SOPHIA GIRLS' COLLEGE, (AUTONOMOUS) AJMER

Scheme of Examination
And
SYLLABUS

2018-19 (Batch)

FOR

Master of Science
(COMPUTER SCIENCE)

Under
Choice Based Credit System

Semester - I to IV

Scheme of Examination
(For M. Sc. Computer Science)

The examination for the M. Sc. Computer Science will consist of (a) Theory papers (b) Laboratory / Practical work and project work. Candidates will be required to pursue a regular, full time course of study at the University department and the affiliated colleges for a period of two academic years in order to be eligible for appearing in the examination.

1. Eligibility for M. Sc. Computer Science: 50% marks in any graduation scheme.
2. Examination:
    i. There shall be 25 papers (16 theory, 8 practical in each year and 1 project as practical in the final year) of 2100 marks (previous and final year). Theory paper shall be of 3 hours duration having 100 marks. Out of 100 marks 30 marks shall be considered as internal assessment based on internal test and seminars and 70 marks will be of theory examination. The practical shall be of 50 marks out of which 15 marks shall be considered as internal & 35 marks assessed by external examiner. The project work shall be of 100 marks based on project presentation and viva-voce out of which 30 marks shall be considered as internal & 70 marks assessed by internal & external examiner.
    ii. For passing a candidate shall have to secure at least 40% marks in each course (theory paper, internal and practical work separately) and 50% marks in the aggregate in all the courses.
    iii. Due paper(s) will be applicable if a candidate obtains 50% marks in aggregate and fails in not more than three (3) papers (theory). Due paper(s) will be held along with the examination of the next year. The chance of due paper(s) will be given only 2 times.
    iv. Wherever a candidate appears at for a due paper examination he/she will do so according to the syllabus in force.
    v. A candidate not appearing at any examination/absent in any paper of term end examination shall be deemed as fail.

3. A candidate for a pass in the examination shall be required to obtain:
    i. At least 50% marks in the aggregate of all the papers prescribed for the examination and
    ii. At least 50% marks in the practical(s) wherever prescribed at the examination, provided that if a candidate fails to secure at least 40% marks in each individual paper at the examination notwithstanding his having obtained the minimum percentage of marks required in the aggregate for that examination.

    No Division will be awarded in the Previous Year examinations. Division shall be awarded at the end of the Final Year Examination on the combined marks obtained at the previous and final examinations taken together as noted below:

    Passed with First Division — 60% of the aggregate marks taken together of previous and final examinations

    Passed with second division — 50%

    Provided that if a candidate clears any paper after a continuous period of two years since he/she was admitted to the M. Sc. Computer Science/Information Technology then for the passing marks, i.e. 40% marks, shall be taken into account in the case of such course(s).

    Provided further that in case where a candidate requires more than 40% marks in order to reach the requisite minimum aggregate as many marks, out of those actually secured by him/her will be taken into account as would enable him/her to make up the deficiency in the requisite minimum aggregate marks.

4. Candidates reappearing at an examination in a subsequent year shall be examined in accordance with the scheme and syllabi in force and shall be entitled to the award of the degree of year in which they clear the last failing/unclear paper.

Examination Pattern

Maximum Marks : 70 **Duration:2½Hrs.**

Section A 10 * 1 =10 marks

Contains 10 Questions of 1 mark each & all are compulsory to do.
Three questions from each unit (but 4 questions from one unit)
3 + 3 + 4 = 10 Questions

Section B 3 * 5 = 15 marks

Contains 3 questions with internal choice (Two questions from each unit).
Each Question carries 5 marks. All Questions are compulsory to do.

Section C 3 * 15 = 45 marks

Contains 3 questions with internal choice (Two questions from each unit).
Each Question carries 15 marks. All Questions are compulsory to do.

Note:

1. There will be sessional (internal assessment) of 30 marks conducted by the college.
2. Two Practical exams shall be conducted by one internal and one external examiner of a batch of 20 students in day.
3. **Project Work:** 6 hours per student.
   The Project Report work shall be assessed by one internal and one external examiner only of a batch of 20 students in a day. The project work should not be done in a group. Each student shall be allotted one project and one copy should be submitted to the College.
4. Duration of Practical exam is 3 hours.
5. A Laboratory Exercise File should be prepared by each student for each practical paper and should be submitted during practical examinations.
6. Practical of 35 marks distribution is as under:
   a. 15 marks for practical examination exercise for 3 questions
   b. 10 marks for Viva-voce
   c. 10 marks for Laboratory Exercise File

Course Structure in Semester - I

Paper Code	Nomenclature	Contact Hours		Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
		Per Sem	Per Week		CIA	ESE			
MSC–101	Computer Architecture	90	06	06	30	70	100	40	3 Hrs.
MSC–102	Computer Communications & Networks	90	06	06	30	70	100	40	3 Hrs.
MSC–103	Programming with 'C++'	90	06	06	30	70	100	40	3 Hrs.
MSC–104	Database Management System	90	06	06	30	70	100	40	3 Hrs.
MSC–105	Computer Architecture & DBMS – Laboratory	90	06	03	15	35	50	20	3 Hrs.
MSC–106	'C++' Programming - Laboratory	90	06	03	15	35	50	20	3 Hrs.
				Semester Total			**500**	**200**	

MCS – 101 Computer Architecture

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand the design of circuits and the number system used
2. Handle interrupts and instruction codes
3. Know basic pin configuration of 8085 microprocessor
4. Demonstrate functioning of different sub systems, such as processor, Input/output, and memory

Unit-I

Number system, Arithmetic operations,1's and 2's complements,9's and 10's complement, BCD (addition and subtraction), codes: BCD to binary convertor, binary to gray and gray to binary.Excess-3 code. Boolean algebra and minimization techniques: boolean logic operations, basic laws of Boolean algebra, demorgan's theorem, sum of product and product of sum, karnaugh map. Logicgates, Arithmetic circuits: halfadder, fulladder. Combinational circuits: multiplexors, demultiplexors, decoders, encoders, Sequential circuits: Latches ,flip-flops., Registers, shift registers.

Unit-II

Register transfer language, inter-register transfer, arithmetic micro operation, logic and shift micro operation, instruction codes, instruction format, timing and control, input/output and interrupts. Processor bus organization, arithmetic logic unit, stack organization,

Unit-III

Block diagram of 8085 and pin configuration, data transfer instructions, arithmetic, logical, shift, rotate, flag, compare, jump instruction, subroutine, loop, addressing modes, associative memory, virtual memory, cache memory, cache coherence.

Reference Books:

- Computer Architecture and Organization, Hayes, Tata McGraw Hill
- Computer Architecture and Logic Design, Thomas C, Tata McGraw Hill
- Computer System Architecture, M. Morris Mano, PHI
- Digital computer, M. Morris Mano, PHI
- Computer Architecture, William Stallings, Pearson

MCS – 102 Computer Communications and Networks

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome

1. Study the basic taxonomy and terminology of computer networking and enumerate the layers of OSI model and TCP/IP model.
2. Acquire knowledge of Transmission Media and Error checking and correction method
3. Gain core knowledge of Asynchronous transmission Mode
4. Include learning about computer network organization and implementation, obtaining theoretical understanding of data communication and computer networks.

Unit I

Introduction to Data communications and networking, protocols, standards and architecture, topology, transmission mode, OSI model, analog and digital signals, periodic and aperiodic signals: time and frequency domain, Encoding digital to digital conversion, analog to digital conversion, digital to analog conversion, analog to analog conversion, transmission of digital data.

Unit II

Transmission media, guided and unguided, Multiplexing, TDM, FDM, WDM, HDLC, error classification, types of errors, error detection, error correction, virtual redundancy check, longitudinal redundancy check, cyclic redundancy check.

Unit III

Asynchronous transfer mode, protocol architecture, ATM cells, ATM layers, switches, circuit switching network and concepts, routing, packet switching, point-to-point layers, link control protocol, network control protocol.

Reference:

- Data and Computer communications, William Stallings, PHI
- Data communication and networking, Behoruz A. Forouzan
- Data communication and networking, A S Godbole, Tata McGrawhill
- Network concepts and Architecture, Hancock, BPB Publications
- Data Communication and Networking, Tannenbaum, PHI

MCS – 103 Programming with C++

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand and apply OOP's features and C++ concepts
2. Construct class and object using constructors
3. Apply the concept of polymorphism and inheritance
4. Implement with an attempt to develop different types of practical skills so that students can acquire the competencies.

Unit – I

Programming Languages & Techniques, Introduction to C++ identifier and keywords, Constants, Variables, Operators, Data Type & Conversion, Instructions : Input Output, Arithmetic Expressions, Decision Control. Loop Control, Nesting, Break, Continue, Case Control. Functions: Characteristics & Advantages, Types of Functions, Call by Value & Reference. Pointers: Pointers to Variable & Function Arguments, Recursion. Storage Classes.

Unit – II

Arrays: One Dim. & Two Dim Character Array : String Definition & Implementation, String Handling Functions: strlen, strcpy, strcat, strcmp, reverse. Structure: Definition, Characteristics, Array of Structure, Pointer to Structure, Union.

Evolution of OOP, Advantages of OOP, comparison between functional programming and OOP approach, characteristics of object oriented language-objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading.

Unit – III

Classes, member functions, objects, arrays of class objects, pointers and classes, constructors, destructors, Function overloading, Static Class Member, friend functions, dynamic memory allocation. Inheritance, types of inheritance, member access control. Function overloading, operator overloading, polymorphism, virtual functions & Function overriding

Reference Books:

- Object Oriented Programming with C++, E. Balagurusamy, Tata McGraw Hill.
- OOPS with C++, N P Bhave,
- OOPS with ANSI C++, A N Kamthane,
- Robert Lafore, "Object-Oriented Programming in C++", Galgotia Publications.

MSC – 104 Database Management System

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand key concepts of database system
2. Apply the ER concept and ER mapping to relational Model.
3. Differentiate file organizations, relational algebra operations and Design database in Excel
4. Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

Unit - I

Overview of Database: Basic DBMS terminology, Conventional File System Drawbacks,
DBMS: Introduction, Advantages and Disadvantages, DBA and his responsibilities, Data Abstraction, Physical and Logical Data Independence , Architecture of DBMS: Client/Server Architecture, 2 Tier & 3 Tier.

Unit – II

Entity-Relationship Model: Concept, Entity, Entity Set, Attributes, Relationships, Keys (Types), Generalization, Specialization, Aggregation, Overview of Hierarchical, Network and Relational Models, Comparison of Network, Hierarchical and Relational Models.

Unit - III

File Organization: Introduction, Types (Sequential, Direct, Indexed sequential).
Relational Algebra: Set Operators (Union, Intersection, Set-Difference, Cartesian Product), **Relational Operators:** (Select, Project, Rename, Join) , Decomposition of Relational Schemes, Dependencies and its types, Normalization up to DKNF.
MS-Access: Introduction, understanding databases, creating table, creating and customizing a form, adding, editing, sorting and searching of records, creating and printing reports, queries(select, update, delete), creating a database and application, linking importing and exporting data, form, creating reports.

Reference Books:

- Fundamentals of Database Systems- Elmasri And Navathe Benjamin/Cummings Publishing Co. Inc.
- An Introduction to Database Management System - Bipin C. Desai
- An Introduction to Database system-C.J. Date Narosa Publishing House.

Course Structure in Semester - II

Paper Code	Nomenclature	Contact Hours		Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
		Per Sem	Per Week		CIA	ESE			
MSC–201	Compiler Design	90	06	06	30	70	100	40	3 Hrs.
MSC–202	Operating System	90	06	06	30	70	100	40	3 Hrs.
MSC–203	Programming in Visual Basic.Net	90	06	06	30	70	100	40	3 Hrs.
MSC–204	Computer Graphics	90	06	06	30	70	100	40	3 Hrs.
MSC–205	Visual Basic.Net - Laboratory	90	06	03	15	35	50	20	3 Hrs.
MSC–206	Linux Shell Programming, Computer Graphics - Laboratory	90	06	03	15	35	50	20	3 Hrs.
AEC-201 ***(Ability Enhancement Course)***	**1.** Adv. Communication Skill **OR** **2.** Human Rights	-	2	2	15	35	50	20	2 ½ hrs
				Semester Total			**550**	**220**	

MCS – 201 Compiler Design

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Describe the functionality of each phase involved in compilation process
2. Implement the parsing techniques including top down and bottom up parsing
3. Understand the different representation of intermediate code and code optimization
4. Provide an in-depth view of translation and optimization process. Compiler design covers basic translation mechanism and error detection & recovery. It includes lexical, syntax, and semantic analysis as front end, and code generation and optimization as back-end.

Unit I

Compilers : Introduction, Definition, Programming Language Processors, Types of Compilers, Architecture of Compiler, Execution of Compiler, Phases & Passes of Compiler. Difference between Interpreter and Compilers. **Lexical Analysis –** Lexeme, token & pattern, role & design of lexical analysis. Regular expression & regular grammar.

Unit II

Syntax Analyzer : Introduction to context free grammar, Derivation & Prase Tree, Ambiguity in grammars, Eliminating ambiguity, Transformations of Grammar : Elimination of left recursion, left factoring.

Parsers: Introduction, Top down parser – Recursive Descent Parsing, Predictive LL(1) parser, Constructing predictive parse table, LL(1) grammar.

Bottom-Up Parsing: Introduction, Right most Derivation, Handle and Handle Pruning. Shift-reduce Parser, Operators Precedence Parser.

Unit III

LR Parser: Introduction, Properties, Structure of LR Parser**.**

Intermediate Code Representation: Introduction, Advantages, Three address code, quadruples, Indirect Triples, **Code Optimization:** Introduction, Classification, DAG, **Code Generation**

Reference Books:

- Principles of Compiler design, Alfred V Aho & Jeffrey D Ullman, Addison Wesley.

- System programming, Donovan
- The Essence of Compilers, Robin Hunter, Pearson Education (LPE)

MCS – 202 Operating System

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand the structure and functionalities of an OS
2. Apply scheduling algorithms and Apply different page replacement algorithms
3. Understand concept of memory management andExecute shell commands
4. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls.

Unit I

Introduction to Operating Systems, goals of OS, operation of OS, classes of OS, batch processing, multi-processing, time sharing, distributed, real time systems, system calls, structure of OS, layer design of DOS, Unix. Process concept, process scheduling, scheduling criteria, long medium short term scheduling, CPU scheduling algorithms threads.

Unit II

Logical versus physical address, swapping, contiguous allocation,Fragmentation ,compactation, segmentation, paging, segmentation with paging, page replacement algorithm, virtual memory, virtual memory with paging, demand paging, dead lock, characterization, methods for handling dead locks, prevention, avoidance, thrashing, allocation of frame.

Unit III

Critical section, critical region, inter-process communication, monitor and semaphores.
History of Linux, Linux architecture, Linux File System, file naming, types of files, directory command, file command, vi editor, locating files in Linux, filter, pipe, shell variables, local and global variables, command substitution, if, while, for, shift, tar, basic networking commands in Linux.

Reference Books:

- Advance Unix – A Programmer's Guide, Prata, SAMS
- Operating System Concepts, Galvin, Addison Wesley
- Operating Systems, Ritchie, BPB Publications.
- Unix System V Primer, Prata, BPB Publications

MCS – 203 Programming in Visual Basic.Net

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Develop programs by using basic features of the language.
2. Test different String manipulation technique and Express programs according to OOP concepts.
3. Handle run time errors and Connect, retrieve and manipulate backend data by using database connectivity.
4. Understand and implement string manipulation, events, and exception handling within. NET application environment

Unit-I

Introduction to Visual Basic .NET IDE and its features, .NET framework, CLR. Language basics: data type, operators, control statements: branching and looping. .NET Controls Forms, text boxes, labels, command button, radio button, option buttons, check boxes, list boxes and combo boxes, introduction to ActiveX controls

Unit-II

Strings and Arrays Working with Arrays, array resizing, System Array, class, manipulation of string, string functions for comparison, concatenation, copy, replace, substring, length.

Working with Classes, Class properties and methods, attaching a class with a form Inheritance: derived from existing classes, overriding methods from base class

Unit-III

Exception Handling Types of errors, structured and unstructured exceptions, Tracing Errors: breakpoints, watch, quick Watch, autos, locals, call stack.

Database Access ADO.NET and its Components, datasets, data adapters, server explorer, binding controls to database

Reference Books :

- Visual Basic.NET Black Book – Steve Holzner
- Visual Basic.NET Programming Bible – Bill Evjen
- Pro ADO.NET with VB.NET – Sahil Mailk and Paul Dickinson

MCS – 204 Computer Graphics

Max. Marks : 100 **Min. Marks : 40**

Credit : 6 **Duration : 3 Hrs.**

Learning Outcome

1. Understand the structure of modern computer graphics systems and Input output Device and implement various algorithms to scan, convert the basic geometrical primitives
2. To define the fundamentals of 2D transformations and To describe the importance of Clipping, viewing and projections
3. To learn the basic principles of 3- dimensional transformation along with surface identification and Curves
4. Students will be able to: write programs involving different multimedia formats and able to create simple 2D animations.

Unit I

Interactive graphics, passive graphics, advantage of interactive graphics, application, Hardware (Video Display Devices: CRT, DVST, Emmisive & Non Emmisive) & software requirement of computer graphics. Raster and random scan system.

Algorithm: - Line (DDA algorithm, Bresenham's line algorithm), Circle(Midpoint circle algorithm, Bresenham's line algorithm), Ellipse (Midpoint ellipse algorithm), Area Filling Algorithm (Scan-Line fill, Boundary fill, Flood fill).

Unit II

2D Transformation and their matrix representation (translation, rotation, scaling, , reflection, shearing), General pivot-point rotation, general fix scaling, composite transformation ,affine transformations, window-to-view port transformation of 2D.

Clipping in Raster, point clipping, Line clipping, Cohen-Sutherland Line clipping Algorithm, Cyrus-Beck Line clipping Algorithm, Liang-Barsky Line clipping Algorithm, Polygon clipping, Text Clipping.

Unit III

3D display method, Projection (parallel projection, perspective projection), Visible line identification, Visible Surface Detection (Back-face, Painter's Algorithm), Polygon (surface, table, equation, mashes), Polynomial and Spline curves, parallel curve algorithms, Splines Representation, Cubic Spline (Interpolation, Approximation), Bezier Curves and surfaces, B-Spline and surfaces, Beta-Spline. 3D transformation, rotation, scaling, composite transformation.

Reference:

- Principles of Interactive Computer Graphics, Newman and Sproull, Tata McGraw Hill
- Computer Graphics, Hern & Becker, Pearson Publication (LPE)
- Computer Graphics, Plastok and Gordon Kalley, McGraw Hill
- Computer Graphics, Cornel Pokorny, BPB Publications.

Course Structure in Semester - III

Paper Code	Nomenclature	Contact Hours		Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
		Per Sem	Per Week		CIA	ESE			
MSC–301	Software Engineering	90	06	06	30	70	100	40	3 Hrs.
MSC–302	Cloud Computing	90	06	06	30	70	100	40	3 Hrs.
MSC–303	Data Warehouse & Mining	90	06	06	30	70	100	40	3 Hrs.
MSC–304	Advance Database Management System	90	06	06	30	70	100	40	3 Hrs.
MSC–305	Data Mining (WEKA) - Laboratory	90	06	03	15	35	50	20	3 Hrs.
MSC–306	ADBMS (Oracle) - Laboratory	90	06	03	15	35	50	20	3 Hrs.
						Semester Total	**500**	**200**	

MCS – 301 SOFTWARE ENGINEERING

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to:-

1. Understand importance of architecture in building effective, efficient, competitive software product.
2. Explain methods of capturing, specifying, visualizing and analyzing software requirements.
3. Explore the different Testing methods
4. Basic knowledge and understanding of the analysis and design of complex systems and ability to apply software engineering principles and techniques.

Unit - I

Concepts of Software Engineering, Software Characteristics, components, applications, Umbrella Activity, System Development Life Cycle (SDLC) ,

Software Process Model: Water fall model (classical and Itreative), Prototype. Spiral model

Software Metrics and Models; Role of Metrics and Measurement, Process and Product Metrics, Size metric, Function Point Analysis, Halsted Theory, Cost Estimation- COCOMO Mode (Basic and Intermediate).

Unit - II

Planning and Software Project:

Project Scheduling and its goal, Work breakdown structure, Project Scheduling and its techniques: Gantt Chart, PERT and CPM. Introduction to Software Quality assurance.

Design: Introduction , Definition, Objective ,Modularity(Cohesion & Coupling)

Coding: Introduction, Code Review (Code Walkthrough, Inspection, Clean room Approach)

Unit - III

Testing : Testing Fundamentals and Introduction , Definitions of Testing, Testing Objective, Testing Principles.

Software Testing Strategies: Unit Testing, Integration Testing, Validation Testing (Alpha and Beta Testing) , System Testing (Recovery, Security, Stress, Performance),

Black Box Testing and its Methods: 1.Graph Based Testing Methods, 2.Equivalence Partitioning, 3.Boundary value Analysis,4. Comparison Testing,

White Box Testing and its Methods: Static Testing (Code walk through, code inspections, Reviews).

Dynamic testing (1. Unit Code /Functional Testing, 2. Unit Code Coverage Testing (Statement, Path,

Condition, Function Coverage) 3. Code Complexity 4. Basis Path Testing (Flow Graph Notation, McCabe's Cyclometic), 5. Graph matrix.) .

Reference Books:

- Software Engineering Fundamentals, Ali Behforooz, Oxford University Press.
- Software Engineering, Pressman, R. S. Pressman & Associates.
- Software Engineering, Sommerville, Addison Wesley

MCS – 302 Cloud Computing

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to:-

1. Define cloud computing and identifying various service models.
2. Demonstrate various technologies related to IAAS and Manage virtual infrastructure in distributed environment.
3. Employ PAAS platforms like Aneka and Comet Cloud and Take appropriate measures for data security over cloud computing.
4. Demonstrate different features of cloud platforms used in Industry.

Unit – I

Introduction to Cloud Computing

Introduction, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Service Models: Infrastructure as a Service(IaaS), Platform as a Service Providers(PaaS), Software as a Service (SaaS), Challenges and Risks.

Unit – II

Infrastructure As A Service (IAAS)

Virtual Machines, Distributed Management of Virtual Infrastructures, Scheduling Techniques for Advance Reservation of Capacity, Cluster as a Service, Cloud Storage, Technologies for Data Security in Cloud Computing.

Unit – III

Platform As A Service (PAAS)

Technologies and Tools for Cloud Computing, Aneka Cloud Platform, Hybrid Cloud Implementation, Comet Cloud, Autonomic Behavior of Comet Cloud.

An Introduction to the Data Security, Cloud Computing and Data Security Risk, The Cloud, Digital Identity, and Data Security, Legal Issues in Cloud Computing.

Reference Books:

- Cloud Computing: Principles and Paradigms, Rajkumar Buyya and James Broberg, Published by Wiley.
- Cloud Computing, Kamal Kant Hiran, Ruchi Doshi, Temitayo Fagbola, Mehul Mahrishi, BPB Publications.
- Handbook of Cloud Computing, Dr. Anand Nayyar, BPB Publications

MCS – 303 DATA WAREHOUSE & MINING

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand the concepts of data warehouse and data mining
2. Analyze transaction databases for association rules
3. Use classification methods and various clustering techniques for categorizing data
4. To provide ability to apply acquired knowledge for understanding data and select suitable methods for data analysis.

Unit - I

Data Warehousing: Introduction to Data Warehouse, Data mart, Data warehouse architecture, Multidimensional Data Model (data cube) OLAP Techniques : Roll-up, slicing and dicing, drilldown, pivot, Approaches to OLAP servers (MOLAP,ROLAP,HOLAP) OLTP, Warehouse schema(star schema, snowflake schema, fact constellation) metadata,. Data Warehouse ETL Process (data extraction, data cleaning, data transformation, loading).

Unit – II

Data Mining: Introduction, Definition, KDD vs. DM, DBMS vs. DM, DM Techniques: verification model, discovery model: discovery of association rule, discovery of classification rule, clustering, discovery of frequent episodes, deviation detection, Issues and Challenges in DM, DM Applications (Business and E-commerce, Scientific, Engineering and Health care, Web data)

Unit – III

Association Rules, Market basket analysis, Association Rules: Apriori Algorithm, Partition, Incremental, FP-tree growth algorithms, learning techniques(supervised and unsupervised)
Classification: Hierarchical and non-hierarchical techniques, Partitioning,
Clustering: K-MEDOID Algorithm K-means clustering, hierarchical clustering.
Decision Trees: decision tree, types of decision tree Decision tree induction, Tree pruning, Extracting classification rules from decision trees, Decision tree construction algorithms: CART, ID3, J48, Decision tree construction with presorting.

Reference Books:

- Data Warehousing in the Real world", Anahory S, Murray D, Addison Wesley
- Building the Data Warehouse, Inmon W. H. Wiley Dreamtech
- Data Mining ,Prof. ArunPujari,University Press
- Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP, McGrawHill.
- D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press.

MCS – 304 ADVANCE DATABASE MANAGEMENT SYSTEMS

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand OODBMS concepts
2. Compare between different database types and Execute various operations on database using SQL
3. Compose packages in PL/SQL and Handle error and various events on database
4. Perform PL/SQL programming using concept of Error Handling, Package and Triggers

Unit I

Object Oriented concepts: complex objects, object definition language, object query language, primary, secondary, multi-level indexes.

Distributed Databases: Distributed Data Storage, Distributed Transactions, Commit protocol, Concurrency Control in Distributed Databases.

Transaction management, and serializability, Recovery technique: log based recovery, Temporal database concept and multimedia database.

Query optimization and processing, algorithm for external sorting, select and join, Project and set operations

Unit II

Introduction to SQL, E.F.Codd's rules, Components of SQL, Data Types, DDL & DML Commands (create, alter, insert, delete and update) & Constraints: Primary Key, Foreign Key, Check Constraints, Unique & Not Null.

SQL: Searching, Matching & Basic Oracle Functions: String, numeric, Aggregate & Conversion Functions, Queries based on group by clause, Sub queries & joins.

Unit III

Introduction to PL/SQL and its advantages over SQL, PL/SQL block structure , PL/SQL syntax, Data types, Control structures, conditional checking, Error handling in PL/SQL, Oracle transactions, creation and execution of procedures, creating function and packages.

Database Triggers: Introduction, Use & type of database Triggers, Triggers Vs. Declarative Integrity Constraints, BEFORE Vs. AFTER Trigger Combinations, Creating a Trigger, Dropping a Trigger.

Reference Books:

- SQL Complete Reference, Leon and Leon, Tata McGraw Hill
- SQL, PL/SQL Programming Language, Ivan Bayross, BPB Publications
- DB2 Developer's Guide, Mullins, BPB Publications
- Data Base Management System, Navathe, Pearson Education Asia.

Course Structure in Semester - IV

Paper Code	Nomenclature	Contact Hours		Credits	Total Marks		Max. Marks	Min. Marks	Exam. Duration
		Per Sem	Per Week		CIA	ESE			
MSC–401	Artificial Intelligence	90	06	06	30	70	100	40	3 Hrs.
MSC–402	XML Technology	90	06	06	30	70	100	40	3 Hrs.
MSC–403	A. Web Technology **OR** B. Image Processing	90	06	06	30	70	100	40	3 Hrs.
MSC–404	Dissertation (Project)	90	06	06	30	70	100	40	3 Hrs.
MSC–405	XML Programming & AI	90	06	03	15	35	50	20	3 Hrs.
MSC–406	Java, JavaScript (Web Technology)	90	06	03	15	35	50	20	3 Hrs.
GE – 401	1. Adv. Tax Management **OR** 2. Adv. Computer Application	-	02	02	15	35	50	20	2 ½ Hr.
				Semester Total			**550**	**220**	
				Consolidate			**2100**	**840**	

MCS – 401 ARTIFICIAL INTELLIGENCE

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Understand basic principles and application of AI
2. Represent knowledge in various ways and Solve various problems by applying a suitable search method
3. Understand key concept of learning and Plan an expert system for specific domain
4. Apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems.

Unit I

Definition of AI, Applications of AI, knowledge-based systems, representation of knowledge, organization and acquisition of knowledge.

Syntax, semantics of propositional logic, syntax and semantics of FOPL, conversion to clausal form.

Unit II

Inference rule, resolution principles Non-deductive inference methods, Representation using rules, truth maintenance system, fuzzy logic.

Bayesian probabilistic inference, associative networks, frame networks, search problems: uniformed or blind search (Recursive DFS, Iterative Broadening, Bi-Directional searching), informed or Heuristics Search(Greedy or Best First search).

Unit III

Concept of learning: Inductive and deductive, Knowledge acquisition, rote learning, Components of Learning Model, Performance Measures, Types of Learning (Supervised, Unsupervised, Active & Reinforcement).

Concept of expert system, need for an expert system, Characteristics & features of an expert system, Components of an expert system, Stages in the development of an expert system, Application areas of Expert System.

Reference Books:

- Introduction to AI & Expert System – Patterson - PHI
- Artificial Intelligence - Elaine Rich & Kevin Knight – MGHill
- Artificial Intelligence - Luger – Pearson

MCS – 402 XML TECHNOLOGY

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

1. Provides a standard way to structure data, along with transformation tools
2. Validate XML documents with the use of Document Type Definitions and schemas according to industry standards.
3. Understand the security aspect of XML document using Cryptography techniques
4. The students will learn the basics of creating XML documents, transforming XML documents, and validating XML documents.

Unit – I

Role of XML - XML and the Web - XML Language Basics - SOAP - Web Services - Revolutions of XML, Service Oriented Architecture (SOA). XML TECHNOLOGY: XML - Name Spaces, Document type definition, schemas, Presentation Techniques: CSS, XSL & XSLT.

Unit – II

Overview Of SOAP , HTTP - XML-RPC , SOAP: Protocol - Message Structure - Design Patterns And Faults, SOAP With Attachments.

WEB SERVICES: Overview, Architecture, Key Technologies, UDDI, WSDL, ebXML, SOAP & Web Services

Unit – III

XML SECURITY: Security Overview, Canonicalization, XML Security Framework, XML Encryption , XML Digital Signature , XKMS Structure.

Reference Books:

- Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson
- Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc.,
- Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education

MCS – 403 (A) WEB TECHNOLOGY

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Get familiar with basics of the Internet contrast between static and dynamic webpages
2. Acquire knowledge and skills for creation of web site considering HTML and client side programming using Javascript
3. Implement the functions of Date, Math and String objects
4. Helps students to build dynamic web pages using JavaScript (Client-side programming).

Unit – I

HTML : Introduction, HTML Documents, Basic structure of an HTML document, Creating an HTML document , Information type elements, Character Formatting Elements, Block Formatting Elements. Working with Lists, Hyperlinks, Images.

HTML Tables : Introduction to HTML tables and their Basic Structure Part, The table tags, Attributes of Table Tag, attributes of <TR>Tag, Attributes of <TD>Tag, Attributes of <TH> Tag.

Unit – II

Forms : Introduction, The FORM Elements, Form Controls, Named Input fields, The <INPUT> tag, Hidden, Text box, Text Area, Password, Button, Submit, Reset, Radio, Checkbox, Select, pull down .

Java Script: Introduction, Keywords, variables, Data type Numbers, Booleans, Strings, Objects, Null, Undefined.

Operators : Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment/ Decrement Operator, Bitwise Operator, Conditional operator, Comma operator, delete, new, this, Expression, Comment, Input-output.

Unit – III

Control Structure: if-else, switch, Loop: while, do-while, for, for-in, break, continue, return, import, export.**Objects and its types:Array**: create, access, methods (length, reverse, sort)**Boolean** : toString, valueof()**Date:** getYear(), setYear(), getMonth(), setMonth(), getDate(), setDate(), getDay(), getTime(), setTime(), getHours(), setHours(),getMinutes(), setMinutes(), getSeconds(), setSeconds()

Math: abs(), min(), max(), pow(), round(), sqrt()**String**: Bold, Italic, Length, indexOf, lastIndexOf(), search(), slice(), substring(), replace(), toUpperCase(), toLowerCase(), concat(), String.trim(), charAt, charCodeAt, **Function**: **Built-in-Function:** (eval(),infinite(), isNaN(), parseFloat(), parseInt()), **User-defined-Function :** (create, calling, return)**Events and Event Handlers** : General Information about Events, Defining Event Handlers, events: onClick, onDblClick, onMouseOver, onMove

Reference Books:

- Introduction to Java Programming, Y. Daniel Liang, PHI.
- Java Complete Reference, Patrick Naughton, Tata McGraw Hill.
- The Java Handbook, Patrick Naughton, Tata McGraw Hill.

MCS – 204 (B) Image Processing

Max. Marks : 100 **Min. Marks : 40**

Credit : 6 **Duration : 3 Hrs.**

Learning Outcomes

1. Apply knowledge of mathematics for image understanding and analysis.
2. Design and analysis of techniques / processes for image understanding.
3. Design, realize and troubleshoot various algorithms for image processing case studies.
4. Select the appropriate hardware and software tools (Contemporary) for image analysis.

Unit I

Introduction and Digital Image Fundamentals Digital Image Fundamentals, Human visual system, Image as a 2D data, Image representation – Gray scale and Color images, image sampling and quantization

Image enhancement in Spatial domain: Basic gray level Transformations, Histogram Processing Techniques, Spatial Filtering, Low pass filtering, High pass filtering

Filtering in the Frequency Domain: Preliminary Concepts, Extension to functions of two variables, Image Smoothing, Image Sharpening, Homomorphic filtering

Unit II

Image Restoration and Reconstruction: Noise Models, Noise Reduction, Inverse Filtering, MMSE (Wiener) Filtering

Color Image Processing: Color Fundamentals, Color Models, Pseudo color image processing

Image Compression: Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression standard

Unit III

Morphological Image Processing: Erosion, dilation, opening, closing, Basic Morphological Algorithms: 04 08 hole filling, connected components, thinning, skeletons

Object Recognition and Case studies Object Recognition- patterns and pattern classes, recognition based on decision – theoretic methods, structural methods, case studies – image analysis Application of Image processing in process industries

Reference Books:

- Gonzalez & Woods, ―Digital Image Processing‖, 3rd ed., Pearson education, 2008
- Jain Anil K., ―Fundamentals Digital Image Processing‖, Prentice Hall India, 2010
- Rangaraj M. Rangayyan, ―Biomedical Image Analysis‖, CRC Press, 2005
- Pratt W.K, ―Digital Image Processing‖, 3rd ed., John Wiley & Sons, 2007
- Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods Publisher: Pearson Education

MCS – 404 Dissertation / Project

Max. Marks : 100 **Min. Marks : 40**
Credit : 6 **Duration : 3 Hrs.**

Learning Outcome:

On successful completion of the course, the students will be able to

1. Express technical and behavioral ideas and thoughts
2. Self learned new tools, algorithms and techniques that contribute to the software solution
3. Test and validate conformance of the developed prototype against the original requirements of the problem
4. The Dissertation modules enable students to develop knowledge and understanding of a specialist area within the broad fields of career development and work-related learning.

Contents

1. Project Work Duration : 60 hours per student.
2. The Project Report work shall be assessed by one internal and one external examiner only of a batch of 20 students in a day.
3. The project work should not be done in a group. Each student shall be allotted one project and one copy should be submitted to the College.