Appendix- A

SAMBALPUR UNIVERSITY

JYOTI VIHAR, BURLA-768019

Two Year M.Sc. Degree Course in

Computer Science

M.Sc. Computer Science

(To be implemented from Academic year 2020-2021)

Semester Structure

First Semester - First August to December.

Second Semester - First January to June.

Third Semester - First July to December.

Fourth Semester - First January to June.

Course Structure of M.Sc. Computer Science Programme

Semester - I	Semester - II	Semester - III	Semester - IV
Object Oriented Programming using C++	Programming with JAVA	Python Programming	Major Project
Software Engineering &OOAD	Database Management System	Data Communication &Networking	Seminar
Operating System	Data Structure	Digital Image Processing	
Computer Organization and Architecture	Discrete Mathematics	Elective: (Select any one) 1. Artificial Intelligence 2. Parallel Computing 3. Computer Security 4. Analysis & Design of Algorithm	
Lab on C++	Lab on JAVA Programming	Lab on Python Programming	
Lab on Operating System	Lab on DBMS	Lab on Digital Image Processing	

Semester - I

Course Code	Course Title	No. of Credits	No. of Hours/Week
MSC -101	Object Oriented Programming using C++	4	4
MSC -102	Software Engineering &OOAD	4	4
MSC -103	Operating System	4	4
MSC -104	Computer Organization and Architecture	4	4
MSC -105	Lab on C++	3	6
MSC -106	Lab on Operating System	3	6
Total No of Credits		**22**	-

Semester - II

Course Code	Course Title	No. of Credits	No. of Hours/Week
MSC -201	Programming with JAVA	4	4
MSC -202	Database Management System	4	4
MSC -203	Data Structure	4	4
MSC -204	Discrete Mathematics	4	4
MSC -205	Lab on JAVA Programming	3	6
MSC -206	Lab on DBMS	3	6
Total No of Credits		**22**	-

Semester - III

Course Code	Course Title	No. of Credits	No. of Hours/Week
MSC -301	Python Programming	4	4
MSC -302	Data Communication &Networking	4	4
MSC -303	Digital Image Processing	4	4
MSC -304	Elective: (Select any one)	4	4
MSC -304(1)	Artificial Intelligence		
MSC -304(2)	Parallel Computing		
MSC -304(3)	Computer Security		
MSC -304(4)	Analysis & Design of Algorithm		
MSC -305	Lab on Python Programming	3	6
MSC -306	Lab on Digital Image Processing	3	6
Total No of Credits		**22**	-

Semester - IV

Course Code	Course Title	No. of Credits	No. of Hours/Week
MSC -401	Major Project	12	24
MSC -402	Seminar	4	4
Total No of Credits		**16**	-

Total Credits of the Course

	Sem - I	Sem - II	Sem - III	Sem - IV	TOTAL
Total No of Credits	22	22	22	16	**82**

First Semester
Course Title: OBJECT ORIENTED PROGRAMMING USING C++
Course Code: MSC-101
No. of Credits - 4

Objectives

- To understand basics of OOPS which includes classes, objects etc.
- To understand inheritance, polymorphism concept
- To understand how to use exceptional handling in C++

UNIT-I

Object-Oriented programming paradigm, Drawbacks of procedural programming, Advantages of OOP, Basic data types, Tokens, Keywords, Identifiers, Variables, Operators: Arithmetic, Relational, Logical, Assignment, Ternary, Bitwise, Unary Operators, Expressions and statements, Input and Output in C++, manipulators with parameters, Flow of control - if, if-else, while, do-while, for loop, Switch, break and continue.

UNIT-II

defining and initializing arrays, accessing array elements, Single and multidimensional arrays. Character array, string variables, reading multiple lines, arrays of strings, specifying the structure, accessing structure members, array of structures. Classes and objects, Class declaration, Data member and Member functions, private and public members, scope resolution operator

UNIT-III

Inline Functions, Passing objects as arguments, returning objects, Function overloading, Friend function, constructors, destructors, overloaded constructors, Types of Constructor, operator overloading: Unary Operator, Binary Operator,

UNIT-IV

Inheritance: Derived Class and Base Class, specifying the derived class, accessing base class members, the protected access specifier, abstract base class, single, multilevel, multiple inheritance, ambiguity and multiple inheritance. Polymorphism, pointers, Virtual base class, Virtual functions & dynamic binding, Exception handling.

Books Recommended:

1. E. Balguruswamy, "Object-Oriented programming with C++",TMH, 5th Edition, 2011
2. R.Lafore**,** "Object-oriented programming in TURBO C++", Galgotia, 1st Edition, 1997
3. Y.P.Kanetkar**,** "Let us C++", BPB publication , 2nd Edition, 2015
4. Stanley B. Lippman, Josée Lajoie, "C++ Primer", Pearson Education, 4th Edition

FIRST SEMESTER
Course Title: SOFTWARE ENGINEERING & OOAD
Course Code: MSC-102
No. of Credits - 4

Objectives

- To understand the importance of software engineering lifecycle models in the development of software
- To understand the various design principles in modelling a software
- To develop a software which adheres to the standard benchmarks

- To undergo the technical know in the process of software testing Outcomes

UNIT-I

Introductory concepts: Introduction, definition, objectives, Life cycle Models. Software project management concept, project planning, metrics, estimation techniques: empirical and heuristic (COCOMO), Scheduling, Staffing, Risk management and Software configuration management. Requirements analysis and specification: Requirement gathering and analysis, SRS.

UNIT-II

Software Design: Overview of Design, Cohesion and coupling, Function oriented software design. Object-oriented Design: Object modeling using UML, use case diagram, class diagram, interaction diagrams: activity diagram, Package, Component and Deployment diagram, State chart.

UNIT-III

Coding and Testing: Coding, Code review, software documentation, testing, unit testing, black box and white box testing, debugging, integration and system testing. Maintenance: Characteristics, controlling factors, maintenance tasks, side effects, types of maintenance - Re Engineering - Reverse Engineering - Maintenance tools and techniques.

UNIT-IV

Software quality: SEI CMM and ISO-9000. Software reliability and fault-tolerance. Computer-aided software engineering (CASE): Characteristics of CASE Tools, Architecture of CASE environment, Software reuse.

Books Recommended:

1. Rajib Mall," Fundamentals of Software Engineering", PHI, 4th edition.
2. R.S. Pressman, "Software Engineering Practitioner's Approach", TMH, 7th Edition, 2010
3. Sommerville, "Software Engineering ", Pearson Pub, 9th edition, 2010
4. Pankaj Jalote, "A Concise Introduction to Software Engineering", Springer

FIRST SEMESTER
Course Title: OPERATING SYSTEM
Course Code: MSC-103
No. of Credits - 4

Objectives

- To know the basics such as process and CPU scheduling algorithms
- To understand the critical regions and dead lock problem
- To understand virtual memory concept, thrashing problem and page replacement algorithms
- To understand the file tables, access algorithms, and spoofing

UNIT-I

Evolution of Operating Systems: Types of operating systems, functional behavior & responsibilities as a resource manager, Logical View and User View, System Components, Operating system services. The process management: Process concept, Process Control Block, Process Scheduling, Short terms and long term Schedulers, Context Switch, Operation on Processes.

UNIT-II

CPU Scheduling: CPU-I/O cycle, CPU Scheduler, preemptive Scheduling, Dispatcher, Scheduling criteria, Scheduling Algorithms- FCFS, SJF, Priority and round robin scheduling. Deadlocks: Deadlock characterization, Resource Allocation graph, Methods of handling Deadlocks, Deadlock prevention & avoidance, Deadlock Detection and deadlock Recovery

UNIT-III

Memory Management: logical versus physical Address, Swapping, Single partition allocation, multiple partition allocation, paging, segmentation, address mapping. Demand paging, Virtual memory, protection and address mapping hardware, page fault, Page replacement algorithms-FIFO, Optimal, LRU.

UNIT-IV

File Systems: general model of a file system, Logical and Physical file system, Disk structure, disk scheduling: FCFS scheduling SSTF scheduling, SCAN scheduling, C-SCAN scheduling, LOOK scheduling.

Books Recommended:

1. Silberschatz & P.B. Galvin, "Operating Systems Concepts", Addison - Wesley, 9th Edition, 2012
2. Tanenbaum," Modern Operating System", Pearson Education, 3rd Edition, 2015
3. William Stallings ,"Operating Systems: Internals and Design Principles", 6th Edition
4. Dhananjay Dhamdhere, "Operating System a Concept Based Approach", 3rd Edition, 2017

FIRST SEMESTER
Course Title: COMPUTER ORGANIZATION AND ARCHITECTURE
Course Code: MSC-104
No. of Credits - 4

Objectives

- To impart the essential knowledge on the fundamentals and applications of digital circuits and digital computing principles
- To provide an overview on the design principles of digital computing systems
- To provide technical knowledge about various digital hardware components

UNIT-I:

Basic organization of the computer and block level description of the functional units as related to the execution of a program. Von-Neumann's architecture. Digital logic gates, Boolean algebra, Boolean Function and simplification, Simplification of Boolean function using K-Map. Canonical form of Boolean functions-SOP and POS.

UNIT-II:

Combinational and Sequential Circuits- Adders, Subtractors, Carry-Look-Ahead (CLA) adder, encoder and decoders, multiplexer and demultiplexer. Flip Flops- RS, JK, D, T and Master Slave Flip Flops. Registers and counters.

UNIT-III:

CPU Organization: Instruction codes, Computer Instructions, Instruction Cycles, Execution of Instructions, Instruction Formats (Zero, One and Two address instruction), Addressing Modes, Discussions about RISC versus CISC architectures.

UNIT-IV:

Memory and IO access: Memory maps, Read Write operation, Programmed IO, Concept of handshaking, Polled and interrupt driven IO, DMA controller and data transfer. IO subsystems: Interfacing with IO devices. Memory organization: static and dynamic memory; Memory Hierarchy, cache memory and its access techniques; Virtual memory.

Books Recommended:

1. M. Morris Mano, "Computer System Architecture", PHI, 3rd Edition
2. William Stallings , "Computer Organization and Architecture", Pearson / PHI, 9th Edition, 2013

3. B.RAM , "Fundamentals of Microprocessor and Microcontrollers", Dhanpat Rai Publication, 2010 Edition
4. Er. Rajiv Chopra ,"Computer Architecture and Organization", S.Chand
5. B.Ram ," Computer Fundamentals- Architecture and Organization", New Age, 2009 Edition
6. B.P.Singh and Renu Singh , "Advanced Microprocessors and microcontrollers", New Age, 2008 Edition

FIRST SEMESTER
Course Title: LAB ON C++ PROGRAMMING
Course Code: MSC-105
(based on Paper-MSC - 101: PROGRAMMING IN C++)
No. of Credits - 3

FIRST SEMESTER
Course Title: LAB ON OPERATING SYSTEM
Course Code: MSC-106
(based on Paper-MSC - 103: OPERATING SYSTEM)
No. of Credits - 3

SECOND SEMESTER
Course Title: PROGRAMMING WITH JAVA
Course Code: MSC-201
No. of Credits - 4

Objectives

- To understand basic syntax of JAVA programming language
- To able to differentiate between JAVA and C++
- To able to understand concepts of inheritance and polymorphism in java
- To understand use of exceptional handling in JAVA
- To get basics of graphics programming in java

UNIT-I

An overview of object oriented programming and Terminology: Abstraction variable and methods, encapsulation interfaces, message: object communicating with objects, modularity, classification, inheritance.

UNIT-II

Overview of JAVA Language, Java development environment, Language fundamental : how java differs from C AND C++: Programs structure and environment name space: packages, classes and members, Command line argument, no processor, Unicode and character escape, primitive data type, reference data type, objects, array, strings, operators, statement, exceptions and exception handling, multi threading .

UNIT-III

Classes and objects in Java: introduction to class and objects, objects creation, class variables, class methods, object destruction, subclass and inheritance overriding methods, Data hiding and encapsulation, abstract class and interface, strings arrays and utility classes, standard system streams. IO streams, filtered stream.

UNIT-IV

Introduction to Applet, designing basics, drawing graphics, handling events, reading applet parameters, images and sounds, AWT overview, graphics, fonts, colors, images, Java controls, layout components.

Books Recommended:

1. Herbert Schildt , "JAVA- The Complete Reference", Mcgraw Higher Ed, 7th Edition, 2007
2. David Flanagan**,** "Java in Nutshell", O' Reilly, 6th Edition, 2015
3. E. Balaguruswami, "Programming with JAVA 5th Edition", Mcgraw Higher Ed, 5th Edition, 2014
4. P Radha Krishna, "Object oriented Programming through Java", Orient BlackSwan, 1st Edition, 2006

SECOND SEMESTER
Course Title: DATABASE MANAGEMENT SYSTEM
Course Code: MSC-202
No. of Credits - 4

Objectives

- To understand the different database models and language queries to access databases
- To understand the normalization forms in building an effective database tables
- To protect the data and the database from unauthorized access and manipulation
- To get basic idea about transaction and concurrency control system
- To get basics of distributed databases

UNIT-I

Introduction to Database Systems: Data and Information, Database: Definition, Database Management, Structure, Limitations of traditional file processing systems, Advantages and disadvantages of DBMS, Users of DBMS. Database Architecture and Environment: Components of DBMS, Data Independence and 3-tier architecture and View of Data. Data Model: Concept, Applications, types of Data models: Hierarchical, Network, Relational, Entity Relationship model: Concepts of entity, entity set, attributes, E-R diagram.

UNIT-II

Relational Query Languages, Relational Algebra and operations, Tuple and Domain Relational Calculus, Keys: Super key, candidate, primary, composite, Alternate and foreign keys. Strong and weak entities. Integrity constraints. SQL- Languages: DDL, DML and DCL.

UNIT-III

Relational Database Design: Domain and Functional dependency, Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF, 5NF), Dependency Preservation decomposition and Lossless Join. Codd's rules. Object Oriented Databases Need for OODBMS, Object structure: Class, polymorphism, encapsulation, inheritance.

UNIT-IV

Specialization, Generalization, and Aggregation. Object modeling techniques. The distributed databases - Motivation for Distributed Database, Distributed Database concepts. Transaction Management: Transaction Management and Concurrency Control Transaction: Properties (ACID), states, Commit, Rollback Concurrency: Control, Lost update problems, Locks, two phase locking, serialization.

Books Recommended:

1. Silberschatz, Korth, Sudarshan, "Database System Concepts", McGraw Hill, 4th Edition 2002
2. Elmasari, Navathe," Fundamentals of Database Systems", Pearson, 7th Edition, 2016

3. Ramakrishnan , "Database Management Systems", Mcgraw Higher Ed, 3rd Edition, 2014
4. Atul Kahate,"Introduction to Database Management Systems", Pearson Education, 1st Edition, 2004

SECOND SEMESTER
Course Title: DATA STRUCTURE
Course Code: MSC-203
No. of Credits - 4

Objectives

- To learn how the choice of data structures impacts the performance of programs.
- To study specific data structures such as arrays, linear lists, stacks, queues, hash tables, binary trees, binary search trees, heaps and AVL trees.
- To learn efficient searching and sorting techniques.

Unit-I
Introduction: Basic Terminology, Data structure, Time and space complexity, Review of Array, Structures, Pointers.
Linked Lists: Dynamic memory allocation, representation, Linked list insertion and deletion, Searching, Traversing in a list, Doubly linked list, Sparse matrices.
Unit-II
Stack: Definition, Representation, Stack operations, Applications (Infix–Prefix–Postfix Conversion & Evaluation, Recursion).
Queues: Definition, Representation, Types of queue, Queue operations, Applications.
Unit-III
Trees: Tree Terminologies, General Tree, Binary Tree, Representations, Traversing, BST, Operations on BST, Heap tree, AVL Search Trees, M-way search tree, Applications of all trees.
Unit-IV
Sorting: Exchange sorts, Selection Sort, Bubble sort, Insertion Sorts, Merge Sort, Quick Sort, Radix Sort, Heap sort.
Searching: Linear search, Binary search.

Text book:
1. Classic Data Structure, P. Samanta , PHI , 2/ed.
Reference Books:
1. Ellis Horowitz, Sartaj Sahni, “Fundamentals of Data Structures”, Galgotia Publications, 2000.
2. Sastry C.V., Nayak R, Ch. Rajaramesh, Data Structure & Algorithms, I. K. International Publishing House Pvt. Ltd, New Delhi.

SECOND SEMESTER
Course Title: DISCRETE MATHEMATICS
Course Code: MSC-204
No. of Credits - 4

Objectives

- To get familiar and understand the fundamental notions in discrete mathematics
- To understand and demonstrate the basic concept of an algorithm and its application in combinatorial mathematics
- To identify the basic properties of graphs and trees and model simple applications

- To understand the basic concept of group theory and its application
- To get familiar with some statistical measures

UNIT - I

Fundamentals of logic, Prepositional equivalences, Predicates and Quantifiers, Methods of Proof, Sequences and summations, Mathematical Induction. Sets, Set operations, Properties of binary relations, Equivalence relations and partitions, Partial ordering relations and lattices, Properties of lattices, Distributive and Complemented lattices, Boolean algebra,

UNIT - II

The basics of counting, Permutations and Combinations, Recurrence relations, Solving Recurrence relations, Generating functions, Inclusion-exclusion.

UNIT - III

Groups, Subgroups, Cosets and Lagrange's Theorem, Codes and Group codes, Homomorphism and Normal subgroups, Isomorphism, Ring, Integral Domains and Fields.

UNIT-IV

Introduction to graphs, Graph terminology, Representing graphs and Graph isomorphism, Euler and Hamilton paths, Introduction to trees, Applications of trees.

Frequency Distribution, Measures of Central Tendencies, Dispersion, Skewness, Kurtosis, Mathematical Expectation.

Books Recommended:

1. Kenneth H. Rosen, "Discrete Mathematics & Its Application", TMH, 7th Edition, 2011
2. C. L. Liu, "Elements of Discrete Mathematics", TMH, 2nd Edition, 2000
3. Bernardi Kolman, Robert C. Busby, Sharon Ross, "Discrete Mathematical Structure", PHI, 6th Edition, 2008
4. S.P.Gupta, "Statistical Methods", S.Chand & Sons, 2011 Edition

SECOND SEMESTER
Course Title: LAB ON JAVA PROGRAMMING
Course Code: MSC-205
(based on Paper- MSC-201: PROGRAMMING WITH JAVA)
No. of Credits - 3 F.M. -10

SECOND SEMESTER
Course Title: LAB ON DBMS
Course Code: MSC-206
(based on Paper- MSC-202: DATABASE MANAGEMENT SYSTEM)
No. of Credits - 3 F.M. -100

THIRD SEMESTER
Course Title: Python Programming
Course Code: MSC-301
No. of Credits - 4

Objectives

- To enable the students to understand the basic principles of the Python Language.
- To use the tools to do simple programs in python.

Unit-I

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Unit-II

Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up
programming.

Unit-III

Overview of Programming: Structure of a Python Program, Elements of Python. Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

Unit-IV

Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments.

Text Books

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011

Reference Books

1. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist :
learning with Python , Freely available online.2012

THIRD SEMESTER
Course Title: DATA COMMUNICATION & NETWORKING
Course Code: MSC-302
No. of Credits - 4

Objectives

- To provide insight about networks, topologies, and the key concepts
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP
- To know the basic concepts of network security and its various security issues related with each layer

UNIT-I:

Overview of Data Communications and Networking. Networking - Needs and Advantages, Network Types- Client, Server and Peers. Network Topology-Bus, Star, Ring, Star and Mesh Topologies (Features, Advantages and disadvantages of each type). Mode of data communication. Physical Layer : Analog and Digital data and signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.

UNIT-II

Digital Transmission: Line coding, Sampling, Transmission mode. Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals. Multiplexing: FDM, WDM and TDM, Transmission Media: Guided Media, Unguided media (wireless), Switching techniques: Circuit switching and Packet switching.

UNIT-III

Data Link Layer: Error Detection and correction: Type of Errors, Detection, Error Correction. Data Link control and protocols: Flow and error Control, Stop-and-wait ARQ. Go-Back-N -ARQ, Selective Repeat ARQ, HDLC. Point-to-Point Access: PPP. Point-to Point Protocol, PPP Stack. Multiple-Access: Random Access, Controlled Access, Channelization. Local Area Network: Ethernet. Traditional Ethernet, Fast Ethernet, Gigabit Ethernet. Token bus (IEEE- 802.4), Token ring (IEEE-802.5).

UNIT-IV

Network Layer: Host to Host Delivery: Internetworking, addressing and Routing. Network Layer Protocols: ARP, IPv4, ICMP, IPv6, Transport Layer; Process to process Delivery: UDP; TCP congestion control and Quality of service. Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP) and File transfer (FTP), Telnet, HTTP and WWW, Security: Cryptography, Message security, User Authentication.

Books Recommended:

1. B.A. Forouzan, "Data Communication and Networking", TMH, 4th Edition, 2006
2. A.S. Tannenbaum, "Computer Networks", Pearson, 5th Edition, 2012
3. William Stallings , "Data and Computer Communications", Pearson, 8th Edition, 2009
4. Rajneesh Agrawal, "Data Communication And Computer Networks", S Chand, 1st Edition, 2005

THIRD SEMESTER
Course Title: DIGITAL IMAGE PROCESSING
Course Code: MSC-303
No. of Credits - 4

Objectives

- To learn the fundamental concepts of Digital Image Processing
- To study basic image processing operations
- To understand image analysis algorithms
- To expose students to current applications in the field of digital image processing

UNIT-I

What is Digital Image Processing, Fundamental Steps in Digital Image Processing, Elements of Visual Perception, Image Sampling and Quantization, Some basic relationships between Pixels, Image Enhancement: Gray Level Transformation: Image Negatives, Log Transformations, Histogram Processing: Histogram Equalization, Basics of Spatial Filtering

UNIT-II

Image Transforms; Fourier Transform and their properties, Smoothing Frequency-Domain Filtering: Ideal, Butterworth, Gaussian Low pass Filters, Sharpening Frequency Domain Filtering: Ideal, Butterworth, Gaussian High pass Filters.

UNIT-III

Image Restoration: A model of the Image Degradation/Restoration Process, Noise Models. Restoration in the Presence of Noise Only-spatial Filtering. Estimating the Degradation Function. Inverse Filtering. Minimum Mean Square Error (Wiener) Filtering. Morphological Image Processing: Preliminaries. Dilation and Erosion. Opening and Closing. The Hit-or- Miss Transformation.

UNIT-IV

Some Basic Morphological Algorithms: Boundary Extraction, region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning. Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory, Error-Free Compression: Variable length

coding, LZW coding, Image Segmentation: Detection of Discontinuity, Edge linking and Boundary Detection, Region based Segmentation.

Books Recommended:

1. R.C.Gonzalez & R.E.Wood, "Digital Image Processing", Addison Wesley.
2. B.Channda & D.Dutta," Digital Image Processing and Analysis", PHI, 2nd Edition, 2011
3. A.K.Jain, "Fundamentals of Digital Image Processing", Pearson Education, 1st Edition, 2015
4. George Baciu David Zhang Zhang Kamel, "Integrated Image and Graphics Technologies", Springer Us, 1st Edition, 2004

THIRD SEMESTER
Course Title: ARTIFICIAL INTELLIGENCE (ELECTIVE)
Course Code: MSC-304(1)
No. of Credits - 4

Objectives

- To know about basic concepts of NLP and Machine Learning
- To obtain a thorough knowledge of various knowledge representation schemes
- To have an overview of various AI applications
- To study about various heuristic and game search algorithms
- To know about various Expert System tools and applications

UNIT - I

General Issues and overview of AI: The AI problems; What is an AI technique; Characteristics of AI applications, Problem solving, search and control strategies: General problem solving; production systems; control strategies: forward and backward and backward chaining Exhaustive searches: Depth first Breadth first search

UNIT - II

Heuristic Search techniques: Hill climbing; Branch and Bound technique; Best first search and A* algorithm; AND/Or Graphs; problem reduction and AO* algorithm; constraint satisfaction problems, Game playing: Minimax search procedure; Alpha-Beta cutoffs; Additional Refinements

UNIT - III

Knowledge Representation: First order predicate calculus; Skolemization Resolution principle and unification; Inference Mechanisms; Horn's clauses; semantic Networks; frame systems and value inheritance. Scripts; conceptual dependency;

UNIT - IV

Natural language processing : Parsing technique; context—context- free grammar; Recursive Transition Nets (RTN); Augmented Transition Nets ((ATN); case and logic grammars; semantic analysis, Planning : Overview- An example Domain: The Blocks Word. Component of planning systems: Goal Stack Planning (linear planning); Non-linear planning using goal sets; probabilistic reasoning and Uncertainty; probability theory; Bayes Theorem and Bayesian networks; certainty factor.

Books Recommended:

1. Elaine Rich and Kevin knight, "Artificial Intelligence", Tata McGraw hill, 3rd Edition, 2012
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson, 1st Edition, 2015
3. Nills j. Nilson, "Principles of Artificial Intelligence", Springer, 1982 Edition
4. Clocksin & C.S. Melish, "Programming in PROLOG", Springer-Verlag, 5th Edition

5. M.sasikumar ,S.Ramani, "Rule based expert system (A practical Introduction)", narosa publishing house.

THIRD SEMESTER
Course Title: PARALLEL COMPUTING (ELECTIVE)
Course Code: MSC-304(2)
No. of Credits - 4

Objectives

- Parallel Programming Platforms.
- Principles of Parallel Algorithm Design.
- Analytical Modelling of Parallel Programs.
- Parallel Programming Paradigms.
- Programming Shared Address Space Platforms.
- Programming Message Passing Platforms.

UNIT-I

Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing. Parallel Programming Platforms : Implicit Parallelism, Limitation of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs of Parallel Machines, Routing Mechanism for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques.

UNIT-II

Principles of Parallel Algorithm Design : Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing Interaction Overheads, Parallel Algorithm Models. Analytical Modeling of Parallel Programs : Sources of Overhead in Parallel Programs, Performance metrics for parallel systems, the effect of Granularity on Performance

UNIT-III

Scalability of Parallel Systems, Minimum Execution time and minimum Cost-optional Execution Time, Asymptotic Analysis of Parallel Programs, other Scalability Metrics. Basic Communication Operations : One-to-All Broadcast and All-to-One Reduction, All-to-All shift.

UNIT - IV

Introduction to MPI : Principles of Message - Passing Programming, The Building Blocks (Send and Receive Operations), MPI (the Message Passing Interface), Collective Communication and Computation Operations, Examples of Matrix - Matrix Multiplication, One dimensional Matrix Vector Multiplication using MPI. Matrix Vector Multiplication, Matrix - matrix multiplication (a simple parallel Algorithm, Cannon's Algorithm), A simple Gaussian Elimination Algorithm, Solving a Triangular System (Back Substitution), Issues in Sorting on Parallel Computers, Odd-Even Transposition, Quick sort.

Books Recommended:

1. Ananth Gramma, Anshul Gupta, George Karypis & Vipin Kumar, "Introduction to Parallel Computing", Pearson, 2nd Edition, 2003
2. Kai Hwang , "Advanced Computer Architecture", McGraw Hill, 2nd Edition, 2010
3. D.E. Culler, J.P.Singh - Morgan Kaufmann , Parallel Computer Architecture" , Elsevier, 1st Edition, 2011
4. Michael J. Quinn, "Parallel Computing Theory and Practice", Mcgraw Higher Ed, 2nd Edition, 2002

THIRD SEMESTER
Course Title: COMPUTER SECURITY (ELECTIVE)

Course Code: MSC-304(3)

No. of Credits - 4

Objectives

- To understand the threat models and the basic types of authentication mechanisms
- To analyze cryptographic techniques, protocols, formats, and standards
- To analyze different log files and understand Cyber laws to recover and secure the data

UNIT-I

The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense, Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption algorithms, The Data Encryption Standard, The AES Encryption Algorithms, Public Key Encryptions, Uses of Encryption.

UNIT-II

Program Security: Secure Programs, Nonmalicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats, Protection in General-Purpose operating system protected objects and methods of protection memory and addmens protection, File protection Mechanisms.

UNIT-III

User Authentication Designing Trusted O.S: Security polices, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples. Data base Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security. Security in Network: Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-Mail.

UNIT-IV

Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security. Legal Privacy and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Praia, Ethical issues in Computer Security, case studies of Ethics.

Books Recommended:

1. Charles P.Pfleeger, Shari Lawrence Pfleeger , "Security in Computing", PHI, 3rd Edition
2. A. Kahate , "Cryptography and Network Security", TMH, 3rd Edition, 2013
3. J.W.Rittiaghouse and William M.Hancok, "Cyber Security Operations Handbook", Elseviers.
4. Dieter Gollmann, "Computer Security", Wiley, 3rd Edition, 2014

THIRD SEMESTER

Course Title: ANALYSIS AND DESIGN OF ALGORITHM (ELECTIVE)

Course Code: MSC-304(4)

No. of Credits - 4

Objectives

- To understand the importance of algorithm and its complexity
- To analyze the complexity of an algorithm in terms of time and space complexities
- To design and implement various programming paradigms and its complexity

UNIT-I

Algorithms and Complexity - asymptotic notations, orders, worst-case and average-case, amortized complexity. Basic Techniques - divide & conquer

UNIT-II

Data Structures - heaps, search trees, union-find problems. Applications - sorting & searching, Branch and bound, randomization, combinatorial problems.

UNIT-III

Graph Algorithms - BFS and DFS, connected components, greedy method, backtracking, Dynamic programming,

UNIT-IV

Optimization problems, computational geometric problems, string matching. Spanning trees, shortest paths, max-flow, NP - completeness, Approximation algorithms.

Books Recommended

1. Horowitz E. & Sahni S and S.Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2nd Edition, 2008
2. Aho, Hopcroft & Ullman, "The Design and Analysis of Computer Algorithms", Pearson, 1st Edition, 1974
3. T.H.Coremen, C.E Leiserson, R.L.Rivest and C.Stein," Introduction to Algorithms", PHI, 3rd Edition, 2009
4. D.E. Knuth, "Fundamental Algorithms", Addison-wesley, 3rd Edition

THIRD SEMESTER
Course Title: LAB ON PYTHON PROGRAMMING
(based on Paper- MSC-301: PROGRAMMING WITH PYTHON)
Course Code: MSC-305
No. of Credits - 3

THIRD SEMESTER
Course Title: LAB ON DIGITAL IMAGE PROCESSING
(based on Paper- MSC-303: DIGITAL IMAGE PROCESSING)
Course Code: MSC-306
No. of Credits - 3

FOURTH SEMESTER
Course Title: MAJOR PROJECT
Course Code: MSC-401
No. of Credits - 12

FOURTH SEMESTER
Course Title: SEMINAR
Course Code: MSC-402
No. of Credits - 4