DAV UNIVERSITY JALANDHAR

FACULTY OF SCIENCE

Course Scheme and Syllabus
for

Master of Computer Science
(Two Years Degree Course)
(Programme ID-70)
1st to 4th Semester

(As per Choice Based Credit System)

Syllabi Applicable for 2018 Batch

Semester 1

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	MTH570	Discrete Structures	Core	4	0	0	4
2	CSA503	Computer System Organization and Architecture	Core	4	0	0	4
3	CSA504	Advances in Operating Systems	Core	4	0	0	4
4	CSA505	Database Management System	Core	4	0	0	4
5	CSA572	JAVA Programming	Core	4	0	0	4
6	CSA507	Database Management System Laboratory	Core	0	0	4	2
7	CSA574	JAVA Programming 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	CSA508	Data Structures and File Processing using C	Core	4	0	0	4
2	CSA510	Computer Networks and Data Communication	Core	4	0	0	4
3	CSA578	Computer Based Optimization Techniques	Core	4	0	0	4
4	CSA579	Interactive Computer Graphics	Core	4	0	0	4
5	CSA580	Theory of Computer Science	Core	4	0	0	4
6	CSA512	Data Structures and File Processing using C Laboratory	Core	0	0	4	2
7	CSA582	Interactive Computer Graphics Laboratory	Core	0	0	4	2
				20	**5**	8	**24**

Semester 3

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	*	Discipline Elective-I	DSE	4	0	0	4
2	CSA601	Design and Analysis of Algorithms	Core	4	0	0	4
3	CSA605	Data Mining and Data Warehousing	Core	4	0	0	4
4	CSA623	.NET Framework and C#	Core	4	0	0	4
5	CSA676	Artificial Intelligence	Core	4	0	0	4
6	CSA679	Artificial Intelligence (LISP and PROLOG) Laboratory	Core	0	0	4	2
7	CSA624	.NET Framework and C# Laboratory	Core	0	0	4	2
				20	**5**	8	**24**

Semester 4

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	*	Discipline Elective-II	DSE	4	0	0	4
2	CSA627	Research Methodology	Core	4	0	0	4
3	CSA677	Advanced Software Engineering	Core	4	0	0	4
4	CSA678	Digital Image Processing	Core	4	0	0	4
5	CSA680	Digital Image Processing Laboratory	Core	0	0	4	2
6	CSA689	Major Project*	Core	0	0	12	6
			Core	**16**	**0**	18	**24**

*The Major Project 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	
CSA671	Microprocessor and Its Applications
CSA672	Mobile Computing
CSA673	Emerging Trends in Information Technology
CSA674	Information Systems

Discipline Elective-II	
CSA681	System Simulation
CSA682	Soft Computing
CSA683	System Software
CSA691	Natural Language Processing
CSA675	Distributed and Parallel Processing

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

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To provide basic knowledge about mathematical structures viz. sets, groups, binary trees, graphs, propositions, functions, recurrence relations, 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 **13 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 **12 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 System Organization and Architecture
Course Code: CSA503
Course Duration: 45-60 Hours

Course Objective: The objective of the course is to introduce students to the design and organization of modern digital computers by showing the relationship between hardware and software and focusing on the concepts of microprocessors.

UNIT– A **18 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 **15 Hours**

Basic Building Blocks

- Combinational logic design:
  - half-adder, full adder , half-subtractor, 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 **15 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 **15 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 **18 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 **15 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

12 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 **15 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 **15 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 **15 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.

Course Title: JAVA Programming
Course Code: CSA572
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 **15 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 **15 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 **15 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: 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.

L	T	P	Credits	Marks
0	0	4	2	50

Course Title: JAVA Programming Laboratory
Course Code: CSA574

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

L	T	P	Credits	Marks
4	0	0	4	100

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

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 **15 Hours**

Preliminaries

- Introduction to Data Structures: Primitive and Comp
- osite, 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 **15 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 **13 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 **18 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. Lipschutz Seymour, *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*.

L	T	P	Credits	Marks
4	0	0	4	100

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

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 **18 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 **15 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 **15 Hours**

Network Layer

- Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast
- Internetworking, IP Protocol, ARP, RARP.

UNIT – D **12 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 Based Optimization Techniques
Course Code: CSA578
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 **15 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 **15 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 **15 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.

Course Title: Interactive Computer Graphics
Course Code: CSA579
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

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

UNIT – A **15 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 **15 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 **15 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 **15 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. andHughes 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 Book Company, 2001.
4. PlastockRoy A., KalleyGordon,*Computer Graphics*, New Delhi: McGraw Hill Book Company, 1996.

Course Title: Theory of Computer Science
Course Code: CSA580
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 **15 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 **15 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, **15 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 **15 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 ofComputation*(2nd ed.), NJ:Prentice-Hall,1997.
4. Anderson J.A., *Automata Theory with Modern Applications*, New York: Cambridge University
   Press, 2006.

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: Interactive Computer Graphics Laboratory
Course Code: CSA582

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of various algorithms of drawing line, circle, ellipse, etc. and2D transformations

Course Title: Microprocessors and Its Applications
Course Code: CSA671
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 **15 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 **15 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 **15 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.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Mobile Computing
Course Code: CSA672
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 **15 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 **15 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 **15 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 Technologies Springer, 2002.

Course Title: Emerging Trends in Information Technology
Course Code: CSA673
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 **15 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 **15 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 **15 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: Information Systems
Course Code: CSA674
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 **15 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 **15 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 **15 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. MurdickRobert, Joel E. Ross, *Information Systems for Modern Management*, New Delhi: PHI, 3rd Ed.
2. TurbanEfraim,*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. BellavistaPaolo and CorradiAntonio (Eds.), *Handbook of Mobile Middleware*, Auerbach Publication, 2006.
5. Steven Alter, *Information Systems* , 3rd Edition, Pearson Education, 2000
6. McNurlinC.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.

L	T	P	Credits	Marks
4	0	0	4	100

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

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

UNIT – A **15 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 **15 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 **15 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: .NET Framework and C#
Course Code: CSA623
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 use with Microsoft's IIS.
- To build XML applications with DTD and style sheets that span multiple domains ranging from finance to vector graphics to genealogy for use with legacy browsers.

UNIT—A **15 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 **15 Hours**

Introducing C# Programming

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

UNIT—C **15 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 Startup Form, Connecting The Dialog, Using Listview and Treeview Controls,
- Building an Image list and add Them To The Listview, Using Details inside The Listview,
- Attaching A Context Menu, Adding a Treeview, 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 **15 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, Custom Controls, Understanding the Web.Config File, Using the Global.asax Page

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. George Shepherd, *Microsoft ASP.NET 4 Step by Step (Microsoft)*, Paperback Edition, 2010.
4. Scott Mitchell, *Teach Yourself ASP.NET 4 in 24 Hours*, Complete Starter Kit.
5. Shukla Charul, *Asp.Net 2.0 Black book*, Paraglyph Press, 2006.

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 **15 Hours**

Introduction to

- Basic Systems Concepts, Elements (Components) of System, Characteristics of System, Types of Systems, System Approach.
- Information Systems: Definition & Characteristics, Types of Information, Role of Information in Decision - Making, Levels of Management.
- Introduction to different kinds of Information Systems: ESS, EIS, DSS, MIS, KWS, TPS, OAS and EDP

Data Warehousing Architecture

- Design and Construction of Data-Warehouses, Three-Tier Data Warehouse Architecture
- Data content, metadata, distribution of data
- Tools for Data Warehousing, Crucial decisions in Designing a Data Warehouse

UNIT-B **12 Hours**

Data Mart

- Types of Data Marts, Loading a Data Mart, Metadata for a data Mart
- Data Model for a Data Mart, Maintenance of a Data Mart
- Software components for a Data Mart, Tables in Data Mart, External Data, Performance issues
- Monitoring requirements for a Data Mart, Security in Data Mart.

UNIT-C **15 Hours**

OLTP and OLAP Systems

- Data Modelling, Star Schema for multidimensional view, multi fact star schema
- Types of OLAP Servers: ROLAP, MOLAP, HOLAP
- Efficient Computation of Data Cubes, Indexing OLAP Data
- Efficient Processing of OLAP Queries, Categories of OLAP tools

UNIT-D **18 Hours**

Data Mining

- Basic Concepts; From Data Warehouse to Data Mining

- Steps of Data Mining Process, Types of Data Mining Tasks
- Data Mining Techniques: Predictive Modeling, Database Segmentation, Link Analysis, Deviation Detection in details
- Data Mining Algorithms Viz. Classification: Decision Tree, Bayesian Classification, Rule based Classification, Back Propagation, Support Vector Machine.
- Prediction: Linear Regression, Nonlinear Regression, Other Regression-Based Methods: Generalized linear models, Log-linear models, Regression trees
- Clustering Analysis: Categorization of Major Clustering Methods: Partitioning methods, Hierarchical methods, Density based methods, Grid-based methods, and Model-based methods.

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. Silberschatz, Korth andSudershan,*Database System Concepts*, New Delhi: McGraw Hill, 4th Edition, 2010.

Title: Artificial Intelligence
Course Code: CSA676
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 **15 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 **15 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 **15 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 **15 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 syste*, New Delhi: PHI, 2005.
6. Bharti &Chaitany, *Natural Language Processing*, New Delhi: PHI, 2006.

Course Title: Artificial Intelligence (LISP and PROLOG) Laboratory
Course Code: CSA679

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of LISP and PROLOG based programs. Natural Language Processing, etc

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: Distributed and Parallel Processing
Course Code: CSA675
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
0	0	4	2	50

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, 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

- Parallelismin 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

- ThreadManagement, 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: Advanced Software Engineering
Course Code: CSA677
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
0	0	4	2	50

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 ProjectManagement, 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 ProjectPlanning

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

UNIT-B **15 Hours**

System Analysis

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

Software Design

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

UNIT-C **15 Hours**

System Administration and Training

- User manual, Implementation Documentation, Operation plan and maintenance

Hardware and Software Selection

- Hardware acquisition, Benchmarking, Vendor selection, Software selection, Performance and acceptance criteria, Site preparation

UNIT-D **15 Hours**

Testing Fundamentals

- Objectives, Principles, Testability
- Test Cases:WhiteBox&blackbox Testing
- Testing Strategies:Verification&Validation
- UNITTest, 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: Digital Image Processing
Course Code: CSA678
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To introduce basic image processing techniques, spatial 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

Intensity Transformations and Spatial Filtering

- 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
15 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
15 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

15 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 of India, 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 of India, 2006

L	T	P	Credits	Marks
0	0	4	2	50

Course Title: Digital Image Processing Laboratory
Course Code: CSA680

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

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: System Simulation
Course Code: CSA681
Course Duration: 45-60 Hours

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

UNIT-A **15 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 **15 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 **15 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 **15 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

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Soft Computing
Course Code: CSA682
Course Duration: 45-60 Hours

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

UNIT-A **15 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 **15 Hours**

Artificial Neural Networks and Applications

- Introduction, Basic models of ANN, Important terminologies, Supervised Learning Networks, Perception Networks, Adaptive Linear Neuron
- Backpropogation 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 Propogation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks

UNIT-C **15 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 **15 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. KarrayFakhreddineO,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. andPaiG.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.

Course Title: System Software
Course Code: CSA683
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 **15 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 **15 Hours**
- Loading, Linking & Relocation
- Program Relocatibility
- Overview of Linkage Editing
- linking for Program Overlays

Compilers
- Phases of Compilation Process
- Logical Analysis
- Parsing, Storage Management Optimisation
- Incremental Compilers
- Cross Compilers
- P Code Compilers

UNIT – C **15 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
- Recognition of Regular Expressions, LEX

UNIT – D **15 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: Addison Wesley, 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: Natural Language Processing
Course Code: CSA690
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 **15 Hours**

Introduction to Natural Language Processing

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

UNIT-B

Syntax **15 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 **15 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.

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 12Hours

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 12 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**.**

Text Books:

1. Borth, Wayne C, et. Al. The Craft of Research Chicago Guides to Writing Edition and Publishing.
2. Johnson, R.A., Probability and Statistics, PHI, New Delhi, 1994.
3. Meyer, P. L. : Introduction to Probability & Statistical Applications : Oxford, IBH, 1986.

References:

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).