

**PunyashlokAhilyadevi Holkar Solapur University, Solapur**



Name of the Faculty : Science and Technology

**CHOICE BASED CREDIT SYSTEM**

Syllabus

Name of the Course : **MCA – I (Sem. I and II)**  
**(Two Year)**

(Syllabus to be implemented from June. 2020)

**MASTER OF COMPUTER APPLICATIONS (SCIENCE & Technology FACULTY)**  
**DETAILS SYLLABUS OF SEMESTERS I AND II**

1. **Introduction:** The Master of Computer Applications (M. C. A.) Programme has been designed with a semester approach in mind. It is a two years course and in each year there are two semesters. Courses in semester-I to semester-IV are aimed at skills development in computers using various technologies.
2. **Program Outcomes :**
  - Students are able to take up positions as systems analysts, systems designers, programmers and managers in any field related to information technology.
  - Students are able to apply knowledge of Mathematical Foundations in computing problems.
  - Students pass on their knowledge for planning, designing and building complex Application Software Systems as well as provide support to automated systems or application.
  - Produce entrepreneurs who can develop customized software solutions for small to large Enterprises.
  - Students are able to function as an effective communicator and team member through essential skills in multidisciplinary projects.
3. **Intake Capacity:60**
4. **Ordinances and regulations**
5. **ELIGIBILITY:** The eligibility criteria for admission for the MCA course will be as decided by the All Indian Council of Technical Education (AICTE), New Delhi and Directorate of Technical Education (DTE), Government of Maharashtra. It will be published on their respective websites time to time.
  - Passed B.C.A. / Bachelor Degree in Computer Science (B.C.S) / B.Sc.(Entire Computer Science / Computer Science) / Bachelor Degree in Computer Science Engineering or equivalent Degree  
**OR** passed B.Sc. / B.Com. / B.A.with Mathematics at 10+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).
  - Obtained at least 50% marks (45 % marks in case of candidates belonging to reserved category) in the qualifying Examination.
6. **FEES STRUCTURE:** The tuition fees or laboratory fees and other fees have to be paid at the beginning of every semester. At present a student has to pay tuition fees Rs.14000/- per semester and laboratory fee Rs.7000/- per semester together with other fees. These fees may be revised from time to time. The fees once paid will not be refunded.

7. **COURSE STRUCTURE:** The MCA course is a FOUR semester course. The teaching for the semesters I and III will be during the first half of the academic year and for these semesters II and IV will be during the second half the academic year.

- a) A candidate will be awarded a class or distinction as per the rules of other science subjects.
- b) The Regulations / Ordinance not covered in this shall be followed from the Regulations / Ordinance laid down for the science faculty.

**A Four Semester M.C.A. Course**

<b>Semester</b>	<b>No. of Papers / Practical / Project</b>	<b>Marks</b>	<b>Credits</b>
<b>Semester - I</b>			
• Theory Papers	06	600	24
• Practical Papers	01	50	02
• Mini Project	01	50	02
<b>Semester - II</b>			
• Theory Papers	06	600	24
• Practical Papers	01	50	02
• Mini Project	01	50	02
<b>Semester - III</b>			
• Theory Papers	06	600	24
• Practical Papers	01	50	02
• Mini Project	01	50	02
<b>Semester - IV</b>			
• Theory Papers	02	200	08
• Major Project	01	200	08
<b>Total marks and credits</b>		<b>2500</b>	<b>100</b>

**Bridge Course for B.Sc. / B.Com. / B.A. students**

<b>Semester</b>	<b>No. of Papers / Practical / Project</b>	<b>Marks</b>	<b>Credits</b>
<b>Semester - I</b>			
• Theory : Programming using C	01	50	02
• Practical : Programming using C	01	50	02

## MCA – I Semester I and II :Structure of the Syllabus

M. C. A. Part – I Semester – I						
PaperCode	Title of the Paper	Contact hrs./week	Distribution of Marks for Exam.			Credits
			Internal	University	Total	
<b>Hard Core – Theory</b>						
HCT1.1	Object Oriented Programming using C++	04	20	80	100	04
HCT1.2	Data Structures	04	20	80	100	04
HCT 1.3	Software Engineering	04	20	80	100	04
HCT 1.4	Operating Systems	04	20	80	100	04
HCT 1.5	Digital Circuits and Microprocessors	04	20	80	100	04
<b>Soft Core - Theory (Any One Group)</b>						
SCT 1.1	Discrete Mathematical Structures	04	20	80	100	04
SCT 1.2	Operation Research					
<b>Hard Core –Practical</b>						
HCP 1.1	Practical based on HCT 1.1 and HCT1.2	04	10	40	50	02
HCP 1.2	Mini Project –I	02	10	40	50	02
<b>Total</b>		-	<b>140</b>	<b>560</b>	<b>700</b>	<b>28</b>
M. C. A. Part – I Semester – II						
PaperCode	Title of the Paper	Contact hrs./week	Distribution of Marks for Exam.			Credits
			Internal	University	Total	
<b>Hard Core –Theory</b>						
HCT 2.1	Java Programming	04	20	80	100	04
HCT 2.2	Advanced DBMS	04	20	80	100	04
HCT 2.3	Computer Communication Network	04	20	80	100	04
HCT 2.4	System Software	04	20	80	100	04
<b>Soft Core - Theory (Any One)</b>						
SCT 2.1	UML	04	20	80	100	04
SCT 2.2	Graph Theory					
<b>Open Elective (Any One)</b>						
OET 2.1	Office Automation	04	20	80	100	04
OET 2.2	SWAYAM course*	--	--	--	--	04
<b>Hard Core –Practical</b>						
HCP 2.1	Practical based on HCT 2.1	04	10	40	50	02
HCP 2.2	Mini Project - II	04	10	40	50	02
<b>Open Elective - Practical (Any One)</b>						
OEP 2.1	Practical Based on OET 2.1	02	10	40	50	02
OEP 2.2	Practical / Seminar / Viva based on SWAYAM course OET2.2					
<b>Total</b>		-	<b>140</b>	<b>560</b>	<b>700</b>	<b>28</b>

\* : The credits will be transferred as per university policy and UGC guidelines after submitting the completion certificate / mark list from the SWAYAM.

Bridge Course for B.Sc. / B.Com. / B.A. students						
M. C. A. Part – I Semester – I						
PaperCode	Title of the Paper	Contact hrs./week	Distribution of Marks for Exam.			Credits
			Internal	University	Total	
<b>Hard Core – Theory</b>						
HCT-B1	Theory : Programming using C	02	50	--	50	02
HCP-B1	Practical : Programming using C	02	50	--	50	02

**8. Passing Standard:** Passing standard is same as that of other M.Sc. courses in the PunyashlokAhilyadevi Holkar Solapur University. The candidate has to appear for internal evaluation of 20 marks and external evaluation (university exam) for 80 marks for each theory paper. The nature of internal evaluation of practical and project will be decided by the respective schools / departments. The internal evaluation is a process of continuousassessment.

A student who failed in Term End examination (theory) & passed in internal assessment of a paper (subject) shall be given FC (Failed in Term End Exam) Grade. Such student will have to appear for Term End examination only. A student who fails in Internal assessment and passed in Term End examination (Theory) shall be given FR (Failed in Internal Assessment) Grade. Such student will have to appear for Term End examination as well as internalassessment.

### 9. Nature of theory questionpaper

M.Sc. / M. C. A. \_\_\_\_ Sem. \_\_\_\_ (*Subject Name*)

Paper Name \_\_\_\_\_

Time : 3 hrs

Marks : 80

#### Instructions :

1. Question No. 1 and 2 are compulsory
2. Attempt any 3 questions from Q. No. 3 to Q. No. 7
3. Figures to the right indicate full marks

Q. 1. A) Choose correct alternatives (10 questions)	10
B) Fill in the blanks or true / false (06 questions)	06
Q.2. Answer the following A) B) C) D)	16
Q.3. Answer the following A) B)	(10 + 6 <b>OR</b> 8 + 8)
Q.4. Answer the following A) B)	(10 + 6 <b>OR</b> 8 + 8)
Q.5. Answer the following A) B)	(10 + 6 <b>OR</b> 8 + 8)
Q.6. Answer the following A) B)	(10 + 6 <b>OR</b> 8 + 8)
Q.7. Answer the following A) B)	(10 + 6 <b>OR</b> 8 + 8)

**MASTER OF COMPUTER APPLICATIONS**  
**SEMESTER I**

**HCT 1.1: Object Oriented Programming using C++**

**Unit – I**

**Introduction to programming :** Algorithms and Flowcharts, Steps in problem solving., Variables and data types, Expressions, Constants, Operators, Type conversions [02]

**Branching and Looping constructs:** If...else statements, Switch-Case construct while, do...while, for loops [02]

**Functions :** Functions, Passing arguments, Function prototyping, Default argument initializers [02]

**Overview Of C++:** Object Oriented Programming, Introducing C++ Classes, Concepts of Object Oriented Programming, C++ as a superset of C, New style comments, main function in C++, meaning of empty argument list, User defined data types: enumerated types, use of tag names, anonymous unions, scope of tag names. [04]

**Classes & Objects:** Classes, Structure & Classes, Union & Classes, Inline Function, Scope Resolution operator, Static Class Members: Static Data Member, Static Member Function, Passing Objects to Function, Returning Objects, Object Assignment. Friend Function, Friend Classes. [05]

**Unit – II**

**Array, Pointers References & The Dynamic Allocation Operators:** Arrays, Array initialization, Multi-dimensional arrays, Character arrays, Working with character strings

Array of Objects, Pointer, Pointers to Object, Type Checking C++ Pointers, The This Pointer, Pointer to Derived Types, Pointer to Class Members, References: Reference Parameter, call by reference and return by reference Passing References to Objects, Returning Reference, Independent Reference, C++'S Dynamic Allocation Operators, Initializing Allocated Memory, Allocating Array, Allocating Objects. [08]

**Constructor & Destructor:** Introduction, Constructor, access specifiers for constructors, and instantiation, Parameterized Constructor, Multiple Constructor in A Class, Constructor with Default Argument, Copy Constructor, Destructor. [07]

**Unit – III**

**Overloading as polymorphism:** Function & Operator Overloading: Function Overloading, Overloading Constructor Function Finding the Address of an Overloaded Function, Operator Overloading: Creating A Member Operator Function, Creating Prefix & Postfix Forms of the Increment & Decrement Operation, Overloading The Shorthand Operation (I.E. +=, -= Etc), Operator Overloading Restrictions, Operator Overloading Using Friend Function, Overloading New & Delete, Overloading Some Special Operators, Overloading [ ], ( ), -, Comma Operator, Overloading << and >>. [08]

**Inheritance:** Base Class Access Control, Inheritance and Protected Members, Protected Base Class Inheritance, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, When Constructor and Destructor Function are Executed,

Passing Parameters to Base Class Constructors, Granting Access, Virtual Base Classes. [07]

#### **Unit – IV**

**Virtual Functions & Polymorphism:** Virtual Function, Pure Virtual Functions, Early Vs.LateBinding. [03]

**Exception handling in C++:** try, throw, catch sequence, multiple catch blocks, uncaught exceptions, catch-allexceptionhandler [03]

**Templates:** Reason for templates compactness and flexibility, function template examples explicit specialization, class templates, out of class definition of member functions. [04]

**The C++ I/O System Basics:** C++ Streams, The Basic Stream Classes C++ **Predefined Streams, Formatted I/O:** Formatting Using The Ios Members, Setting The Format Flags, Clearing Format Flags, An Overloaded Form Of Setf(), Using Width() Precision() and Fill(), Using Manipulators to Format I/O, Creating Your own Manipulators. [05]

#### **Reference Books:**

1. C++: The Complete Reference: Herbert Schildt, Tata McGrawHill.
2. Object Oriented Programming with C++: E. Balguruswami, Tata McGrawHill.
3. Programming with C++ made simple: M. Kumar, Tata McGrawHill.



## HCT 1.2: Data Structures

### Unit – I

**Fundamental notions:** Primitives and composite data types, choice of data structure and complexity of algorithms, Abstract Data Type. [04]

**Arrays:** Single and Multidimensional Arrays, sparse matrices. [04]

**Stacks:** Processing the stacks, Linked list implementation, Application of Stacks for expression solving, Non recursive implementation of recursive algorithms. [07]

### Unit – II

**Queues:** Processing the queues, Linked list implementation, Dequeues, Priority queues and their applications. [06]

**Linked List:** Processing linked list, Circularly linked list, Doubly linked list, Multilinked lists, String and characters manipulation using arrays and linked list. [09]

### Unit – III

**Trees:** Representation of hierarchical relationships, Tree processing, Binary trees, linked list implementation, traversal algorithms, Graph theoretic solutions and tree traversals, Binary trees, Threaded binary trees, Height balanced trees, General Trees. [08]

**Design and analysis of algorithm for the implementation:** Greedy methods, Dynamic programming, Backtracking, Branch and bound. [07]

### Unit – IV

**Sorting and searching:** Various sorts viz. Insertion, Bubble sort, Selection sort, Quick sort, Merge sort, Radix / Bucket sort, Counting sort, searching algorithms and their complexities, Binary tree indexing, B-tree indexing, Hash indexing. [15]

### Reference Books:

1. Data structures and algorithms: Alfred Aho, John Hopcraft and Jeffrey Ullman, Addison – Wesley.
2. Introduction to data structures: Bhagat Singh and Thomas Nap, West Publishing Company.
3. The C Programming Language: Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall, 1988.
4. Introduction to Data Structures with applications: J. P. Tremble, Tata McGraw Hill, 1984.
5. Data and file structures: Weiderberg.

## HCT 1.3: Software Engineering

### Unit – I

**Introduction:** Product and Process: Evolving role of software, software characteristic and components, crisis, myths, software engineering – a layered technology, software process, linear sequential model, prototyping model, RAD model, evolutionary software process model. [10]

**Software Process And Project Metrics:** Measures, metric indicators, metric in process and the project domains, software measurement, metrics for software quality, software quality assurance. [05]

### Unit – II

**Analysis Concepts And Principles:** Requirement analysis, communication techniques, analysis principles, software prototyping & Specification. [07]

**Modeling:** Elements of the analysis model, data modeling, functional modeling, behavioral modeling, the mechanics of structured analysis, data dictionary, other classical analysis methods. [08]

### Unit – III

**Design Concepts & Principles:** Software Design and software Engineering design process, Design principles, Design concepts, Design methods-Data design, Architectural design and process, Transform and Transaction mappings, Design post processing, Architectural design optimization, Interface design, Procedural design. [15]

### Unit – IV

**Software Testing Methods:** Fundamentals, Test case design, White box testing, basis path testing, control structure testing, black box testing, Software testing strategies. [08]

**Object Oriented Software Engineering:** Object oriented concepts, Identifying the elements of an object model, Management of object-oriented software projects, Object-oriented analysis, design and testing. [07]

### Reference Books:

1. Software Engineering: Roger S. Pressman, McGraw Hill, 1997.
2. Software Engineering: Shooman, McGraw Hill, 1987.
3. Software Engineering: Ian Sommerville, Addison Wesley, 1985.
4. Object Oriented Analysis and Design: Grady Booch, Pearson.
5. Object Oriented Modeling and Design: James Rumbaugh, Michael Blaha, Prentice Hall India, 1991.
6. Fundamentals of Software Engineering: Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Prentice Hall India, 2003.

## HCT 1.4: Operating System

### UNIT-I

**Introduction and structure of Operating System:** Concept of multi – programming, Parallel, Distributed and real – time – sharing, Operating system structure - Operating system components and Services System Call System.

[15]

### UNIT-II

**Process Management, Synchronization and Deadlocks:** Process Concept, process scheduling, cooperating process, Threads, inter process communication, CPU scheduling Criteria, scheduling algorithms-FCFS, SJF, Priority, Round Robin, Multilevel feedback queue scheduling.

**Process Synchronization and Deadlocks:** Critical Section problem, Synchronization hardware, Semaphores, Critical region, Monitors, Deadlock system model, characterization of deadlocks and deadlock Prevention, Avoidance and detection, recovery from deadlock.

[15]

### UNIT-III

**Memory Management:** Memory Management, Logical and physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation.

**Virtual, memory:** demand paging and its performance, page replacement algorithm, allocation of frames, thrashing.

[15]

### UNIT-IV

**File System:** Secondary Storage Structure File Concept Access method, Directory Structure, Protection and consistency Semantics, File System Structure, Allocation Method, Free space Management, Directory implementation, Disk Structure, Disk Scheduling methods, Disk Management, Swap space Management.

**Security and protection:** goals of protection domain of protection, access matrix, security program threats, system threats.

**CASE Study:** Network Operating System, OS Environment, Comparison of Distributed Operating System, Multiprocessor Time Sharing Systems and Network Operating System.

[15]

### Reference Books:

1. Operating System Principles: Abraham Silberschatz, Peter Galvin, Greg Gagne, 7<sup>th</sup>ed., Wiley Student Edition.
2. Operating System: Bawn.
3. Modern Operating Systems: Andrew S. Tanenbaum, Prentice Hall India.
4. Operating Systems: Stuart E. Madnick, John J. Donovan, McGraw-Hill, 1974.
5. Operating system: Peterson.

## HCT 1.5: Digital Circuits and Microprocessors

### Unit – I

**Digital Logic and Combinational Circuits:** Logic gates: basic gates, derived gates and universal gates, Boolean algebra and Map simplification (K-map), Combinational Circuits: Half adder, Full adder, Subtractor, Flip-Flops: SR, D, JK, T, edge triggered Flip-flops. [15]

### Unit – II

**Digital Components:** Integrated Circuits, Decoders, Multiplexers, Register and Shift Registers, Counters. [15]

### Unit – III

**The 8085 Microprocessor:** Architecture of 8085, Instruction set of 8085, Addressing modes of 8085, simple programs, Buffered bus system of 8085, Timing diagrams. [15]

### Unit – IV

**The 8086 Microprocessor:** EU and BIU of 8086 (Architecture), Instruction set of 8086, Addressing modes of 8086, Flags in 8086, concept of memory segmentation, Buffered system bus of 8086 in Minimum and Maximum mode. [15]

### Reference Books:

1. Computer System Architecture: M. M. Mano, Prentice Hall India.
2. Introduction to 8085/ 8080 Microprocessors: Architecture, Programming and Applications: Ramesh Gaonkar, New Age Publishers.
3. Microcomputer systems: The 8086/8088 Family - Architecture, Programming and Design: Y. Liu, G. A. Gibson, Prentice Hall India.
4. Microprocessor and its Applications: S. Malarvizhi, Anuradha Publications.

## SCT 1.1: Discrete Mathematical Structures

### Unit – I

**Combinatorics:** Permutations and combinations, Distinct and non-distinct objects, Generating functions for combinations, Enumerators for permutations, Distribution of distinct objects. [07]

**Matrices:** Basic concepts, Types of matrices, Arithmetic operations on matrices, Scalar Multiplication, Transpose of matrix, Symmetric matrix, Inverse of matrix, Solving simultaneous equation using matrices, Boolean matrices, Eigen values, Eigen vectors, Determinant. [08]

### Unit – II

**Mathematical Logic:** Notations, Connectives, Normal forms, Theory of inference for statement calculus, Propositional logic, Predicate calculus, Inference theory of the predicate calculus. [15]

### Unit – III

**Relations and Functions:** Elementary set theory, product sets, Relations, Closure properties and related algorithm, Functions, Types of functions, Computer representation of sets, Relations, functions and their manipulations, ordering functions, Recursion. [15]

### Unit – IV

**Graph Theory:** Definition, walks, paths, trails, connected graphs, Di-graph representation of relations, regular and bipartite graphs, cycles and circuits, eccentricity of a vertex, radius and diameter of a graph, Central graphs, Hamiltonian and Eulerian graphs, and planar graphs. [08]

**Algebraic structures:** Groups, Lattices, Applications of the Residue Arithmetic's to computers, Group Codes, Definition & examples of algebraic structures their applications to computer science. [07]

### Reference Books:

1. Applied Discrete Structure for Computer Science: Kenneth Levasseur, Alan Doerr, Galgotia Publications, 1986.
2. Discrete Mathematical Structures for Computer Science: B. Kolman and R. C. Busby, Prentice Hall, 1987.
3. Foundations of Discrete Mathematics: K. D. Joshi, Wiley Eastern.
4. Elements of Discrete Mathematics: C. L. Liu, D. P. Mahapatra, Tata McGraw Hill, 1977.
5. Concepts in Discrete Mathematics: S. K. Sahni, Camelot Publishing Co., USA.
6. Discrete Mathematics: Schaums series, McGraw Hill.
7. Discrete Mathematical Structures with applications to the Computer Science: Tremblay and Manohar, Tata McGraw Hill, 1977.

## SCT 1.2: Operations Research

### Unit - I

**Introduction of Linear Programming:** Various definitions, statements of basic theorems and properties, Advantages, Limitations and Application areas of Linear Programming. [05]

**Linear Programming Problems:** The Graphical method – Graphical Solution methods of Linear Programming problem, Phase II of the Simplex Method, Primal and Dual Simplex Method, Big –M method, Transportation Problem and its solution, Assignment Problem and its solutions by Hungarian Method. [10]

### Unit – II

**Non-Linear programming:** Kuhn-Tucker conditions, Convex functions and convex regions, Convex programming problems, Algorithms for solving convex programming problems. [15]

### Unit – III

**PERT and CPM:** Basic differences between PERT and CPM, Arrow Networks, time estimates, Earliest expected time, Latest – allowable occurrences time, Forward Pass Computation, Backward Pass Computation, Representation in Tabular Form, Critical Path, Probability of meeting scheduled date of completion, Calculation on CPM network. Various floats for activities, Critical path updating projects. Operation time cost trade off Curve project, Time cost – trade off Curve, Selection of schedule based on Cost. [15]

### Unit – IV

**Network Flow Problem:** Formulation, Max-Flow Min-Cut theorem, Ford and Fulkerson's algorithm. Exponential behavior of Ford and Fulkerson's algorithm. [10]

**Matroids:** Definition, Graphic and Cographic matroids, Matroid intersection problem. [05]

### Reference Books:

1. Linear Programming: G. Hadley, Addison Wesley, 1969.
2. Operations Research an Introduction: H. A. Taha, Macmillan N. Y., 1971.
3. Operations Research: Kanti Swaroop, Gupta and Manmohan, Sultan Chand and Co., 1985.
4. Operations Research Theory and Applications: J. K. Sharma, 2nd Ed. Macmillan India Ltd, 2003.
5. Mathematical Models Operations Research: J. K. Sharma, McGraw Hill, 1986.

## SEMESTER II

### HCT 2.1: Java Programming

#### Unit – I

**Introduction to Java:** Importance and features of java, keywords, constants, variables and data types, Operators and expressions, Decision making, branching and looping: if..else, switch, ?: operator, while, do, for statements, labeled loops, jump statements: break,continue,return. [09]

**Classes and Objects:** defining a class, adding variables and methods, creating objects, constructors,classinheritance. [06]

#### Unit – II

**Arrays and strings:** creating an array, one and two dimensional arrays, string array and methods, String and StringBufferclasses, Wrapperclasses. [05]

**Inheritance:** Basics types, using super, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces,packages. [06]

**Exception Handling:** Fundamentals, exception types, uncaught exceptions, throw, final, built in exception, creating yourownexceptions. [04]

#### Unit – III

**Multithreaded Programming:** Fundamentals of Java thread model, priorities, synchronization, messaging, thread class, Runnable interface, interthread Communication, suspending, resuming andstoppingthreads. [08]

**Input/Output:** Basics, Streams, Byte andCharacterstream, predefined streams, Reading and writing from console and files. Using Standard Java Packages (lang, util, io,net). [07]

#### Unit – IV

**Event Handling:** Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, graphics and text, using AWT controls, Layout managers and menus, handling Image, animation, sound and video, Java Applet. [08]

**JDBC:** JDBC API, JDBC Drivers, Products, JDBC Design considerations, Basic steps to JDBC, setting up a connection to database, Creating and executing SQL statements. [07]

#### Reference Books:

1. Java-2 the complete Reference: Patrick Naughton and HerbertzSchidt, Tata McGraw-Hill Education,2002.
2. Programming with Java: Balaguruswamy, Tata McGraw-Hill Edn., 4<sup>th</sup>edition, 2006.
3. Computing Concepts with Java 2 E Essentials: Horstmann, John Wiley, 2<sup>nd</sup>edition,1999.
4. Programming Java: Decker and Hirshfield, Vikas Publication,2000.

## HCT 2.2 : Advanced DBMS

### Unit – I

**Introduction to Database Systems:** Database – Definition, Limitations of traditional file processing systems, Advantages of DBMS, Users of DBMS. [02]

**Database Architecture and Environment:** Components of DBMS, Architecture, Physical, logical and view, DDL, DML, DCL, schemas, life cycle of Database System Development, Functions of DBMS. [05]

**Conceptual Database Modelling:** Data Model – Concept, types of data models, ER model, concepts of entity, entity set, attributes, domains, existence dependency, Keys: candidate, primary, composite, strong and weak entities, cardinality, specialization, generalization, aggregation, Relational Algebra, Relational Calculus. [08]

### Unit – II

**Relational Database Systems:** Characteristics, relation, attribute, tuple, domain, null, Normalization, Functional Dependencies, Multivalued Dependencies, 1NF, 2NF, 3NF, 4NF, 5NF Boyce-Codd's normal form. [07]

**SQL and PL/SQL:** DDL, DML, DCL, Select: From, Where, Order by, Group by, Having, Intersect, Union, Distinct, Between, In, Between, Different types of functions, Delete, Update, Insert, Nested queries, joins, create, alter and drop, constraints, index, views, Triggers, Grant, Revoke, Commit, RollBack, Savepoint, PL/SQL: %Type, %Rowtype, Exception, Cursors etc. [08]

### Unit – III

**Transaction Management and Concurrency Control:** Transaction – properties (ACID), states, Concurrency – control, locks, two phase locking serialization. [08]

**Distributed Databases:** Standalone v/s Distributed databases, Replication, Fragmentation, Client/Server architecture, types of distributed databases. [07]

### Unit – IV

**Database Recovery:** Need for recovery, techniques – log based recovery, check point, deferred and immediate updates, shadowing, Catastrophic and non-catastrophic failures, Recovery in multi-database environments, Two phase commit protocol. [06]

**Query Processing:** Steps in query processing, advantages of optimization. [03]

**Object – Relational Databases:** Abstract Datatypes, Nested Tables, Varying Arrays, Large Objects, Naming Conventions for Objects. [06]

### Reference Books:

1. Database System Concepts by Korth: Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill Higher Education, 2006.
2. Ramez Elmasri, Shamkant Navathe, Pearson Education India, 2011.



3. AnIntro.toDatabaseSystems:C.J.Date,PearsonEducationIndia.
4. Oracle 8i – The Complete Reference: Kevin Loney, GeorgeKoch,Osborne / McGraw-Hill, 2000.

## **HCT 2.3 : Computer Communication Network**

### **Unit – I**

**Introduction:** Uses of Computer networks: Business Applications, Home Applications, Mobile Users, Social Issues; Network Hardware: Local Area Networks, Metropolitan Networks, Wide Area Networks, Wireless Networks, Home Networks, Internetworks; Network Software: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Service Primitives, Relationship of Services to Protocols; Example of Networks: The Internet, The ARPANET, NSFNET, Internet usage, Architecture of the internet.

[07]

**Data Link Layer:** Data Link Layer Design Issues: Services Provided to the Network Layer, Framing, Error Control, Flow Control; Error Detection and Correction: Error-Correcting Codes, Error-Detecting Codes; Elementary Data Link Protocols: An Unrestricted Simplex Protocol, A Simplex Stop-and-Wait Protocol, A Simplex Protocol for a Noisy Channel; Sliding Window Protocols: A One-Bit Sliding Window Protocol, A Protocol Using Go Back N, A Protocol Using Selective Repeat; Example Data Link Protocols: HDLC—High-Level Data Link Control, The Data Link Layer in the Internet.

[08]

### **Unit – II**

**Network Layer:** Network Layer Design issues: Store and Forward packet Switching, Services Provided to the Transport Layer, implementation of Connectionless Service, Implementation of Connection-oriented Services, Comparison of Virtual Circuit and Datagram subnets; Routing algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link state Routing, Hierarchical Routing, Broadcast Routing, Routing for Mobile Hosts; Congestion Control Algorithms: General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnet, Load Shedding, Jitter Control; Quality of Service: Requirements, Techniques for Achieving Good Quality of Service; Internetworking: Differences in Networks, Network Connection, Concatenated Virtual Circuits, Connectionless Internetworking; Tunneling; Internetwork Routing, Fragmentation; The Network Layer in the Internet: The IP Protocol, IP Addresses, Internet Control Protocols, Mobile IP; IPV6.

[15]

### **Unit – III**

**The Transport Layer:** The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Berkeley Sockets; Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release Flow Control and Buffering, Multiplexing, Crash Recovery; The Internet Transport Protocol – UDP: Introduction to UDP, Remote Procedure Call, The Real-Time Transport Protocol; The Internet Transport Protocols – TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management TCP Transmission Policy, TCP Congestion Control, Wireless

TCP andUDP.

[15]

#### **Unit – IV**

**The Application Layer:** DNS – The Domain Name System: The DNS Name Space, Resource Records, Name Servers; Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery; The World Wide Web: Architectural Overview, Static Web Documents, Dynamic Web Documents, HTTP, Performance Enhancements, The WirelessWeb. [15]

#### **Reference Books:**

1. ComputerNetworks: Andrew S.Tanenbaum, 4<sup>th</sup>Edition, Pearson Education, Asia,2002.
2. Communication Networks: Fundamental Concepts and Key Architectures, Alberto Leon-Garcia, Indra Widjaja, Tata McGraw Hill, 2006.
3. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw Hill, Second Edition,2001.

## HCT 2.4 : System Software

### Unit I

Introduction: System software and machine architecture, traditional (CISC)machines, RISC machines. [06]

Assemblers: Basic assembler functions, machine dependent and machineindependent assembler features, one-pass assemblers, multi-pass assemblers,MASM and SPARC assembler. [09]

### Unit II

Loaders and Linkers: Basic loader functions, machine dependent and machineindependent loader features, linkage editors, dynamic linking, bootstraploaders, MS-DOS and SunOS Linkers. [15]

### Unit III

Macro Processors: Basic macro processor functions, machine independentmacro processor features, macro processor design options, MSAM macroprocessor, ANSI C macro language. [15]

### Unit IV

Compilers: Basic compiler functions, machine-dependent compiler features,machine-independent compiler features, compiler design options, the YACCcompiler-compiler. [15]

### Reference Books:

1. System Software – An Introduction to System Programming: Leland L.Beck, 3/e, Pearson Education.
2. Compilers – Principles, techniques and tools: A. V. Aho, R. Semi, J.D.Ullman, Pearson Education.
3. Systems Programming and Operating Systems: D.M. Dhamdhare, TataMcGraw Hill.
4. Compiler Design: Santanu Chattopadhyay, Prentice Hall India.

## SCT 2.1: UML

### Unit – I

**Object Oriented Design and Modeling:** Object Oriented Fundamentals, Objects and object classes, object oriented design process, importance of modeling, principles of modeling, objectorientedmodeling, Rational Unified Process. [08]

**Introduction to UML:** Conceptual model of UML, building blocks of UML, Mechanisms in UML, architecture, software development lifecycle. [07]

### Unit – II

**Basic Structural Modeling:** Classes, relationships, common mechanisms, class and objectdiagrams. [07]

**Advanced structural Modeling:** Advanced classes, advanced relationships, Interfaces types and roles, packages, instances and objectdiagrams. [08]

### Unit – III

**Collaboration Diagrams and Sequence Diagrams:** Terms, concepts and depicting a message in collaboration diagrams, Terms and concepts in sequence diagrams, Difference between collaboration and sequence diagram, Depicting synchronous messages with/without priority callbackmechanism. [08]

**Basic behavioral modeling:** Interactions, use cases, Use Case Diagrams, Interaction Diagrams andactivitydiagrams. [07]

### Unit – IV

**Advanced behavioral modeling:** Events and signals, state machines, process and threads, time and space, statechartdiagrams. [07]

**Architectural Modeling:** Terms, Concepts, examples, Modeling techniques for component diagrams anddeploymentdiagrams. [08]

### Reference Books:

1. The Unified Modeling Language User Guide: Grandy Booch, James Rumbough, Ivar Jacobson, Pearson Education2002.
2. Software Engineering: Ian Sommerville, Sixth Edition,2003.
3. Fundamentals of Object Oriented Design in UML: Meilir Page Jones, Addison Wesley,2000.

## SCT 2.2: Graph Theory

### Unit – I

**Introducing graphs and algorithmic complexity:** Introducing graphs, Introducing algorithmic complexity, Introducing data structures and Depth-first searching, Two linear –time algorithms.

**Spanning – trees, branchings and connectivity:**

Spanning-trees and branchings, Optimum weight spanning-trees, Optimum branchings, enumeration of spanning-trees, Circuits, cut-sets and connectivity, Fundamental circuits of a graph, Fundamental cut-sets of a graph, Connectivity. [15]

### Unit – II

**Planner graphs:** Basic properties of planar graphs, Genus, crossing-number and thickness, Characterisations of planarity, Dual graphs, A planarity testing algorithm.

**Networks and flows:** Networks and flows, Maximising the flow in a network, Menger’s theorem and connectivity, A minimum-cost flow algorithm, Summary and references, Exercises. [15]

### Unit – III

**Matchings:** Definitions, Maximum-cardinality matchings, Perfect matchings, Maximum-weight matchings, Summary and references, Exercises.

**Eulerian and Hamiltonian tours:** Eulerian paths and circuits, eulerian graphs, Finding Eulerian circuits, Postman problems, counting Eulerian circuits, The Chinese postman problem for undirected graphs, The Chinese postman problem for digraphs, Hamiltonian tours, Some elementary existence theorems, Finding all Hamiltonian tours by metrical products, The traveling salesman problem, 2-factors of a graph. [18]

### Unit – IV

**Colouring graphs:** Dominating sets, independence and cliques, Colouring graphs, Edge-colouring, Vertex-colouring, Chromatic polynomials, Face- colouring of embedded graphs, The five-colour theorem, The four-colour theorem, Summary and references, Exercises. [12]

### Reference Books:

1. Algorithmic graph theory: Alan Gibbons, Cambridge University Press.
2. Graph theory: Harary, Addison Wesley, 1972.

## OET 2.1: Office Automation

### UNIT-I

[15]

**Introduction to Computer:** Applications of Computer – Advantages of Computer – Terms related to Computer - Characteristics of Computer: Speed, Storage, Versatility and Diligence – Hardware & Software.

**Windows:** Desktop icons and their functions: My computer, My documents, Network neighborhood, Recycle Bin, Quick launch tool bar, System tray, Start menu, Task bar, Dialog Boxes: List Box, Spin Control Box, Slide, Drop-down list, Radio button, Check box, Text box, Task Bar - System Tray - Quick launch tool bar - Start button - Parts of Windows -Title bar-Menu bar - Scroll bar- Status bar, Maximize, Minimize, close and Resize & Moving a Window, Keyboard Accelerators: Key board short keys orhotkeys.

### UNIT-II

[15]

**MS Word:** Working with Documents -Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, usinghelp.

**Formatting Documents:** Setting Font styles, Font selection- style, size, colouretc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering.

**Setting Page style:** Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page.

**Creating Tables:** Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula.

**Drawing:** - Inserting Clip Arts, Pictures/Files etc.

**Tools:** Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature. Printing Documents – Shortcut keys.

### UNIT-III

[15]

**MS Excel:** Spread Sheet & its Applications, Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types. Working with Spreadsheets- opening, Saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – ShortcutKeys.

**Entering & Deleting Data:** Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data,InsertCells,Column,rows&sheets,Symbols,Datafromexternalfiles,Frames,

Clipart, Pictures, Files etc, Inserting Functions, Manual breaks.

**Setting Formula:** finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), using other Formulae.

**Formatting Spreadsheets:** Labelling columns & rows, Formatting- Cell, row, column & Sheet, Category - Alignment, Font, Border & Shading, Hiding/ Locking Cells, Anchoring objects, Formatting layout for Graphics, Clipart etc., Worksheet Row & Column Headers, Sheet Name, Row height & Column width, Visibility - Row, Column, Sheet, Security, Sheet Formatting & style, Sheet background, Colouretc, Borders & Shading – Shortcutkeys.

**Working with sheets:** Sorting, Filtering, Validation, Consolidation, and Subtotal.

**Creating Charts:** Drawing. Printing. Using Tools – Error checking, Formula Auditing, Creating & Using Templates, Pivot Tables, Tracking Changes, Security, Customization.

#### UNIT-IV

[15]

**MS Power point:** Presentation – Opening new presentation, Different presentation templates, setting backgrounds, selecting presentation layouts.

**Creating a presentation:** Setting Presentation style, Adding text to the Presentation.

**Formatting a Presentation:** Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using draw.

**Adding Effects to the Presentation:** Setting Animation & transition effect. Printing Handouts, Generating Standalone Presentation viewer.

**MS Access:** Introduction, Planning a Database, Starting Access, Access Screen, Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing & Print Preview – Importing data from other databases viz. MS Exceletc.

#### Reference Books:

1. Information Technology in Business: Principles, Practices, and Opportunities by James A Senn, PrenticeHall.
2. Technology and Procedures for Administrative Professionals by Patsy Fulton-Calkins, ThomsonLearning.
3. Computer Fundamental MS Office – Including Internet & Web Technology: Anupama Jain (Author), Avneet Mehra
4. The Complete Reference: Virginia Andersen, McGrawHill
5. MS Office 2007 in a Nutshell: S. Saxena, Vikas Publications
6. MS-Office 2007 Training Guide: S. Jain, BPB Publications
7. Learning Computer Fundamentals, MS Office and Internet & Web Technology: D.Maidasani.

## **OET 2.2: SWAYAM Course**

1. Student has to register one course of minimum 4 credits from SWAYAM
2. The selected course should not be from the syllabus.
3. After registration student has to report to the SWAYAM mentor of the dept.
4. Student should register for the online exam of the same course, pass the exam. and submit the marklist / certificate from SWAYAM to the mentor.



**Bridge Course for B.Sc. / B.Com. / B.A. students**  
**M. C. A. Part – I Semester – I**

**HCT-B1** | **Theory : Programming using C**

**Unit – I**[15]

Introduction to problem solving: Algorithms and Flowcharts, pseudo code

Language Fundamentals: History, Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types Operators: Types of operators, Precedence and Associativity, Expression, Statement and types of statements, Structure of 'C' program. Console based I/O and related built-in I/O function: printf( ), scanf( ), getch(), getchar( ), putchar( )

**Unit – II**[15]

Control structures: Decision making structures (if, if-else, Nested if –else, Switch), Loop Control structures (while, do-while, for, Nested for loop), break, continue, goto, exit.

Functions: Basic types of function, Declaration and definition, Function call, Parameter passing, Call by value, Call by reference, Scope of variables, Storage classes, Recursion.

Arrays: Definition, declaration and initialization of one dimensional array, Accessing array elements, Displaying array elements, Sorting arrays, Arrays and function, Two-Dimensional array,

**Unit – III**[15]

Pointers: Definition and declaration, Initialization, indirection operator, address of operator, pointer arithmetic, dynamic memory allocation, arrays and pointers, function and pointers.

**Unit – IV** [15] Strings: Definition, declaration and initialization of strings, standard library functions: strlen( ), strcpy( ), strcat( ), strcmp( ), implementation without using standard library functions.

Structures: Definition and declaration, structure variables initialization, Accessing fields and structure operations, Nested structures,

**Reference Books:**

1. Let us C: Yashwant Kanetkar, 12th Edn., B P B Publications.
2. Programming in ANSI C: E. Balguruswamy, Tata McGraw Hill, 2008.

**HCP-B1** | **Practical : Programming using C**

Minimum 20 practicals based on the above HCT-B1 syllabus.