:** .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic

List of practicals:

1. First Console Application (Hello World ) in C#
2. Program to demonstrate Convert function
3. Program to demonstrate Boolean Operators
4. Write a program to take two numbers from user and determine the largest one?
5. Write a program to calculate simple interest
6. Draw Mandelbrot sets using for loop and switch case
7. Write a program using enum
8. Write a program using struts
9. Write a program using string arrays
10. Write a program using properties
11. Write a program for single level inheritance
12. Write a program for polymorphism
13. Write a program for method overriding
14. Write a program of single cast delegate
15. Write a program of multicast delegate
16. Write a program of using event
17. Write a program of exception handling
18. Write a program of multithreading
19. Write a program of indexers
20. Write a program of creating a assembly
21. Write a program of unsafe code
22. Write a program of boxing
23. Write a program of unboxing
24. Write a program of Arraylist Collection
25. Write a program of HashTable collection

26. Write a program of reading and writing to a data file

**Learning Outcome** : After completion of this course student will be able to:

- Apply OOAD concepts to build C# applications
- Develop console based applications using C#
- Develop windows applications using C#
- Create database applications using C#
- Use Winforms for building rich GUI applications

**TextBooks:**

1 **"AGuidetothe Project ManagementBodyof Knowledge (PMBOK)"**, ProjectManagementInstitute, USA,5th edition., 2013.

2 **"Project Management Workbook and PMP/CAPM Exam Study Guide"** HaroldKerzner,FrankP.Saladis,,John-Wiley &Sons,USA,,11th edition., 2013

3 **"C#.Net Web Developer's Guide"**SaurabhNandu et al, ,Syngress Publishing Inc,USA,1st edition., 2002

4 **"Beginning Visual C# 2010"**Karli Watson,Christian Nagel , ,Wrox,USA,,1stedition., 2010.

**ReferenceBooks:**

1. **"Professional C#"**Simon Robinson, Christian Nagel, Karli Watson, Jay Glynn, Morgan Skinner, Bill Evjen,Wrox p2p series,USA,3rdedition 2004

2. **"Professional C# and .Net 4"**, Christian Nagel et al, ,Wrox,USA,1stedition 2010.

3." **Microsoft .Net for Programmers"**, Fergal Grimes, ,Manning,USA,1stedition 2002

5. **"C# Black Book",**Matt tells, CORIOLIS,USA,1/e 2001

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA802 | Subject Title | MOBILE AND ADHOC COMPUTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt.Core | Year | 3rd | Semester | V |

**Objective** :This course aims to provide basic understanding to realize the vision of "Optimally Connected Anywhere, Anytime". The course is an introduction to the fundamentals of mobile computing, to learn about different architectures of mobile application development, to study the routing algorithm, security mechanism and transport protocols used in mobile adhoc networks, and to know recent and future trends in mobile computing.

Unit I

Issues in Mobile Computing, WirelessTelephony: Frequency Reuse, Cell Design, Cellular Architecture. Digital Cellular Standards, GSM: air-interface, channel structure, location management: HLR-VLR, Handoffs, Channel allocation in cellular systems, CDMA, GPRS, Overview of 3G Cellular Networks

Unit II

Wireless Networking, WLAN Overview, Infrared LAN, Spread-Spectrum LAN, Narrowband Microwave LAN, MAC issues, MACA & MACAW, IEEE 802.11, IEEE 802.16, Bluetooth, Wireless Metropolitan Area Networks (Wireless Local Loop), Wireless Multiple Access.

Unit III

Wireless Internet: IP Limitations, Mobile IP &its working, Issues in Mobile IP. TCP over Wireless, Wireless Access Protocol (WAP): Architecture & Protocol Stack. Security in Wireless Systems, Mobile Agents Computing, Transaction Processing in Mobile Computing Environment

Unit IV

Ad Hoc Networks: Ad Hoc Networks vs. Cellular Networks, Issues in Ad Hoc Wireless Networks,
MAC Protocols, Routing Protocols for Ad Hoc Wireless Networks-Design Issues and Classification, Proactive Routing Protocols, Reactive Routing Protocols, Hybrid Routing Protocols.

Unit V

Wireless Sensor Networks: Overview, Application Areas, Sensor Nodes' Architecture, Data Aggregation, Routing, and Query Processing in WSN.

**Learning outcome**: After completion of this course student will be able to:

- Describe wireless and mobile communications systems and be able to choose an appropriate mobile system from a set of requirements.
- Be able to avoid or work around the weaknesses of mobile computing, or to reject mobile computing as a solution.
- Understand the routing concept of mobile adhoc networks.
- Understand the reliable and unreliable communication and provide solutions to improve the quality of service in mobile adhoc networks.
- Program applications on a mobile computing system and interact with servers and database systems.

**Text Books:**


1. **"Mobile Communication",**JSchiller, ,Pearson Education Ltd.,India,2/e 2003
2. **"AdhocNetworking"**,Charles E. PerkinsAddison-Wesley,USA, 1/e, 2001


**Reference Books:**


1. **"Mobile Computing: Implementing Pervasive Information and Communications Technologies"** ShambhuUpadhyaya et al, Springer US,USA, illustrated edition, 2013
2. **"Mobile Computing",** ShambhuUpadhyaya et al, ,Springer India,India, 1/e ,2008
3. **"Mobile Computing :A book of reading"**,C S R Prabhu, , ,Universities Press,India, 1/e 2003

4. **"Principles of Mobile Communication",**Gordon L,Springer,USA,3/e,2012
5. **"Mobile Computing",**Sipra Das Bit, Biplab K. Sikdar, , PHI Learning,India,1/e 2009
6. **"Wireless Networking Complete"**,VijayGarg et al, , Elsevier, Morgan Kaufmann Publisher,USA,1/e ,2004
7. **"Networks:An Information Processing Approach" ,**Feng Zhao, Leonidas J. Guibas,Wireless sensor, Elsevier Morgan Kaufmann,USA,1/e 2004

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA803 | Subject Title | CLOUD COMPUTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 0 2 | Credit | 3.5 | Subject Category | Dept.Core | Year | 3rd | Semester | V |

**Objective: To** provide students with the fundamentals and essentials of Cloud Computing. It will create a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios. To enable students exploring some important cloud computing driven commercial systems such asGoogleApps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.

**UNIT-I**

**Understanding Cloud Computing:** Cloud Computing – History of Cloud Computing –Advantages of Cloud Computing –Disadvantages of Cloud Computing- Goals of Cloud Computing- NIST Cloud Computing Model: Essential Characteristics, Delivery Models, IaaS, PaaS, Saas, Deployment Models, Public, private, Hybrid & Community, Pricing Model of Cloud Computing.

**UNIT-II**

**Understanding Virtualization and Cloud Infrastructure:** Using virtualization technique – Load balancing- Understanding hypervisors –Machine imaging- Porting applications Network capacity – Scaling –role of virtualization in enabling the cloud-Business Agility– Administrating the cloud –Management products – Communicating with the cloud – Instant messaging – Collaboration technologies –Social networks – Media and streaming.

**UNIT-III**

**Developing Cloud Services:** Web-Based Application – Pros and Cons of Cloud Service Development– Types of Cloud Service Development – Software as a Service –Platform as a Service – Web Services – On-Demand Computing –Discovering Cloud Services Development Services and Tools –Amazon Ec2 – Google App Engine – IBM Clouds.

**UNIT-IV**

**Management of Cloud Services and Cloud Storage** : Reliability, availability and security of services deployed from the cloud- Performance and scalability of services- tools and technologies used to manage cloud services deployment-Introduction to cloud storage- Global storage management locations, scalability, operational efficiency- Global storage distribution; terabytes to petabytes and greater.

**UNIT-V**

**Cloud Applications and Cloud Security :** Working with mobile devices – Smartphone with the cloud – Mobile web services -Scientific applications – Business and consumer applications-Securing the cloud-The security boundary, Security service boundary, security mapping, Data security- Brokered cloud storage access, storage location and tenancy, encryption, Auditing and compliance, Establishing identity and presence.

**List of Practicals:**

1. Working of Virtualization software Virtual Box
2. Working of Virtualization software VMware Workstation
3. Working of Virtualization software Microsoft Hyper V
4. Working of Google Drive to make spreadsheet and notes.
5. Installation and Configuration of Just cloud.
6. Working in Cloud9 to demonstrate different language.
7. Installation and Configuration of Hadoop/Eucalyptus
8. Working and installation of Google App Engine
9. Working and installation of Microsoft Azure
10. Simulating Cloud Computing Concept using CloudSim

**Learning Outcomes:**Upon successful completion of this course student will be able to:

- Develop and deploy cloud application using popular cloud platforms,
- Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and building private cloud.
- Explain and identify the techniques of big data analysis in cloud.
- Compare, contrast, and evaluate the key trade-offs between multiple approaches to cloud system design, and Identify appropriate design choices when solving real-world cloud computing problems.
- Write comprehensive case studies analysing and contrasting different cloud computing solutions.
- Make recommendations on cloud computing solutions for an enterprise.

**Text Books:**

1. **"Handbook of Cloud Computing"**,Furht, Borko, Escalante, Armando,Springer,USA, 1/e,2010
2. **"Cloud Computing: Concepts, Technology &Architecture",**ThomasErl et al,Prentice Hall,USA,1/e 2013

**Reference Books:**

1. **"A Road to Cloud Computing:A Beginner's Perspective"**HarjotDhawan,LAP Lambert Academic Publishing,USA,2012
2. **"Cloud Computing for Dummies",** Judith Hurwitz,, ,John Wiley &Sons,USA,1/e 2010
3. **"Cloud Computing: Principles and Paradigms"**,RajkumarBuyya,,John Wiley &Sons,USA,1st edition 2011

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA851 | Subject Title | PRINCIPLES OF COMPILER DESIGN | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objectives:** Students will have knowledge of phases of the compilation process and be able to describe the purpose and implementation approach of each phase. A practical exposure to aspects of theoretical computer science including Languages, Grammars, and machines.Exercise and reinforce prior programming knowledge with a non-trivial programming project to construct a compiler. Lexical analysis, parsing, and intermediate code-generation will be completed.

Unit I

**Introduction:** Review of Languages & Grammar, Compiler and Interpreter- Basic Concepts, Phases and Passes, Finite State Machines & Regular Expressions and their application to Lexical Analysis, Design Issues using Finite State Machines, Scanner Generator- LEX, Formal Grammar and their application to Syntax Analysis, Ambiguous Grammar, and The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG, BNF Notation.

Unit II

**Basic Parsing Techniques:** Parsing-Top Down and Bottom-Up Strategies: General Consideration.

Top Down Parsing: Brute-Force Method, Recursive Descent, & Predictive Paring, Bottom-Up Parsing: Shift Reduce Parsing, Operator Precedence Parsing. LR Grammars-LR (0), SLR (1), Canonical LR (1) & LALR (1) Parser, Comparison of parsing methods.

Unit III

**Semantic Analysis:** Basic Concepts, Syntax Directed Definitions-Inherited & Synthesized Attributes, Evaluation Orders of SDDs. Syntax directed Translation Schemes, Intermediate Codes, Postfix notation, Parse Trees and Syntax Trees, Directed Acyclic Graphs, Three address Codes: Quadruple & Triples, Translation of Assignment Statements, Boolean expressions, Control Statements, Postfix Translation, Translation with a Top Down Parser, Array references in Arithmetic expressions , Procedure Calls, Declarations and Case statements Translations.

Unit IV

**Symbol Tables:** Organization of Non-Block Structured Language (Unordered/Ordered/Tree/Hash) and Block Structured Language (Stack Tables & Stack Implementation), Runtime Storage Management: Static Allocation, Dynamic Allocation- Activation Records and their usage, Recursive Procedure. Heap Allocation-Storage Registers and Release Strategies.

Unit V

**Error detection and Recovery:** Code Optimization- Basic Blocks and Optimization, Loop Optimizaton, Flow Graph Analysis, Machine Dependent Optimization.

Error Handling: Detection, Reporting, Recovery and Maintenance, Compiler-Compiler—YACC, Code Generation, Concept of Compiler Design for Object-Oriented Language.

**Learning Outcomes:**

Upon successful completion of the course, the student will be able to:

- Will have acquired the skills to understand, develop, and analyze recognizers for programming languages.
- Will also be able to deploy efficient and methodical techniques for integrating semantic analysis into the afore-mentioned recognizers, and generate low-level code for most constructs that characterize imperative and functional programming languages.

**Text Books:**

1. **"Compiler Design: Principles ,Techniques &Tools"**,Aho, Ullman &Sethi",Addison Wesley,USA,2/e 2006

**Reference Books:**

1. **"Compiler Construction – Principles &Practice"**D.M.Dhamdhere, Macmillan India Ltd,India,2/e 2008
2. **"Crafting a Compiler with C"**CharlesFischer et al, ,PHI,India,,2/e 2008

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA852 | Subject Title | REAL TIME AND EMBEDDED SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective: This** course covers the concepts, task model and scheduling algorithms of real-time systems, with particular emphasis on real-time systems and embedded systems. Real time communication is also discussed.

Unit I

**Introduction:** Concept of Real Time System, Issues in real time computing, Performance measures of Real Time System, Issues in Real Time Computing, Performance measures of Real time Systems, Real Time Application.

**Task Assignment and Scheduling:** Different task model, Scheduling hierarchy, offline vs Online scheduling, Clock Drives.

Unit II

**Model of Real Time System:** Processor, resources, temporal parameter, Periodic Task Model, Sporadic Task Model, Precedence Constraints and Data Dependencies, Scheduling hierarchy, **Scheduling of Periodic Task:** Assumptions, fixed versus dynamic priority algorithms, schedulability test for fixed priority task with arbitrary deadlines. **Scheduling of Aperiodic and Sporadic Tasks:** Assumptions and approaches, deferrable, sporadic servers, slack stealing in deadline driven and fixed priority systems. Two level schemes for integrated scheduling, Scheduling for applications having flexible constrains.

Unit III

**Resources and Resource Access Control:** Assumptions on resources and their usage, resource contention, resource access control (Priority Ceiling Protocol, Priority Inheritance protocol, Slack Based Priority Ceiling Protocol, Peremption Ceiling Protocol).

Unit IV

**Multi-Processor Scheduling:** Model of multi-processor and distributed systems, scheduling algorithms for end to end periodic tasks in homogeneous/heterogeneous systems, Predictability and validation of dynamic multiprocessor system.

Unit V

**Real time Communication:** Model of real time Communication, Priority base service for switched network, Weighted Round Robin Service, Medium access Control Protocol, Real Time Protocol.

**Learning Outcomes**

By end of this course, students should be able to:

- Applyvarious scheduling approach to complex embedded systems.
- How Real time communication take place.

**Text Books:**


1. **"Real Time Systems",**,Jane .W. S. Liu ,Pearson Higher Education,USA,1st edition , ,2000.


**Reference Books:**


1. **"Real-Time Systems: Theory and Practice" Rajib Mall**, Pearson publication, 1st edition , 2007
2. **"Real Time Systems"**,Krishna .C.M",TMH,India,3rdReprint 2010.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA853 | Subject Title | OPERATION RESEARCH | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective:** this course will introduce students to the fundamental concepts of optimization and its applications to real world problems. In addition to this, student will be able to develop mathematical models like LPP to solve real world with given constraints and make business decisions that optimize the resources. It also discusses Inventory problems, PERT and CPM and Game theory.

Unit I

**Linearprogramming:** graphical methods for two dimensional problems–central problem of linear programming – various definitions – statements of basic theorems and properties – phase I and phase ii of the simplex method – revisedsimplexmethod–primalanddual–dualsimplexmethod–sensitivityanalysis–transportation problem and its solution–assignment problem and its solution by Hungarian method.

Unit II

**Integer programming:** Gomorycutting plane methods–branch and bound method. Queuing theory: characteristics of queuing systems–.Replacement theory: replacement of items that deteriorate–replacement of items that fail group replacement and individualeplacement.

Unit III

**Inventory theory:** costs involved in inventory problems–single item deterministic models–economic lot size models without shortages and with shortages having partition rate infinite and finite.

Unit IV

**Pert and CP/M:** arrow network- time estimates – earliest expected time, latest allowable occurrence time, latest allowable occurrence time and slack–critical path–probability of meeting scheduled date of completion of project– calculationofCP/Mnetwork–variousfloatsforactivities–criticalpath– updating project–operation time cost trade off curve–selection of schedule based on cost analysis

Unit V

**GameTheory:** The formation of Two person, Zero sum games, solving simple games, games with mixed strategies, Graphical solution Procedure, Solving by LP.

**Learning Outcomes**

By end of this course, students should be able to:

- Identify and develop operational research models from the verbal description of the real system.
- Make good business decision that optimizes the given resources.

**Text Book:**

1. **"Operations Research – An Introduction"**, Taha,H.A.,,Prentic Hall,NY,8thedition 2007

**ReferenceBooks:**

1. **"Convex Optimization"**,Stephen Boyd et al,Cambridge University Press ,United Kingdom Cambridge, ,7thedition, 2009

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA854 | Subject Title | MODELING AND SIMULATION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective:**

The goal is to introduce students to basic simulation methods and tools for modelling and simulation of continuous, discrete and combined systems. Further student will get aware with queuing systems.

Unit I

**Introduction to Modeling and Simulation:** Nature of Simulation. Systems , Models and Simulation, Continuous and Discrete Systems, system modeling, concept of simulation, Components of a simulation study, Principles used in modeling ,Static and Dynamic physical models, Static and Dynamic Mathematical models Introduction to Static and DynamicSystemsimulation,Advantages,DisadvantagesandpitfallsofSimulation.

Unit II

**System Simulation and Continuous System Simulation:** Types of System Simulation, Monte Carlo Method, Comparison of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cob web Model. Continuous System models, Analog and Hybrid computers, Digital- Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

Unit III

**System Dynamics &Probability concepts in Simulation:** Exponential growth and decay models, logistic curves, Generalization of growth models,Systemdynamics diagrams, Multisegmentmodels, Representation of Time Delays. Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.

Unit IV

**Simulation of Queuing Systems and Discrete System Simulation:** Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system.Discrete Events, Generation of arrival patterns, Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization, Recording Distributions and Transit times.

Unit V

**Introduction to Simulation languages and Analysis of Simulation output GPSS:** Action times, Succession of events, Choice of paths, Conditional transfers, program control statements .SIMSCRIPT: Organization of SIM SCRIPT Program, Names &Labels, SIMSCRIPT statements .Estimation methods, Relicationof Runs, Batch Means,Regenerativetechniques,TimeSeriesAnalysis,SpectralAnalysisandAutoregressiveProcesses.

**Learning Outcome:** By end of this course, students should be able to:

- Identify what is simulation, its types and its mathematical background.
- Understanding simulation can be used in natural, physical and engineering sciences, mathematics, statistics, computer and information sciences.

**Text Books:**

1. **"Discrete-Event Modeling and Simulation: A Practitioners Approach",**Wainer, A. G, CRC Press, Boca Raton, FL,2009
2. **"System Simulation Techniques with MATLAB and Simulink**",DingyüXue, YangQuanChen,John Wiley & Sons,UK,2014

**References Books:**

1. **"Discrete-Event System Simulation Banks"**, J., J.S. Carson, B.L. Nelson, and D.M. Nicol,,Prentice-Hall, Upper Saddle River, NJ,4/e, 2005
2. **"Simulation Modeling and Analysis,Law",** A.M. and W.D. Kelton,McGraw-Hill, New York, NY,, 3/e 2000

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA855 | Subject Title | WIRELESS SENSOR NETWORKS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective:** This course deals with the comprehensive knowledge about wireless sensor networks. It provides an insight into different layers and their design considerations. A thorough knowledge of infrastructure establishment and sensor network platform is provided

**UNIT- I**

**Characteristics of WSN**: Introduction: Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks Sensor Node, Hardware and Network Architecture: Single-node architecture, Hardware components & design Constraints

**UNIT –II**

**Operating Systems For WSN**: Operating Systems for Wireless Sensor Networks , Introduction Operating System Design Issues, Execution Environment , Introduction to Tiny OS, NesC Interfaces and Modules- Configurations Operating systems and its execution environments,
Examples of Operating Systems – TinyOS – Mate MagnetOS MANTIS OSPM EYES OS , SenOS, EMERALDS PicOS

**UNIT-III**

**Medium Access Control Protocols:** Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, Low duty cycle protocols and wakeup concepts – Contention based protocols - Schedule-based protocols - SMAC - BMAC, Traffic-adaptive medium access protocol (TRAMA). The IEEE 802.15.4 MAC protocol, Random Access Based Protocols, Access Control and Data Exchange

**UNIT –IV**

**Routing And Data Gathering Protocols:**Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping ,Data centric Routing – SPIN – Directed Diffusion, Energy aware routing , Gradient-based routing, Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN,APTEEN, SPEED, RAP

**UNIT–V**:

**Data Storage and its Application**:

**Data aggregation:**Data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.NIT-II

WSN Applications: Home Control, Building Automation, Industrial Automation,

**Medical Applications:**Reconfigurable Sensor Networks, Highway Monitoring

**Military Applications:** Civil and Environmental Engineering Applications, Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications, Target detection and tracking , Contour/edge detection - Field sampling

**Learning Outcomes :**On completion of this course you should be able to:

- Apply knowledge of wireless sensor networks(WSN) to various application areas.
- Design and implement WSN.
- Conduct performance analysis of WSN and manage WSN.
- Formulate and solve problems creatively in the area of WSN.

**Text Books:**

1. **"Fundamentals of Wireless Sensor Networks: Theory and Practice"**,WaltenegusDargie, Christian Poellabauer, ,Wiley,India,1st edition ,2010

2. **"Multihop Wireless Networks: Opportunistic Routing**",Kai Zeng, Wenjing Lou, Ming Li ,Wiley,India, 1st edition, 2011

References:

1. **"Protocols and Architectures for Wireless Sensor Network"**,HolgerKerl, Andreas Willig, ,Wiley,India,1st edition,,2005
2. **"Wireless Sensor Network"**, Raghavendra, Cauligi S, Sivalingam, Krishna M., ZantiTaieb, Springer,USA, 1st edition, 2004
3. **"Sensor Network Wireless"**Feng Zhao, Leonidas Guibas,Elsevier,USA, 1st edition, 2004

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA856 | Subject Title | FAULT TOLERANCE COMPUTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective**: This course will consider the range of techniques available to organizations with different dependability requirements and budgets for fault tolerance. The course will thus satisfy the needs of companies that have to decide between market offerings of fault-tolerant commercial systems, and/or the need to integrate a fault-tolerant system out of non- fault-tolerant products.

Unit I

Definitions of fault tolerance, fault classification, fault tolerant attributes and system structure. Information redundancy, hardware redundancy, and time redundancy.

Unit II

Fault Tolerant Design :Basic concepts on dynamic, hybrid and self purging ,software redundancy, fail-soft operation,Network Redundancy and Fault Tolerance , Software and Hardware Checkpointing, examples of practical fault tolerant systems.

Unit III

Basic concepts of Reliability: Failures and faults, Reliability and failure rate, Relation between reliability & mean time between failure, Maintainability & Availability, reliability of series and parallel systems. Modeling of faults. Test generation for combinational logic circuits:conventional methods (path sensitization,Boolean difference), Random testing, transition count testing and signature analysis**.**

Unit IV

Fault tolerant networks for Shared bus and Shared memory Architecture. Security, fault tolerance in wireless/mobile networks and Internet.

Unit V

System level diagnosis, Error correcting codes: Hamming codes, SED-DED codes, SEC-SBD codes, cyclic codes, Watchdog techniques, check pointing and error recovery, Software Fault Tolerance.

**Learning Outcomes :**By end of this course, students should be able to:

- understand the risk of computer failures and their peculiarities compared with other equipment failures;
- know the different advantages and limits of fault avoidance and fault tolerance techniques;
- be aware of the threat from software defects and human operator error as well as from hardware failures;
- understand the basics of redundant design;

**Text Books:**

1. "**Fault-Tolerant Computer System Design**", D.K. Pradhan, Prentice Hall,USA , 1st edition, 2003.

**References:**

1. **Design and Analysis of Reliable and Fault-Tolerant Computer Systems**, MostafaAbd-El-Barr,WorldScientific,USA, 1/e,2006
2. **Self-checking and Fault-Tolerant Digital Design**,Lala, P.K., Morgan Kaufmann,San Francisco, CA, USA, 1/e, 2001.
3. **Reliability of Computer Systems and Networks**,Shooman, M.L., Wiley,USA, 1/e, 2002

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA857 | Subject Title | BIG DATA ANALYTICS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective :** The course aims to aware the students with big data and its analytics. A detail study of various data analysis tools and methods are discussed. In addition we consider Big Data platforms (such as Hadoop) to present practical applications of the tools covered in the course.

UNIT I

**INTRODUCTION TO BIG DATA:** Introduction to Big Data Platform – Traits of Big data -Challenges of Conventional Systems -Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - ReSampling- Statistical Inference - Prediction Error.

UNIT II

**DATA ANALYSIS:** Regression Modeling, Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees

UNIT III

**MINING DATA STREAMS :**Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications.

UNIT IV

**FREQUENT ITEMSETS AND CLUSTERING :**Mining Frequent Item sets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Item sets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS.

UNIT V

**FRAMEWORKS AND VISUALIZATION:**MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies-Industry challenges and application of Analytics

**Learning outcomes:** By end of this course, students should be able to:

- Implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.
- Analyse methods and algorithms, to compare and evaluate them with respect to time and space requirements, and make appropriate design choices when solving real-world problems.
- Explain the Big Data Fundamentals, including the evolution of Big Data, the characteristics of Big Data and the challenges introduced.

**Text Books:**

1. **Intelligent Data Analysis**,Michael Berthold, David J. Hand,2/e, Springer, 2007.
2. **Mining of Massive Datasets**,Anand Raja Raman and Jeffrey David Ullman,2/e, Cambridge University Press, 2012.
3. **Taming the Big Data Tidal Wave:Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks**", 1/e,John Wiley & sons, 2012.

**Reference Books:**

1. **Making Sense of Data I**,Glenn J. Myatt, 2/e, John Wiley & Sons, 2014
2. **Big Data Glossary**, Pete Warden,1/e, O'Reilly, 2011.
3. **Data Mining Concepts and Techniques**, Jiawei Han, Micheline kamber, 2/e, Elsevier, Reprinted 2008.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA858 | Subject Title | DIGITAL IMAGE PROCESSING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective:** The course aims to aware the students with image in different domain and its processing. A detail study of various image enhancement in different domain are discussed. In addition we have color, morphological image processing covered in the course.

Unit I

**Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, ASimpleImage Model, Sampling and Quantization. Introduction of image standard JPG, GIF, TIFF, PNG.

**Image EnhancementinSpatial Domain:** Introduction; Basic Gray Level Functions – Piecewise- Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations, Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing -Mean filter, Ordered Statistic Filter; Sharpening–The Laplacian.

Unit II

**Image Enhancement inFrequency Domain:** Fourier Transform and the Frequency Domain ,Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial andFrequencyDomain;SmoothingFrequencyDomainFilters–GaussianLowpassFilters; Sharpening Frequency Domain Filters–Gaussian Highpass Filters; Homomorphic Filtering. **Image Restoration:**A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters–Median Filter, Max and Minfilters; Periodic Noise Reduction by Frequency Domain Filtering–Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III

**Color Image Processing:** Color Fundamentals, Color Models, ConvertingColors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

**Morphological Image Processing:** Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing,MorphologicalAlgorithms–BoundaryExtraction,RegionFilling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

Unit IV

**Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging–AlgorithmstoEstablishCorrespondence,AlgorithmstoRecoverDepth.

Unit V

**Segmentation:** Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding,EdgeDetectorPerformance,LineDetection,CornerDetection.

**Learning outcomes:** By end of this course, students should be able to:

- Understanding the concept of image processing.
- Analysevarious methods and algorithms, for doing image processing in different domain.

**Text Books:**

1. **Digital Signal Processing**,S. Salivahanan et al, TMH, 3rd edition, 2000.

2. **Theory and Application of Digital Signal Processing**,L. R. Rabiner& B. Gold, PHI, NJ, 3rd edition, 2009

**Reference Books:**

1. **Digital Image Processing and Computer Vision**,R.J. Schalkoff , John Wiley and Sons, NY,3rd Edition, 1996.
2. **Fundamentals of Digital Image Processing**,A. K. Jain, Prentice Hall, Upper Saddle River, NJ,2nd edition, 2004.
3. **Digital Signal Processing using MATLAB**,Vinay K. *Ingle*, John G. Proakis, Thomson Delmar-*Vikas*Pub. , 3rd edition,2007.
4. **Digital Signal Processing** - A Computer based approach,S. K. Mitra, TMH, 2nd edition, 2002.

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA861 | Subject Title | MULTIMEDIA SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective :** The course aims to aware the students with multimedia and its various compression techniques. A detail study of various lossy and lossless compression techniques are discussed. Student are also made aware with latest form of multimedia communication and its security.

UNIT I

Introduction: Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work, Stages of Multimedia Projects, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

UNIT II

Multimedia Building Blocks: Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

UNIT III

Data Compression: Introduction to data compression, Compression ratio, loss less &lossy compression, Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding ,Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77,LZ78, LZW compression.

UNIT IV

Image, Audio and Video Compression: Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, ZigZag Coding, Multimedia Database. Content based retrieval for text and images, Video Compression, MPEG standards, MHEG Standard Video Streaming on net.

UNIT V

Advanced forms of interaction in Multimedia: Video Conferencing, Elements of (immersive/non-immersive) Virtual Reality, Augmented Reality, Telepresence, Mobile technologies

Multimedia Security: Overview- Multimedia Systems, Secured Multimedia, Digital Rights Management Systems and Technical trends, Multimedia Encryption and Digital Watermarking, Security Attacks and Multimedia Authentication. Overview of CAD/CAM tool.

**Learning outcomes:** By end of this course, students should be able to:

- Tools and objects of Multimedia.
- Understand the need of various format and its compression techniques.
- Explain how security can be enhanced using multimedia.

**Text Book:**


1. "**Multimedia Making It work**",Tay Vaughan, , Tata McGraw Hill,India,8th edition, 2011.


**Reference Books:**


1. **Fundamentals of Multimedia**, ZeNian Li, Mark S. Drew, Pearson Higher Education, USA, 1st edition,2004

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA862 | Subject Title | ETHICAL HACKING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective :** The course aims to aware the students with hacking and its approaches. . A detail study of various remote control insecurities are discussed.

Unit I

Casing the Establishment - What is footprinting- Internet Footprinting. -Scanning-Enumeration - basic banner grabbing, Enumerating Common Network services. Case study- Network Security Monitoring.

Unit II

Securing permission - Securing file and folder permission.Using the encrypting file system.Securing registry permissions.Securing service- Managing service permission. Default servicesin windows 2000 and windows XP.Unix - The Quest for Root. Remote Access vs Local access.Remote access.Local access.After hacking root.

Unit III

Dial-up,PBX, Voicemail, and VPN hacking - Preparing to dial up. War-Dialing.Brude-Force Scripting PBX hacking. Voice mail hacking. VPN hacking. Network Devices – Discovery, Autonomous System Lookup.Public Newsgroups.Service Detection.Network Vulnerability.
Detecting Layer 2 Media.

Unit IV

Wireless Hacking - Wireless Footprinting. Wireless Scanning and Enumeration.Gaining Access.
Tools that exploiting WEP Weakness.Denial of Services Attacks. Firewalls- Firewalls landscape- Firewall Identification-Scanning Through firewalls- packet Filtering- Application Proxy Vulnerabilities .Denial of Service Attacks - Motivation of Dos Attackers.Types of DoS attacks.Generic Dos Attacks.Unix and Windows DoS

Unit V

Remote Control Insecurities - Discovering Remote Control Software.Connection.Weakness. VNC. Microsoft Terminal Server and Citrix ICA .Advanced Techniques Session Hijacking.Back Doors.Trojans.Cryptography.Subverting the systems Environment.Social Engineering.Web Hacking. Web server hacking web application hacking. Hacking the internet User - Malicious Mobile code, SSL fraud, E-mail Hacking, IRC hacking, Global countermeasures to Internet User Hacking.

**Learning outcomes:** By end of this course, students should be able to:

- Understand Hacking and its challenges.
- Various approach to do hacking and its challenges.

**Text Books:**

1. **The Unofficial Guide to Ethical Hacking**, AnkitFadia,Macmillan Publishers,India,2nd edition, 2006

**Reference Books:**

1. **"Hacking Exposed Network SecuritySecrets& Solutions",** Stuart McClure, Joel Scambray and Goerge Kurtz, Tata McgrawHillPublishers,India, 7th edition, 2012.
2. **Certified Ethical Hacker All in one Exam Guide**, Matt Walker,TMH,India,1st edition,2011

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA863 | Subject Title | GENETIC ALGORITHM AND NEURAL NETWORKS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective:** The course aims to aware the students with genetic and neural networks. A detail study of various learning approach are discussed. In addition we are having matlabto present practical applications of the tools covered in the course.

Unit I

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection.

Unit II

Genetic operators, Mutation, Generational Cycle, Applications.An Overview of Combinatorial Optimization.Theoretical Foundations of Genetic Algorithms.

Unit III

Genetic Algorithms in Engineering and Optimization, Genetic Algorithms in Natural Evolution, Simulated Annealing and Tabu Search.

Unit IV

Artificial Neural Networks, Evolving Neural Networks, feed forward n/w, Threshold units, linear units, nonlinear units, stochastic units, capacity of simple perceptron, Reinforcement learning.

Learning: Supervised, Unsupervised (Hebbian/Competitive), Adaptive resonance theory, Travelling salesman problem

Unit V

Implementing Genetic Algorithms: GALib, Genetic Algorithm Optimization Toolbox (GAOT) under Matlab.

**Learning outcomes:** By end of this course, students should be able to:

- Understand the concepts of ANN and its use in real world problems.
- How learning take place in ANN and its challenges.

**Text Books:**

1. **"Genetic Algorithms in search ,optimization & Machine Learning"**, Goldberg, Pearson Education, Indi,4(Reprint) ,2009
2. **"An Introduction to Genetic Algorithms, "**Mitchell, MIT Press, London England, 1/e, 1998
3. **Neural Networks and Learning Machines**, Simon O. Haykin, Pearson Education,USA,3/e,2009

**References Book:**

1. **Machine Learning: Neural Networks, Genetic Algorithms, and Fuzzy Systems**, HojjatAdeli et al, John Wiley &Sons,USA,1/e,1995
2. **Machine Learning: The Art and Science of Algorithms that Make Sense of Data,** Peter Flach, Cambridge University Press,UK,1/e, 2012
3. **Introduction to Machine Learning**, EthemAlpaydin, MIT Press, USA,1/e,2004
4. **An Introduction to Statistical Learning: with Applications in R**, Gareth James et al,Springer,USA,1/e, 2013

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA864 | Subject Title | FUZZY SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 3.5 | Subject Category | Deptt. Elective | Year | 3rd | Semester | V |

**Objective:** The course aims to aware the students with fuzzy set and its logic. A detail study of its various applications in real world is discussed.

Unit I

**Fuzzy Systems**: Probabilistic reasoning,Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Fuzzy Relations, Fuzzy Graphs, and Fuzzy, Arithmetic, Fuzzy If-Then Rules, Fuzzy Implications and Approximate Reasoning

Unit II

**Fuzzy Logic**: Fuzzy Logic, Fuzzy Logic and Artificial Intelligence, Fuzzy Logic in Database and Information Systems.

Unit III

Fuzzy Logic in Pattern Recognition, Fuzzy Logic Control, Fuzzy Discrete Event Systems

Unit IV

**Hybrid systems:** euro- fuzzy and fuzzy genetic systems, applications to engineering problems.

Unit V

**Application of FLC**: Fuzzy logic control – Inverted pendulum – Image processing – Home heating system – Blood pressure during anesthesia – Introduction to neuro fuzzy controller.

**Learning outcomes:** By end of this course, students should be able to:

- Understand Fuzzy sets, Crisp Sets and its logic.
- How to use Fuzzy in real world problems like pattern Recognition, Image Processing

**Text Books:**

1. **Bo Yuan,Fuzzy Sets And Fuzzy Logic Theory And Applications**, George J. Klir, PHI,India,1/e, 2009

**Reference Books:**

1. "**Fuzzy Logic with Engineering Applications"** Timothy J. Ross, John Wiley &Sons,Englnd,2nd edition, 2004
2. **Neural Networks, Fuzzy Logic and genetic Algorithm**, S Rajsekaran et al, PHI, New Delhi,1st edition ,2006

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA804 | Subject Title | PROJECT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 0 0 2 | Credit | 1 | Subject Category | Deptt. Core | Year | 3rd | Semester | V |

**Guidelines for submission of MCA Project (Project)**

All the candidates of MCA project are required to submit a project report based on the work done by him/her during the project period.

**PROJECT TIME / MAN-HOURS**

The MCA Projects would be approximately 25 man-hours and carries a total of 25/50 marks.

Number of students in a project group will not be more than two.

**Technology / Programming Language to be used:**

C, C++, Data structures, Java, .Net, PHP, etc

**SUMMARY/ABSTRACT**

All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following

1. Name / Title of the Project
2. Statement about the Problem
3. Why is the particular topic chosen?
4. Objective and scope of the Project
5. Methodology (including a summary of the project)
6. Hardware & Software to be used
7. What contribution would the project make?

Also any other important feature that makes the system stands out from the rest.

**FORMAT OF THE PROJECT REPORT**

1. Cover Page with university logo, Student Name and Roll Number, Project Title and Guide's name.
2. Acknowledgement
3. Main Report
   - Objective & Scope of the Project
   - Theoretical Background
   - Definition of Problem
   - System Analysis & Design vis-a-vis User Requirements
   - Details of Hardware & Software requirements
   - Detailed Life Cycle of the Project
     - o ERD, DFD
     - o Input and Output Screen Design process involved
     - o Methodology used for testing:
     - o Test Report, Printout of the Reports, Printout of the Code Sheet
   - Conclusion
   - Future Scope of Project.
   - **Annexure:**

     Data Dictionary (This should give a catalogue of the data elements used in the system / sub system developed. The following are the details required. Write NA if NOT applicable.

     Data Name, Aliases, if any Length (Size) Type, Numeric, Alpha, Binary etc.

     List of abbreviations, Figures, Tables
   - References
   - Bibliography Website
   - Soft copy of the project on CD/Floppy

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA805 | Subject Title | MATLAB | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 0 0 2 | Credit | 1 | Subject Category | Deptt. Core | Year | 3rd | Semester | V |

**Knowledge and understanding**

- understand the main features of the MATLAB development environment;
- use the MATLAB GUI effectively;
- design simple algorithms to solve problems;
- write simple programs in MATLAB to solve scientific and mathematical problems;
- know where to find help.

**Contents**

Matlab fundamentals, Matrix Operations, Data Types, Data Analysis and Statistics, Equation systems, Curve Fitting, Programming in Matlab, Graphics, Graphical User Interface (GUI), System commands, Symbolic Math toolbox, Simulink

# Course Structure& Syllabus of MCA-LE
# Applicable for Batch: 2018-2020

| Subject Code | CA811 | Subject Title | INDUSTRIAL PROJECT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTP | 3 1 0 | Credit | 16 | Subject Category | Audit Course | Year | 3rd | Semester | VI |

**PROJECT REPORT:** The main purpose of the report is to explain what you did in your project. The reader should be able to see clearly what you set out to do and what you achieved. It should describe the problem addressed and explain why you tackled it in the way you did. It should include your own assessment of how successful the project was.

The length of the text is generally about 8000-10000 words, but the length should be dictated by what you have to say. A shorter report is also acceptable if content is good. Resist temptation to include pages of padding.

The work that is presented for examiners should be your own. The presentation of another person's work, design or program as though they are your own is a serious examination offence. Direct quotation from the work of others published or unpublished) must always be clearly identified as such by being placed in quotation marks, and a full reference to the source must be provided. Students are advised to pay attention to the quality of their English. Sometimes a project containing good work is marred by a report, which is turgid, obscure and simply ungrammatical

**SOME IMPORTANT POINTS FOR CARRYING OUT A PROJECT:** The organizations or companies offer you a placement for project work out of good will or to get some useful work done. Usually the companies do not provide you everything required by you. You must settle this right in the beginning of your project with the business that what will you get from them and what you will have to arrange yourself.

Sometimes a complication arises due to the fact that the company considers some aspect of your project work confidential. If this is so, it is your responsibility to get whatever clearance is necessary from the organization right in the beginning as essential parts like system analysis &design, flowcharts etc. cannot be missing from a project report.

**PROJECT REPORT FORMAT**

1. Title Cover
2. Certificate from organization about your stay (Project Duration) at that place and about submission of work done under external guide at the place of training.
3. Certificate from your guide about the submission of work done under his/her guidance, Internal Supervisor.
4. Table of Contents, abstract of the project (abstract of actual work done).
5. A brief overview of the organization (regarding function area, location, division in which you are working, turnover)
6. Profile of problems assigned.
7. Study of existing system, if any.
8. System requirements
    a. Function to be Provided
    b. Product Definition
    c. Problem Statement
    d. Processing Environment: H/W, S/W.
    e. Solution Strategy
    f. Acceptance Criteria
9. Feasibility Analysis
10. Project Plan
    a. Team Structure
    b. Development Schedule
    c. Programming Languages And Development Tools
11. System Requirement Specifications
    a. Developing / Operating / Maintenance Environments
    b. External Interface And Data Flows
    c. User display and report format, user command summary
    d. High level DFD and data dictionary