DAV UNIVERSITY JALANDHAR

FACULTY OF SCIENCE

Course Scheme and Syllabus
for

Master of Computer Applications
(Three Years Degree Course)
(Programme ID-50)
1st to 6th Semester

(As per Choice Based Credit System)

Syllabi Applicable for 2019 Batch

Master of Computer Applications
Syllabus 2019-22

Semester 1

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	MTH570	Discrete Structures	Core	4	0	0	4
2	CSA502	Computer Fundamentals and Programming in C	Core	4	0	0	4
3	CSA503	Computer System Organisation and Architecture	Core	4	0	0	4
4	CSA504	Advances in Operating Systems	Core	4	0	0	4
5	CSA505	Database Management System	Core	4	0	0	4
6	CSA506	Programming in C Laboratory	Core	0	0	4	2
7	CSA507	Database Management Systems Laboratory	Core	0	0	4	2
				20	**0**	**8**	**24**

Semester 2

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	COM502	Financial Statement Analysis	Core	4	1	0	4
2	CSA508	Data Structures and File Processing using C	Core	4	0	0	4
3	CSA510	Computer Networks and Data Communication	Core	4	0	0	4
4	CSA517	Computer Oriented Statistical Methods	Core	4	0	0	4
5	CSA514	Object Oriented Programming using Java	Core	4	0	0	4
6	CSA512	Data Structures and File Processing using C Laboratory	Core	0	0	4	2
7	CSA515	Object Oriented Programming using Java Laboratory	Core	0	0	4	2
8	CSA516	Computer Networks and Data Communication Laboratory	Core	0	0	4	2
				20	**0**	**12**	**26**

Semester 3

S. No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA601	Design and Analysis of Algorithms	Core	4	0	0	4
2	CSA602	Computer Based Optimization Techniques	Core	4	0	0	4
3	CSA603	Computer Graphics	Core	4	0	0	4
4	CSA625	Python Programming	Core	4	0	0	4
5	**Discipline Elective-I**		DSE	4	0	0	4
6	CSA610	Computer Graphics Laboratory	Core	0	0	4	2
7	CSA626	Python Programming Laboratory	Core	0	0	4	2
				20	**0**	**8**	**24**

Semester 4

S. No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA612	Theory of Computer Science	Core	4	0	0	4
2	CSA613	Microprocessor and Interfaces	Core	4	0	0	4
3	CSA615	Advanced JAVA & Network Programming	Core	4	0	0	4
4	CSA623	.NET Framework and C#	Core	4	0	0	4
5	**Discipline Elective-II**		DSE	4	0	0	4
6	CSA622	Advanced JAVA & Network Programming Laboratory	Core	0	0	4	2
7	CSA624	.NET Framework and C# Laboratory	Core	0	0	4	2
				20	**0**	**8**	**24**

Semester 5

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA702	Artificial Intelligence	Core	4	0	0	4
2	CSA703	System Programming	Core	4	0	0	4
3	CSA709	Linux and Shell Programming	Core	4	0	0	4
4	**Discipline Elective-III**		DSE	4	0	0	4
5	**Discipline Elective-IV**		DSE	4	0	0	4
6	CSA715	Linux and Shell Programming Laboratory	Core	0	0	4	2
7	**Discipline Elective-V Laboratory**		DSE	0	0	4	2
				20	**0**	**8**	**24**

Semester 6

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA720	Industrial Training*	Core	**0**	**0**	**48**	**24**
				0	**0**	**48**	**24**

*The Industrial Training will be of 20 to 24 weeks duration. It will include the development of application/system software in industries, commercial or scientific environment. For evaluation, 20% weightage will be given to the synopsis of the project and 80% weightage will be given to the Viva, Project Execution, and Project Report.

Discipline Elective-I	
CSA605	Data Mining and Data Warehousing
CSA606	Mobile Computing
CSA607	Emerging Trends in Information Technology
CSA608	Distributed and Parallel Processing
CSA609	Information Systems

Discipline Elective-II	
CSA616	System Simulation and Modelling
CSA617	Embedded Systems
CSA618	Software Testing and Quality Assurance
CSA619	Advanced Software Engineering
CSA620	Compiler Design
CSA627	Research Methodology

Discipline Elective-III	
CSA704	Soft Computing
CSA705	Cloud Computing
CSA706	Cryptography & Network Security
CSA723	Natural Language Processing

Discipline Elective-IV	
CSA701	Digital Image Processing
CSA710	Advanced Web Technology
CSA711	Visual C++ Programming
CSA721	Big Data Analytics

Discipline Elective –V	
CSA714	Digital Image Processing Laboratory
CSA716	Advanced Web Technology Laboratory
CSA717	Visual C++ Programming Laboratory
CSA722	Big Data Analytics using Hadoop Laboratory

Course Title: Discrete Structures
Course Code: MTH570
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of this course is to acquaint the students with the basic concepts in Discrete Mathematics viz. sets, functions, relations, groups, graphs etc. required for the implementation of various computer science courses.

UNIT – A **12 Hours**

Set Theory

- Set and its Representations, Types of sets
- Subsets
- Operations on Sets-Union, Intersection and Difference of Sets
- Venn Diagrams, Statement Problems
- Laws- Associative Laws, Distributive Laws, Demorgan's Laws

Relation and Functions

- Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties
- Equivalence Relations and Partitions, Hasse diagram, Lattices, Bounded Lattices, Distributive Lattices.
- Functions, Special functions, Composition of Functions, one-one, onto and Inverse of a function
- Mathematical functions, Exponential and Logarithmic Functions

UNIT – B

Group Theory **13 Hours**

- Group Axioms, Semi groups, Properties of Groups
- Subgroups
- Cosets, , Normal subgroup
- Permutation Group
- Dihedral Group

Recurrence relations

- Characteristic Equation
- Homogeneous and non-homogeneous linear recurrence relations with constant coefficients
- Generating Functions for some standard sequences

UNIT – C **10 Hours**

Graphs

- Basic Terminology, Special Graphs,
- Handshaking Theorem,
- Isomorphism of Graphs,
- Walks, Paths, Circuits, Eulerian and Hamiltonian Paths
- Planar and Non Planar Graphs,
- Coloring of Graph, Directed graphs, Travelling Salesman Problem

Logic and Propositional Calculus

- Propositions,
- Basic logic operators
- Logic equivalence involving Tautologies and Contradiction
- Algebra of Propositions
- Conditional and Biconditional Statements
- Logical Implication, Propositional Functions, Quantifiers

UNIT – D **10 Hours**

Vectors and Matrices

- Vectors, Matrices
- Matrix Addition, Scalar Multiplication
- Matrix Multiplication, Transpose
- Square matrices
- Invertible Matrices, Inverses, Determinants

Counting and Probability Theory

- Basic counting principle, Factorial Notation
- Binomial Coefficients, Permutations, Combinations
- Sample Space and Events
- Finite Probability Spaces
- Conditional Probability
- Independent Events, Binomial Distribution
- Random variables

Reference Books:

1. Rosen, K. H.,*Discrete Mathematics and its Applications*, 6th Edition, McGraw Hill, 2007.
2. Malik, D.S. andSen, M.K., *Discrete Mathematical Structures: Theory and Applications*, ThomsonCengagae Learning, New Delhi, 2004.
3. Lipschutz, S. and Lipson M.,*Schaum's Outline of Discrete Mathematics*,Schaum's Outlines, New Delhi, 2007
4. Ram, B., *Discrete Mathematics*, Pearson Publications, 2011.
5. Liu, C. L.,*Elements of Discrete Mathematics***,** McGraw Hill, International Edition, Computer Science Series, 1986.
6. Trembley, J.P. and Manohar, R.P., *Discrete Mathematical Structures with Applicationsto Computer Science*, McGraw Hill.
7. Joshi, K.D., *Foundations of Discrete Mathematics*, Wiley, 1989

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Computer Fundamentals and Programming in C
Course Code: CSA502
Course Duration: 45-60 Hours

Course Objective: The objective of this course is to familiarize students with concepts of fundamentals of information technology along with developing the logic for solving a given problem using the procedure oriented language C for construction of code.

UNIT– A **12 Hours**

Computer Fundamentals

- Definition, Block Diagram Along With Computer Components, Characteristics of Computers
- Classification of Computers, Hardware & Software, Types of Software, Firmware.

Planning the Computer Program

- Concept of Problem Solving, Problem Definition
- Program Design, Debugging
- Types of Errors In Programming, Documentation, Algorithms, Flowchart
- Decision Table, Structured Programming Concepts, Programming Methodologies Viz. Top Down and Bottom Up Programming

UNIT – B **10 Hours**

Overview of C

- History of C, Importance of C, Structure of a C Program

Elements of C

- C Character Set, Identifiers and Keywords,
- Data Types
- Constants and Variables. Operators: Arithmetic,
- Relational, Logical, Bitwise
- Unary, Assignment, Conditional Operators and Their Hierarchy & Associativity

UNIT – C **10 Hours**

Input/Output

- Unformatted & Formatted I/O Function in C

Control Statements

- Sequencing, Selection: if and switch statement; alternation,
- Repetition: for, while, and do while loop
- break, continue, goto

Functions

- Definition, Prototype, Passing Parameters, Types of Functions
- Recursion

Storage Classes in C

- Auto, extern, register and static storage classes, their scope
- Storage and Lifetime

UNIT – D **13 Hours**

Arrays

- Definition, Types, Initialization, Processing an Array, Passing Arrays to Functions, Strings

Pointers

- Declaration, Operations on Pointers, Pointers and Arrays
- Dynamic Memory Allocation, Pointers and Functions, Pointers and Strings.

Structure & Union

- Definition, Processing, Structure
- Pointers
- Passing Structures To Function

Data files

- Opening and Closing a File, I/O Operations on Files
- Error Handling During I/O Operation
- Random Access to Files

Reference Books:

1. Gottfried and Byron S.,*Programming with C*, New Delhi:Tata McGraw Hill, 2010.
2. E. Balagurusamy, *Programming in ANSI C*, New Delhi:McGrawHill, 2011.
3. HanlyR. Jeri andKoffman Elliot P., *Problem Solving and Program Design in C*, India: Addison Wesley, 2011.
4. KanetkerYashwant, *Let us C*, New Delhi:BPB Publications, 2011.
5. Thareja Reema, Introduction to C Programming, Oxford University Press.

Course Title: Computer System Organisation and Architecture
Course Code: CSA503
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system. Syllabus includes machine language, instruction set architecture, control design, memory hierarchy, input/output and communication.

UNIT– A **10 Hours**

Information Representation

- Signed and unsigned numbers, Addition and subtraction, multiplication, division, Floating point representation, logical operation
- Binary Codes: Gray Code, Decimal Code and Alphanumeric Codes
- Error Detection and Correction codes: Parity Check

Binary Logic

- Logic gates, Boolean algebra, Boolean functions
- Truth tables, simplification of Boolean functions
- K-maps for 2, 3 and 4 variables

UNIT – B **10 Hours**

Basic Building Blocks

- Combinational logic design:
  - Half and full adder half and full subtractor
  - Encoder, Decoder
  - Multiplexer, De-Multiplexer

Sequential Circuits

- Concept, flip-flops (D, RS, JK, T, and Master-Slave)
- Registers:
  - Register with parallel load
  - Buffer, Bidirectional Shift Register with parallel load and Controlled shift registers
- Counters: Binary, Ripple, Ring, Johnsan Counter

UNIT – C **13 Hours**

Computer Organization

- Microcomputer Organization; Microprocessor Organization, Instruction codes
- Memory Reference, Register Reference and Input-Output Reference Instructions
- Instruction cycle, Instruction formats
- Processing UNIT Design: one, two and three bus Organization.
- Addressing Mode, CISC, RISC

Memory Organization

- Memory Hierarchy, Types of Memory: RAM and ROM Chips,
- Associative Memory, Cache Memory, Auxiliary Memory, Virtual

- Memory
- Memory Address Map, Memory Connection to CPU.

UNIT – D **12 Hours**

Input Output Organization

- Input output Interface, Memory Mapped I/O; Interrupt, isolated versus memory mapped I/O, Modes of transfer-Programmed I/O
- Asynchronous Data Transfer: Strobe Control, Handshaking
- Priority Interrupts: Daisy-Chaining, Parallel Interrupt, Priority Encoder
- Interrupt Cycle, Types of Interrupt: Program interrupt
- Priority Interrupts, Direct Memory Access (DMA).
- Input output processor-CPU-IOP communication
- Introduction to Assembly Language.

Reference Books:

1. Mano M.M.,*Computer System Architecture*, New Delhi: Prentice Hall of India, 2000.
2. Mano M.M., *Digital Logic and Computer Design*, New Delhi: Prentice Hall of India, 2008.
3. Hayes,*Computer Architecture and Organization*, New Delhi: McGrawHill International Edition, 1998.
4. TannenbaumA.S., *Structured Computer Organization*, New Delhi: Prentice Hall of India, 2012.
5. BreyB., *The Intel Microprocessors*, New Jersy: Pearson Education, 2009.
6. Sloan M.E., *Computer Hardware and Organization*, 2nd Edition, New Delhi: Galgotia, Pvt. Ltd, 1995.

Course Title: Advances in Operating Systems
Course Code: CSA504
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To understand and learn the fundamentals of Operating System including dealing with memory management, process management, CPU scheduling, deadlocks and file management.

UNIT– A **10 Hours**

Introduction to Operating System

- OS, History of OS, Types of OS
- Functions/operations of OS, User services/jobs, system calls
- Traps, architectures for operating systems

Process Management

- Process overview, Process states
- Interrupt mechanism

UNIT – B **12 Hours**

CPU Scheduling and Process Synchronization

- Scheduling algorithms
- Preemptive scheduling & Non-Preemptive scheduling
- Levels of schedulers
- Process Synchronization, Critical section and mutual exclusion problem
- Classical synchronization problems,. Multithreading.

System Deadlock

- Deadlock characterization, Deadlock prevention and avoidance
- Deadlock detection and recovery, practical considerations

UNIT– C **13 Hours**

Storage Management

- Storage allocation methods: Single contiguous allocation
- Multiple contiguous allocation

Memory Management

- Paging, Segmentation combination of Paging and Segmentation
- Virtual memory concepts, Demand Paging, Page replacement Algorithms
- Thrashing. Address Protection,
- Cache memory, hierarchy of memory types, associative memory.

File Management

- Overview of File Management System
- Disk Space Management, Directory Structures
- Protection Domains, Access Control Lists, Protection Models
- Queue management, File and directory systems

Device Management

- Goals of I/O software, Design of device drivers, Device scheduling policies

UNIT – D

10 Hours

Disk Scheduling Algorithms

- FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK

Android

- Android Overview, Android architecture, Linux Kernel, Android Run-time
- Android Application Framework, Android Application architecture
- Android Security

Reference Books:

1. Galvin and Silberschatz A.,*Operating System Concepts*, Eigth Addition, New York: J. Wiley & Sons, 2009.
2. Crowley, *Operating Systems: A Design Oriented Approach*, New Delhi: Tata McGraw Hill, 2008.
3. Donovan J.J,*Systems Programming*, New York: McGraw Hill, 1972.
4. Dhamdhere. D.M, *System Programming and Operating Systems*, New Delhi: Tata McGraw Hill, 1999.
5. Madnick and Donovan, *Operating System*, New York: McGraw Hill, 1978.
6. Beck Leland L., *System Software*, Delhi: Pearson Education, 2000.
7. Henson P.B., *Operating System Principles*, Delhi: Prentice Hall
8. TenenbaumA.S., *Operating System: Design and Implementation*, New Delhi: PHI, 2013.

Course Title: Database Management System
Course Code: CSA505
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The concepts related to database, database design techniques, transaction management, SQL, PL/SQL and database operations are introduced in this subject. This creates strong foundation for data base creation

UNIT– A **10 Hours**

Data Base Concepts

- Data base vs. file oriented approach, Data Independence
- Data Base Models
- General Architecture of a Data Base Management Software, Components of a DBMS
- Advantages and Disadvantages of DBMS

Introduction to Data Models

- Entity Relationship model, hierarchical model
- from network to hierarchical, relational model
- object oriented database, object relational database
- Comparison of OOD & ORD, comparison of network, hierarchical and relational models.

UNIT – B **10 Hours**

Data Base Design

- Entities, Attributes, ER Diagrams
- Functional dependencies; Normalization
- Multivalued dependencies, decomposition
- Relational algebra and calculus
- Need and types of query optimization procedures, phases of query optimization

Data Base Protection

- Concurrency, recovery
- Integrity, Protection, essentials of security
- authorization, types of database security

UNIT – C **10 Hours**

Relational Query Language

- SQL, client/server architecture
- Technical introduction to Oracle.

Software Development using SQL

- SQL data types, Querying database tables
- Conditional retrieval of rows, working with Null values, matching a pattern from the table
- querying multiple tables: Equi joins, Cartesian joins, Outer joins,

- Self joins;
- Set operator: Union, Intersect, Minus, Nested queries

UNIT – D **15 Hours**

Introduction to PL/SQL

- The PL/SQL block structure, PL/SQL data types
- Variables and constants, assignment and expressions
- Writing PL/SQL code, cursor management in PL/SQL
- Concept of stored procedures
- Database triggers, types of triggers, Dropping triggers, storage of triggers
- Program Design & Development for Program Design & Development for Payroll, University Examination and Student Management System

Reference Books:

1. Desai. B.C., *An Introduction to Database Systems*, New Delhi: Galgotia Publ. Private Ltd, 2000.
2. Date. C.J, *Data Base Systems*, Vols. I & II, New Delhi: Narosa Publishers, 2002.
3. Silberscatz, Korth and Sudarshan, *Database System Concepts*, Third Ed., New York: McGraw Hill International Editions, Computer Science Series, 2010.
4. Peter Rob Carlos Coronel, *Data Base Systems* (3rd Edition), New Delhi: Galgotia Publications (P) Ltd, 2001.
5. Elmasri, Navathe, *Fundamentals of Database System*, 7e, Pearson India.

Course Title: Programming in C Laboratory
Course Code: CSA506

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of C programs: Control Structures, Arrays, Strings, Pointers, Structures, Union, Files, etc.

Course Title: Database Management System Laboratory
Course Code: CSA507

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of SQL: DDL, DML, DCL, TCL
Practice of PL/SQL.

Course Title: Financial Statement Analysis
Course Code: COM502
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: Students will learn the skill of analysing the financial statements by applying various tools of financial analysis.

UNIT– A **12 Hours**

- Introduction to demand for financial statement information
- Introduction to generally accepted accounting principles
- Parties demanding Financial Statement Information
- Conflicts among diverse parties
- Factors affecting demand for financial statement information
- Regulatory forces and supply of financial statement information
- Market forces and supply of financial statement information
- Cost associated to generating of financial statement Information
- Some empirical issues and evidence of Financial Statement Analysis

UNIT – B **13 Hours**

- Introduction to Financial statement numbers
- Common size statements and Comparative statements
- Introduction to cross sectional techniques of financial statement analysis
- Trend analysis
- Ratio analysis and its application in investment decisions
- Computational issues in calculating ratios
- Combining financial statement with non-financial statement information
- Time series analysis of financial statement Information.

UNIT – C **10 Hours**

- Introduction to Fund flow analysis
- Preparation of fund flow statement
- Relevance of different approaches of computation of funds from operation
- Introduction to cash flow analysis
- Operating activity analysis of liquidity
- Financing and investing activity analysis
- Interpretations of cash flow and net income
- Limitations of cash flow reporting
- Specialized cash flow ratios

UNIT – D **10 Hours**

- Concept of corporate distress analysis

- Identification of corporate sickness
- Causes, indicators and predictors of financial distress.
- Models of financial distress (Univariate and Multivariate)
- Information sources of Loan decisions
- Descriptive analysis of loan decisions
- Identifying and overcoming the limitations of Financial Statements

Text Book:

1. Foster, G. Financial Statement Analysis. New Delhi Pearson Education, Latest Edition.

Reference Books:

1. Bhattacharyya, D. Financial Statement Analysis. New Delhi, Pearson Education. Latest Edition.
2. Gibson, C. H. Financial Statement Analysis. New Delhi, Cengage Learning, Latest Edition.
3. Subramanyam, K.R. and Wild, J.J. Financial statement Analysis. New Delhi, McGraw Hill Education, Latest Edition.

Course Title: Data Structures and File Processing using C
Course Code: CSA508
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs.

UNIT– A **12 Hours**

Preliminaries

- Introduction to Data Structures: Primitive and Composite, Various data structures
- Common operations on data structures, algorithm complexity
- big O notation, timespace tradeoff between algorithms
- Complexity of Algorithms, Records and Pointers.

Arrays

- Arrays defined, representing arrays in memory, various operations on linear arrays
- Multi dimensional arrays, Records, Matrices, Sparse Matrices
- Linear Search, Binary Search
- Insertion Sort, Selection Sort, Bubble Sort
- Merge Sort, Radix Sort
- String, Representation and Manipulation

UNIT – B **13 Hours**

Linked Lists

- Types of linked lists, representing linked lists in memory
- Advantage of using linked lists over arrays
- Various operation on linked lists

Stacks

- Description of stack structure, implementation of stack using arrays and linked lists
- Applications of stacks converting arithmetic expression from infix notation to polish and their subsequent evaluation
- Quicksort technique to sort an array, parenthesis checker.

Queues

- Implementation of queue using arrays and linked lists
- Deques, Priority Queues and their implementation, applications of queues.

UNIT – C **10 Hours**

Trees

- Description of tree structure and its terminology, binary search tree

- Implementing binary search tree using linked lists
- Various operations on binary search trees, AVL Trees
- Threaded Binary Trees, BTrees, B+ trees

Heaps

- Description of heap structure, implementing heaps using arrays
- Various operations on heaps, Applications of heaps
- Heapsort technique to sort an array

UNIT – D **10 Hours**

Graphs

- Representation of Graphs and Applications: Adjacency Matrix, Path Matrix
- Warshall's Algorithm, Linked Representation of a Graph
- Traversing a Graph, DFS and BFS.

Hash Tables

- Direct address tables, hash tables
- Collision resolution by chaining, hash functions
- Open addressing – linear probing, quadratic probing, double hashing

Files

- Operations on files, Types of files
- File Organizations: Sequential files, Indexed Sequential file, Directed files and multikey files
- File performance criteria and terms.

Reference Books:

1. LipschutzSeymour, *Theory and Problems of Data Structures*, Schaum Outline Series, New Delhi: Tata McGrawHill Book Company, 2001.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis In C* ,Mexico City:Addison Wesley, (An Imprint of Pearson Education),.New Delhi: Prentice Hall of India Pvt. Ltd, 1993.
3. Esakov Jeffery, Weiss Tom, *Data Structures: An Advanced Approach Using C*, New Delhi: Prentice Hall International, Inc, 2007.
4. Trembley and Sorenson,*An Introduction to Data Structures with Application*, New York : McGraw Hill Company, 1984.
5. Tanenbaum, *Data Structures using C,* New Delhi: Pearson Education*, 2009*.

Course Title: Computer Networks and Data Communication
Course Code: CSA510
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: As part of this course, students will be introduced to computer networks and data communication paradigms, about network models and standards, network protocols and their use, wireless technologies.

UNIT – A **15 Hours**

Introduction to Data Communication

- Components of Data Communication, Data Representation
- Transmission Impairments, Switching, Modulation, Multiplexing

Review of Network Hardware

- LAN, MAN, WAN
- Wireless networks, Internetworks

Review of Network Software

- Layer, Protocols, Interfaces and Services

Review of Reference Models

- OSI, TCP/IP and their comparison

Physical Layer

- Transmission Media**:** Twisted pair, Coaxial cable, Fiber optics
- Wireless transmission (Radio, Microwave, Infrared)
- Introduction to ATM, ISDN
- Cellular Radio and Communication Satellites

UNIT – B **10 Hours**

Data Link Layer

- Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat)
- Examples of DLL Protocols–HDLC, PPP

Medium Access Sub layer

- Channel Allocation, MAC protocols – ALOHA, CSMA protocols
- Collision free protocols, Limited Contention Protocols
- Wireless LAN protocols
- IEEE 802.3, 802.4, 802.5 standards and their comparison

Bridges

- Transparent, source routing, remote

UNIT – C **10 Hours**

Network Layer

- Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast

- Internetworking, IP Protocol, ARP, RARP.

UNIT – D **10 Hours**

Transport Layer

- Addressing, Establishing and Releasing Connection
- Flow Control, Buffering
- Internet Transport Protocol (TCP and UDP).
- Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding)

Application Layer

- Domain name system, Email, File transfer protocol
- HTTP, HTTPS, World Wide Web.

Reference Books:

1. Tanenbaum. Andrew S., *Computer Networks*, 4th Edition, New Delhi: PHI, 2013.
2. Forouzan B. A.,*Data Communications and Networking*, Fourth Edition, New Delhi: Tata McGraw Hill, 2003.
3. Stallings William,*Data Computer Communications*, (8th Edition), New Delhi: PHI, 2008.
4. Bary Nance, *Introduction to Networking*, 4th Edition, New Delhi: PHI, 1997.

Course Title: Computer Oriented Numerical and Statistical Methods
Course Code: CSA511
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The course aims at discussing various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Numerical Algorithms and Statistical Methods.

UNIT– A **10 Hours**

Basic Statistics:

- Preparing Frequency Distribution Table.
- Cumulative frequency.

Measure of Central Tendency:

- Requisites of a good average.
- Arithmetic mean, Geometric Mean, Harmonic Mean, Median, Mode.
- Selection and limitations of an average.

Measure of Dispersion:

- Range, Quartile Deviation, mean deviation, Coefficient of mean Deviation, Standard Deviation.

Moments:

- Moments About mean, Moments about any point, Moment about origin, Moment about mean in terms of moment about any point, Moment about any point in terms of Moment about mean.

UNIT– B

Probability Distribution: **10 Hours**

- Random Variable- Discrete Random and Continuous Random variable, Probability Distribution of a Random Variable.

Mathematical Expectation Types:

- Binomial, Poisson, Normal Distribution, Mean and Variance of Binomial, Poisson, and Normal Distribution.

Correlation:

- Introduction, Types, Properties, Methods of Correlation: Karl Pearson's Coefficient of Correlation, Rank Correlation and Concurrent Deviation method, Probable error interpolation.

UNIT– C **13 Hours**

Regression:

- Introduction, Aim of Regression Analysis, Types of Regression Analysis, Lines of Regression, Properties of Regression Coefficient and Regression Lines, Comparison with Correlation.

Curve Fitting:

- Straight Line, Parabolic curve, Geometric Curve and Exponential

- Curve Bayes' Theorem in Decision Making, Forecasting Techniques.

Sampling

- Meaning, methods of Sampling.

Statistical Inference:

- Test of Hypothesis, Types of hypothesis, Procedure of hypothesis Testing, Type I and Type II error, One Tailed and two tailed Test.

UNIT – D **12 Hours**

Types of test of Significance:

- Test of significance for Attribute-Test of No. of success and test of proportion of success.

Test of significance for large samples:

- Test of significance for single mean and Difference of mean.

Test of significance for small samples (t-test):

- Test the significance between the mean of a random sample, between the mean of two independent samples Chi square Test.

Analysis of Variance

- Definition, Assumptions, Cochran's Theorem (only statement)
- Oneway classification, ANOVA Table
- Twoway classification (with one observation per cell).

Reference Books:

1. Gupta S.C., *Fundamental of Statistics*,Himalayas Publication House, 1992.
2. Gupta & Kapoor, *Applied Statistics*, Sultan Chand & Sons, 1996.
3. Gupta S.P., *Statistical Method*, Sultan Chand & Sons, 2011.
4. Gupta C.B, Gupta Vijay, "An Introduction to Statistical Methods" Vikas Publishing House.

Course Title: Object Oriented Programming using Java
Course Code: CSA514
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of this course is to get insight of the subject and after completion of this course, students will be able to:

- Use the advanced features of Java Technology
- Develop good program to handle exceptions and errors in program.
- Work with collection API and develop fast programs.
- Use the java.io package in detail.
- Use the serialization concepts of java technology.
- Develop good multithreaded programs

UNIT – A **10 Hours**

Introduction

- Features of Java
- Data Types, Operators & Expressions
- Control Structures, Arrays,
- Class, Objects & Methods, Constructors
- Garbage Collection, Access Qualifiers, String Handling – String Operations
- Inheritance, static Classes, Abstract Classes, Final Classes
- Wrapper Classes: Autoboxing and Unboxing, Garbage Collection & Finalize method
- Enumerated Types and Annotations, Handling String and String Buffer Classes, Method Overloading and Overriding
- Nesting of Methods and Methods with Varargs.

UNIT-B **15 Hours**

Packages and Interface

- Packages, Access Protection
- Importing Packages, Interfaces
- Defining, Implementing
- Applying Interfaces
- Extending Interfaces

Exception Handling

- Exception Types
- Uncaught Exceptions
- Multiple Catch Clauses
- Nested Try Statements Built-in Exceptions
- Creating Your Own Exceptions.

Multithreading

- Java Thread Model, Creating Multiple Threads, Thread Priorities
- Synchronization, Interthread Communication
- Suspending, Resuming and Stopping Threads

UNIT – C **10 Hours**

Applets

- Local & Remote Applets
- Applet Architecture
- Passing Parameters to Applets
- I/O Streams: Console I/O
- Reading Console Input, Writing Console Output
- Files I/O – Byte Streams, Character Streams
- Collection Interfaces & Classes
- Delegation Event Model

UNIT – D **10 Hours**

AWT Classes

- Window Fundamentals
- Working With Graphics
- Working With Color & Fonts
- AWT Controls
- Layout Managers & Menus

Introduction to Graphic Programming

- Applying 2-D transformations on Objects
- Event Listeners: Action Listener and Item Listener

Reference Books:

1. Liang. Y. Daniel, *Introduction to Java Programming*, Comprehensive Version, New Delhi: Pearson, 9/E, 2012.
2. PetricNoughton and HerbetSchildt,*Java 2 The Complete Reference*,New Delhi: McGraw Hill Professional, 1999.
3. SeirraKethyandBates Bert*, Head First java*,Kindle Edition, 2005.
4. SchildtHerbert, *The Complete Reference Java 2*, Fourth Edition, New Delhi: Tata McGraw Hill, 2001.
5. Balaguruswami, *Programming with Java*, Second Edition, New Delhi: Tata McGraw Hill, 1998.
6. Mughal K. A., Rasmussen R. W., *A Programmer's Guide to Java Certification*, Addison-Wesley, 2000.

Course Title: Data Structures and File Processing using C Laboratory
Course Code: CSA512

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of Data Structures using C: Arrays Linked List, Stack, Queues, Trees, etc.

Course Title: Object Oriented Programming using Java Laboratory
Course Code: CSA515

L	T	P	Credits	Marks
0	0	4	2	50

- Implementation of OOP concepts using JAVA
- Packages and Interfaces
- Exception Handling
- Applets
- AWT classes and Event Listener

Course Title: Computer Network and Data Communication Laboratory
Course Code: CSA516

L	T	P	Credits	Marks
0	0	4	2	50

- Specifications of latest desktops and laptops.
- Familiarization with Networking Components and Devices: LAN Adapters, Hubs, Switches, Routers etc.
- Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc.
- Preparing straight and cross cables.
- Study of various LAN topologies and their creation using network devices, cables and computers.
- Configuration of TCP/IP Protocols in Windows and Linux.
- Implementation of file and printer sharing.
- Designing and implementing Class A, B, C Networks
- Subnet planning and its implementation
- Installation of ftp server and client
- Implementation of Various routing protocol (With the help of simulation)

Course Title: Design and Analysis of Algorithms
Course Code: CSA601
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of the module is to create skills in students to design and analysis of algorithms.

UNIT – A **10 Hours**

Algorithms and Analysis

- Introduction
- Algorithms specification
- Recursive algorithms
- Space and Time Complexity
- Asymptotic Notation (O, Θ and Ω) practical complexities, Best, average and worst case performance of algorithms
- Introduction to recurrence relations

Divide and Conquer

- General method
- Binary Search, Merge sort, Quick sort, Selection sort,
- Analysis of these problems

UNIT – B **10 Hours**

String Processing and Greedy Method

- KMP
- Boyre-Moore
- Robin Karp algorithms

Greedy Method

- General Method, Knapsack problem
- Job sequencing with deadlines
- Minimum spanning Trees
- Single Source Shortcut paths and analysis of these problems

UNIT – C **10 Hours**

Dynamic Programming

- General method, Optimal Binary Search Trees
- 0/1 Knapsack
- The Travelling Salesperson Problem

Back Tracking

- General method, 8 queen's problem
- Graph Coloring
- Hamiltonian Cycles
- Analysis of these Problems

UNIT – D **15 Hours**

Branch and Bound

- Least Cost Search and LC Branch and Bound
- Bounding
- FIFO Branch and Bound
- 0/1 Knapsack Problem
- Travelling Salesperson Problem

Introduction to Complexity Theory

- NP-Hard and NP-Complete Problem
- Basic concepts, Cook's theorem, examples of NP-Hard problems
- Approximation Algorithms

Reference Books:

1. Horowitz, Ellis and Sahni, *Fundamentals of Computer Algorithms*, New Delhi: GalgotiaPublications, 2nd Edition, 2008
2. Aho, A.V., Hopcroft, J.E., Ullman, J.D., *The Design and Analysis of Computer Algorithms*, Addison-Wesley, First Edition, 2003.
3. Bentley, J.L., *Writing Efficient Programs*, New Delhi: Prentice-Hall India, Eastern Economy Edition, 2009.
4. Goodman, S.E. &Hedetniemi,*Introduction to the Design and Analysis of Algorithms*, New Delhi: Tata McGraw-Hill Book Comp, 2004.

Course Title: Computer Based Optimization Techniques
Course Code: CSA602
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To introduce linear programming, dynamic programming and related Optimization Theories to solve real life / simulated problems.

UNIT – A **10 Hours**

Introduction

- The Historical development
- Nature, Meaning and Management Application of Operations Research Modelling
- Its Principal and Approximation of O.R.Models
- Main Characteristic and Phases
- General Methods of solving models
- Scientific Methods, Scope, Role on Decision Making
- Development of Operation Research in India

UNIT – B **15 Hours**

Linear Programming

- Mathematical formulation of linear programming problems
- Canonical and standard forms of linear programming problems
- Solution by Graphical & Simplex method
- Revised simplex method
- Two phase & Big-M method, Duality, Primal-Dual Relationship
- Simplex Method
- Economic Interpretation of Optimal simplex Solution

Special Types of Linear Programming Problems

- Transportation
- Assignment Problems

UNIT – C **10 Hours**

Integer & Dynamic Programming

- Integer programming problem
- Branch and Bound Techniques
- Characteristics
- Deterministic DP Problems, Recursive Approach and Tabular method

PERT / CPM

- Project Planning
- Scheduling
- Activity Cost

- Network Diagram Representation
- Difference between CPM and PERT
- Floats and Slack Times

UNIT-D **10 Hours**

Queuing Models

- Introduction, Applications
- Characteristic, Waiting and Ideal time costs
- Transient and Steady states
- Kendall's Notations
- M/M/1, M/M/C, M/Ek/1 and Deterministic Models

Reference Books:

1. Hiller, F.S. &Liberman, G.J., *Introduction to Operations Research*, 2nd Edn. London Holden Day Inc., 1974.
2. Tara, H.A., *Operations Research*, 3rd Edn., New Delhi:PHI, 2004.
3. Beightler, C.S. & Phillips, D.T., *Foundations of Optimisation*, 2nd.Edn. New Delhi: Prentice-Hall, 1979.
4. McMillan Claude Jr., *Mathematical Programming*, 2nd. Edn., J. Wiley Series, 1975.
5. Srinath, L.S., *Linear Programming*,New Delhi: East-West, 1975.
6. Churchman, C.W. &Arnchoff, E.L.,*Introduction to Operations Research*, New York: John Wiley and Sons, 1988.
7. Srinivasan G., *Operations Research: Principles and Applications*, PHI
8. Prasad Durga, V.M., *Operations Research* , Cengage Publications.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Computer Graphics
Course Code: CSA603
Course Duration: 45-60 Hours

Course Objective: The aim is to introduce the students to key concepts of Computer Graphics like display devices, co-ordinate system, transformations, line and circle drawing, pointing, positioning, projections, etc.

UNIT – A **13 Hours**

Display Devices

- Line and point plotting systems
- Raster, vector, pixel and point plotters
- Continual Refresh and storage displays
- Digital frame buffer
- Plasma panel displays, Display processors
- Character generators
- Color-display techniques : shadow mask and penetration CRT, Color look-up tables

Elementary Drawing Algorithms

- Line drawing using direct method, simple DDA, integer DDA
- Incremental method, and Bresenham's algorithm
- Circle drawing using incremental method,Bresenham's and MidPoint algorithm
- drawing arcs, sectors
- Flood Fill Algorithms, Boundary Fill Algorithms

UNIT – B **12 Hours**

Geometric Transformations.

- Two Dimensional Translation, rotation, scaling, reflection and shear
- Concept of homogenous coordinates
- Building composite transformations

Viewing Transformations

- Concept of Windows & Viewport
- Window-To-Viewport Mapping
- Clipping Operations - Point Clipping
- Line Clipping Algorithms (Cohen - Sutherland, Mid-Point, Subdivision, Cyrus - Beck),
- Sutherland - Hodgeman Polygon Clipping Algorithm

UNIT – C **10 Hours**

Three-dimensional concepts

- 3-D representations and transformations

- perspective and parallel projections
- spline curves and surfaces
- Quadtree and Octree data structures

Hidden line/surface Removal

- Back Face Removal
- Z-Buffer Algorithm
- Painters (Depth Sort) Algorithm
- Subdivision Algorithms - Warnock's Algorithm
- Scan Line Algorithms - Scan Line

UNIT – D **10 Hours**

Rendering

- Introduction, a simple illumination model
- Shading - Gouraud shading &Phong Shading
- Ray Tracing, Shadows, Textures

Open GL

- Primitives of the language and interface with C/C++

Reference Books:

1. D. Hearn and M.P. Baker, *Computer Graphics* (2nd ed.), New Delhi: Prentice–Hall of India, 2004.
2. Foley. J.D., Dam A van, FeinerS.K. and Hughes J.F., *Computer Graphics: Principals and Practices*(2nd ed.), Addison-Wesley, MA, 1990.
3. Rogers D.F., *Procedural Elements in Computer Graphics (2nd ed.),*New Delhi:McGraw Hill BookCompany, 2001.
4. PlastockRoy A., KalleyGordon,*Computer Graphics*, New Delhi: McGraw Hill Book Company, 1996.

Course Title: Python Programming
Course Code: CSA625
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides the knowledge about developing programs and scripts using Python programming language. All the advanced concepts of programming will help benefit the students in research as well in software development.

UNIT-A

Introduction to Python Language **13 Hours**

- Programming language, History of Python, Origin of Python Programming, Features, Limitations, Applications, Getting and Installing Python, Python Environment Variables, Python Help, Python differences from other languages.

Python Data Types and Input Output

- Keywords, Identifiers, Variables, Statements, Indentation, Documentation, Data Type, Type Conversion.
- Python Input and Output.

Operators and Expressions

- Arithmetic, Comparison, Assignment, Logical, Bitwise, and Python special operators.
- Expressions, Precedence and Associativity.

UNIT-B **12 Hours**

Control Structures

- Decision Making Statements
- Python Loops

Python Native Data Types

Creation of following Data Types along with methods and functions

- Number, String, Tuple,Set, Dictionary

Python Functions and Modules

- Creating Functions, Advantages of Functions, Types of Functions, Built-In, User Defined Functions, Anonymous Functions, Call by Value, Call by Reference, Recursion.
- Designing of Modules. Importing Modules

UNIT-C **10 Hours**

Python Class and Objects

- Designing Classes, Creating Objects, Accessing Objects, __init__ method, constructor, garbage collection, destroying objects.

- Inheritance and Operator Overloading.

File Handling

- File creation, open() and close() methods, read() and write() methods, file modes, file encoding, file object attributes, renaming and deleting files, Python directory, directory methods and functions.

Exception Handling

- Python Exception, Built-in Exception, Exception Handling, Try, except, finally, Python user defined exceptions.

UNIT-D **10 Hours**

GUI Programming in Python (using Tkinter/wxPython/Qt)

- Introduction to GUI, Advantage of GUI, Layout Management, Events and Bindings, Fonts, Colors, Drawing on Canvas, Line, Oval, Rectangle, etc. Widget such as Frame, Label, Button, Check Box, Entry, ListBox, Radiobutton, Message, Text, Spinbox, etc.
  Database connectivity in Python
- Installing MySQL connector, accessing connector module, using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statements, executing transactions, understanding exceptions in database connectivity

Algorithm Sorting and Searching

- Searching and Sorting Techniques, Efficiency of Algorithms.

Reference Books

1. M. C. Brown, *The Complete Reference Python*, Osborne/McGraw-Hill, 2001.
2. S. Maruch, A. Maruch, *Python for Dummies*, John Wiley & Sons, 2011.
3. A. B. Downey, *Think Python*, O'Reilly Media Inc., 2012.
4. B. Slatkin, *Effective Python*, Addison Wesley Professional, 2015.
5. J. M. Zelle, *Python Programming: An Introduction to Computer Science*, Franklin, Beedle& Associates, Inc., 2004.
6. Taneja, Kumar , Python Programming: A Modular Approach , Pearson India.
7. Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press
8. Y. Daniel Liang, Introduction to Programming Using Python, Pearson India, 2013.
9. Charles Dierbach, Introduction to Computer Science using Python: A computational problem solving focus, Wiley India

Course Title: Data Mining and Data Warehousing
Course Code: CSA605
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To introduce the concepts and techniques of data mining and data warehousing, including concept, principle, architecture, design, implementation, applications of data warehousing and data mining.

UNIT-A **10 Hours**

Introduction

- Basic Systems Concepts, Differences between Operational Database system and Data Warehouse, Need of Separate Data Warehouse, Data Warehouse Models (Enterprise, Data Mart and Virtual Data Warehouse), Extraction Transformation and Loading, Metadata repository
- Data Warehouse Design Process, Two Tier and Three-Tier Data Warehouse Architecture, Data Warehouse Modelling (Data Cube and OLAP), Data Warehouse Implementation, From online Analytical Processing to Multidimensional Data Mining.
- OLAP, ROLAP, MOLAP and HOLAP, Data Warehouse Back-End Tools and Utilities, Data Cubes, Efficient Computation of Data Cubes

UNIT-B **13 Hours**

Data Mart

- Types of Data Marts, Loading a Data Mart, Metadata for a Data Mart, Monitoring requirements for a Data Mart, Security in Data Mart
- From Data Warehouse to Data Mining, Steps of Data Mining Process, Types of Data Mining Tasks, Trends and Application of Data Mining, Statistical Data Mining, Visual and Audio Data Mining, Ubiquitous and invisible Data Mining.
- Privacy, Security and Social Impacts on Data Mining
- Machine Learning, Information Retrieval, Business Intelligence, Major issues in Data Mining.
- Data Objects and Attribute Types, Statistical Description of Data, Data Visualization, Measuring Data Similarity and Dissimilarity, Data Cube Computation, General Strategies for Data Cube Computation

UNIT-C **12 Hours**

Data Preprocessing:

- Major Tasks in Data Preprocessing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

Outlier detection:

- Outliers and their Types, Challenges of Outlier Detection, Statistical Approach to Outlier Detection
- Market Basket Analysis, Frequent Itemsets, Closed Itemsets and Association Rules

- Apriori Algorithm, Improving Efficiency of Apriori algorithm, From Association to Correlation Analysis.

UNIT-D **10 Hours**

Classification:

- General Approach to Classification, Decision Tree Induction, Bayes Classification, Rule based Classification, Genetic Algorithm, Random forest, Support Vector Machine Rough Set Approach, Confusion Matrix, Metrics for Evaluating Classifier Performance, Cross Validation

Clustering:

- Cluster Analysis, Requirement for Cluster Analysis, Partitioning Methods, Hierarchical Methods, DBSCAN, OPTICS, CLIQUE, Clustering Graph and Network Data.

Reference Books:

1. Inmon W. H., *Building the Data Warehouse*, New York: John Wiley 2002.
2. Inmon W. H., *Data Warehousing and Knowledge Management*, ork: New YJohn Wiley 1996.
3. Romez Elmasri, Shamkant B., Navathe, *Fundamentals of Database Systems,* New Delhi:Pearson Education, 2009.
4. Han, Kamber, Morgan Kaufmann, *Data Mining: Concepts and Techniques*, 2nd Edition, Elsevier, 2012.
5. Inmon, W.H., C. L. Gassey,*Managing the Data Warehouse*, New York:John Wiley 1999.
6. Fayyad, Usama M., *Advances in Knowledge Discovery and Data Mining*, MIT Press, 1996.
7. Charu C. Aggarwal, *Data Mining: The Textbook*, Springer.
8. Hongbo Du, "Data Mining Techniques and Applications: An Introduction", Cengage India.
9. Tan, Steinbach, Kumar, "Introduction to Data Mining", Pearson India.
10. Alex Berson, Stephen Smith, "DATA WAREHOUSING, DATA MINING, & OLAP", McGraw Hill Education
11. Prasad R.N., *Fundamentals of Business Analytics*, Wiley India, Second Edition.
12. Shroff G., *The Intelligent Web: Search, smart algorithms, and big data*, Oxford University Press.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Mobile Computing
Course Code: CSA606
Course Duration: 45-60 Hours

Course Objective: To familiarize students with wireless technology, wireless networking, WAP architecture, WAP applications, database management issues like data replications in mobile computers, data delivery models, mobile agent computing, security in wireless and mobile systems.

UNIT-A **10 Hours**

Introduction

- Issues in Mobile Computing
- Overview of Wireless Telephony: cellular concepts, GSM, Channel structure.
- Location Management: HLR-VLR, handoffs, channel allocation in cellular systems, CDMA, GPRS
- Impacts of mobility and portability in computational model and algorithms for mobile environment.
- Analysis of algorithms and termination detection.

UNIT-B **10 Hours**

Wireless Networking

- Wireless Networking
- Wireless LAN Overview: MAC Issues, IEEE802.11, Bluetooth, Wireless multiple access protocol, TCP over wireless
- Wireless applications, Data broadcasting, Mobile IP
- WAP Architecture: Protocol Stack, Application Environment, Applications

UNIT-C **10 Hours**

Data Management Issues

- Data Replication for mobile computers
- Adaptive Clustering for wireless networks, File System, Disconnected operations

Data delivery models

- Push and pull. Data dissemination in wireless channels
- Broadcast disks. Effects of caching

UNIT-D **15 Hours**

Mobile Agent Computing

- Transaction processing in Mobile Computing Environment

Security in Wireless and Mobile Systems

- Security and fault tolerance, Threats, Vulnerabilities, Attacks, Integrity, Confidentiality, Policy and relevant definitions
- Authentication – Different techniques
- Cryptography – Symmetric Key Cryptography, Asymmetric key Cryptography, Key management, Digital signatures, Certificate
- Wireless and Mobile system security – Strategies, Routing security, Different schemes for MANET

Reference Books

1. AdelsteinFrank, Gupta S.K.S., Richard G.III and SchiwebertLoren, *Fundamentals of Mobile and Pervasive Computing*, New Delhi: McGraw-Hill Professional, 2005.
2. T. Rappaport, *Wireless Communication: Principles and Practice*, New Delhi: Pearson Education, 2002.
3. Reza B'Far (Ed), *Mobile Computing Principles*, New York: Cambridge University Press, 2005.
4. BellavistaPaolo and CorradiAntonio (Eds.), *Handbook of Mobile Middleware*, Auerbach Publication, 2006.
5. Schiller J., *Mobile Communications*, New Delhi: Addison Wesley, 2008.
6. Perkins Charles, *Mobile IP*, New Delhi: Addison Wesley, 2008.
7. Upadhyaya, *Mobile Computing*, Implementing Pervasive Information and communications TechnologiesSpringer, 2002.

Course Title: Emerging Trends in Information Technology
Course Code: CSA607
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides understanding of emerging trends in multimedia, lossless and lossy compression techniques, wireless delivery techniques, software intelligent agent and familiarize students with emerging technologies such as Multimedia, Parallel Computing, Mobile Computing and intelligent Agent Technologies

UNIT-A **10 Hours**

Introduction to Information Technology

- Latest development in Computer hardware :RISC V/S CISC architecture,
- Intel V/S, Motorola chips, Computer peripherals.
- Programming Paradigms, Software Agents, Interoperable objects

Multimedia Systems

- Architecture and Subsystems of Multimedia Computer Systems
- Multimedia applications, multimedia building blocks (text, hypertext, image, audio, video, animation)
- Multimedia Authoring- Introduction, methodologies (Frame Based, Time based, Icon Based)

UNIT-B **10 Hours**

Compression Technologies of Multimedia

- Introduction and Need of Compression
- Compression Basics, Lossless Compression Techniques
- Lossy Compression Techniques

Audio and Video Conferencing

- Technology & Applications
- Application to information technology to various function areas such as education, banking, communication etc.

UNIT-C **10 Hours**

Data Management technologies

- Data Ware Housing and Data Mining
- Data Marts and Conceptual Foundation of ERP

Networking Technologies

- Computer Networks, LAN, WAN, MAN, topologies.
- Internet, ISDN, PSDN, Wireless Networks
- Internet Telephony, Virtual learning environment, Mobile communications.

- IP Addressing

UNIT-D **15 Hours**

Mobile Computing

- Mobile connectivity-Cells, Framework, wireless delivery technology and switching methods
- Mobile information access devices, mobile data internetworking standards
- Cellular data communication protocols, mobile computing applications
- Mobile databases-protocols, scope, tools and technology, M-Business

Intelligent Agent Technology

- Introduction to agents, intelligent software systems
- Attributes, intelligent architectures, components of intelligent agent based distributed systems
- Agent communication protocols, Internetworking applications of intelligent Agents.

Reference Books

1. Jeffcoate and Judith, *Multimedia in Practice*, Technology & Practice, New Delhi: PHI, 2003.
2. Multiagent Systems, *A Modern Approach to Distributed Artificial Intelligence*, London: Edited by Gerhard Weiss, The MIT Press, 1999.
3. Vaughan and Tay, *Multimedia Making It Work*, TMH, 7th Edition, 2008.
4. Bannerjee and Rahul, *Internetworking Technologies: An Engineering Perspective*, New Delhi: PHI, 2003.

Course Title: Distributed and Parallel Processing
Course Code: CSA608
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of this course is to introduce students to the fundamentals and techniques of distributed computing, distributed operating systems and provides them with the basic skills of how to write distributed programs. Topics to be covered include: distributed computing, parallel processing, parallel processing architecture, concurrency, inter-process communications, distributed objects, application programming interfaces (RMI, RPC).

UNIT-A **15 Hours**

Introduction

- Definition, Characteristics, Goals and applications of Distributed Computing,
- Basic design issues and user requirements

Inter-process Communication

- Client Server Communication, Group Communication
- IPC in UNIX. Remote Procedure Calls
- Design issues and implementation

UNIT-B **15 Hours**

Distributed Operating Systems

- Introduction, The Kernel, Process and Threads, Communication.
- Simple distributed transactions and Nested transactions, Atomic Commit protocols
- Concurrency control, N distributed transaction,
- Distributed deadlocks
- Transactions with replicated data.

Parallel Processing

- Introduction, Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science

UNIT-C **15 Hours**

Parallel Processing Architectures

- Parallelism in Sequential Machines, Abstract model of parallel computer
- Multiprocessor architecture, programmability issues

Data Dependency Analysis

- Types of Dependencies, Loop and Array Dependence

- Loop Dependence Analysis, Solving Diophantine Equations.

Thread Based Implementation

- Thread Management, Thread Implementation

UNIT-D **15 Hours**

Recovery and Fault Tolerance

- Transaction recovery, Fault tolerance, Hierarchical and group masking of faults.

Algorithms for Parallel Machines

- Speedup, Complexity and Cost, Parallel Reduction
- Quadrature Problem, Matrix Multiplication
- Parallel Sorting Algorithms and Solving Linear System

Reference Books:

1. Sasikumar. M., Shikhara, Dinesh and Prakash Ravi, *Introduction to Parallel Processing*, New Delhi: PHI, 2000.
2. CoulourisGeorge, DollimoreJean, KindbergTim, *Distributed Systems: Concepts and Design*, New Delhi:Pearson Education 4th edition, 2009.
3. Madnick and Donovan, *Operating System*, New delhi: McGraw Hill, 1997
4. Wilkinson and Barry, *Parallel Programming Techniques & Applications*, New Delhi: Pearson Education, 2007.
5. Crichlow and Joel M., *An Introduction to Distributed and Parallel Computing*, New delhi: PHI, 1997.
6. RajaramanV., *Elements of Parallel Computing*, New Delhi:PHI, 1990
7. A.S. Tenenbaum, *Operating System: Design and Implementation*,New Delhi:PHI, 1989

Course Title: Information Systems
Course Code: CSA609
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides a comprehensive understanding of the information systems, types of systems, subsystems, management information systems, decision support systems, expert systems, enterprise information systems and decision making and analysis.

UNIT-A **15 Hours**

System and Information Concepts

- General Model, Types of systems, Subsystems
- Attributes of Information, Evolution of Information Systems, categories of Information Systems, Building and Maintaining Information Systems
- Feedback Control, Systems approach to organization, Law of requisite variety, Control by exception
- Information Concepts, Types of Information, Quality of Information, Value of Information

Management Information System

- Definitions, Role of MIS, MIS in Academics
- Structure of MIS based on management activity and functions System and Information concepts to MIS

UNIT-B **10 Hours**

Decision Support Systems

- Conceptual Foundations of DSS, Concepts of DSS
- DSS Software, Strategies for DSS, GDSS, and Executive Support System (ESS),
- Fundamentals of Knowledge Management systems, Knowledge Based Decision Support
- DSS Application, Case Study

UNIT-C **10 Hours**

Expert System

- Basic concepts of Expert System, Structure of Expert System, How Expert System works
- Expert System Application, Comparison of Conventional & Expert System
- Case Study

Executive Information and Support Systems

- Enterprise & Executive Information System, Concept and Definition
- Information needs of Executives, Characteristics and benefits of EIS
- Comparing and Integrating EIS and DSS.

UNIT-D **10 Hours**

Decision Making Systems, Modelling and Analysis

- Decision Making Definition and Concept, Phases of Decision Making Process
- Modelling Process, Static and Dynamic Models
- Sensitivity Analysis
- Heuristic programming, Simulation

Reference Books

1. Murdick Robert, Joel E. Ross, *Information Systems for Modern Management*, New Delhi: PHI, 3rd Ed.
2. Turban E fraim, *Decision Support & Intelligent System*, New Delhi: Pearson Education, 8th Ed, 1998.
3. Laudon C. Kenneth &Laudon P. Janes, *Management Information Systems*, Pearson Education, 2002.
4. Bellavista Paolo and CorradiAntonio (Eds.), *Handbook of Mobile Middleware*, Auerbach Publicatio n, 2006.
5. Steven Alter, *Information Systems* , 3rd Edition, Pearson Education, 2000
6. McNurlin C.Barbara & Spargue H. Ralph, *Information Systems Management in Practice*, fifth Edition, Pearson Education, 2003
7. V.Rajaraman, *Analysis and Design of Information System*,PHI,2nd Ed, 2006.

Course Title: Computer Graphics Laboratory
Course Code: CSA610

L	T	P	Credits	Marks
0	0	4	2	50

- Implementation of line drawing algorithms, Circle Drawing Algorithms, Ellipse, etc.
- Implementation of 2D transformations.

Course Title: Python Programming Laboratory
Course Code: CSA626

L	T	P	Credits	Marks
0	0	4	2	50

- Implementation of Python programs: Control Structures, Lists, Tuples,
- Strings, Dictionary, Sets, Files,
- Exception handling, Classes and Objects,
- Inheritance, Overloading, GUI Programming,
- Database Connectivity, etc.

Course Title: Theory of Computer Science
Course Code: CSA612
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective Understanding and development of theoretical models of computations and their analysis. The models of computations include (i) Finite Automata (and Regular Languages), (ii) Push Down Automata (and Context-free Languages), (iii) Turing Machine (and their Languages).

UNIT – A **10 Hours**

Automata Theory

- Deterministic Finite Automata, Moves
- Non Deterministic Finite Automata
- Moore and Mealy Machines
- Minimization Algorithm

Regular Languages

- Regular Sets
- Regular Expressions
- Pumping Lemma for Regular Sets

UNIT – B **13 Hours**

Context Free Grammars

- Context free grammars (CFG)
- Derivation Graphs
- Ambiguities in Grammars and Languages
- Properties of Context Free Languages
- Normal Forms
- Pumping Lemma for CFL
- Closure Properties

Pushdown Automaton

- Pushdown Automaton (PDA)
- Deterministic Pushdown Automaton (DPDA)
- Non-equivalence of PDA and DPDA
- Language Accepted by PDA

UNIT – C, **12 Hours**

Linear Bounded Automata (LBA)

- Power of LBA
- Closure properties

Turing Machines

- Turing Machine as A Model of Computation
- Programming with a Turing Machine
- Variants of Turing Machine and Their Equivalence

- Turing Machines and Languages

UNIT – D **10 Hours**

Undecidability

- Chomsky Hierarchy of Languages
- Recursive and Recursive-Enumerable Languages
- Halting Problem, Undecidable Problems about Turing machines
- Rice theorem
- The Equivalence of the Automata and the appropriate grammars

Reference Books:

1. G.E. Reevsz, *Introduction to Formal Languages*, New Delhi: McGraw Hill 1983.
2. HopcroftJ. E., MotwaniR., and Ullman J. D., *Introduction to Automata Theory, languages, and computation*(2nd ed.), New Delhi: Addison-Wesley, 2001
3. Lewis H.R., Papadimitriou C.H., *Elements of the Theory of Computation*(2nd ed.), NJ:Prentice-Hall,1997.
4. Anderson J.A., *Automata Theory with Modern Applications*, New York: Cambridge University
Press, 2006.

Course Title: Microprocessors and Interfaces
Course Code: CSA613
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The purpose of this course is to teach students the fundamentals of microprocessor and to introduce students to features and technology of microprocessor systems. The students studying the subject are supposed to learn the architecture of a typical microprocessor and also get general information about microprocessor based control systems.

UNIT – A **15 Hours**

Introduction

- Introduction to Microprocessor
- Microcontroller and Microcomputer

Microcomputer structure

- Processor, memory and I/O; Bit slices and 8/16/32- bit microprocessors
- Microprocessor architecture (registers, index and stack pointers, addressing modes)
- I/O interface adapters (parallel and serial) interface devices, system clock, clock phase and bit rates

Architecture of 8085/ 8086 Microprocessor

- Description of various pins
- Configuring the 8086/8088 microprocessor for minimum and maximum mode systems description of system mode interfaces
- Internal architecture of the 8086 / 8088 microprocessor, system clock, Bus cycle, instruction execution sequence.

UNIT – B **10 Hours**

Memory Interface

- Memory Devices
- Address Decoding, 8-bit, 16-bit, 32-bit and 64-bit memory interfaces
- Dynamic RAM

Basic I/O Interface

- I/O Port Address Decoding
- Programmable Peripheral Interface
- 8279 Programmable Keyboard/Display Interface
- 8254 Programmable Interval Timer
- 16550 Programmable Communication Interface

UNIT – C **10 Hours**

Interrupts

- Basic Interrupt Processing
- Hardware Interrupts
- Expanding the Interrupt Structure
- 8259A Programmable Interrupt Controller

Direct Memory Access (DMA)

- Basic DMA Operations
- 8237 DMA Controller
- Shared Bus Operations

UNIT – D **10 Hours**

Bus Interface

- ISA, EISA
- VESA Buses, PCI, USB Bus

Assembly Language Programming

- Addition, Subtraction, Complement First and Second, Shifting of 8 and 16-bit number by one and two bits.

Reference Books:

1. Barry B. Brey, *The Intel Microprocessors 8086/8088, 80186/80188,80286, 80386, 80486, Pentium, Pentium Pro Processors, Pentium II, Pentium III, Pentium 4 and Core2 with 64-bit Extensions: Architecture, Programming and Interfacing*, 8th Edition, New Delhi: Pearson Education-2009.
2. Khambata J.,*Microprocessor and Microcomputer*, New York: John Wiley and Sons, 1985.
3. Liu, Y., Gibson, and G.A., *Microcomputer Systems: The 8086/8088 Family*, New Delhi: Prentice Hall, 2nd Edition, 1986.
4. Tribel Walter, *The 80386, 80486, and Pentium Processors:Hardware, Software, and Interfacing*, New Delhi: Prentice Hall, ISBN #0-13-533225-7, 1998.
5. Douglas V. Hall, *Microprocessors and Interfacing - Programming and Hardware*, New Delhi :TataMcGraw Hill Publishing Company Ltd, 2006.

Course Title: Advanced JAVA and Network Programming
Course Code: CSA615
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To introduce Advanced JAVA concepts to the students with the design of network protocols.

UNIT – A **10 Hours**

Abstract Window Toolkit

- Review of Java Basic Features
- Applets
- AWT Controls
- Event Handling
- Multithreading, I/O Files

Swing

- Features, Components, Swing Vs AWT, Swing Containers, Controls, Using Dialogs,
- Sliders, Progress Bars, Tables, Creating User Interface using Swing

UNIT – B **15 Hours**

Java Database Connectivity

- Connectivity model, Java. SQL package, JDBC Exception
- classes
- Database connectivity
- Data manipulation and navigation
- Creating Database Applications

Java RMI

- Distributed object technologies
- RMI architecture
- Creating RMI applications.

UNIT – C **10 Hours**

TCP Connection

- TCP Connection establishment & Termination
- Port Numbers and Concurrent Servers
- Protocol Usage by common Internet Applications

UDP Connection

- UDP Communication Semantics
- UDP Echo Server
- Echo Client working
- Protocol Usage by Common Internet Applications

UNIT-D **10 Hours**

Networking

- Networking basics
- Client/server model
- Java and the Net, TCP/IP client sockets
- TCP/IP server sockets
- Inet Address, URL
- Data grams, creating networking applications

Socket Programming

- Sockets Address Structures
- Byte ordering & Manipulation Functions
- TCP Socket System Calls

Reference Books:

1. Stevens W. Richard, *Networking Programming*, New Delhi: Pearson Education, 2007.
2. Stevens W.Richard,*Advanced Programming in UNIX Environment*, New York: Addison Wesley Professional, 2013
3. Cornell, Gary and Horstmann Cay S, *Core Java*, Vol I and Vol II, CA: Sun Microsystems Press, 2008.
4. Bayross Ivan, *Web Enabled Commercial Application Development using Java 2.0*, New Delhi: BPB, 2000.
5. Schildt Herbert,*The Complete Reference Java 2*, New Delhi: TMH, 2005.

Course Title: .NET Framework and C#
Course Code: CSA623
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: Describe the general shape and syntax of the C# included with Visual Studio.NET.

UNIT—A **12 Hours**

Introduction to Three-Tier Architecture

- Overview of .NET Framework , Common Language Runtime (CLR)
- The .NET Framework Class Library, familiarization with visual studio .NET IDE, Design Window, Code Window, Server.
- Explorer, Toolbox, Docking Windows, Properties Explorer, Solution Explorer, Object Browser, Dynamic Help, Task List Explorer.
- Features of VS.NET, XML Editor, Creating a Project, Add Reference, Build the Project, Debugging a Project.

UNIT—B **10 Hours**

Introducing C# Programming

- Introduction, Basic Language Constructs, Types (Reference and Value, Relations Between Types)
- Delegates, Generics, Collections
- Strings , Exceptions, Threads , Networking

UNIT—C **13 Hours**

Windows Forms, Adding Controls

- Adding An Event Handler, Adding Controls at Runtime
- Attaching An Event Handler at Runtime, Writing a Simple Text Editor, Creating a Menu Adding a New Form,
- Creating a Multiple Document Interface, Creating a Dialog Form Using form Inheritance, Adding a Tab-Control, Anchoring Controls,
- Changing the Start up Form, Connecting The Dialog, Using List view and Tree view Controls,
- Building an Image list and add Them To The List view, Using Details inside The List view,
- Attaching A Context Menu, Adding a Tree view, Implementing Drag And Drop, Creating Controls at Run Time, Creating a User Control, Adding a Property, Adding Functionality,
- Writing a Custom Control, Testing the Control.

UNIT—D **10 Hours**

ADO.NET Architecture

- Understanding the Connectionobject
- Building the Connection String, Understanding the Commandobject,
- Understanding Datareaders, Understanding Datasets and Dataadapters, Datatable, Datacolumn, Datarow

- Differences between Datareader Model and Dataset Model, Understanding the Dataviewobject, Working with System.Data.Oledb
- Using Datareaders, Using Datasets, Working with SQL.NET, Using Stored Procedures, Working With Odbc.NET, Using DSN Connection

Introducing The ASP.NET Architecture

- ASP.NET Server Controls, Working with User, Controls.

Reference Books

1. Paul J. Deitel and Harvey M. Deitel, *C# 2010 for Programmers*, Forth Edition New Delhi: Pearson 2010.
2. ImarSpaanjaars, *Beginning ASP.NET 4: in C# and VB* (Wrox), Paperback Edition, 2010.
3. Shukla Charul, *Asp.Net 2.0 Black book*, Paraglyph Press, 2006.
4. Balagurusamy, E., *Programming in C#,* New Delhi:Tata McGraw-Hill (UNIT I, II),2004.

Course Title: System Simulation and Modelling
Course Code: CSA616
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: In this course, students will analyze specified systems such as inventory system, queuing models and environmental dynamics. They introduce with how to simulate system, simulation techniques, statistical models, random number generations, design and analysis of simulation.

UNIT-A **12 Hours**

Systems and environment

- Concept of model and model building
- Model classification and representation, Use of simulation as a tool, steps in simulation study.

System simulation

- Why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods
- Types of system simulation, real time simulation, hybrid simulation
- Simulation of pure-pursuit problem, single-server queuing system and an inventory problem
- Monte-Carlo simulation, Distributed Lag models, Cobweb model

UNIT-B **10 Hours**

Continuous-time and Discrete time Systems

- Laplace transform, Transfer functions, state-space models
- Order of Systems, z-transform, feedback systems, Stability, observability, controllability
- Statistical Models in Simulation: Common Discrete and Continuous Distribution, Poisson process empirical distribution

UNIT-C **13 Hours**

Random Numbers

- Properties of random numbers, generation of pseudo random numbers
- Techniques of random number generations, tests for randomness
- Random variate generation using inverse transformation
- Direct transformation, convolution method, acceptance-rejection

Design and Analysis of Simulation Experiments

- Data collection, identifying distributions with data, parameter estimation
- Goodness of fit tests, selecting input models without data
- Multivariate on time series input models, static and dynamic simulation

- output analysis
- Steady state simulation, terminating simulation confidence interval estimation, output analysis for steady state stimulation, variance reduction techniques

UNIT-D **10 Hours**

Queuing Models

- Characteristics of queuing systems, notation, transient and steady-state behaviour performance, network of queue

Large Scale System

- Model reduction, hierarchical control
- Decentralized control structural properties of large scale systems

Reference Books

1. Law Averill, *System Simulation Modeling and Analysis*, New Delhi: Tata McGraw-Hill, 2007.
2. GordanG., *System Simulation*, New Delhi: Pearson Education, 2nd Ed. 2007
3. DeoNarsingh, *System Simulation with Digital Computer*, New Delhi: Prentice Hall of India, 1999
4. Banks J., Garson J.S., Nelson B.L., *Discrete Event System Simulation*, New Delhi: Prentice Hall of India, 4th Ed. 2004
5. SeilaA.F., Ceric V. and TadikamallaP., *Applied Simulation Modeling*, Thomsan Learning, International Student Edition, 2004
6. Banks Jerry, *Handbook of Simulation: Principles, Methodology, Advances, Application and Practice*, New York: Wiley Inter Science, 1998

Course Title: Embedded Systems
Course Code: CSA617
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides the knowledge of embedded systems, their applications like Industrial and control applications, networking and telecom applications, common architectures, programming for embedded systems,programming for microcontrollers, Interfacing, and Simulation of PERT Networks.

UNIT-A **12 Hours**

Introduction to Embedded Systems

- Overview of embedded systems, features, requirements and applications of embedded systems
- Recent trends in the embedded system design, common architectures for the ES design
- Embedded software design issues, communication software
- Introduction to development and testing tools
- Architecture of Embedded Systems - Hardware Architecture, Software Architecture, Communication Software, Development/Testing Tools

Programming for Embedded Systems

- The Process of Embedded System Development - Design Trade-offs, Hardware Software co-design, Implementation, Integration and Testing

UNIT-B **13 Hours**

Embedded System Architecture

- Basics of 8 – bit RISC microcontroller (PIC), block diagram
- Addressing modes, instruction set, timers, counters, stack operation, programming using PIC controller
- Basics of 32 – bit microprocessor (ARM), processor and memory organization, data operations, flow of control, pipelining in ARM, ARM bus (AMBA)

Embedded Software

- Programming for microcontrollers such as Intel 8051 and PIC
- Overview of Java 2 micro edition (J2ME), concept of a MIDLET, applications of J2ME in mobile communication.

UNIT-C **10 Hours**

Interfacing and Communication Links

- Serial interfacing, real time clock, SPI / micro wire bus, I2C bus, CAN bus

- PC parallel port, IRDA data link, PCI bus architecture

Operating Systems for Embedded Systems

- OS Fundamentals, processes and threads, context switching, scheduling issues, inter task communication
- Introduction to memory management, evaluating OS performance, real time operating systems, popular RTOS and their applications.

UNIT-D **10 Hours**

Applications of Embedded Systems

- Industrial and control applications, networking and telecom applications
- DSP and multimedia applications, applications in the area of consumer appliances, concept of smart home

Simulation of PERT Networks

- Critical path computation, uncertainties in activity duration, resource allocation and consideration
- Simulation languages and software, general purpose vs. application - oriented simulation packages

Reference Books

1. Dreamtech Software team, *Programming for Embedded Systems*, New York: Willey – dreamtech, 2002.
2. Lewis Daniel W., *Fundamentals of Embedded Software, where C and assembly meet*, New Delhi: Pearson Education, 2001.
3. Peatman John B., *Design with PIC Microcontrollers*, New Delhi: Pearson Education, 1997.
4. Yuan Michael Juntao, *Enterprise J2ME – Developing Mobile Java Applications*, New Delhi: Pearson Education, 2003.
5. Reese Robert B., *Microprocessors: From assembly language to C using PIC18Fxx2*, Shroff Publishers and Distributors Pvt Ltd. 2005
6. Andrew N. Sloss, Dominic Symes, Chris Wright, *ARM System Developer's Guide – Designing and Optimizing System Software*, Elsevier Publications, 2007
7. SilberschatzA., Galvin P.B. and Gagne G., *Operating System Concepts*, New York: John Wiley & Sons, Inc., 6th 2001

Course Title: Software Testing and Quality Assurance
Course Code: CSA618
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The students will gain the knowledge about software testing techniques**,** STEP methodology, software testing strategies, software metrics, software quality assurance tools and techniques, quality management, quality models and system configuration management.

UNIT-A

Introduction **10 Hours**

- Software Testing, Objectives of Software Testing, Software Testing Process, Static and Dynamic Analysis
- STEP Methodology, Elements of STEP and STEP Architecture

Software Testing Techniques

- BBT & its Technique, Boundary Value Analysis, Cause-Effect Graph, White-Box Testing and its Techniques
- Domain and Boundary Testing, Logic Based Testing, Data Flow Testing

UNIT-B **15 Hours**

Software Testing Strategies

- Characteristics, Integration Testing, Functional Testing
- Object Oriented Testing, Alpha and Beta Testing, Overview of Testing Tools
- Test planning, functional testing, stability testing and debugging techniques

Metrics for Software

- Importance of Metrics to Software Project, Software Quality Metrics
- Software Metrics: Product Metrics: Software Size Metrics, Control Complexity Metrics, Object-Oriented Metrics, Software Quality Metrics

UNIT-C

Quality Assurance **10 Hours**

- Concept of Software quality, product and process quality, software quality metrics, quality control and total quality management,
- Quality tools and techniques, quality standards, Software Quality Attributes, Factors Affecting Software Quality
- Building software quality assurance plan, Components of SQAP

Quality Management & Quality Models

- Software Quality System, Quality Management Principles, Essence of International Standards
- ISO 9000 Quality Standard, SEI Capability Maturity Model

Designing software quality assurance system

- Statistical methods in quality assurance, fundamentals of statistical process control, process capability, Six-sigma quality

UNIT-D **10 Hours**

Reliability

- Basic concepts, reliability measurements, predictions and management
- Factors affecting software reliability, Software reliability vs hardware reliability, Software reliability metrics

System Configuration Management (SCM)

- Basic requirements for SCM System, SCM principles, Planning and organizing for SCM
- Benefits of SCM, Change Management, Version and Release Management

Reference Books

1. Schulmeyer G.G. and McManus J. (eds.), *Handbook of Software Quality Assurance*New Delhi: Prentice Hall, 3rd Ed. 1999
2. Deutsch, Wills and Hall, *Software Quality Engineering: A Total Technique and Management Approach*, New Delhi: PHI, 1993.
3. Futrell Robert T., SnaferDonald F., Shafter Linda I., *Quality Software Project Management*, New Delhi: Pearson, 2002.
4. Perry, William E., *Effective Methods for Software Testing*, New York: Wiley, 1995
5. Hutcheson, *Software Testing Fundamentals*, Wiley India Pvt. Ltd, 2007.
6. Gill Nasib Singh,*Software Engineering: Software Reliability, Testing and Quality Assurance*, Khanna Book Publishing, 2009.
7. Galin Daniel, *Quality Assurance: From theory to implementation*, New Delhi: Pearson Education Ltd., 2004
8. Kan S.H., *Metrics and Models in Software Quality Engineering*, New Delhi: Pearson, 2nd Ed, 2003.
9. Myers Glenford J., *The Art of Software Testing*, New York: John Wiley, 2nd Ed. 2004.

Course Title: Advanced Software Engineering
Course Code: CSA619
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides the understanding of software project planning, various software process models, system design analysis, various testing techniques and software engineering tools.

UNIT-A **15 Hours**

Introduction

- Software Engineering goals, Characteristics, Components Applications
- Software Process Models: Waterfall, Spiral, Prototyping, Fourth Generation Techniques
- Concepts of Project Management, Role of Metrics And Measurement
- Software requirements, Definition, Software requirements specifications (SRS), Components of SRS.
- Software engineering features (data abstraction exception handling and concurrency mechanism).

Software Project Planning

- Objectives, Decomposition Techniques: Software Sizing, Problem Based Estimation
- Process Based Estimation, Cost Estimation Models: COCOMO Model, The Software Equation

UNIT-B **10 Hours**

System Analysis

- Principles of Structured Analysis, Requirement Analysis
- DFD, Entity Relationship Diagram, Data Dictionary

Software Design

- Objectives, Principles, Concepts
- Design Mythologies: Data Design, Architecture Design
- Procedural Design, Object–Oriented Concepts

UNIT-C **10 Hours**

System Administration and Training

- User manual, Implementation Documentation, Operation plan and maintenance

Hardware and Software Selection

UNIT-D **10 Hours**

Testing Fundamentals

- Objectives, Principles, Testability
- Test Cases: White Box & Blackbox Testing

- Testing Strategies: Verification& Validation
- UNIT Test, Integration Testing, Validation Testing, System Testing
- Software documentation procedures, Software reliability and quality assurance. Quality Matrics and software models
- Software maintenance and configuration management

Software engineering tools and environment

- International software engineering standards and their relevance
- Case studies in software engineering

Reference Books

1. Fairley, R.E., *Software Engineering Concepts*, New Delhi: McGraw Hill, 1997.
2. Lewis, T.G., *Software Engineering*, New Delhi: McGraw Hill, 1982.
3. Ochoa Sergio and RomanGruia-Catalin, *Advanced Software Engineering,* Spinger, 2006.
4. Pressman, *Software Engineering*, New Delhi: Tata McGraw Hill, 2002.
5. Meyers, G., *The Art of Software Testing*, NJ: Wiley-Inter-Science, 2004.
6. Sommerville, Ian, *Software Engineering*, Addison Wesley, 9th Ed, 2010.

Course Title: Compiler Design
Course Code: CSA620
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides a comprehensive understanding of phases of compiler, finite automata, regular expressions, syntax-directed translation & implementation, code generation and run time environment.

UNIT-A **13 Hours**

The Structure of A Compiler

- Phase of a Compiler, Compiler Tools, Finite Automata, Regular Expressions
- Conversion From Regular Expression To Finite Automata

Syntax Analysis

- Context Free Grammars, Top Down & Bottom Up Parsing Techniques
- Parsing Table Construction, LR, SLR & LALR Parsers.

UNIT-B **12 Hours**

Syntax Directed Translation

- Syntax-directed translation & implementation, Intermediate Code, Postfix translation
- Phase Trees, Syntax Trees

UNIT-C
Run Time Environment **10 Hours**

- Storage Organization Allocation Strategies, Parameter Passing
- Symbol Tables, Code Generation, Problem In Code Generation

UNIT-D
Code Generation & Code Optimization **10 Hours**

- Principle Sources, Loop Optimization, DAG Representation

Reference Books:

1. Aho, Alfred V. and Ullman Jeffery D.,*Principles of Compiler Design*, Addison-Wesley, 1977.
2. Barrett, *Compiler Construction*, Prentice Hall
3. Trembley, Jean-Paul & Paul G. Sorenson, *The Theory and Practice of Compiler Writing*, New York: McGraw Hill, 1985.
4. Keith Cooper and Linda Torczon, *Engineering a Compile*, Morgan Kaufmann Publishers, 2011
5. Dhamdhere D.M, *Compiler Construction—Principles and Practice*, Macmillan India, 2008
6. Gaddis. David,*Starting out with Modern Compiler Design*, New Delhi: Wiley India Pvt. Ltd, 2005.

Course Title: Research Methodology
Course Code: CSA627
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Objectives: The objective of the study is to let students understand basics of Research design and activities. The focus will be on data analysis and their effective presentation.

UNIT – A **10 Hours**

Scientific Research: Nature and Objectives of research; Methods of research: historical, descriptive and experimental. Study and formulation of research problem. Scope of research and formulation of hypothesis; Feasibility, preparation and presentation of research proposal.

Statistical Analysis: Introduction to statistical analysis: Measures of central tendency and dispersion; mean, median, mode, range, mean deviation and standard deviation.

UNIT-B **12 Hours**

Regression and Correlation Analysis.

Random Variables and Probability Distribution: Probability and probability distributions; Binomial, Poisson, Geometric, Negative binomial, Uniform, Exponential, Normal and Log-normal distribution.

UNIT – C **12 Hours**

Test of Hypothesis:
Basic ideas of testing of hypothesis; Tests of significance based on normal, t and Chi-square distributions. Analysis of variance technique.

Design of Experiments:
Basic principles, study of completely randomized and randomized block designs.

UNIT – D **11 Hours**

Introduction to dissertation design and report writing

Presentation: Tabular and graphical representation of results, quoting of references and preparing bibliography.

Plagiarism: Introduction, types of plagiarism, plagiarism detection tools**.**

Reference Books:

1. Hogg, R.V. & Craig, A. T : Introduction to Mathematical Statistics: MacMillan, 1965.
2. Goon, A. M., Gupta, M. K. & Dasgupta : Fundamentals of Statistics, Vol. I : World Press, 1975.
3. Gupta, S.C. & Kapoor, V. K. : Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 1994.
4. Dowdy, S., Wearden, S. and Chilko, D., Statistics for Research, Wiley Series (2004)
5. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., Probability and Statistics for Engineers and Scientists, Pearson Education (2002).
6. Borth, Wayne C, et. Al. The Craft of Research Chicago Guides to Writing Edition and Publishing.
7. Johnson, R.A., Probability and Statistics, PHI, New Delhi, 1994.
8. Meyer, P. L. : Introduction to Probability & Statistical Applications : Oxford, IBH, 1986.

Course Title: Advanced JAVA & Network Programming Laboratory

Course Code: CSA622

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of network protocol design, socket programming using JAVA

Course Title: .NET Framework and C# Laboratory
Course Code: CSA624

L	T	P	Credits	Marks
0	0	4	2	50

- Implementation of ASP.NET classes and Tools
- Connectivity with database

Course Title: Artificial Intelligence
Course Code: CSA702
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective The objective of this course is to familiarize students with concepts of AI, its tools & technologies.

UNIT – A **12 Hours**

Introduction

- Background and History
- Overview of AI applications Areas

The Predicate Calculus

- Syntax and Semantic for Propositional Logic and FOPL
- Clausal Form, Inference Rules
- Resolution and Unification

Knowledge Representation

- Network Representation-Associative Network & Conceptual Graphs
- Structured Representation- Frames & Scripts

UNIT – B **13 Hours**

Search Strategies

- Strategies For State Space Search-Data Driven And Goal Driven Search
- Search Algorithms- Uninformed Search (Depth First, Breadth First, Depth First With Iterative Deepening) And Informed Search (Hill Climbing, Best First, A* Algorithm, etc)
- Computational Complexity
- Properties of Search Algorithms-Admissibility
- Monotonicity, Optimality, Dominance

Expert Systems

- Introduction, Examples
- Characteristics Architecture, People Involved and Their Role in Building an Expert Systems
- Case Studies of Expert Systems, MYCIN And DENDRAL; Features of Knowledge Acquisition Systems : MOLE And SALT

UNIT – C **10 Hours**

Natural Language Processing

- Component Steps of Communication
- Contrast Between Formal and Natural Languages in the Context of Grammar
- Grammars and languages
- Basic parsing techniques

Introduction to AI languages

- Introduction to LISP
- Introduction to Prolog

UNIT-D **10 Hours**

Planning

- Basic Representation for Planning
- Symbolic-Centralized Vs. Reactive-Distributed

Pattern Recognition

- Introduction
- Recognition & Classification Process
- Learning classification patterns
- Clustering

Reference Books:

1. Elaine Rich, Kevin Knight and Nair Shiva Shankar B,*Artificial Intelligence*, Third Edition, New Delhi: Tata-McGraw Hill, 2008.
2. Winston, P.H. and Horn, B.K.P, *LISP*, Pearson, 1993.
3. Rajasekharan, S. and VijayalakshmiPai, G. A.,*Neural Networks, Fuzzy Logic and Genetic Algorithms*, New Delhi: Prentice Hall of India, 2003.
4. Luger George F., *Artificial Intelligence*, 5th edition, Pearson Education.
5. Patterson Dan W.,*Introduction to Artificial Intelligence and Expert system,* New Delhi: PHI, 2005.
6. Bharti &Chaitany,*Natural Language Processing*, New Delhi: PHI, 2006.
7. Kaushik Saroj, *Artificial Intelligence,* Cengage Learning, 2011.

Course Title: System Programming
Course Code: CSA703
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course demonstrates an in-depth understanding system software loader, linker, assembler, compiler, and parsing techniques.

UNIT – A **10 Hours**

System Software

- Definition, Evolution of System Software

Assemblers

- Elements of Assembly Language Programming
- Overview of Assembly Process
- Design Options- One Pass Assembler & Multi Pass Assembler
- Macro Processors: Basic Functions
- Design Options-Recursive Macro Expansion
- General Purpose Macro Processors
- Macro Processing Within Language Translators

UNIT-B

Loaders & Linkage Editors **12 Hours**

- Loading, Linking & Relocation
- Program Relocatibility
- Overview of Linkage Editing
- Linking for Program Overlays

Compilers

- Logical Analysis
- Storage Management Optimization
- Incremental Compilers
- Cross Compilers
- P Code Compilers

UNIT – C **13 Hours**

Compilers

- Phases And Passes
- Analysis-Synthesis Model of Translation

Compiler Construction Tools

- Lexical Analysis
- Process of Lexical Analysis
- Finite State Automata, DFA And NFA

UNIT – D **10 Hours**

Parsing Techniques

- Top Down & Bottom-Up Parsing
- Shift Reduce Parsing, Operator Precedence Parsing
- Predictive Parsers Automatic Construction Of Efficient Parsers
- LR Parsers
- The Canonical Collection Of LR(0) Items
- Constructing SLR Parsing Tables
- Constructing Canonical LR Parsing Tables, Constructing LALR Parsing Tables

Reference Books:

1. Beck Leland L.,*System Software, An introduction to system programming*, New Delhi: AddisonWesley, 2009.
2. Dhamdhere D.M., *Introduction to System Software*, New Delhi: Tata McGraw Hill, 1990.
3. Dhamdhere D.M., *System Software and Operating System*, New Delhi: Tata McGraw Hill, 1992
4. Alfred V Aho and Ullman Jeffery D, *Principles of Compiler Design*, New Delhi: Narosa/Addison Wesley, 1986.
5. Donovan J. John, *System Programming*, New Delhi:Tata McGraw Hill, 1999.

Course Title: Linux and Shell Programming
Course Code: CSA709
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides an introduction to programming with utilities and shell scripting languages in a Linux environment. This course covers the essential aspects of shell programming including similarities and differences among the three most popular shells: the Bourne shell, the C shell. Students will learn features including, command line argument processing, debugging techniques.

UNIT—A **15 Hours**

Introduction

- Linux distributions
- Linux/Unix operating system, Linux/Unix architecture
- Features of Linux/Unix, Accessing Linux system
- Starting and shutting down system, Logging in and Logging out

Commands in Linux

- General-Purpose commands
- File oriented commands, directory oriented commands
- Communication-oriented commands, process oriented commands, etc.
- Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, pwd, file, more, less, creating and viewing files using cat, file comparisons – cmp & comm, View files, disk related commands, checking disk free spaces.
- Regular expressions & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, etc., grep, sed. introducing regular expressions.

UNIT—B **10 Hours**

The Linux File system

- Linux/Unix files, inodes and structure and file system
- File system components, Standard file system
- File system types, file system mounting and unmounting.

Processes in Linux

- Starting and stopping processes, initialization Processes, mechanism of process creation, rc and init files, job control - at, batch, cron, time, Signal handling

UNIT—C **10 Hours**

Shell Programming

- vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating shell scripts.
- Basic system administration in Linux/Unix.

UNIT—D **10 Hours**

The C Environment

- The C compiler, compiler options, Managing projects, memory management, use of makefiles, dependency calculations

- Memory management - dynamic and static memory, building and using static and dynamic libraries, using ldd, soname, dynamic loader, debugging with gdb.

Reference Books:

1. Sobell Mark G., *A Practical Guide to Linux Command and Shell Programming*, New Delhi: Pearson Publishers, India 2012.
2. Robbins, *Linux Programming by Example: The fundamentals*, New Delhi: Pearson Publishers, India 2011.
3. Drew and Mike Harwood, *Linux + Certification Guide*, New Delhi: TataMc-Graw Hill Publishers,2009.
4. John Goerzen, *Linux Programming Bible*, IDG Books, New Delhi 2000.

Course Title: Soft Computing
Course Code: CSA704
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To introduce the concepts of artificial neural networks, fuzzy sets, fuzzy logics, various search techniques, genetic algorithms, artificial applications, supervised and unsupervised learning, neuro-fuzzy systems and their applications

UNIT-A **13 Hours**

Introduction

- Introduction to soft computing; introduction to biological and artificial neural network, genetic algorithm
- Introduction to fuzzy sets and fuzzy logic systems

Genetic Algorithm and Genetic Programming

- Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.
- Genetic Programming: Characteristics of genetic programming: Human, Competitive, High-Return, Routine, Machine Intelligence; Data Representation: Crossing Programs, Mutating Programs, The Fitness Function.
- Advantages and Limitations of Genetic Algorithm.
- Applications of Genetic Algorithm.

UNIT-B **12 Hours**

Artificial Neural Networks and Applications

- Introduction, Basic models of ANN, Important terminologies, Supervised Learning Networks, Perception Networks, Adaptive Linear Neuron
- Backpropagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks
- Neural network applications in control systems. Neural Nets and applications of Neural Network.

Unsupervised Learning Network

- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps
- Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks

UNIT-C **10 Hours**

Fuzzy Systems and Applications

- Introduction to Classical Sets (crisp Sets)and Fuzzy Sets- operations

and Fuzzy sets

- Fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering
- Membership functions- Features, Fuzzification, membership value assignments, Defuzzification, applications of fuzzy systems
- Neuro-fuzzy systems : neuro-fuzzy modeling; neuro-fuzzy control

UNIT-D **10 Hours**

Applications

- Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design
- Robotics and Sensors, Information Retrieval System, Share Market Analysis, Natural Language Processing

Reference Books

1. SivanandamS N and DeepaS N, *Principles of Soft Computing*, New Delhi: Wiley India, 2007
2. KarrayFakhreddine O,Silva Clarence D, *Soft Computing and Intelligent System Design*, New Delhi: Pearson Edition, 2004
3. Mitchell M.,*An Introduction to Genetic Algorithms*, New Delhi: Prentice-Hall
4. Jang J.S.R., Sun C.T. and MizutaniE., *Neuro-Fuzzy and Soft Computing*, New Delhi: PHI, Pearson Education, 2004.
5. Rich Elaine andKnight Kevin, *Artificial Intelligence*, New Delhi: TMH, 2008
6. Ross Timothy J., *Fuzzy Logic with Engineering Applications*, New Jersy: Wiley, 2004.
7. RajasekaranS. and PaiG.A.V., *Neural Networks, Fuzzy Logic and Genetic Algorithms*, PHI, 2012.
8. Goldberg Davis E.,*Genetic Alorithms, Search, Optimization and Machine Learning*, Addison Wesley, 1989.
9. Jang J.S.R., Sun C.T., MizutaniE, *Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence*, Prentice Hall, 1997.
10. Melanie Mitchell, *An Introduction to Genetic Algorithms*, London: MIT press, 1999.
11. N.P. Padhy and S.P. Simon, *Soft Computing: With Matlab Programming* , Oxford University Press.

Course Title: Cloud Computing
Course Code: CSA705
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

- To understand the emerging area of "cloud computing" and how it relates to traditional models of computing.
- To gain competence in Map Reduce as a programming model for distributed processing of large datasets. Specifically:
  - To understand and be able to articulate key concepts behind MapReduce, including its functional abstraction, the use of distributed storage, and the scheduling of data-local jobs.
  - To understand how well-known algorithms such as PageRank and inverted index construction can be expressed in the MapReduce framework.

UNIT—A **15 Hours**

Overview of Computing Paradigm

- Recent trends in Computing
- Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing

Evolution of cloud computing

- Business driver for adopting cloud computing
- Introduction to Cloud Computing
- Cloud Computing (NIST Model)
- Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers
- Properties, Characteristics & Disadvantages
- Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing
- Role of Open Standards

UNIT—B **10 Hours**

Infrastructure as a Service(IaaS)

- Introduction to IaaS
- IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM)
- Resource Virtualization
- Server
- Storage
- Network
- Virtual Machine(resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage

as a service)

UNIT—C **15 Hours**

Platform as a Service(PaaS)

- Introduction to PaaS
- What is PaaS, Service Oriented Architecture (SOA)
- Cloud Platform and Management
    - Computation
    - Storage

Software as a Service(PaaS)

- Introduction to SaaS
- Web services
- Web 2.0
- Web OS
- Case Study on SaaS

UNIT—D **5 Hours**

Case Study on Open Source & Commercial Clouds

- Eucalyptus
- Microsoft Azure
- Amazon EC2

Reference Books:

1. Barrie Sosinsky, *Cloud Computing Bible*, New Delhi: Wiley-India, 2010
2. BuyyaRajkumar , BrobergJames , Goscinski Andrzej M., *Cloud Computing: Principles and Paradigms*, Wiley, 2011
3. Antonopoulos Nikos, GillamLee, Cloud *Computing: Principles, Systems and Applications*, Springer, 2012
4. KrutzRonald L, Vines Russell Dean,*Cloud Security: A Comprehensive Guide to Secure Cloud Computing,*New Delhi: Wiley-India, 2010
5. Shailendra Singh*, Cloud Computing*, Oxford University Press, 2018.

Course Title: Cryptography and Network Security
Course Code: CSA706
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

- Appreciate the core techniques of cryptography and how they can be applied to meet various security objectives
- Understand both the importance of cryptographic key management, and the different key management requirements and practices associated with the use of different security techniques
- Appreciate how the techniques described are employed in practice in a variety of security applications, from SSL enabled websites through to disk encryption

UNIT—A **10 hours**

Introduction

- Classical cryptography
- Secret Key Encryption
- Perfect Secrecy - One time pads
- Stream ciphers and the Data Encryption Standard (DES)
- The Advanced Encryption Standard (AES) - adopted September 2000
- Public Key Encryption
- Factoring and the RSA encryption
- Discrete log. Diffie-Hellman Key Exchange

UNIT—B **12 Hours**

Digital Signatures

- One-time signatures.
- Rabin and ElGamal signatures schemes.
- Digital Signature Standard (DSS).

Hashing

- Motivation and applications. Cryptographically Secure Hashing.
- Message Authentication Codes (MAC). HMAC.

UNIT—C **13 Hours**

Network Security

- Authentication requirement
- Authentication functions
- Authentication functions
- Hash Functions
- Message Authentication Codes
- Hash Functions

- Security of Hash Functions and MACs – MD5 message Digest algorithm
- Secure Hash Algorithm – HMAC, Digital Signatures – Authentication Protocols – Digital Signature Standard

UNIT—D **10 Hours**

Authentication Applications

- Kerberos
- X.509, Authentication Service – Electronic Mail Security
- Electronic Mail Security – PGP – S/MIME - IP Security
- Web Security, Intrusion detection – password management

Viruses and related Threats

- Virus Counter measures – Firewall Design Principles – Trusted Systems

Reference Books:

1. Stalling William, *Cryptography and Network Security*, Fourth Ed., New York: Prentice Hall, 2010.
2. Frouzen,*Cryptography and Network Security*, Fourth Ed., New York: Prentice Hall, 2008.

Course Title: Natural Language Processing
Course Code: CSA723
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To provide basic knowledge about Natural language processing viz. Morph, Part of speech tagging, syntactic analysis, semantic analysis etc.

UNIT – A **10 Hours**

Introduction to Natural Language Processing

- Definition, History
- Applications, Goals
- Regular expressions and Automata
- Morphology and Finite State Transducers

UNIT-B

Syntax **10 Hours**

- Word Classes and Part-of Speech Tagging
- Context Free Grammars for English
- Parsing with Context-Free Grammars.

UNIT – C **15 Hours**

Word Sense Disambiguation

- Selection Restriction Based Disambiguation
- Robust WSD: Machine Learning, Supervised Learning Approaches, Bootstrapping Approaches, Unsupervised Methods, Dictionary Based Approaches.

UNIT – D **10 Hours**

Introduction to various statistical techniques used in NLP

- Introduction to computation al linguistic
- Hidden Markov Model
- Support Vector Machine
- CRF, N-Gram, HMMs

Reference Books:

1. Grosz, B.J., Sparck Jones, K. & Webber, B.L. (eds)., *Readings in natural language processing*, Los Altos, CA. Morgan Kaufmann, 1986.
2. Allen, J., *Natural Language Understanding*, Redwood City, CA: 1994. Benjamin/Cummings.
3. Bharti, Akshar,Chaitanya Vineet, Sangal Rajeev, *Natural Language Processing*, Prentice Hall.
4. Jurafsky, D. & J. Martin, *Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition*, Prentice Hall, 2000.
5. Alpaydin E., Introduction to Machine Learning, 3ed, PHI.

Course Title: Digital Image Processing
Course Code: CSA701
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To introduce basic image processing techniques, sptial and frequency domain, linear programming, color image processing, image compression, etc.

UNIT – A **15 Hours**

Introduction

- Fundamental Steps in Image Processing
- Element of Visual Perception
- A simple image model, sampling and quantization
- Some Basic Relationships Between Pixel
- Image Geometry in 2D

Image Processing Techniques

- Basic Intensity Transformation Functions
- Image Restoration
- Histogram Processing: Histogram Equalization, Histogram matching, Local Histogram Processing, Using Histogram Statistics for Image Enhancement
- Image Subtraction, Image Averaging
- Filtering: Smoothing Spatial Filters, Sharpening Spatial Filters

UNIT – B **10 Hours**

Introduction to the Fourier Transformation

- Discrete Fourier Transformation
- Fast Fourier Transformation
- Image Smoothing Using Frequency Domain Filters: Ideal Lowpass Filters, Butterworth low pass filters, Gaussian Lowpass Filters
- Image Sharpening Using Frequency Domain Filters: Ideal Highpass Filters, Butterworth High pass filters, Gaussian High pass Filters, Unsharp Masking, Highboost Filtering and High Frequency-Emphasis filtering.

UNIT – C **10 Hours**

Techniques of Color Image Processing

- Color image signal representation
- Color System Transformations
- Extension of Processing Techniques to Color Domain

Morphological Image Processing

- Erosion and Dilation
- Opening and Closing
- Hit – or- miss Transformations

Applications of Image Processing

- Picture Data Archival
- Machine Vision

- Medical Image Processing

UNIT-D **10 Hours**

Introduction to Image Compression

- Coding Redundancy
- Spatial and Temporal Redundancy
- Irrelevant Information
- Measuring Image Information

Basic Compression Methods

- Huffman Coding
- LZW Coding
- Run Length Coding
- Wavelet Coding

Reference Books:

1. Gonzalez Rafael C. and Woods Richard E., *Digital Image Processing*, New Delhi: Prentice–Hall ofIndia, 2002.
2. Pratt William K., *Digital Image Processing: PIKS Inside*(3rd ed.), New Jersy: John Wiley & Sons,
   Inc., 2001.
3. Bernd Jahne, *Digital Image Processing*, (5th revised and extended edition), Springer, 2002
4. AnnaduraiS. and ShanmugalakshmiR., *Fundamentals of Digital Image Processing*, New Delhi: Pearson Education, 2007
5. Joshi M.A., *Digital Image Processing: An Algorithmic Approach*, New Delhi: Prentice-Hall ofIndia, 2006
6. Sridhar , *Digital Image Processing* 2ed, Oxford University Press.

Course Title: Advanced Web Technology
Course Code: CSA710
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

- To build web applications using ASP and client side script technologies based on Microsoft's IIS.
- Creating web based applications using ADO.Net
- To build Web services and creating XML files for writing and reading data from XML

UNIT—A **10 Hours**

Introducing

- History of the Internet and World Wide Web
- HTML 4 protocols – HTTP, SMTP, POP3, MIME, IMAP

ActiveX Controls Object Based Scripting for the web.

- Introduction to The TextBox Control,The List Box Controls, The Combo Box Control, The Scroll Bar, The Slider Control, The FlatScrollBar Control, File Controls, Timer Control, Advanced ActiveX Control, Common Dialogs Control, The TreeView Control, The ImageList Control, The ListView Control

UNIT—B **13 Hours**

Overview of ASP .NET Framework

- ASP.NET and the .NET Framework, Understanding the framework class Library, Understanding the Common language Runtime, Installing the ASP.NET Framework, Introduction of ASP .NET
- Creating your First ASP .NET Web, Understanding ASP.NET Pages, Understanding ASP.NET Controls, Overview of ASP.NET Controls, Understanding HTML Controls, Understanding and Handling Control Events
- Understanding Control Trees, Using Code –Behind pages, Deciding Between Single-File and Code-Behind Pages, Handling Page Events, Using the Page.IsPostBack Property, Debugging and Tracing ASP.NET Pages, Debugging Pages with Visual Web Developer, ASP.Net Applications, Web Server (IIS Server)

Web Forms & Web Forms Control

- Introduction, Web Forms, WEB FORM CONTROL, Server Control, Client Control, WEB FORMS & HTML, Adding control to a web form, Submitting From Data, Accepting User Input, Using the Label Control
- Using the Checkbox Control, Using the Radio Button Control, Performing Cross-Page Posts, Specifying a Default Button, Displaying Images, Using the ImageMap Control, Using the Panel Control, Using the HyperLink control, Running a Web applications, Multi forms, Creating a Multiform

UNIT—C **12 Hours**

Form Validation:

- Introduction, Client Side and Server Side Validation, Client Side Validation, Server Side Validation, Overview of the Validation Controls, Validation Control and JavaScript, Using Page.IsValid, Validation Controls
- Using the RequiredFieldValidator control, Using the CompareValidator Control, Using the RangeValidator control, Calendar Control, Ad-rotator Control (Displaying Advertisements),Using the RegularExpressionValidator Control, Using the CustomValidator Control, Using the ValidationSummary Control, Creating Custom Validation Controls, Creating a LengthValidator Control, Creating an Ajaxvalidator control

State Management & Rich Control::

- Introduction, State Management, Client – Side State Management, Server - Side State Management:, Advantages of State Management, Accepting File UPLOADS, Saving Files to the file System, Displaying Different Page Views, Displaying a Tabbed Page view, Displaying a Multi – Part form, Displaying a Wizard

UNIT—D **10 Hours**

Introduction of ADO .NET:

- Introduction, The ADO.NET Data Architecture, Component classes that make up the Data Providers, Connected and Disconnected Database, Create an XML Web service using ASP.NET, Create a disconnected ADO.NET Windows application
- Create Connection using ADO .NET object model, Building a Connection String, Connection Classes, Executing Commands, DataSet Classes, Using an XSD Schema to Create a Typed DataSet, Using the Designer to Build a Typed DataSet, Programming with a Typed DataSet, DataAdapter Classes, Filling Typed DataSets
- Using TableAdapters, Adding Additional Queries to a Typed DataSet, Display data on data bound control, Working with List controls, Working with tabular databound controls, Using ASP.NET Parameters with DataSource controls, Overview of SQL Server 2005 Express , Features of SQL Server Express, SQL Server 2005 Express Management tools, Server Database Versus Local Databases

Database Accessing on Web Application:

- DataBinding Concept with Web, Understanding Templates and DataBinding Expressions, Using Templates, DataGrid Control, Creating DataGrid, Binding standard web server control, Working with tabular databound controls, Display data on web form using DataBound Control

Web Service & XML:

- Introduction to XML, Reading and Writing DataSet's Data in XML File, Writing Data in XML, Reading data from XML, Remote Method Call using XML, Web Services Overview, Soap Message, ASP.NET Web Services, Web Services Description Language, Building & Consuming a web service, Changes to our source, Performance Counter Web Service, Testing Web Services, Consuming, Contract, Command line tool, Using

the Web Service, Web Applications Deployment, Deploying Applications

Reference Books:

1. Stephen Walther, *ASP.NET 4 Unleashed*, Sams Publishing, 2004.
2. George Shepherd, *Microsoft ASP.NET 4 Step by Step (Microsoft)*, Paperback Edition, 2010.
3. Scott Mitchell,*Teach Yourself ASP.NET 4 in 24 Hours*, Complete Starter Kit.
4. A. Russell Jones, *Mastering Asp.Net with Visual C#,* CA, USA:SYBEX Inc. Alameda 2002
5. Wallace B. McClure*, Professional ADO.NET 2: Programming with SQL Server 2005*, *Oracle, and MySQL* Wrox 2005.

Course Title: Visual C++ Programming
Course Code: CSA711
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

- To introduce the concepts of windows programming.
- To introduce GUI programming using Microsoft Foundation Classes.
- To enable the students to develop programs and simple applications using Visual C++

UNIT – A **15 Hours**

Introduction to Developer Studio, its working and debugging support

- Installing and Exploring Developer Studio
- Developer Studio wizards, Using App Wizard
- Creating a basic application
- Resource editors, The Gallery and the Info Viewer,
- The debugging environment,
- Using Developer Studio debugger
- Adding debugger support

Visual C++ Programming – Introduction

- Application Framework
- Mfc Library, Visual C++ Components
- Event Handling – Mapping Modes
- Colors – Fonts – Modal And Modeless Dialog
- Windows Common Controls – Bitmaps

UNIT-B **10 Hours**

The Document And View Architecture

- Menus – Keyboard Accelerators – Rich Edit Control – Toolbars – Status Bars
- Reusable Frame Window Base Class
- Separating Document From Its View
- Reading And Writing SDI And MDI Documents
- Splitter Window And Multiple Views
- Creating DLLs
- Dialog Based Applications

UNIT – C **10 Hours**

Activex And Object Linking And Embedding (OLE)

- Activex Controls Vs. Ordinary Windows Controls
- Installing Activex Controls
- Calendar Control
- Activex Control Container Programming

- Create Activex Control at Runtime
- Component Object Model (COM)
- Containment And Aggregation Vs. Inheritance – OLE Drag and Drop – OLE Embedded Component and Containers – Sample Applications

UNIT – D **10 Hours**

Advanced Concepts

- Database Management With Microsoft ODBC
- Structured Query Language
- MFC Odbc Classes
- Sample Database Applications
- Filter And Sort Strings
- DAO Concepts
- Displaying Database Records In Scrolling View – Threading –
- VC++ Networking Issues
- Winsock – Wininet – Building A Web Client
- Internet Information Server
- Isapi Server Extension – Chat Application
- Playing And Multimedia (Sound And Video) Files

Reference Books:

1. Petzold Charles, *Windows Programming*, Microsoft press, 1996
2. Kruglinski David J., ShepherdGeorge and Wingo Scot, *Programming Visual C++*, Microsoft press, 1999
3. Holtzner Steve, *Visual C++ 6 Programming*, New Dehi: Wiley Dreamtech India Pvt. Ltd., 2003.

Course Title: Big Data Analytics
Course Code: CSA721
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

- To explore the fundamentals concepts of big data analytics.
- To learn and understand the concept of big data intelligent techniques, various search methods and visualization techniques.

UNIT – A **10 Hours**

Introduction to Big Data

- Overview of Big Data, Stages of analytical evolution.
- Challenges of Conventional Systems
- Intelligent data analysis, Nature of Data
- Analytic Processes and Tools
- Analysis vs Reporting, Modern Data Analytic Tools
- Statistical Concepts:
    - Sampling Distributions - Re-Sampling
- Statistical Inference - Prediction Error

UNIT-B **10 Hours**

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 – C **15 Hours**

Hadoop

- History of Hadoop, The Hadoop Distributed File System
- Components of Hadoop, Analyzing the Data with Hadoop
- Scaling Out- Hadoop Streaming, Design of HDFS-Java interfaces to HDFSBasics
- Developing a Map Reduce Application
- How Map Reduce Works
- Anatomy of a Map Reduce Job run-Failures
- Job Scheduling-Shuffle and Sort, Task execution
- Map Reduce Types and Formats, Map Reduce Features

Hadoop environment

- Setting up a Hadoop Cluster, Cluster specification
- Cluster Setup and Installation, Hadoop Configuration,
- Security in Hadoop, Administering Hadoop, HDFS – Monitoring

- Maintenance, Hadoop benchmarks

UNIT – D **10 Hours**

Frameworks

- Applications on Big Data Using Pig and Hive
- Data processing operators in Pig
- Hive services, HiveQL, Querying Data in Hive
- Fundamentals of HBase and ZooKeeper
- Visualizations
    - Visual data analysis techniques, interaction techniques
- Systems and applications

Reference Books:

1. Michael Berthold, David J. Hand, *Intelligent Data Analysis*, Springer, 2007.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*, 2012.
3. Tom White, *Hadoop: The Definitive Guide* Third Edition, O'reilly Media, 2012.
4. Anand Rajaraman and Jeffrey David Ullman, *Mining of Massive Datasets*, Cambridge University Press, 2012.
5. Bill Franks, *Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics*, JohnWiley & sons, 2012.
6. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author), *Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses*,Wiley Publications, 2013.
7. Jiawei Han, Micheline Kamber, *Data Mining Concepts and Techniques*, Second Edition, Elsevier, Reprinted 2008.
8. Thomas Erl, Wajid Khattak, Paul Buhler, *Big Data Fundamentals: Concepts, Drivers & Techniques,* Pearson India, 2016.

Course Title: Linux Shell Programming Laboratory
Course Code: CSA715

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of filters, Fourier transforms, and various digital image processing techniques

Course Title: Elective-V Laboratory
Course Code: *

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of the concepts of the course chosen from Elective-IV