**Semester Syllabus for Postgraduates**
**As recommended by Board of Studies of Computer Science and Applications**
**Barkatullah University, Bhopal**
**Session 2018-19 onwards**

**Class: M. Sc. Computer Science Semester II (for Regular Students only)**

| Paper Code | Paper Title | Internal | Theory | Grand Total |
|---|---|---|---|---|
| **MSCS-201** | Data Structures and Algorithms | 15 | 85 | 100 |
| **MSCS -202** | Advanced Computer Networks | 15 | 85 | 100 |
| **MSCS -203** | Advanced RDBMS | 15 | 85 | 100 |
| **MSCS -204** | Information Storage Management | 15 | 85 | 100 |
| **MSCS -205** | **Lab-I(Data Structures & Algorithms)** | | | 50 |
| **MSCS -206** | **Lab-II( Advanced RDBMS)** | | | 50 |
| | | | Grand Total | 500 |

**Paper code:MSCS-201**

**Paper Title:DATA STRUCTURES AND ALGORITHMS** **Max. Marks: 85**

## UnitI

Data Representation:Introduction,Linear List, Formula Based Representation,Linked representation, Indirect Addressing,Simulating Pointers.

Arrays and Matrices:The abstract data type, Operations: traversing, insertion, deletion, searching( linear & binary search) and their algorithms, row major & column major representation. Matrices: definition and operations, Special Matrices, Sparse Matrices.

### UnitII

Stacks:The Abstract Data Type,PUSH & POP operations, Array representation, Linked Representation, Applications.

Queues: The Abstract Data Type, Formula Based Representation, Linked Representation, Applications.

Priority Queues: Introduction, Linear List, Applications.

### UnitIII

Binary and other Trees: Trees, Binary Trees, Properties, Representation, Common Binary Tree Operation, Binary Tree Traversal, The ADT Binary Tree, The Class Binary Tree, ADT and Class Extensions, Applications.

Tournament Trees: Introduction, The ADT Winner Tree, The Class Winner Tree, Loser Tree Applications.

Search Trees: Binary Search Tree,AVL Trees,Red-Black Tree,B-Tree Applications.

### UnitIV

Graphs : Definitions, Applications, Properties,The ADTs Graph And Digraph, Representation of Network,Class Definition:Graph Iterators,Language Features,Graph Search Methods, Applications.

The greedy Method: Optimization Problems, The Greedy Method , Applications.

Divide and Conquer: The Method , Applications: merge sort, quick sort and selection sort.

### UnitV

Dynamic Programming: The Method, Applications.

### TEXT BOOKS & REFERENCE BOOKS:


1. SartajSahni, Data Structures , "Algorithms and Applications in C++", McGraw Hill
2. Seymour lipschutz, "Theory and problems of data structures", Schaum Series.
3. Weiss, "Data Structures & Algorithm Analysis in C++", A.W.L

**Paper Code: MSCS- 202** **Max. Marks:85**

**Paper Title: ADVANCED COMPUTER NETWORKS**

**Unit I**

**Introduction:** Protocols and standards, Standards Organizations, Internet Standards, Internet Administration; Overview of reference models: The OSI model, TCP/IP protocol Suite, Addressing, IP versions. Connectors, Transceivers and Media converters, Network interface cards and PC cards, Repeaters, Hubs, Bridges, Switches, Routers and Gateways.

**Unit II**

**IPV6:** Why IPV6, basic protocols, extension & option, support for QOS, Security, etc, neighbor discovery, auto- configuration, routing. Change to other protocols. Application Programming interface for IPV6. 6Bone.

Introduction to Cryptography: Basic Terms-Plain Text, Cipher Text, Encryption, Decryption, Cryptography, Cryptanalysis, Cryptology, Secret Key, Cipher Principles-Security, Attacks, Services and Mechanisms, Classical Encryption Techniques-Substitution and Transposition Techniques.

**Unit III**

**Mobility in Network:** Mobile, Security related issues, IP Multicasting, Unicast Routing Protocols – RIP, OSPF, BGP, Multicasting Routing Protocols, Host Configuration: BOOTP AND DHCP .

**Unit IV**

TCP extensions for high speed networks, Transaction oriented Applications, ARP, RARP, Internet Protocol, ICMP, IGMP, TCP, UDP, Introduction to Socket & Ports, Socket Class, Methods of Socket.

**Unit V**

Network Security at various layers, Secure-HTTP, SSL, PSP, authentication Header, Key distribution protocols, digital Signature, Digital Certificates, Firewalls.

**IT Act & Cyber Laws :**Cyber Crime and Cyber Laws, Types of Cyber Crimes, Cyber Law Issues in E-Business Management, Overview of Indian IT Act, Information Technology Act 2000, International Scenario in Cyber Laws: Data Protection Laws in EU and USA, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical hacking.

**Textbooks & Reference Books:**


1. A. S. Tanenbaum, "Computer Networks", Pearson Education.
2. Behrouz A. Forouzan, "TCP/IP Protocol Suite", 3rd Edition, Tata McGraw Hill.
3. W. Stallings, "Data and Computer Communication", Pearson Education.
4. Forouzan, "Data Communication and Networking", 2nd Edition, Tata McGraw Hill.
5. W. Stallings, "Computer Network with Internet Protocols", Pearson Education.
6. Eugene Blanchard , "Introduction to Networking and Data Communications"
7. J. Martin, "Computer Network and Distributed Data Processing", PHI.
8. P S Gill, " Cryptography and Network Security", Trinity press.
9. Sood,—Cyber Laws Simplified, Mc-Graw Hill

**Paper Code: MSC 203** **Max.Marks: 85**
**Paper Title: ADVANCED RDBMS**

## Unit I

The Database Life Cycle (DBLC): Initial Studyof The Database, Database Design, Implementation and Loading, Testing And Evaluation, Operations and Maintenance.
**Database Administration:** The Role of Database Administrator, Modeling Enterprise Data, Planning for Databases, Managing Data Security, Backing Up Databases, Controlling Concurrent Access, Managing Data Quality, Data Dictionaries and Repositories.

## UNITII

**Transactions**: ACID properties, states of transaction, Concurrent executions, concepts of serializability and recoverability,
**Concurrency control**: Overview of Locking,modes of locking: shared & exclusive, 2 phase locking protocol, time stamping, Timestamp-ordering protocol, validation-based protocol, multi-versioning ,Deadlock Handling.
**Recovery**: transaction failure classification, stable storage implementation, log based recovery, Shadow paging, recovery with concurrent transactions, checkpoints & rollback.
**Security & Integrity:** security measures for protection of data at various levels, authorization, views, granting of privileges, security specifications in SQL, encryption.

## Unit III

**Database System architectures:** Centralized systems, Client-Server Systems: Architecture And Implementation, transaction servers, data servers, Parallel systems, parallel database architectures, Distributed systems and databases : Introduction, distributed database transparency features, levels of data and process distribution: SPSD (Single site Processing, Single-site data), MPSD (Multiple Site Processing, Single-site data), MPMD (Multiple –Site Processing, Multiple- Site data).Advantages and disadvantages of distributed database systems.

## UNITIV

**PL/SQL:** Introduction, the SQL execution environment, the PL/SQL syntax, block structure – declarative part, executable part, exception handling part, variable declaration using %type, %rowtype, if statements, looping structures, oracle transactions, cursors & its types, cursor attributes, nesting of cursors, parameterized cursors, error handling in SQL.
**Concurrency control**: Locks, implicit locking, levels of locks, explicit locking, select for…update statement, using lock table statement.

## UNIT V

**Error handling**: user named exception handlers for i/o validation and business rule validation.
**Stored Procedures and Functions**: creating a stored procedure or function, syntax for declaration, execution and exception handling parts, advantages of using procedure or function. Deleting a procedure or function.
**Database Triggers**: Introduction, use, database triggers v/s procedures, database triggers v/s declarative integrity constraints, how to apply triggers. Types of triggers, Creating a trigger, deleting trigger.
User defined error messages through Raise_Application_Error Procedure.

**Text Books& Reference Books:**


1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System Concepts" McGraw Hill
2. Rajesh Narang "Database Management System" PHI
3. C.J. Date , "An introduction to database system "
4. Bipin C. Desai, "An Introduction to Database System".
5. RamakrishnanGehrke, "Database management system".
6. Ivan Bayross, "SQL PL/SQL: The programming language of Oracle", BPB Publications

**Paper Code: MSCS-204** **Max.Marks:85**
**Paper Title: Information Storage Management**

**Unit I**
**Introduction to Storage Technology**: Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data centre requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

**Unit II**
**Storage Systems Architecture**: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

**Unit III**
**Introduction to Networked Storage**: JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fiber Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.

**Unit IV**
**Introduction to Information Availability**: Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

**Unit V**
**Managing & Monitoring**: Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

**Textbook & Reference book:**


1. Antonio Cantiago, Information Storage and Management: Storing, Managing, and Protecting Digital Information, Wiley, ISBN: 9788126521470
2. Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments, ISBN-13: 978-1118094839, ISBN-10: 1118094832, Wiley
3. Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE, Ulf Troppens and Rainer Erkens, Wiley

**MCS -205 : Lab I** (Data Structures & Algorithms) **Max.Marks: 50**

**Suggested List of Practicals**

1. Write a choice based menu driven program to traverse an array, insert an item at the kth position in the array and delete item at kth position from the array.
2. Write a program for matrix multiplication.
3. Write a program to find the maximum number from the given array elements
4. Write a program to implement PUSH & POP operations on a stack using array.
5. Write a program for evaluation of a postfix expression using stack
6. Write a program for conversion of infix expression into postfix expression using stack
7. Write a program for parenthesis matching of given expression using stack.
8. Write a program for selection sort.
9. Write a program for quick sort.
10. Write a program for merge sort.
11. Write a program for linear search.
12. Write a program for binary search.
13. Write a program to implement insertion and deletion operation on queue using array.
14. Write a program to implement linked list.
15. Write a program to implement binary tree.

**MCS 206: Lab-II ( Advanced RDBMS)** **Max. Marks: 50**

**SUGGESTED LIST OF PRACTICALS**

1. Write a PL/SQL code to create an employee database with the tables and fields specified as below. a) Employee b) Works c) Company d) Manages Note: Primary keys are underlined.
2. Write a PL/SQL code to create a student database with the tables and fields specified as below. a) Student (Roll_no, student_name, course , gender) b) Student_personal (Roll_no,dob, fathers_name, address, city) c) Student_enrollment (Roll_no, course, course code, sem, total_marks,percentage).
3. Write a PL/SQL code to calculate the total and the percentage of marks of the students in four subjects from the table- Student with the schema given below. STUDENT ( RNO , S1 , S2, S3, S4, total, percentage)
4. Write a PL/SQL code to display employee number, name and basic of 5 highest paid employees.
5. Write a PL/SQL code to calculate the total salary of first n records of emp table. The value of n is passed to cursor as parameter.
6. Write a PL/SQL code to update the salary of employees who earn less than the average salary.
7. Write a row trigger to insert the existing values of the salary table in to a new table when the salary table is updated.
8. Write a trigger on the employee table which shows the old values and new values of Ename after any updations on ename on Employee table.
9. Writ a PL/SQL procedure to find the number of students in first, second, and third division respectively in each course by using database tables as described in problem 2 above . Also write the code to call your procedure.
10. Create a stored function that accepts 2 numbers and returns the addition of passed values. Also write the code to call your function.
11. Write a PL/SQL function that accepts department number and returns the total salary of the department. Also write a function to call the function.