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Programme:- MCA **Semester - II** **wef: July 2022**

Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
RDBMS	MCA-201	3	1	0	80	20	100

Course Objective	The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Units	Contents (*Theory*)	Hours /week
I	**Introduction:** Advantage of DBMS approach, various view of data, data independence, schema and subschema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture. ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.	8
II	**Domains, Relations and Keys:** domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys. Relational Algebra & SQL: Features of good relational database design, Codd's rule, The structure, relational algebra with extended operations, modifications of Database, , basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, views, join relations, DDL in SQL. PL/SQL programming: working with stored procedures, triggers, cursor Database Integrity: general idea. Integrity rules, domain rules, attribute rules, relation rules, Database rules, assertions, triggers, integrity and SQL.	8
III	**Functional Dependencies and Normalization:** basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first, second, third Normal forms, dependency preservation, BCNF, multi-valued dependencies and fourth normal form, Join dependency and fifth normal form.	8
IV	**Transaction, concurrency and Recovery:** basic concepts, ACID properties, Transaction states, implementation of atomicity and durability, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, storage structure types, stable storage implementation, data access, recovery and atomicity- log based recovery,	8

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	deferred Database modification, immediate Database modification, checkpoints. Distributed Database: basic idea, distributed data storage, data replication, data fragmentation: horizontal, vertical and mixed fragmentation.	
V	**Emerging Fields in DBMS:** object oriented Databases-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing - terminology, definitions, characteristics, data mining and it's overview, Database on www, multimedia Databases-difference with conventional DBMS, issues, similarity based retrieval, continuous media data, multimedia data formats, video servers. Storage structure and file organizations: overview of physical storage media, magnetic disk performance and optimization, basic idea of RAID, file organization, organization of records in files, basic concepts of indexing, ordered indices, basic idea of B-tree and B+-tree organization. Network and hierarchical models: basic idea, data structure diagrams, DBTG model, implementations, tree structure diagram, implementation techniques, comparison of the three models.	8

Text Books/ References Book:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
A Silberschatz, H.F Korth, Sudersan	Database System Concepts	VI	MGH Publication
C.J Date	An introduction to Database Systems	VI	Addison-Wesley
Elmasri & Navathe	Fundamentals of Database systems	VII	Pearson
Raghurama Krishnan	Database Systems	III	TMH

COURSE OUTCOMES: Students will be able to

CO1	Understand the basic principles of database management systems and Draw ER diagrams to represent simple database application scenarios.
CO2	Understand relations, keys, relational algebra and SQL and write SQL queries for a given context in relational database.
CO3	Discuss normalization techniques with simple examples.
CO4	Describe transaction processing and concurrency control concepts.
CO5	Learn the various systematic database design approaches

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Object Oriented Methodology in C++	**MCA-202**	3	1	0	80	20	100

Course Objective	The objective of this course is learning about the concepts of object oriented methodology and their implementation using C++.

Units	Contents (*Theory*)	Hours /week
I	Evolution of OOP, OOP Paradigm, 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. Introduction to C++, Identifier and Keywords, Constants, C++ Operators, Type Conversion, Variable Declaration, Statements, Expressions, Features of Iostream.h and Iomanip.h Input and Output, Conditional Expression Loop Statements, Breaking Control Statements.	8
II	**Programming Constructs:** Input output statements: cin, cout, comments, escape sequence, manipulators, type conversion, operators, and library functions. Control statements, Structures, Enumeration, Functions, passing arguments to functions, reference arguments, overloaded functions, inline functions, default arguments, variables and storage class and returning by reference, Arrays and Strings.	8
III	**Classes & Operator Overloading:** Objects and Classes, defining class, c++ objects as physical objects, c++ objects and data types, object as function argument, constructors, as function argument, overloaded constructors, copy constructors, returning objects from functions, this pointer, structures and classes, static class data, static functions, friend functions, const and classes, array of objects. Overloading unary and binary operator, Data conversions (built-in & user defined data types).	8

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IV	**Inheritance & Virtual Functions:** Inheritance concept, derived class and base class, derived class constructors, overloading member functions, class hierarchies, public, private & protected inheritance, levels of inheritance, multiple inheritance, Virtual Inheritance, new and delete operator. Early & late binding, Virtual functions.	8
V	**Files I/O & Generic Programming:** Using istream/ostream member functions, Understanding implementation of Files, Writing and Reading Objects.Exception Handling: types of exceptions, try, throw, catch block. Templates: types and concepts of generic programming.	8

Text Books/ References Book:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Bjarne Stroustrup	The C++ Programming Language	IIIrd	Addision Wesley
Herbert Schildt,	"C++ The Complete Reference", McGraw Hill		McGraw Hill
D. Ravichandran,	Programming with C++		Tata Mcgraw Hill
E. Balagursamy	Object Oriented Programming using C ++		Tata McGraw Hill.

COURSE OUTCOMES: Students will be able to

CO1	Describe OOPs concepts and Understand tokens, expressions, and control structures.
CO2	Explain functions, arrays and strings and create programs using them.
CO3	Describe and use constructors and destructors.
CO4	Apply virtual and pure virtual function & complex programming situations
CO5	Understand and employ file management.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
Computer Network	MCA-203	L	T	J	EST	CAT	Total
		3	1	0	80	20	100

Course Objective	The objectives of this course include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks.

Units	Contents (*Theory*)	Hours /week
I	Introduction: Computer Network, Layered Network Architecture-Review of ISO-OSI Model, Transmission Fundamentals-, Communication Media-Conductive Metal (Wired Cable), Optical Fiber links, Wireless Communication-Radio links, Satellite Links, Communication Services & Devices, Telephone System., Integrated Service Digital Network (ISDN)., Cellular Phone., ATM. Network Security, Virtual Terminal Protocol, Overview of DNS, SNMP, email, WWW.	8
II	Data Security and Integrity: Parity Checking Code, Cyclic redundancy checks (CRC), Hamming Code, Protocol Concepts –, Basic flow control, Sliding window protocol-Go-Back-N protocol and selective repeat protocol, Protocol correctness- Finite state machine.	8
III	Local Area Network: Ethernet : 802.3 IEEE standard, Token Ring : 802.5 IEEE standard, Token Bus : 802.4 IEEE standard, FDDI Protocol, DQDB Protocol, Inter Networking, Layer 1 connections- Repeater, Hubs, Layer 2 connections- Bridges, Switches, Layer 3 connections Routers, Gateways.	8
IV	Wide Area Network: Introduction, Network routing, Routing Tables, Types of routing, Dijkstra's Algorithm, Bellman-Ford Algorithm, Link state routing, Open shortest path first, Flooding, Broadcasting, Multicasting, Congestion & Dead Lock, Internet Protocols, Overview of TCP/IP, Transport protocols, Elements of Transport Protocol, Transmission control protocol (TCP), User datagram protocol (UDP).	8
V	Wireless Broadband Networks Technology Overview, Platforms and	8

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	Standards: Wireless broadband fundamentals and Fixed Wireless Broadband Systems, Platforms Enhanced Copper, Fibre Optic and HFC, 3G Cellular, Satellites, ATM and Relay Technologies, HiperLAN2 Standard, Global 3G CDMA Standard, CDMA Harmonization G3G Proposal for Protocol Layers.	

Text Books/ References Book:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
A.S. Tanenbaum	Computer Network	4th	PHI
Forouzan	Data Communication and Networking	3rd	TMH
D.E.Comer	Internetworking with TCP/IP		PHI
William Stalling	Data & Computer communications		Maxwell Macmillan International Ed.
Joh R. Vacca	Wireless Broadband Networks Handbook 3G, LMDS and Wireless Internet		TMH

COURSE OUTCOMES: Students will be able to

CO1	To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.
CO2	Learn error correction technique and algorithms.
CO3	Describe LAN protocols and internetworking devices.
CO4	Describe wide area network algorithms and TCP/IP protocol.
CO5	Describe wireless Networks technologies

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Software Engineering Methodologies and UML	MCA-204	3	1	0	80	20	100

Course Objective	To understand the software engineering methodologies involved in the phases of project development and study of the problem identify project scope, objectives and infrastructure.

Units	Contents (*Theory*)	Hours /week
I	Software Engineering paradigms – Waterfall Life cycle model – Spiral Model – Prototype Model– Software Requirement - Requirements Elicitation Techniques – Initial Requirements Document — SRS Document – Requirements Change Management - Project Management.	8
II	Software Design Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Various Design Concepts and notations – Development of Detailed Design & Creation of Software Design Document - Dataflow Oriented design – Designing for reuse – Programming standards.	8
III	Scope – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Reliability – Software Quality Assurance – Standards. Need of Software Estimation – Function Point – Risk Management.	8
IV	Software Testing Fundamentals – Software testing strategies – Black Box Testing – White Box Testing – System Testing – Functional Testing – Structural Testing – Regression Testing - Testing Tools – Test Case Management – Challenges of Software Maintenance – Types of Maintenance. Software Maintenance Organization – Maintenance Report.	8
V	Introduction to UML: Use Case Approach,: Identification of Classes and Relationships, Identifying State and Behavior, Use Case Diagram Class Diagram – State Diagram - Sequence ‘Diagram – Activity Diagram – Deployment Diagrams Case Study – LMS.	8

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Text Books/ References Book:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
R. S. Pressman	Software Engineering – A practitioner's approach	VI	McGraw Hill
Pankaj Jalote	Software Engg	IV	Narosa Publications
Ian Sommerville	Software Engineering 6/e	VI	Addison-Wesley

COURSE OUTCOMES: Students will be able to	
CO1	Understand software process models, software requirements and the SRS documents.
CO2	Understand software design approaches.
CO3	Describe software measurement and software risks
CO4	Learn software testing approaches and fundamentals of maintenance.
CO5	Understand UML to model software solutions, application structures, system behavior and business processes.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
PYTHON	MCA-205	3	1	0	80	20	100

Course Objective	The main objective of this course is to provide basic knowledge of Python programming.

Units	Contents (*Theory*)	Hours /week
I	Introduction to Python: Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.	8
II	Control Flow, Functions Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.	8
III	Lists, Tuples, Dictionaries Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: Sorting and Searching	8
IV	Classes and Inheritance: Object Oriented Programming, Class Instances, Methods Classes Examples, Why OOP, Hierarchies, Your Own Types – An Extended Example: Building a Class, Visualizing the Hierarchy, Adding another Class, Using Inherited Methods	8
V	Files, Modules, Packages Files and exception: text files, reading and writing files,	8

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	format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.	

Text Books/ References Book:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Reema Thareja,	"Python Programming using Problem Solving Approach"		Oxford University Press, 2017
Allen B. Downey	"Think Python: How to Think Like a Computer Scientist"	Second	O'Reilly Publishers, 2016
Guido van Rossum, Fred L. Drake Jr.	"An Introduction to Python – Revised and Updated for Python 3.2"		Network Theory Ltd., 2011

COURSE OUTCOMES: Students will be able to

CO1	To develop the basic programming skills in core Python.
CO2	Understand loop and decision statements in Python.
CO3	Learn how to use lists, tuples, and dictionaries in Python programs.
CO4	Learn Object Oriented Programming Concepts with Python.
CO5	Learn file management and exception handling in Python applications for error handling.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Data Structures	MCA-206	3	1	0	80	20	100

Course Objective	The goal of this course is to bring out the importance of data structures in a variety of applications.

Units	Contents (*Theory*)	Hours /week
I	**Stack and Queue:** contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another-using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue; linked implementation of stack and queue operations	8
II	**General List:** list and it's contiguous implementation, it's drawback; singly linked list-operations on it; doubly linked list-operations on it; circular linked list; linked list using arrays.	8
III	**Trees:** definitions -height, depth, order, degree, parent and child relationship etc; Binary Trees: various theorems, complete binary tree, almost complete binary tree; Tree traversals -preorder, in order and post order traversals, their recursive and non -recursive implementations; expression tree - evaluation; linked representation of binary tree -operations. Threaded binary trees; forests, conversion of forest into tree. Heap-definition.	8
IV	**Searching, Hashing and Sorting:** requirements of a search algorithm; sequential search, binary search, indexed sequential search, interpolation search; hashing-basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort on linked and contiguous list, shell sort, heap sort, tree sort.	8
V	Graphs: related definitions: graph representations- adjacency matrix, adjacency lists, adjacency multilist; traversal schemes- depth first search, breadth first search; Minimum spanning tree; shortest path algorithm; kruskals & dijkstras algorithm. Miscellaneous features Basic idea of AVL tree- definition, insertion	8

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	& deletion operations; basic idea of B-tree- definition, order, degree, insertion & deletion operations; B+-Tree- definitions, comparison with B-tree; basic idea of string processing.	

Text Books/ References Book:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Kruse R.L	Data Structures and Program Design in C	II	PHI
Trembly	Introduction to Data Structure with Applications	IV	
TennenBaum A.M & others	Data Structures using C & C++	III	PHI
Mark Allen Addison Wesley	Data structure and Algorithm Analysis in C Weiss		

COURSE OUTCOMES: Students will be able to

CO1	Describe, explain and use abstract data types including stacks and queues.
CO2	Design and implement linked list data structures.
CO3	Explain Tree data structure.
CO4	Understand searching and sorting algorithms and their implementations
CO5	Describe Graph, B tree and B+ tree.

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Name of Paper	Paper Code	Practical				
		Credit		**Marks**		
Programming Lab in C++	**MCA-207**	**P**	**J**	**ESP**	**CAP**	**Total**
		8	0	120	80	200

Content:

1. Simple C++ programs to implement various control structures.
   - if statement
   - switch case statement and do while loop
   - for loop
   - while loop
   - Array
2. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members
3. Write a C++ Program to illustrate default constructor, parameterized constructor and copy constructors
4. WAP to find the largest of three numbers using inline function.
5. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
6. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).
7. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.
8. WAP to Illustrate Multilevel Inheritance.
9. WAP to Demonstrate Multiple Inheritances.
10. Write a Program to demonstrate friend function and friend class.
11. Write a C++ to illustrate the concepts of console I/O operations.
12. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.
13. Write a Program to illustrate New and Delete Keywords for dynamic memory allocation
14. Write a C++ program to allocate memory using new operator.
15. WAP to demonstrate template class
16. WAP to demonstrate template function.

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Name of Paper	Paper Code	Practical				
		Credit		**Marks**		
RDBMS Lab	**MCA-208**	**P**	**J**	**ESP**	**CAP**	**Total**
		2	0	30	20	50

Contents:

Create the following Databases.

Salesmen

SNUM SNAME CITY COMMISSION

1001 Piyush London 12 %

1002 Sejal Surat 13 %

1004 Miti London 11 %

1007 Rajesh Baroda 15 %

1003 Anand New Delhi 10 %

SNUM : A unique number assigned to each salesman.

SNAME : The name of salesman.

CITY : The location of salesmen.

COMMISSION: The Salemen's commission on orders.

Customers

CNUM CNAME CITY RATING SNUM

2001 Harsh London 100 1001

2002 Gita Rome 200 1003

2003 Lalit Surat 200 1002

2004 Guni Bombay 300 1002

2006 Chirag London 100 1001

2008 Chinmay Surat 300 1007

2007 Pratik Rome 100 1004

CNUM : A unique number assigned to each customer.

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CNAME : The name of the customer.
CITY : The location of the customer.
RATING : A level of preference indicator given to this customer.
SNUM : The number of salesman assigned to this customer.
Orders

ONUM AMOUNT ODATE CNUM SNUM

3001 18.69 10/03/97 2008 1007
3003 767.19 10/03/97 2001 1001
3002 1900.10 10/03/97 2007 1004
3005 5160.45 10/03/97 2003 1002
3006 1098.16 10/03/97 2008 1007
3009 1713.23 10/04/97 2002 1003
3007 75.75 10/04/97 2004 1002
3008 4723.00 10/05/97 2006 1001
3010 1309.95 10/06/97 2004 1002
3011 9891.88 10/06/97 2006 1001

ONUM : A unique number assigned to each order.
AMOUNT : The amount of an order.
ODATE : The date of an order.
CNUM : The number of customer making the order.
SNUM : The number of salesman credited with the sale.
Write queries :-

1. Produce the order no, amount and date of all orders.
2. Give all the information about all the customers with salesman number 1001.
3. Display the following information in the order of city, sname, snum and commission.
4. List of rating followed by the name of each customer in Surat.
5. List of snum of all salesmen with orders in order table without any duplicates.
6. List of all orders for more than Rs. 1000.
7. List of names and cities of all salesmen in London with commission above 10%.
8. List all customers whose names begins with a letter 'C'.
9. List all customers whose names begins with letter 'A' to 'G'.
10. List all orders with zero or NULL amount.
11. Find out the largest orders of salesman 1002 and 1007.

12. Count all orders of October 3, 1997.
13. Calculate the total amount ordered.
14. Calculate the average amount ordered.
15. Count the no. of salesmen currently having orders.
16. List all salesmen with their % of commission.
17. Assume each salesperson has a 12% commission. Write a query on the order table that will produce the order number, salesman no and the amount of commission for that order.
18. Find the highest rating in each city in the form : For the city (city), the highest rating is : (rating)
19. List all in descending order of rating.
20. Calculate the total of orders for each day and place the result in descending order.
21. Show the name of all customers with their salesman's name.
22. List all customers and salesmen who shared a same city.

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		Credit		**Marks**		
Mini Project in PYTHON	**MCA-209**	**P**	**J**	**ESP**	**CAP**	**Total**
		0	2	30	20	50

Design a project using Python to fulfill complete requirements of any office/firm like data insertion, retrieval, editing, searching, and generating various reports.