

# BERHAMPUR UNIVERSITY

## *Syllabus*

for

## **Master of Computer Applications**



**Department of Computer Science**  
**Berhampur University**  
**Berhampur-760007 (Orissa)**

**2015-16**

# BERHAMPUR UNIVERSITY

## Syllabus for Masters of Computer Application

(Applicable for Students Taking Admission from the Session 2015-16)

### Objectives of the Course

The MCA curriculum has been designed keeping in view the requirements of the IT industry and also to serve as a foundation for higher studies in computer science. It focuses both on theoretical and practical aspects of computer science. After successful completion of this course a student can join the IT industry as a system professional or pursue research in the core areas of computer science and applications.

### First Semester

Sl. No.	Subject Code	Subject Title	Internal	External	Credits
1.	CS 1.1	Information Technology	20	80	4
2.	CS 1.2	Programming in C	20	80	4
3.	CS 1.3	Data and File Structures	20	80	4
4.	CS 1.4	Logical Organization of Computers	20	80	4
5.	CS 1.5	Mathematical Foundations of Computer Science	20	80	4
6.	CS 1.6	Practical - 1 (C Programming & UNIX/LINUX Lab )	100		4

### Second Semester

7.	CS 2.1	Data Base Management Systems	20	80	4
8.	CS 2.2	Operating Systems	20	80	4
9.	CS 2.3	Computer Architecture	20	80	4
10.	CS 2.4	Computer Oriented Numerical & Statistical Techniques	20	80	4
11.	CS 2.5	Management Information Systems	20	80	4
12.	CS 2.6	Practical - 2 (Data Base Lab)	100		4

### Third Semester

13.	CS 3.1	Object Oriented Programming with C++	20	80	4
14.	CS 3.2	Computer Based Optimization Techniques	20	80	4
15.	CS 3.3	Computer Network	20	80	4
16.	CS 3.4	Design and Analysis of Algorithms	20	80	4
17.	CS 3.5	Software Engineering	20	80	4
18.	CS 3.6	Practical – 3 (C++ Programming Lab)	100		4
19.	CS 3.7 (CBCS)	Information and Communication Technology	20	80	4

<b>Fourth Semester</b>					
20.	CS 4.1	Programming in Java	20	80	4
21.	CS 4.2	Object Oriented Modeling	20	80	4
22.	CS 4.3	Information Security	20	80	4
23.	CS 4.4	Cloud Computing	20	80	4
24.	CS 4.5	Elective-I	20	80	4
25.	CS 4.6	Practical – 4 (Java Programming Lab)	100		4
<b>Fifth Semester</b>					
26.	CS 5.1	E-Commerce	20	80	4
27.	CS 5.2	Artificial Intelligence	20	80	4
28.	CS 5.3	Soft Computing	20	80	4
29.	CS 5.4	Data Warehousing and Data Mining	20	80	4
30.	CS 5.5	Elective-II	20	80	4
31.	CS 5.6	Minor Project & Comprehensive Viva	100		4
<b>Sixth Semester</b>					
32.	CS 6.1	Major Project Work & Viva	300		15
<b>Elective – I Courses for Paper CS 4.5</b>					
33.	CS 4.5	Computer Graphics	20	80	4
34.	CS 4.5	Image Processing	20	80	4
35.	CS 4.5	Distributed Systems	20	80	4
36.	CS 4.5	Software Project Management	20	80	4
<b>Elective – II Courses for Paper CS 5.5</b>					
37.	CS 5.5	Mobile Computing	20	80	4
38.	CS 5.5	Service Oriented Computing	20	80	4
39.	CS 5.5	Compiler Design	20	80	4
40.	CS 5.5	Parallel Computing	20	80	4
<b>Total</b>			<b>3300</b>		<b>135</b>

Credit distribution pattern in **L - T - P** format for theory and practical papers is as follows:-

Theory : 3 - 1 - 0 (three lectures, one tutorial, and no practical classes per week)

Practical : 0 - 0 - 4 (no lecture, no tutorial, and four practical classes per week)

A student has to opt for one elective paper in each of the 4<sup>th</sup> and 5<sup>th</sup> semesters from among the courses as listed against Elective - I and Elective - II.

**Note: Under the Choice Based Credit System a student in 3<sup>rd</sup> semester may opt for a course offered by other P.G. Departments of the University in lieu of the courses CS 3.1 to CS 3.5.**

# **FIRST SEMESTER COURSES**

## **CS 1.1 INFORMATION TECHNOLOGY**

### **UNIT-1**

Evolution of computers, basic organization of a computer with its working principle, input-output and secondary storage devices, memory representation of data, number systems and their inter-conversions.

### **UNIT-2**

Computer software: types of software, problem solving using a computer, flowchart, algorithms, basic algorithmic notions, procedure- and object oriented programming, role of operating system, business data processing, role of DBMS, multi-media applications.

### **UNIT-3**

Data communication and computer networks: basic elements of a communication system, data transmission media, digital and analogue transmission, network topologies, types of networks, use of different network components, Internet, WWW, web browsers, search engines, applications of Internet, cyber security.

### **UNIT-4**

Office automation tools:

MS WORD: creating a document, editing and formatting, setting header and footer, insertion of table, chart, etc., mail merge facility

MS EXCELL: creating a spread sheet, use of basic formulae and functions, filter and creating charts.

MS POWER POINT: preparing power point slides, adding animation and different effects.

### **BOOKS:**

1. Computer Fundamentals, P K Sinha, P Sinha, BPB publications.
2. Information Technology, D. V. Singh and S. Kumar, N. Tyagi *et al*, University of Delhi
3. Essential Computer and IT Fundamentals for Engineering and Science Students, N. B. Venketeswarlu, S. Chand publications.

## **CS 1.2 PROGRAMMING IN C**

### **UNIT-1**

Program development: Problem Analysis, coding, editing, Compiling, executing and testing of programs, Structured programming, C language fundamentals, data types, Constants and variables, Statements, Expressions, Operators, Type conversion, input and output statements. Control structures: IF...ELSE, SWITCH...CASE, FOR..., WHILE..., DO...WHILE

### **UNIT-2**

Arrays: one dimensional, multidimensional arrays, Declaration and manipulation of arrays

Strings: String variable, String handling functions, Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function prototype, Parameter passing, Recursive functions.

### **UNIT-3**

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

Pointers, pointer arithmetic, pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers.

### **UNIT-4**

Dynamic memory allocation: malloc( ) and calloc ( )

Storage classes: Auto, Extern, register and static variables.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files,

Pre-processor directives, command line arguments, Macros.

### **BOOKS:**

1. Programming with C, R S Bichkar, University Press
2. Programming in ANSI C - E. Balguruswamy, McGraw-Hill
3. Let us C, Y Kanitkar, BPB Publications.
4. The C programming Language-Kernigham & Ritchie, PHI
5. Introduction to C Programming - Reema Thareja, Oxford University Press.

## **CS 1.3 DATA AND FILE STRUCTURES**

### **UNIT-1**

Review of algorithmic notations, Linear data structures and their sequential storage representation, representation of stack, Queues, Circular Queues and Dequeues, Operations on these data structures, Applications of Stack and Queue, Priority Queue.

### **UNIT-2**

Linear data structures and their linked representation: Singly linked, Circularly linked and doubly linked lists, insertion and deletion operations on these data structures, Applications of linked lists: representation of sparse matrix and polynomials.

### **UNIT-3**

Representation of binary tree, tree traversal algorithms: Inorder, Preorder, Postorder (recursive and non-recursive algorithms), Binary search tree, applications of Binary tree, Representations of graph : adjacency matrix, adjacency list, multi list, graph traversals : Depth first and Breadth first.

### **UNIT-4**

Searching algorithms: Sequential and Binary search

Sorting algorithms: Insertion, Selection, Bubble, Quick, Merge, Radix and Heap sort.

File structures: Sequential, Indexed sequential and direct access files, Concepts of B-tree and AVL tree.

## **BOOKS:**

1. Data Structure and Algorithms - G.A. V. Pai, McGraw Hills Education India
2. Fundamentals of Data Structures in C - Horowitz, Sahni, Anderson-Freed, Universities Press India Pvt. Ltd.
3. Data Structures using C - Reema Thareja, Oxford University Press.
4. An Introduction to data structures with applications, J. P. Tremblay and P. G. Sorenson, McGraw Hill.

## **CS 1.4 LOGICAL ORGANISATION OF COMPUTER SYSTEMS**

### **UNIT-1**

Complements, Signed binary numbers, Addition and Subtraction in 1's complement and 2's complement form, Logic Gates, Boolean Algebra, Sum of product and product of sum Expression, Map simplification, Combinational Circuits: Half and Full adders & subtractors, parallel adders and subtractors, Binary Adder-Subtractor, Decoder, Multiplexer

### **UNIT-2**

Flip-flops, Register, Shift register, Sequential circuits: Counters (4-bit Synchronous counters with serial and parallel load only), Carry Look Ahead Adder, Addition and subtraction with Signed two's complement data, Booth Multiplication Algorithm, Floating Point Representation

### **UNIT-3**

Basic Processing Unit: Some Fundamental Concepts: Register Transfers, Performing an Arithmetic or Logic Operation, Fetching a Word from memory, Storing a word in memory, Execution of complete instruction, Multiple Bus Organization, Hardwired Control

### **UNIT-4**

Input-Output Organizations: Input-Output Interface, Asynchronous Data Transfer: Strobe control, Handshaking, Modes of transfer, Priority interrupt, Direct Memory Access (DMA)

## **BOOKS:**

1. Mano M. M: Computer System Architecture (PHI)
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computes Organization- 5th Edition, McGraw-Hill Education India
3. William Stallings: Computes Organization & Architecture (PHI)
4. M. Morris Mano and M. D. Ciletti: Digital Design (Pearson)
5. Modern Digital Electronics: R. P. Jain ((TMH)

## **CS 1.5 MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE**

### **UNIT-1**

Statements and Notations, connectives, statement formula and truth tables, normal forms, theory of inference for statement calculus, predicate calculus, inference theory of predicate calculus.

### **UNIT-2**

Functions, recursion, algebraic systems with one binary operations, monoids, semi groups, groups, subgroups, homomorphism, Lagrange's theorem, Normal subgroups, residue arithmetic, application of residue arithmetic to security, Group codes.

### **UNIT-3**

Algebraic systems with two binary operations, Lattice as partial order sets, Boolean, Functions, Finite State Machines.

### **UNIT-4**

Basic concepts of Graph Theory, Directed and Undirected Graph, matrix representation of graph, storage representation and manipulation of graph, shortest path and APSP problem, trees and their representation and operations, List and graphs.

### **BOOKS :**

1. Discrete mathematical structures with application to computer science, J. P. Tremblay and R. Manohar (Mc Graw Hill International)
2. Elements of Discrete Mathematics- C. L. Liu (Mc Graw Hill)
3. Modern Applied Algebra- G. Birkhoff and T.C. Bartee (Mc Graw Hill)
4. Discrete Mathematics – S K Chakraborty & B K Sarkar, Oxford University Press.

### **CS 1.6 Practical - 1 (C Programming & UNIX/LINUX Lab)**

## **SECOND SEMESTER COURSES**

### **CS 2.1 DATA BASE MANAGEMENT SYSTEMS**

#### **UNIT-1**

Introduction to Database Systems, DBMS concepts and architecture, Data models, schemas and instances, Data Abstraction, Data Independence, Database languages. Role of DBA  
Data modelling using Entity - Relationship (ER) Model: Entity sets, attributes and keys, Relationship types, Weak Entity types.

#### **UNIT-2**

Relational model: Codd rules, Relational model constraints, Relational Algebra and Relational calculus, Constraints on Relations, Relational database design by ER & EER to Relational Mapping.

SQL, set operations, nested subqueries, derived relations, views and indexes, triggers.

Database Design: Data dependency, Functional dependencies, Normalization, First, Second and Third Normal forms, Boyce-Codd Normal form (BCNF)

#### **UNIT-3**

Query Processing: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Execution

Storage Strategies and file organizations: Disc Storage, Basic File Structures and Hashing, Indexing structures for files, multi-level indexing using B-trees and B<sup>+</sup>-trees.

#### **UNIT-4**

Transaction processing in data bases: states of a transaction, ACID Properties, Serializability.

Concurrency control: lock-based and timestamp based protocols

Database recovery techniques: log-based recovery and shadow paging, Database Security.

Deadlock detection and recovery.

#### **BOOKS :**

1. Database Systems Concepts, A. Silberschatz, H. F. Korth, S. Sudarshan (McGraw Hill)
2. Fundamentals of Database Systems, Elmsari and Navathe (Addison Wesley)
3. Database Management Systems – Rajiv Chopra, S Chand pub.

### **CS 2.2 OPERATING SYSTEM**

#### **UNIT-1**

Evolution of Operating Systems, Batch processing, Multiprogramming, time sharing, real-time systems, multi-tasking, multi processor systems, Operating System Structure, Operating system services.

File systems, File access methods: sequential, indexed and direct, File Allocation Methods, directory systems, File protection mechanisms.



## **UNIT-2**

CPU Scheduling, Scheduling concepts, Scheduling techniques: preemptive and non-preemptive, FCFS, SJF, Priority, Round Robin, multi-level feedback queues, evaluation of scheduling techniques.

Memory management: Contiguous and non-contiguous allocation, MFT, MVT, memory fragmentation, swapping, paging and segmentation.

## **UNIT-3**

Concept of Virtual Memory, demand paging, page faults, page replacement techniques: FIFO, Optimal, LRU, Belady's Anomaly, frame allocation techniques, Thrashing.

Disk scheduling : FCFS, SSTF, Scan, Look, C-Scan, C-Look

## **UNIT-4**

Concept of Deadlock, conditions for deadlock, resource allocation graph, deadlock prevention, deadlock avoidance, safety sequence, Banker's algorithm, deadlock detection and recovery, Inter-process Communication (IPC), Concurrent processes, Process synchronization, Critical Section, Classic IPC Problems, Mutual Exclusion, Semaphore.

### **BOOKS :**

1. Operating system concepts, Galvin and Silberschatz, Wiley India.
2. Principles of Operating Systems, Naresh Chauhan, Oxford University Press.
3. Modern Operating systems, A.S. Tanenbaum, Pearson Education Inc.
4. Operating Systems: A Spiral Approach", Elmasri, Carrick, Levine, McGraw-Hill

## **CS 2.3 COMPUTER ARCHITECTURE**

### **UNIT-1**

Register Transfer and Micro-operations:

Register Transfer Language, Register transfer, Bus and memory transfer, Arithmetic, Logical and Shift Micro Operation, Arithmetic Logic Shift Unit;

Basic Computer Organization and Design:

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input-Output and Interrupt. Design of Basic Computer, Design of Accumulator Logic

### **UNIT-2**

Micro-Programmed Control: Control Memory, Address Sequencing, Micro Program, Design of Control Unit

### **UNIT-3**

Memory Organization: Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, Virtual Memory

### **UNIT-4**

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors

## **BOOKS :**

1. Computer system Architecture- M. M . Mano (PHI)
2. Computes Organization & Architecture-William Stallings (PHI)
3. Computer Architecture and Organization- Rajiv Chopra (S. Chand)
4. Computes Organization- Carl Hamacher, Zvonko Vranesic, Safwat Zaky 5th Edition, Mc Graw-Hill Education India

## **CS 2.4 COMPUTER ORIENTED NUMERICAL AND STATISTICAL TECHNIQUES**

### **UNIT-1**

Solution of Algebraic and Transcendental equations, Bisection method, Method of false position, Newton-Raphson method, Algorithm and convergence of the above methods an error analysis

### **UNIT-2**

Solution of simultaneous linear equations: Gauss elimination method, Gauss-Jordan method, Gauss-Seidal method, Gauss-Jacobi method, error analysis of the above methods, ill-condition equation and refinement

### **UNIT-3**

Interpolation, polynomial interpolation, Lagrange Interpolation, Different Table, Error detection, Newton's forward and backward, Simpson's 1/3 rule

### **UNIT-4**

Probability theory: sample space, Events, probability of events, probability of union, intersection and complement of events, conditional probability, Baye's theorem, normal, binomial, poisson distribution.

## **BOOKS :**

1. Numerical Methods in Science and Engineering – S. Rajasekaran, S Chand Pub.
2. Numerical Methods Principles, Analyses, and Algorithms, Srimanta Pall, Oxford University Press
3. Introductory Methods of Numerical Analysis, S.S. Sastry (PHI).
4. Computer based numerical algorithms, V. Krishnmurty and S. K. Sen (East-West).
5. Probability & Mathematical Statistics, B. D. Gupta & O. P. Gupta (Sultan Chand)

## **CS 2.5 MANAGEMENT INFORMATION SYSTEMS**

### **UNIT-1**

Importance of information systems, Framework for business End users, Global information society, Need for information technology in Business, Globalization, Business process re-engineering, Information, System concepts, feedback & controls, Info. System components resources & activities, Types of Info system Operations support systems, management support system.

## **UNIT-2**

System approach to problem solving, defining problems & opportunities, developing & evaluating alternative solutions, System development cycle: feasibility study, system analysis, system design, prototyping, computer aided systems engineering.

## **UNIT-3**

Business information systems: marketing information system, manufacturing information system, accounting information system, human resource information system, financial information system, Transaction Processing system, information system for management, decision support system (DSS & EIS).

## **UNIT-4**

Information system for strategic advantage, reengineering business process, Managing information resources & technologies: operational management, resource management, technology management, distributed management, organizational planning & information technology, implementing business changes, security & ethical issues in information systems.

### **BOOKS :**

1. Management Information System (4<sup>th</sup> Edition), James A O'Brien (Galgotia)
2. Management information system, Sadagopan (PHI)

### **CS 2.6 Practical – 2 (Data Base Lab)**

## **THIRD SEMESTER COURSES**

### **CS 3.1 OBJECT ORIENTED PROGRAMMING WITH C++**

#### **UNIT-1**

Object Oriented programming paradigm: Procedural vs object oriented programming, Abstraction and encapsulation, data hiding, inheritance, polymorphism, Classes and objects, object creation, access specifiers: private, public and protected, Constructors: default constructor, parameterized constructor, copy constructors, destructors, member function, Inline function.

#### **UNIT-2**

Function overloading, friend function, friend class, Operator overloading, overloading Unary and Binary operators, operator overloading through friend function, type conversion, Memory management in C++: new, delete.

#### **UNIT-3**

Inheritance: Base and Derived classes, Single, Multi-level, Hierarchical, Multiple, and Hybrid inheritance, public derivation, private derivation, protected derivation, virtual base class, constructor in derived classes, function overriding.

Polymorphism: Compile time and Run time polymorphism, pointer to object, *this* pointer, virtual functions, pure virtual functions,

#### **UNIT-4**

Exception Handling, *try-throw-catch* mechanism, Exception class

Templates: Function Templates, Class Templates

Files in C++: *iostream*, Text and Binary input/output, opening and closing files, *fstream* class, file pointers, command line arguments.

#### **BOOKS:**

1. Computer Science: A Structured Approach using C++ - B A Forouzan & R F Gilberg, CENGAGE Learning Pub.
2. Programming with ANSI C++ - Bhushan Trivedi, Oxford University Press.
3. Object-Oriented Programming with C++ - E. Balguruswamy, TMH, New Delhi.
4. Object-Oriented Programming with C++ - Sourav Sahay, Oxford University Press.
5. Object-Oriented Programming with C++ - David Parsons, Pearson Education.

### **CS 3.2 COMPUTER BASED OPTIMISATION TECHNIQUES**

#### **UNIT-1**

Linear programming problem: Formulation of LPP, Graphical Method, Simplex Method, Artificial variable technique: Two Phase method and Big-M method; Duality in LPP: Concept of Duality in LPP, General rules for converting any Primal into its Dual, Duality and Simplex Method

## **UNIT-2**

Dual simplex method; Revised simplex method (Emphasis should be only on algorithm); Integer Programming: Gomory's Cutting Plane Method, Branch and Bound Method

## **UNIT-3**

Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Moving towards Optimality, MODI method, Minimization, Degeneracy, Unbalanced transportation problem; Assignment problems: Hungarian method for solution of Assignment problems, Unbalanced Assignment problems, variations in Assignment problems; Travelling salesman problem; Job sequencing

## **UNIT-4**

Non-linear programming, Quadratic programming, Project management by PERT/CPM: Determination of critical path, Project Evaluation and Review Technique (PERT), Resource allocation.

### **BOOKS:**

1. Operation Research-S.D. Sharma (Kedar Nath Ramnath Publication)
2. Operations Research – Prem Kumar Gupta and D. S. Hira (S. Chand)
3. Operations Research - Kanti Swarup (Sultan Chand & Sons).
4. Operation Research – S. R. Yadav & A. K. Malik (Oxford University Press)
5. Optimization Theory - S.S. Rao (New Age International publishers)

## **CS 3.3 COMPUTER NETWORK**

### **UNIT-1**

Introduction to computer networks, uses of computer networks, Network Hardware, Network software, OSI Reference Models, Wireless Transmission, Cellular Radio, Satellite Network , Data link layer design issues, Error Detection and Correction, Elementary Data link Protocols, Protocol Specification and Verification.

### **UNIT-2**

Channel Allocation Problem, Multiple Access Protocols, IEEE standard 802 for LANS and MANS, Internetworking Devices : Repeater, Bridges, Router, Gateway, High-speed LANS, Satellite Networks, Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, TCP/IP Protocol Suit, ATM networks.

### **UNIT-3**

Transport Layer Services, Elements of Transport Protocols, Performance Issues, Cryptography and Network security.

### **UNIT-4**

DNS, Electronic mail, SMTP, FTP, TELNET, SNMP, WWW and HTTP.

### **BOOKS :**

1. Computer Networks -A S Tenenbaum (PHI)

2. Data Communications and Networking - B. A. Forouzan (PHI)
3. Computer Networks – Bhushan Trivedi, Oxford University Press.

## **CS 3.4 DESIGN AND ANALYSIS OF ALGORITHMS**

### **UNIT-1**

Review of basic data structures, concepts in algorithm analysis, asymptotic complexity, Big O, Omega and Theta notations.

### **UNIT-2**

Domain independent algorithm, design techniques such as divide and conquer, Greedy technique, Dynamic programming, Back tracking, Branch and Bound techniques.

### **UNIT-3**

Example algorithm for the above techniques from sets, graphs, text processing, internal and external sorting, height balanced trees, B-trees, hashing algorithms.

### **UNIT-4**

P and NP problem, Lower bound theory, NP hard problem

### **BOOKS :**

1. Fundamentals of Computer Algorithms– Horowitz, Sahni, Rajasekaran, Universities Press.
2. Introduction to algorithms–Coremen, Leisorsen and Rivest (PHI)
3. The design and analysis of computer algorithms–Aho, Ulman (Addition Wesley).
4. Data Structures and algorithm– Aho and Ulman (Addison Welsey).
5. Design and Analysis of Algorithms – S Sridhar, Oxford University Press.

## **CS 3.5 SOFTWARE ENGINEERING**

### **UNIT-1**

Evolution of Software Engineering, Software Processes, software Life cycle Models, Software Project Management, Software Requirements, Requirements Engineering, Feasibility study, Requirement analysis and specification, System Models.

### **UNIT-2**

Software Design, Architectural Design – Cohesion and coupling, Abstraction, Data flow Oriented Design, Object-Oriented Design, User Interface Design.  
Rapid Software Development, Software Reuse, Component Based Software Engineering.  
Implementation and Testing: Verification and Validation, Software Testing techniques

### **UNIT-3**

Software Cost Estimation, COCOMO Model, Software Reliability, Software Quality Management, Configuration Management, Software Maintenance.

#### **UNIT-4**

New trends and technologies in software development, Capability Maturity Model, Capability Maturity Model Integration, Agile software development, Extreme Programming, Service-oriented Software Engineering

#### **BOOKS :**

1. Fundamentals of Software Engineering - Rajib Mall (PHI)
2. Software Engineering - Ian Sommerville (Pearson Education)
3. Software Engineering: A Practitioner's Approach - Roger Pressman (McGraw Hill)

#### **CS 3.6 Practical – 3 (C++ Programming Lab)**

### **CS 3.7 INFORMATION AND COMMUNICATION TECHNOLOGY**

**(CBCS Course for Non-Computer Science Students)**

#### **UNIT-1**

Characteristics of computers, generation and classification of computers, block diagram of a computer with its working, input-output and secondary storage devices, representation of data using Binary number system.

#### **UNIT-2**

Computer software: classification of software, system software, application software, firmware, middleware, low-level and high level programming languages, problem solving using a computer, flowchart, algorithms, Role of operating system, business data processing, role of DBMS, multi-media applications.

#### **UNIT-3**

Computer networks: data transmission media, digital and analogue transmission, network topologies, LAN, WAN, MAN, use of different network devices, Internet, Internet services, WWW, web browsers, search engines, applications of Internet, Internet security.

#### **UNIT-4**

Office automation tools:

MS WORD: creating a document, editing and formatting, setting header and footer, insertion of table, chart, etc., mail merge facility

MS EXCELL: creating a spread sheet, use of basic formulae and functions, filter and creating charts.

MS POWER POINT: preparing power point slides, adding animation and different effects.

#### **BOOKS :**

1. Fundamentals of Computers - Reema Thareja, Oxford University Press.
2. Computer Fundamentals, P K Sinha, P Sinha, BPB publications.
3. Information Technology, D. V. Singh and S. Kumar, N. Tyagi *et al*, University of Delhi

## **FOURTH SEMESTER COURSES**

### **CS 4.1 PROGRAMMING IN JAVA**

#### **UNIT-1**

Introduction to Java Programming, concept of JVM, Data Types and Operations, Structured Programming, Selection Statements, Loops, Methods, Method Abstraction and Stepwise Refinement, Arrays

Classes and Objects, Constructors, Implementing & Designing Classes, Use of Keywords: *static, final, this*, Class Abstraction and Encapsulation, Strings and Text I/O

#### **UNIT-2**

Inheritance, use of *super* keyword, Overriding vs. Overloading

Abstract Classes and Interfaces, Packages, polymorphism, Object-Oriented Design and Patterns.

#### **UNIT-3**

GUI Programming: GUI Basics, Graphics, Event-Driven Programming, Creating User Interfaces, Applets and Multimedia, Exception Handling, Binary I/O, Files & Streams, Recursion, Dynamic Binding, Generic Programming.

#### **UNIT-4**

Multithreading, JDBC, MVC, JavaBeans, Containers, Swing Models, *JTable and JTree*, advanced features of Java.

#### **BOOKS :**

1. Introduction to Java Programming: Comprehensive Version- Y. Daniel Liang, Pearson Education Inc., New Delhi.
2. Programming with Java: A Prime - E. Balagurusamy, McGraw-Hill Education (India).
3. Java How to Program -Harvey M. Deitel & Paul J. Deitel, PHI, New Delhi.

### **CS 4.2 OBJECT ORIENTED MODELING**

#### **UNIT-1**

Introduction: Object Orientation and object Oriented development, Modeling concepts: Modeling as a design technique, Object Modeling: Objects and Classes, Links and Association, Generalization and inheritance

#### **UNIT-2**

Advanced object Modeling: Aggregation, abstract classes, Meta data, Candidate keys, Dynamic Modeling: Events and States, Operations, concurrency advanced dynamic modeling concepts. Functional modeling: Functional models, DFD



### **UNIT-3**

ANALYSIS and Design: Overview of Analysis, Problem statement, Iterating the analysis. System Design: Overview of system Design, Breaking a system into subsystems, Identifying concurrency, management of Data stores

### **UNIT-4**

Implementation and Programming style: Implementation using a programming Language, Implementation using a Database system, Object oriented style, Reusability, Extensibility, Robustness, use of UML as a modelling tool

### **BOOKS :**

1. Object-Oriented Modeling and Design with UML, Michael R. Blaha and James R. Rumbaugh, Pearson Education, Inc. New Delhi.
2. Practical Object-Oriented Design with UML, Mark Priestley McGraw-Hill Education, India.

## **CS 4.3 INFORMATION SECURITY**

### **UNIT-1**

Attacks, services and mechanism, security attacks, security services, conventional encryption model, Steganography, cipher principles, data encryption standards, strength of DES, differential and linear crypto analysis, Block cipher design principles, Block cipher model of operation.

### **UNIT-2**

DES, double DES, Triple DES, international data encryption algorithm, blowfish, RC5, CAST-128, RC2, characterization of advanced symmetric block ciphers, placement of encryption function, traffic confidentiality, key distribution, random number generation, public key cryptography: principles of public key cryptosystem, RSA algorithm, Key management, diffie-Hellman key exchange, Elliptic curve cryptography.

### **UNIT-3**

Message authentication and Hash function: authentication requirements, functions message authentication codes, hash functions, security of hash functions and MACs, MD5 message digest algorithm, secured hash algorithm, digital signatures, authentication protocols, digital signature standard.

### **UNIT-4**

Firewall design principles, IP security architecture, authentication header, encapsulating security payload, security associations, key management.

### **BOOKS :**

1. Cryptography and network security Principles and practice - William Stallings (Person education)
2. Applied Cryptography–Schneier (John wiley)
3. Cryptography and network–Security Atul Kahate (TMH)

## **CS 4.4 CLOUD COMPUTING**

### **UNIT-1**

Evolution of cloud computing, utility computing, service based computing, characteristics of cloud computing, Cloud service models: IaaS, PaaS, SaaS, Cloud deployment models: public, private, hybrid, community, examples of cloud services such as Amazon EC2, Azure VMs, Google App engine, Salesforce,

### **UNIT-2**

Virtualization concepts and technologies, scalability and elasticity, deployment, replication and monitoring, identity and access management, Virtual machines provisioning and migration services: VM provisioning process, VM migration services, migration techniques.

### **UNIT-3**

Cloud Resource provisioning, SLA management in cloud computing, billing, load balancing, admission control, types of SLA, life cycle of SLA, SLA management, automated policy-based management.

### **UNIT-4**

Cloud disaster management, privacy and security issues in cloud, digital identity and data security, cloud storage, data centre, Cloud based services and applications in education, healthcare and business.

### **BOOKS :**

1. Cloud Computing: Principles and Paradigms – Rajkumar Buyya, James Broberg and Andrzej Goscinski, Wiley publications.
2. Cloud Computing: A Hands-On Approach – A Bahga and V Madiseti, University Press
3. Cloud Computing – U S Pandey and K Choudhary, S Chand

## **CS 4.5 (ELECTIVE – I COURSES)**

### **1. COMPUTER GRAPHICS**

#### **UNIT-1**

Output Primitives:

Overview of computer graphics, Raster scan displays, Random scan displays, Raster scan systems, Random scan systems, Points and lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Filled-Area Primitives: Scan line polygon fill algorithm

#### **UNIT-2**

2D Transformation & Viewing:

Basic transformations: Translation, rotation, scaling; Matrix representations & homogeneous coordinates, Composite transformation, Other transformations

The Viewing pipeline, Window to viewport co-ordinate transformation, Clipping operations, Point clipping, line clipping (Cohen-Sutherland), Polygons clipping(Sutherland-Hodgeman)

### **UNIT-3**

3D Transformation & Viewing:

3D transformations: Translation, rotation, scaling & other transformations, Viewing pipeline, Viewing coordinates, Projections, View volume and General Projection Transformations, clipping

### **UNIT-4**

Visible Surface Detection Methods: Back-Face Detection, Depth Buffer Algorithm, Scan-Line method, Area Subdivision method

Illumination and Surface-Rendering: Light sources, Basic illumination models: Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined Diffuse and Specular reflections with multiple light sources, Polygon rendering methods

### **BOOKS :**

1. Computer Graphics – Donald Hearn and M. Pauline Baker (Pearson)
2. Computer Graphics - Zhigang Xiang, Roy A. Plastock (McGraw-Hill Education, India)
3. Computer Graphics – Er. Rajiv Chopra, (S. Chand Publication)
4. Principles of Interactive Computer Graphics – W.M. Newman, R F Sproull (McGraw Hill)

## **2. IMAGE PROCESSING**

### **UNIT-1**

Introduction to digital image processing, Digital image representation, steps in image processing, elements of Digital Image Processing System. Elements of Visual perception, Sampling and Quantization, Basic relationships between Pixels.

### **UNIT-2**

Image Transforms, Imaging geometry, Photographic film, Fourier transform, properties of two separable Fourier transform, Four Fourier transform, other separable Fourier transforms.

### **UNIT-3**

Image Enhancement, background of image enhancement, enhancement by point processing, spatial filtering, enhancement in the frequency domain, colour image processing.

### **UNIT-4**

Image Restoration : Degradation model, diagonalization of circulant block, circulant matrices, algebraic approach to restoration, inverse filtering, least mean square restoration, interactive restoration, restoration in the spatial domain, geometric transformations.

### **BOOKS :**

1. Digital Image processing - R.C. Gonzalez and R.E. Wood (Addition Wesley)
2. Fundamentals of Digital Image Processing - Anil K. Jain (PHI)

### **3. DISTRIBUTED SYSTEMS**

#### **UNIT-1**

Introduction to Distributed systems, types of Distributed Systems, Architectures, Key characteristics-resource sharing openness, concurrency, scalability, fault tolerance, transparency; Design issues, naming, communication, workload allocation, consistency maintenance; Interprocess communication, client server communication, RMI.

#### **UNIT-2**

Distributed Operating systems: kernel, processes and threads, Naming and protection - Communication and Invocation, virtual memory, Distributed file services - design issues, interfaces, Name services: Name spaces; Name resolution, Domain Name System, Peer-to-Peer Systems. Coordination and Agreement: Time and Global States, Time and co-ordination, Synchronizing physical clocks- logical time and logical clocks, Distributed co-ordination, distributed mutual exclusion, elections.

#### **UNIT-3**

Distributed database systems: a comparative view of distributed DB and centralized DB, distributed DBMS, levels of distribution transparency, reference architecture, data fragmentation (hierarchical, vertical and mixed), Distributed database design: top-down and bottom up approaches, Management of distributed transactions, concurrency control, distributed deadlocks.

#### **UNIT-4**

Recovery and fault tolerance in distributed systems: Transaction recovery, Fault tolerance, Hierarchical and group masking of faults; Security, authentication and key distribution, CORBA, Distributed object based systems, Distributed file systems.

#### **BOOKS :**

1. Distributed Systems: Concepts and Design - George Coulouris, Jean Dollimore et al Pearson Education, Inc. New Delhi.
2. Distributed Systems: Principles and Paradigms - Andrew S. Tanenbaum, Maarten van (PHI)
3. Principles of Distributed Database Systems – M. Temer Ozsu, P.Valduriez (Pearson Educations)

### **4. SOFTWARE PROJECT MANAGEMENT**

#### **UNIT-1**

Conventional software project management, principles of modern software management. software cost estimation, Reducing software product size, improving software processes, improving team effectiveness, improving automation through software environments, achieving required quality.

Life-cycle phases: Engineering and production stages, inception phase, elaboration phase, construction phase transition phase.

## **UNIT-2**

Model-based software architectures and Process Architecture: management perspective, technical perspective. Workflows of the process: Software process workflows, Iteration workflows. Checkpoints of the process: Major milestones, minor milestones, periodic status assessments.

Iterative process planning: Work breakdown structures, planning guidelines, the cost and schedule estimating process, the iteration planning process.

## **UNIT-3**

Process automation and Project control: Automation building blocks, the project environment, Project control and process instrumentation: The seven core metrics, management indicators, quality indicators, life-cycle expectations, pragmatic software metrics, metric automation, small-scale project versus large-scale project.

## **UNIT-4**

Modern project profiles: Continuous integration, early risk resolution, evolutionary requirements, teamwork among stakeholders, software management best practices, Next-generation software economics and Modern process transitions: Next-generation cost models, modern software economics.

### **BOOK :**

1. Software Project Management - Barry Boehm (Pearson Education Asia)

### **CS 4.6 Practical – 4 (Java Programming Lab)**

## **FIFTH SEMESTER COURSES**

### **CS 5.1 E-COMMERCE**

#### **UNIT-1**

Introduction to e-commerce: Business models and business processes, identifying e-commerce opportunities, international nature of e-commerce, technology infrastructure-internet & WWW; Business strategies for e-commerce: Revenue models in transaction, revenue strategic issues, creating an effective web presence, website usability; Marketing on the web: Web marketing strategies, communicating with different market segments, customer behavior and relationship intensity, advertising on the web, technology enabled CRM

#### **UNIT-2**

Business to business strategies: Purchasing, logistics and supply activities, electronic data interchange (EDI), electronic data interchange on the internet, supply chain management using internet technologies, electronic market place & portals (Home shopping, E-marketing, Tele marketing), auctions, online auctions, virtual communicative & web portals

#### **UNIT-3**

Payment systems in e-commerce: card system, E-cheque, E-cash, E-coin, use of digital signature

Technologies for e-commerce: web server hardware & software, e-commerce software  
Intelligent agents in E-commerce, PUSH & PULL technology

#### **UNIT-4**

Security issues in e-commerce, online security issues, security for client computers and server computers, communication channel security

Intellectual property in online business, online crime, terrorism & warfare, ethical issues.

Planning for e-commerce: planning e-commerce initiatives, strategies for delivering e-commerce web sites, managing e-commerce Implementations.

#### **BOOKS :**

1. E-Business and E-Commerce Management- Dave Chaffey (Pearson Education Inc)
2. Electronic Commerce - Gary P. Schneider (CENGAGE Learning India)
3. E-Commerce- K.K. Bajaj, D. Nag (McGraw Hill Education)
4. Electronic Commerce-Technology and Application - Bhaskar Bharat, (McGraw Hill)
5. E-Commerce fundamentals and Applications – Chan (Wiley India)

### **CS 5.2 ARTIFICIAL INTELLIGENCE**

#### **UNIT-1**

Concepts in AI, problem solving in AI, Defining an AI Problem as state space search, production systems, AI problem characteristics

Heuristic Search Techniques: generate-and-test, hill climbing, best first search, problem reduction, simulated annealing

## **UNIT-2**

Knowledge Representation in AI, approaches & issues in knowledge representation, Knowledge Representation using predicate logic, forward and backward reasoning, semantic nets, frames, scripts & conceptual Dependency

## **UNIT-3**

Expert systems: Architecture, knowledge base, inference engine, Knowledge acquisition Expert system development.

Natural language processing: Syntactic processing, Semantic analysis

## **UNIT-4**

Introduction to pattern recognition and classification process, learning classification patterns, Visual image understanding, image transformation, Parallel and distributed AI.

Artificial Neural networks, LMS learning rule, General Delta Rule, Back Propagation

### **BOOKS :**

1. Artificial Intelligence - E. A. Rich and Kelvin Knight (TMH)
2. Introduction to AI and Expert Systems- D.W.Patterson (PHI)
3. Principles of AI and Expert systems development, D. W. Rolston (McGraw Hill)
4. Artificial Intelligence - P . H. Winston (Addison Wesley)

## **CS 5.3 SOFT COMPUTING**

### **UNIT-1**

#### **Artificial Neural Network**

Artificial Neural Network: Fundamental concepts, basic models of Neural Networks, Supervised Learning Network: Perceptron network, Adaline, Madaline, Back-propagation, Radial basis function network, Functional Link Networks

### **UNIT-2**

Unsupervised Learning Network: Kohonen Self-organization Feature Maps, Learning Vector Quantization, Adaptive Resonance Theory Network

### **UNIT-3**

#### **Fuzzy Logic System**

Introduction to Fuzzy Logic, Fuzzy sets, Fuzzy relations, Features of Membership functions, Fuzzification, Methods of membership value assignments: Intuition, Inference, Lambda cuts for fuzzy sets, Lambda cuts for fuzzy relations, Defuzzification methods, Fuzzy propositions, Formation of Rules, Decomposition of rules, Aggregation of fuzzy rules, fuzzy inference system

### **UNIT-4**

#### **Genetic Algorithm**

Genetic Algorithm, Operators in Genetic Algorithm, Stopping condition for Genetic Algorithm flow, Constraints in Genetic Algorithm, Problem solving using Genetic Algorithm, Basic concepts of integrating genetic algorithms with neural networks and fuzzy logic

## **BOOKS :**

1. Principles of Soft Computing - S. N. Sivanadam, S. N. Deepa (Wiley India Pvt. Ltd)
2. Soft Computing and Intelligent Systems Design: Theory, Tools and Applications - Fakhreddine O. Karray, Clarence De Silva (Pearson Education, New Delhi)
3. Genetic Algorithms: Search, Optimization and Machine Learning - D.E. Goldberg (Addison Wesley)
4. Learning and Soft Computing – Vojislav Kecman (Pearson Education)
5. Neural Networks, Fuzzy Logic, & Genetic Algorithms Synthesis & Applications - S. Rajasekaran, and G. A. Vijayalakshmi Pai (PHI)

## **CS 5.4 DATA WAREHOUSING AND DATA MINING**

### **UNIT-1**

Concept of Data warehousing, 3-tier architecture, multidimensional data model, OLAP, ROLAP, and MOLAP operations, Introduction to data mining, knowledge discovery, DBMS vs. data mining, issues and challenges in data mining , application areas.

### **UNIT-2**

Concept hierarchies, interestingness measures, data generalization and summarization-based characterization, Mining association rules, Apriori algorithm for finding frequent item-sets, iceberg queries, mining multilevel association rules, mining distance-based association rules, correlation analysis.

### **UNIT-3**

Classification and prediction: decision tree based classification, Bayesian classification, classification by back propagation, k-nearest neighbor classifier  
Cluster analysis: categorization of clustering methods, partitioning methods, k-Means and k-Medoids, hierarchical methods, Density-based clustering (DBSCAN)

### **UNIT-4**

Web Mining, classification of web documents, web content mining ,web structure mining, web usage mining , text mining , text clustering, Mining spatial databases, mining multimedia databases, Temporal data mining, temporal association rules, sequence mining.

## **BOOKS :**

1. Data mining; Concepts and techniques by J. Han and M. Kamber (Morgan Kaufmann)
2. Data Mining by A.K. Pujari (University press)



## **CS 5.5 (ELECTIVE - II COURSES)**

### **1. MOBILE COMPUTING**

#### **UNIT-1**

Introduction to mobile computing, mobile computing architecture, mobile devices, mobile system networks, data dissemination, mobility management, Security Cellular Network and frequency reuse, Mobile Smartphones, Smart Mobiles and Systems, Handheld Pocket Computers, Handheld Devices, Smart Systems, Limitations of Mobile Devices, Automotive Systems

#### **UNIT-2**

Modulation, Multiplexing, Controlling the Medium access, Spread spectrum, Frequency Hopping Spread Spectrum, Coding Methods, Code division Multiple Access, IMT-2000 3G Wireless Communication Standards, WCDMA 3G Communication Standards, CDMA2000 3G Communication Standards, I-mode, OFDM, High Speed Packet Access (HSPA) 3G Network, Long Term Evolution, WiMax Rel 1.0 IEEE 802.16e, Broadband Wireless Access, 4G Networks, Mobile Satellite Communication Networks

#### **UNIT-3**

Data Organization, Database Transactional Models- ACID rules, Query Processing, Data Recovery Process, Database Hoarding Techniques, Data Caching, Client-Server Computing for Mobile Computing and Adaptation, Adaptation software for Mobile Computing, Power-aware Mobile computing, Context-aware Mobile Computing Mobile Agent, Application Framework, Application Server, Gateways, Service Discovery, Device Management, Mobile File Systems, Security

#### **UNIT-4**

Mobile Ad-hoc & sensor networks, MANET and its applications, Routing algorithms: DSR protocol, AODV routing protocol, and TORA. Wireless sensor networks, applications, WLAN architecture, introductory concepts of mobile application languages: XML, J2ME, features of Mobile OS: Palm OS, Symbian OS

#### **BOOKS :**

1. Mobile Computing, Raj Kamal (Oxford University press)
2. Mobile Computing Technology, Applications & Service Creation, A K Talukder & R R Yavagal (TMH)

### **2. SERVICE ORIENTED COMPUTING**

#### **UNIT-1**

Service oriented computing paradigm: computing with services, its suitability for the evolving open environment, a comparative view of objects, components and services, Service-oriented architecture: service provider, service consumer, service registry, SOA collaboration, service orchestration and service choreography.

## **UNIT-2**

Coordination frameworks for web services: WSCL, Web services choreography interface, WS-coordination: coordination service, activation service, registration service, Service management, Notion of grid services

## **UNIT-3**

Building SOC applications: elements of SOC design, steps of the SOC approach, service identification, domain decomposition, subsystem analysis, service allocation, component specification, technology realization mapping. Applications of SOC.

## **UNIT-4**

Web services architecture, Web services standards, web services technology options: Transport (HTTP, Java Message service), Service Communication protocol (SOAP), Service Description (XML, WSDL), accessing web services, Service registry (UDDI), security issues.

### **BOOKS :**

1. Service-Oriented Computing - M. P. Singh & M. N. Huhns (John Wiley & Sons Ltd)
2. Patterns: Service-Oriented Architecture & Web Services, IBM Redbook.

## **3. COMPLIER DESIGN**

### **UNIT-1**

Introduction to compilers, compilers and Interpreters, Phases of Compiler: Lexical analysis, syntax analysis, Intermediate code generation, code optimization, object code generation, symbol table management, error handling, multi-pass compilers, cross compiler.

Lexical analysis: role of lexical analyzer, design of lexical analyzer, finite state machine, transition diagram, regular expression, conversion of NDFSM to DFSM, regular expression to FSM.

### **UNIT-2**

Syntax Analysis : syntactic specification of programming language, context free grammar, derivation of parser tree, basic parsing techniques, types of parser, shift-reduce parser, operator, grammar, operator precedence grammar, operator precedence parsing, LL(I) grammar, predictive parser.

### **UNIT-3**

Intermediate code generation: syntax directed translation schemes, implementation of SDTS, intermediate codes: polish notation. Abstract syntax tree, three address codes, quadruples, triples, indirect triples translation of assignment statement, Boolean expression, declarative statement.

Symbol table and error handling: data structure of symbol table, types of errors, lexical and semantic errors.

### **UNIT-4**

Code optimization: Sources of code optimization, loop optimization, identification of loops, DAG representation.

Object code generation: problem of code generation, simple code generation, register allocation and object code generation, peep hole optimization.

**BOOKS :**

1. Principles of compiler Design - Aho & Ullman (Narosa)
2. Compiler design : Theory and practice - Burrett (Mc Graw Hill)

**4. PARLLELEL COMPUTING**

**UNIT-1**

Models of parallel computation : Processor organizations (Mesh, Pyramid, Butterfly, Hypercube), SIMD models, Associative processor , Multi-Processors (Loosely coupled and tightly coupled ), Multi –computers , Amdahl’s Law , Developing algorithms for processor array and MIMD computers, Process communication and synchronization on MIMD models, Deadlock , Task scheduling on MIMD computers.

**UNIT-2**

Sorting on Processor Arrays, Multiprocessor implementation of Quick sort , complexity of parallel search , Searching on tightly coupled multiprocessor (Ellis’s and Manbar and Ladne’s Algorithm), Matrix Multiplication for processor array and multiprocessors .

**UNIT-3**

Graphs and Combinatorial Search

Processor Arrays : Searching , Connected components , All pairs shortest path: multiprocessor Minimum spanning tree ,Single source shortest path .

Combinatorial Search : Divide and conquer , Branch and bound , Travelling sales man problem Alpha –Beta search and parallel Alpha- Beta search and parallel Alpha- Beta search.

**UNIT-4**

Piplined and Vector Processors

Vector computers , pipelined vector processor , CRAY-1 ,CRAY- XMP and CYBER 205 computers , Vectorizing compilers , Attached Processors (FPS 164 MAX)

**BOOKS :**

1. Designing Efficient Algorithm for parallel computers – M J Quinn (Mc Graw Hill)
2. Computer Architecture and parallel processing - Hwang , Briggs (Mc Graw Hill)

**CS 5.6 Minor Project & Comprehensive Viva**

**SIXTH SEMESTER COURSES**

**CS 6.1 Major Project Work & Viva**