AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA

(An Autonomous college under the jurisdiction of Krishna University, Machilipatnam)

Programme Structure for M.C.A
under Choice Based Credit System (CBCS)
w.e.f. 2022-23 (R22 Regulations)

Course Code	Course Name	Teaching Hours / Week L	P	T	CORE/IDC/ DSE/SEC/OEC/ MOOCS	Internal Marks	External Marks	No. of Credits
I SEMESTER (For the batch of students admitted during 2022-2023)					M.C.A.			
22MCA101	Programming and Problem Solving Using Python	4	0	0	Core	30	70	4
22MCA102	Database Management Systems	4	0	0	Core	30	70	4
22MCA103	Operating Systems	4	0	0	Core	30	70	4
22MCA104	Mathematical and Statistical Foundations	4	0	0	Core	30	70	4
22PG101	Personality Development through Life Enlightenment Skills	3	1	0	Core	30	70	3
22MCA105P	Programming and Problem solving using Python Lab	0	6	0	Core	30	70	3
22MCA106P	Database Management Systems Lab	0	6	0	Core	30	70	3
TOTAL FOR FIRST SEMESTER						**210**	**490**	**25**

Course Code	Course Name	Teaching Hours/ Week L	P	T	CORE/IDC/ DSE/SEC/ OEC/MOOCS	Internal Marks	External Marks	No. of Credits
II SEMESTER (For the batch of students admitted during 2022-2023)					M.C.A			
22MCA201	Computer Networks	4	0	0	Core	30	70	4
22MCA202	Data Structures	4	0	0	Core	30	70	4
22MCA203	Web Technologies	4	0	0	Core	30	70	4
22PG201	Research Methodology & IPR	3	1	0	SEC	30	70	3
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22MCA204.1	Cloud Computing	4	0	0	DSE	30	70	4
22MCA204.2	Data Mining Techniques	4	0	0	DSE	30	70	4
22MCA204.3	Unix Programming	4	0	0	DSE	30	70	4
LAB PRACTICALS								
22MCA205P	Data Structures Lab	0	6	0	Core	30	70	3
22MCA206P	Web Technologies Lab	0	6	0	Core	30	70	3
TOTAL FOR SECOND SEMESTER						**210**	**490**	**25**

At the end of 2nd semester, every student must undergo summer Internship / Apprenticeship / Project Work/Industrial training/Research based Project work for Six weeks and must prepare a report concerned as per approved project guidelines and submit the same to the University 14 days before the commencement of third semester end examinations.

III SEMESTER (For the batch of students admitted during 2022-2023)					M.C.A			
Course Code	**Course Name**	**Teaching Hours/ week**			**CORE/IDC/ DSE/SEC/ OEC/MOOCS**	**Internal Marks**	**External Marks**	**No. of Credits**
		L	P	T				
22MCA301	Data Science	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
22MCA302.1	Design & Analysis of Algorithms	4	0	0	DSE	30	70	4
22MCA302.2	Object Oriented Software Engineering	4	0	0	DSE	30	70	4
22MCA302.3	Cryptography & Network Security	4	0	0	DSE	30	70	4
22MCA302.4	Deep Learning	4	0	0	DSE	30	70	4
22MCA302.5	Internet of Things	4	0	0	DSE	30	70	4
22MCA302.6	Block Chain Technologies	4	0	0	DSE	30	70	4
LAB PRACTICALS								
22MCA303P	Data Science Lab	0	6	0	Core	30	70	3
22MCA304P	Object Oriented Software Engineering Lab	0	6	0	Core	30	70	3
OPEN ELECTIVE (INTERDISCIPLINARY/MULTIDISCIPLINARY) COURSES (CHOOSE ANY ONE)								
22OE301	Python Programming	3	0	0	OEC	30	70	3
22OE302	Office Tools	3	0	0	OEC	30	70	3
22OE303	Mobile Computing	3	0	0	OEC	30	70	3
22OE304	R Programming	3	0	0	OEC	30	70	3
22OE305	Web Development	3	0	0	OEC	30	70	3
TOTAL FOR THIRD SEMESTER						**210**	**490**	**25**

IV SEMESTER (For the batch of students admitted during 2022-2023)					M.C.A			
Course Code	**Course Name**	**Teaching Hours/week**			**CORE / IDC/ DSE/SEC/ OEC/MOOCS**	**Internal Marks**	**External Marks**	**No. of Credits**
		L	P	T				
22MCA401	Machine Learning	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22MCA402.1	Artificial Intelligence	4	0	0	DSE	30	70	4
22MCA402.2	Social Media Analytics	4	0	0	DSE	30	70	4
22MCA402.3	Mobile Applications	4	0	0	DSE	30	70	4
22MCA402.4	Technical Report Writing	4	0	0	DSE	30	70	4
LAB PRACTICALS								
22MCA404P	Machine Learning Lab	0	6	0	Core	30	70	3
ENTREPRENURAL & INNOVATION/IT SKILL RELATED TO DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22MCA403.1	Big Data Analytics	3	0	0	SEC	30	70	3
22MCA403.2	Dynamic Web Programming using Python	3	0	0	SEC	30	70	3
22MCA403.3	Software Testing and Project Management	3	0	0	SEC	30	70	3
* CHOOSE MOOCs FROM SWAYAM/NPTEL SOURCES								
MOOCS								4
PROJECT WORK EVALUATION AND VIVA-VOCE						--	200	12
TOTAL FOR IV SEMESTER						**120**	**480**	**30**

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22MCA101: PROGRAMMING AND PROBLEM SOLVING USING PYTHON

Course code	22MCA101	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES
Upon successful completion of the course, the student will be able to:	
1	Understand Basics of Python Programming, Decision Control Statements.
2	Know the concepts of Data Structures, Functions and Modules.
3	Know the concepts of Classes and Objects, Object Oriented Programming.
4	Apply Error and Exception Handling.
5	Implement Operator overloading and abstract classes , interfaces

Syllabus

Unit	Contents	Lecture Hours
I	**Basics of Python Programming**-Features of Python, History of Python, The Future of Python, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion.	12
II	**Decision Control Statements**-Conditional Branching Statements, Basic Loop Structures, Nested Loops, The break statement, The continue statement, The pass statement. The else statement used with loops. **Functions and Modules**- Function Definition, Function Call, Variable Scope and Lifetime, The return statement, More on Defining Functions, Recursive functions, Modules, Packages in Python, Standard Library Modules.	12
III	**Python Strings Revisited**-Concatenating, Appending and Multiplying Strings, String formatting operator, Built in String Methods and Functions, Comparing Strings, Regular Expressions. **Data Structures**- Sequence, Lists, Functional Programming, Tuple, Sets, Dictionaries.	12
IV	**Classes and Objects**- Classes and Objects, Class Method and self Argument, Class variables and Object Variables, Public and Private Data Members, Private Methods, Calling a Class Method from Another Class Method, Built-in Class Attributes, Class Methods, Static Methods.	12

V	**Inheritance**- Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces.	12
	Error and Exception Handling- Introduction to Errors and Exceptions, Handling Exceptions, Raising Exceptions, Built- in and User defined Exceptions	
	Operator Overloading- Concept of Operator Overloading, Advantage of Operator Overloading, Implementing Operator Overloading.	

Reference Text books

1. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press
2. Wesley Chun, Core Python Programming, Prentice Hall

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA
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22MCA102: DATABASE MANAGEMENT SYSTEMS

Course code	22MCA102	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES
	Upon successful completion of the course, the student will be able to:
1	Understand basic concepts of *Database and Database Users*, *Database Architecture*.
2	Understand *ER*, *EER Modeling* and *Relational Algebra and Relational Calculus*.
3	Learn the basics of *Functional Dependencies and Normalization* for Relational Databases.
4	Learn *Transaction Processing* and *Concurrency Control Techniques*.
5	Understand the *Structured Query Language* and *Emerging Database Technologies and Applications*.

Syllabus

Unit	Contents	Lecture Hours
I	**Database and Database Users:** Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of the using the DBMS Approach. **Database System Concepts and Architecture:** Data Models, Schemas and Instances, Three Schema Architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architecture for DBMS, Classification of Database Management Systems.	12
II	**Data Modeling Using the ER Model:** Conceptual Data Models, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Relationship Types of Degree Higher than Two, Refining the ER Design for the COMPANY Database. **The Enhanced Entity-Relationship Model:** Sub Classes, Super Classes and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization. **The Relational Algebra and Relational Calculus:** Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples, The Tuple Calculus and Domain Calculus.	12

III	**Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based in Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies.	12
IV	**Introduction to Transaction Processing Concepts and Theory:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules based on Serializability. **Concurrency Control Techniques:** Two Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency control techniques, Validation Concurrency Control Techniques.	12
V	**SQL-99:** Schema Definition, Constraints, Queries and Views: SQL Data Definitions and Data Types, Specifying Constraints in SQL, Schema Change Statements on SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE statements in SQL, Triggers and Views. **Emerging Database Technologies and Applications:** Mobile Databases, Multimedia Databases, Geographic Information Systems.	12

Reference Text books

1. Ramez Elmasri Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, Seventh Edition, 2017.
2. C.J.Date, A.Kannan, S.Swamynathan, An Introduction to Database Systems, 7th Edition, Pearson Education , 2006.
3. Peter Rob, Carlos Coronel, Database Systems-Design Implementation and Management, Eight Edition, Thomson, 2008
4. Ramon A. Mata-Toledo, Pauline K. Cushman, Database Management Systems, Schaum's outlines, McGraw-Hill, 2007
5. Steven Feuerstein et al.,Oracle PL/SQL, Programming, OREILLY, 2008

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA

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22MCA103 : OPERATING SYSTEMS

Course code	22MCA103	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES
Upon successful completion of the course, the student will be able to:	
1	Understand the basic concepts of operating system, operating system structure and process concept.
2	Applying concepts of Threads, Process Synchronization & CPU Scheduling.
3	Understand Deadlock, Main Memory & Virtual Memory.
4	Explain Mass Storage Structure, File System Interface & File System Implementation.
5	Understand the concepts of Distributed Operating Systems and Mobile & Android Operating Systems.

Syllabus

Unit	Contents	Lecture Hours
I	**Introduction to Operating System Concepts:** Functions of Operating System, Operating System Structure, Operating System Operations, Kernel Data Structure, Computing Environment. **Operating System Structures:** Operating System Services, System Calls, Types of System Calls. **Processes:** Process Concept, Process Scheduling, Operations on Processes, Inter Process Communication, Communication in Client-Server Systems.	12
II	**Threads:** Overview, Multi core Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. **Process Synchronization:** Background, The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors. **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple Processor Scheduling.	12

III	**Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. **Main Memory:** Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table, Intel32and64-bitArchitectures. **Virtual Memory:** Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing.	12
IV	**File System Interface:** File Concept, Access Methods, Directory and Disk Structure, File System Mounting, Protection. **File System Implementation:** File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery.	12
V	**Distributed Operating Systems:** Types of Network based Operating Systems, Network Structure, Network Topology, Communication Structure, Communication Protocols, Robustness, Design Issues. **Mobile &Android Operating Systems:** Are view of Mobile Operating Systems, Features of Android Operating Systems.Overloading, Implementing Operator Overloading.	12

Reference Text books

1. Abraham Silberschatz & PeterBaer Galvin,Greg, Operating System Concepts, 9thEdition, Wiley, 2015.
2. William Stallings, Operating Systems-Internals and Design Principles, 5thEdition, Pearson Education, 2007.
3. Achyut S Godbole, Operating Systems, 2nd Edition, TMH, 2007
4. Flynn/McHoes, Operating Systems, Cengage Learning, 2008
5. Deitel & Deitel, Operating Systems, 3rdEdition, Pearson Education, 2008

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22MCA104 : MATHEMATICAL AND STATISTICAL FOUNDATIONS

Course code	22MCA104	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES
	Upon successful completion of the course, the student will be able to:
1	Understand Mathematical Foundations and Recursion.
2	Learn and apply Advanced Counting Techniques.
3	Understand the Relations and Applications of Graphs.
4	Learn and apply Probability Laws and Discrete Distributions.
5	Understand Inferences on the Mean and the Variance of a Distribution and Inferences on Proportions.

Syllabus

Unit	Contents	Lecture Hours
I	**The Foundations:** Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers. **Introduction and Recursion:** Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.	12
II	**Advanced Counting Techniques:** Recurrence Relations, Solving Linear Recurrence Relations, Divide and Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion & Exclusion, Applications of Inclusion &Exclusion.	12
III	**Relations:** Relations and Their Properties, Equivalence Relations, Partial Orderings **Graphs:** Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest Path Problems, Planar Graphs, Graph Coloring.	12
IV	**Some Probability Laws:** Axioms of Probability, Conditional Probability, Independence of the Multiplication Rule, Bayes' Theorem. **Discrete Distributions:** Random Variables, Discrete Probability Densities, Expectation and Distribution Parameters, Binomial Distribution, Poisson Distribution, Simulating a Discrete Distribution.	12

V	**Inferences on the Mean and the Variance of a Distribution:** Hypothesis Testing, Significance Testing, Hypothesis and Significance Test on the Mean, Hypothesis Tests on the Variance. **Inferences on Proportions:** Estimating Proportions, Testing Hypothesis on a Proportion, Comparing two Proportions: Estimation, Comparing two Proportions: Hypothesis Testing.	12

Reference Textbooks:

1. Susan Milton and Jesse C. Arnold, Introduction to Probability andStatistics,4thEdition, November 2002.
2. William Mendenhall, Robert J Beaver, Barbara M Beaver, Introduction to Probability and Statistics, 12thEdition,Thomson, January 2012.
3. Kenneth H Rosen, Discrete Mathematics and its Applications, 6thEdition, McGraw-Hill, Chapters [1-10], 2007.
4. Ralph P. Grimaldi, B.V. Ramana, Discrete and Combinational Mathematics, 5thEdition, Pearson Education, 2008.
5. Swapan Kumar Sarkar, A Text Book of Discrete Mathematics, S.Chand, 2008.
6. D.S.Malik and M.K.Sen, Discrete Mathematical Structures, Thomson, 2006.

Master of Computer Applications (M.C.A)
Syllabus
(for the batch of students admitted from 2022-24)

SEMESTER - I

22MCA105P: PROGRAMMING AND PROBLEM SOLVING USING PYTHON LAB

List of Programs

1. Write Python Program to reverse a number and also find the Sum of digits in the reversed number. Prompt the user for input.

2. Write Pythonic code to check if a given year is a leap year or not.

3. Write Pythonic code to check if a given year is a leap year or not.

4. Write Python code to determine whether the given string is a Palindrome or not using slicing.

5. Write Python program to add two matrices and also find the transpose of the resultant matrix.

6. Write Python program to swap two numbers without using Intermediate/Temporary variables.Prompt the user for input.

7. Consider a Rectangle Class and Create Two Rectangle Objects. Write Python program to Check Whether the Area of the First Rectangle is Greater than Second by Overloading > Operator.

8. Write Python program to count the number of times an item appears in the list.

9. Write Python program to convert uppercase letters to lowercase and vice versa.

10. Write Python program to perform a linear search for a given Key number in the list and report Success or Failure.

11. Write Python program to sort numbers in a list in ascending order using Bubble Sort by passing the list as an argument to the function call.

12. Write Python program to Calculate Area and Perimeter of different shapes using Polymorphism.

Master of Computer Applications (M.C.A)
Syllabus
(for the batch of students admitted from 2022-24)

SEMESTER - I
22MCA106P : DATABASE MANAGEMENT SYSTEMS LAB

CYCLE-I
Aim: Marketing Company wishes to computerize their operations by using following tables.

Table Name :Client-Master			
Column Name	Data Type	Size	Attribute
CLIENT_NO	Varchar2	6	Primary key and first letter must start with
NAME	Varchar2	20	Not null
ADDRESS1	Varchar2	30	
ADDRESSS	Varchar2	30	
CITY	Varchar2	15	
PINCODE	Varchar2	8	
STATE	Varchar2	15	
BAL_DUE	Number	10,2	

TableName:Product_Master			
ColumnName	DataType	Size	Attribute
PRODUCT_NO	Varchar2	6	Primarykeyandfirstlettermuststartwith
DESCRIPTION	Varchar2	15	Notnull
PROFIT_PERCENT	Number	4,2	Notnull
UNIT_MEASUE	Varchar2	10	
QTY_ON_HAND	Number	8	
REORDER_LVL	Number	8	
SELL_PRICE	Number	8, 2	Notnull,cannot be0
COST_PRICE	Number	8,2	Notnull,cannot be0

TableName:Salesman_Master			
ColumnName	DataType	Size	Attribute
SALESMAN_NO	Varchar2	6	Primarykeyandfirstlettermuststartwith'S'
SALESMAN_NAME	Varchar2	20	Notnull
ADDRESS1	Varchar2	30	
ADDRESS2	Varchar2	30	
CITY	Varchar2	20	

PINCODE		Number	8	
STATE		Vachar2	20	
SAL_AMT	Number	8,2	Notnull,cannot be0	
TGT_TO_GET	Number	6,2	Notnull,cannot be0	
YTD_SALES	Number	6,2	Notnull	
REMARKS	Varchar2	20		

TableName:Sales_Order			
ColumnName	DataType	Size	Attribute
ORDER_NO	Varchar2	6	Primarykeyandfirstlettermuststartwith'S'
CLIENT_NO	Varchar2	6	ForeignKey
ORDER_DATE	Date		
DELY_ADDRESS	Varchar2	25	
SALESMAN_NO	Varchar2	6	ForeignKey
DELY_TYPE	Char	1	Delivery:part(p)/full(f)anddefault 'F'
BILL_YN	Char	1	
DELY_DATE	Date		Can'tbelessthanorderdate
ORDER_STATUS	Varchar2	10	Values("InProcess","Fulfilled",

TableName:Sales_Order_Details			
ColumnName	DataType	Size	Attribute
ORDER_NO	Varchar2	6	PrimarykeyreferencesSALES_ORDERtable
PRODUCT_NO	Varchar2	6	ForeignKeyreferencesSALES_ORDER_table
QTY_ORDERED	Number	8	
QTY_DISP	Number	8	
PRODUCT_RATE	Number	10,2	ForeignKey

Solve the following queries by using above tables.

1. Retrieve the list of names, city and the state of all the clients.
2. List all the clients who are located in 'Mumbai' or 'Bangalore'.
3. List the various products available from the product_master table.
4. Find the names of sales man who have a salary equal to Rs.3000.
5. List the names of all clients having 'a' as the second letter in their names.
6. List all clients whose Bal due is greater than value 1000.
7. List the clients who stay in a city whose first letter is 'M'.
8. List all information from sales-order table for orders placed in the month of July.
9. List the products whose selling price is greater than 1000 and less than or equal to 3000.
10. Find the products whose selling price is greater than 1000 and also find the new selling price as original selling price 0.50.
11. Find the products in the sorted order of their description.
12. Find the products with description as '540HDD' and 'Pen drive'.
13. Count the total number of orders.
14. Print the description and total qty sold for each product.
15. Calculate the average qty sold for each client that has a maximum order value of 15,000.

16. Find all the products whose quantity on hand is less than reorder level.
17. List the order number and day on which clients placed their order.
18. Find out the products and their quantities that will have to deliver in the current month.
19. Find the names of clients who have placed orders worth of 10000 or more.
20. Find the client names who have placed orders before the month of June,2018.

CYCLE-II

Aim: An enterprise wishes to maintain a database to automate its operations. Enterprise divided into a certain departments and each department consists of employees. The following two tables describes the automation schemas.

Emp(Empno, Ename, Job, Mgr, Hiredate, Sal, Comm, Deptno) Dept(Deptno, Dname, Loc)

Solve the following queries by using above tables.

1. List the details of employees who have joined before the end of September' 81.
2. List the name of the employee and designation of the employee, who does not report to anybody.
3. List the names of employees who are more than 2 years old in the organization.
4. Determine the number of employees, who are taking commission and not taking commission.
5. Update the employee salary by 25% , whose experience is greater than 10 years.
6. Determine the department does not contain any employees.
7. List the department numbers and number of employees in each department.
8. List average salary for all departments employing more than five people.
9. Determine the names of employees, who take highest salary in their departments.
10. Display ename, dname, even if no employee belongs to that department (use outer join)

PL/SQLPROGRAMS

1. Writea PL/SQLprogram to check the given number is strongor not.
2. Write a PL/SQL program to check the given string is palindrome or not.
3. Write a PL/SQL program to swap two numbers without using third variable.
4. Writ a PL/SQL program to generate multiplication tables for 2, 4, 6..
5. Write a PL/SQL program to display sum of even numbers and sum of odd numbers in the given range.
6. Write a PL/SQL program to check the given number is palindrome or not.The HRD manager has decide to raise the employee salary by 15% write a PL/SQL block to accept the employee number and update the salary of that employee. Display appropriate message based on the existence of the record in Emp table.
7. Write a PL/SQL program to display to 10 rows in Emp table based on their job and salary.
8. Write a procedure to update the salary of Employee, who are not getting commission by 10%.
9. Write a function to update the salary of the employee, who are not getting commission by 10%.
10. Write a PL/SQL trigger using row level and statement level triggers.

Master of Computer Applications (M.C.A)
22MCA101: Programming and problem solving using python

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain Features of Python
2. Explain different Data Types in Python
3. What is Recursive Function? Explain with example
4. List out and explain any 4 Built in String Method.
5. List out Built in Class Attributes?
6. Explain Advantages of Operator Overloading?
7. Explain Public and private data members.
8. Explain about packages.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

9. a) Explain the basic data types available in Python with examples.

(OR)

b) Describe different operators in detail with examples.

10. a) Explain Conditional Branching Statements in Python.

(OR)

b) How to define and call a function in Python.

11. a) Explain Built-in String methods and functions in Python.

(OR)

b) Discuss the relation between tuples and lists, tuples and dictionaries in detail.

12. a) Explain the concept of scope and lifetime of variables in Python programming language with an example.

(OR)

b) How to call a class method from another class method in Python.

13. a) Explain different types of inheritances in Python.

(OR)

b) Explain about Exception handling.

Master of Computer Applications (M.C.A)
22MCA102: DATA BASE MANAGEMENT SYSTEMS

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Write the advantages of the DBMS.
2. What is Data Independence? Explain the difference between Physical data independence and Logical Data Independence.
3. What is Generalization? Explain it diagram.
4. Explain First Normal Form.
5. Explain Dependency Preservation with example.
6. Explain Properties of Transaction.
7. Explain DML Commands with example.
8. Explain Mobile Databases.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

9. (a) Explain various Data Models of Database Management Systems.

(or)

(b) Explain Three Schema Architecture of DBMS with neat diagram

10. (a) Demonstrate Select and Project operations of Relational Algebra.

(or)

(b) Explain ER Design for the Company Database with all constraints.

11. (a) Explain BCNF with example.

(or)

(b) Explain Fifth Normal Form with example.

12. (a) Identify whether the transactions T1 & T2 ensure serializability.

T1	T2
read_item (X) ; X:=X – N;	
	read_item(X); X:=X + M;

(or)

(b) Develop a technique for Concurrency Control Based on Timestamp Ordering.

13 (a) Analyze Multimedia Databases in detail.

(or)

(b) Distinguish various Constraints of SQL.

Master of Computer Applications (M.C.A)
22MCA103: Operating Systems

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain the structure of Operating System.
2. Explain Inter Process Communication
3. List various Multi threading Model
4. What is Semaphore.
5. Test for Demand Paging
6. Demonstrate the File Concept
7. Explain various File Operations
8. Identify the design issues in Distributed OS.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

9. (a) Explain Operating System Services.

(or)

(b) Explain various types System Calls.

10 (a) Illustrate the Dining Philosophers problem of Process Synchronization.

(or)

(b) Demonstrate

(i) First-Come, First-Serve Scheduling with the following data

Process	Burst Time
P1	24
P2	3
P3	3

(ii) Shortest-Job-First Scheduling with following data

Process	Burst Time
P1	6
P2	8
P3	7
P4	3

11. (a) Apply the necessary conditions for preventing Deadlock Situation.

(or)

   (b) Utilize the reference string7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1
      for a memory with three frames implement Optimal Page Replacement and LRU Page
      Replacement.

12. (a) Compare Single-Level Directory, Two Level Directory, and Tree-Structured Directories.

(or)

   (b) Categorize various Allocation Methods of File System Implementation

13 (a) Explain various types of Network based Operating Systems.

(or)

   (b) Explain features of Mobile Operating Systems.

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA

(An Autonomous college under the jurisdiction of Krishna University, Machilipatnam)

Master of Computer Applications (M.C.A)
22MCA104: MATHEMATICAL AND STATISTICAL FOUNDATIONS

Time 3 Hours   **Max Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain about Quantifiers.
2. Define Strong Induction with an example.
3. Solve the Recurrence relation $a_r - 4a_{r-1} - 11a_{r-2} + 30a_{r-3} = 0$.
4. What is Graph coloring and explain with an example.
5. Define Graph and explain Types of Graphs.
6. State and prove multiplication theorem for 2 events.
7. Explain Distribution function and its properties.
8. Define Null hypothesis and Alternative hypothesis.

SECTION-B
Answer all questions. 5 × 10 = 50 Marks

9 (a) Determine whether $\{(p \lor q) \land (p \to r) \land (q \to r)\} \to r$ is a tautology or not
     and verify whether $PV(Q \land R)$ and $(PVQ) \land (PVR)$ are Logically equivalent.

<div align="center">(or)</div>

  (b) Use mathematical induction to show that $1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = (n(2n-1)(2n+1))/3$.

10 (a) Solve the Recurrence relation $a_r - 3a_{r-1} - 4a_{r-2} = 3^r$ given $a_0 = 1, a_1 = 2$.

<div align="center">(or)</div>

  (b) Solve the Recurrence relation $a_n - 7a_{n-1} + 12a_{n-2} = 1$.

11 (a) Define Relation and properties of Relation with an example.

<div align="center">(or)</div>

  (b) Explain Isomorphism between two graphs with an example.

12 (a) State and prove additional theorem for n events.

<div align="center">(or)</div>

 (b) Define Binomial Distribution and derive its mean and variance.

13 (a) The average no of articles produced by a machines per day are 200 and 250 with a
     standard deviation of 20 and 25 respectively. On the basis of records of 25 days
     production can you regard both the machines equally efficient at 5% l.o.s.

<div align="center">(or)</div>

  (b) Explain test of significance for difference of two proportions.

22MCA201: Computer Networks

Course code	22MCA201	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES	
	Upon successful completion of the course, the student will be able to:	
1	Become familiar with layered communication architectures (OSI and TCP/IP).	
2	Understand the client/server model and key application layer protocols.	
3	Understand the concepts of reliable data transfer and how TCP implements these concepts.	
4	Learn the principles of routing and the semantics and syntax of IP.	
5	Understand the basics of error detection including parity, checksums, and CRC.	

Syllabus

Unit		
I	Uses of Computer Networks, Connection Oriented and Connectionless Services, Reference Models: The OSI Reference Model, The TCP/IP Reference Model, A Comparison of OSI and TCP/IP referenceModel. Physical Layer: ALOHA, CSMA, CSMA/CA Data Link Layer Design Issues: Services Provided to the Network Layer, Framing, Error correcting Codes, Error Detecting Codes. An unrestricted Simplex Protocol, A simplex Stop and wait Protocol, Sliding Window Protocols: A one, bit sliding Window Protocol, A Protocol using Go Back N, A protocol using selective repeat.	12
II	Ethernet: Ethernet Cabling, The Ethernet MAC sub layer Protocol, Bluetooth: Bluetooth Architecture, Bluetooth Applications, Remote Bridges, Repeaters, Hubs, Bridges, Switches, Routers and Gateways, Virtual LANs.	12

III	Network Layer Design Issues: Store and Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Services, 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, Multicast Routing, Routing for Mobile Hosts.	12
IV	The Transport Service: Services provided to the Upper Layers, Transport Services Primitives, Berkeley Sockets. Elements of Transport Protocols : Addressing , Connection Establishment, Connection Release, Flow Control and Buffering , Multiplexing , Crash Recovery. Transport Protocols TCP : Introduction to TCP, The TCP Service Model, the TCP Protocol, The TCP segment header, TCP connection establishment, TCP connection release, TCP congestion Control, Comparison of TCP and UDP.	12
V	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: Architecture Overview, Static Web Documents, Dynamic Web Documents.	12

Reference Text Books:

1. Andrew S. Tanenbaum, Computer Networks, PHI
2. James F. Kurose, Keith W Ross, Computer Networking, 3rd edition Pearson Edition
3. Michael A. Gallo, William M. Hancock, Data Communications and Networking, 4th edition, TMH

22MCA202: Data Structures

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES	
	Upon successful completion of the course, the student will be able to:	
1	Learn overview and Preliminaries of Data Structure.	
2	Understand the concepts of *String Processing*, *Arrays*, *and Records and Pointers*.	
3	Understand and implement *Linked Lists*, *Stacks*, *and Queues and Recursion*.	
4	Analyze and implement *Tree Concepts*.	
5	Understand and implement *Graphs*, *Sorting and Searching*.	

Syllabus

Unit		
I	**Introduction and Overview**: Elementary Data Organization, Data Structures, Data Structure Operations, Algorithms: Complexity, Time-Space Tradeoff. **Preliminaries**: Mathematical Notations and Functions, Algorithmic Notations, Control Structures, Complexity of Algorithms, Sub algorithms.	**12**
II	**String Processing :** Storing Strings, Character Data Type, String Operations, Word Processing, Pattern Matching Algorithms. **Arrays, Records and Pointers :** Linear Arrays, Representation and Traversing Linear Arrays, Inserting and Deleting, Bubble Sort, Linear Search, Binary Search	**12**
III	**Linked Lists :** Representation, Traversing, Searching, Memory Allocation: Garbage Collection, Insertion, Deletion, Two-Way Lists. **Stacks, Queues, Recursion:** Stacks, Array representation, Linked List representation, Evaluation of Arithmetic Expressions, Quick sort, Recursion, Towers of Hanoi, Queues, Linked representation of Queues, Deques, Priority Queues.	**12**
IV	**Trees** : Binary trees, Representing and traversing binary trees, Traversal algorithms using stacks, Header nodes, Binary Search Trees, Searching, Insertion and Deletion in Binary Search Trees, AVL Search Trees, Insertion and Deletion in AVL trees, Heap: Heap Sort, Huffman's Algorithms, General Trees	**12**

V	**Graphs**: Terminology, Sequential representation of Graphs, Warshall's Algorithm, Linked representation of Graphs, Operations on Graphs, Traversing a Graph, Topological Sorting. **Sorting and Searching** : Insertion Sort, Selection sort, Merging, Merge sort, Radix sort, Searching and Data modification, Hashing.	**12**

Reference Text Books:

	Author	Title	Publisher
1	Seymour Lipschutz	Data Structures	McGraw Hill (Schaum's Outlines)

Reference books

	Author	Title	Publisher
1	Seymour Lipschutz	Theory and Problems of Data Structures	McGraw Hill (Schaum's Outlines)
2	John R Hubbard, Second Edition	Data Structures with Java	McGraw Hill (Schaum's Outlines)
3	Robert Lafore	Data Structures & Algorithms in Java	Second edition, Pearson Education

22MCA203: Web Technologies

Course code	22MCA203	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES	PO'S
	Upon successful completion of the course, the student will be able to:	
1	Gain insights about fundamental Web Technologies concepts and its underlying mechanism.	
2	Design and develop websites using fundamental web languages, technologies, and tools.	
3	Distinguish between server-side and client-side web technologies.	
4	Describe various web technology and application development issues and trends	

Syllabus

Unit		
I	**Introduction:** Evolution of the Internet and World Wide Web, Web Basics, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, Object Technology **HTML5:** Introduction, Editing HTML5, First HTML5 Example, W3C HTML5 Validation Service, Headings, Linking, Images, Special Characters and Horizontal Rules, Lists, Tables, Forms, Internal Linking, meta Elements, HTML5 Form input Types, input and datalist Elements and autocomplete Attribute, Page-Structure Elements.	**12**
II	**CSS:** Introduction, Inline Styles, Embedded Style Sheets, Conflicting Styles, Linking External Style, Positioning Elements, Backgrounds, Element Dimensions, Box Model and Text Flow, Media Types, Building a CSS Drop-Down Menu, User Style Sheets, Text Shadows, Rounded Corners, Color, Box Shadows, Image Borders, Animation- Selectors. **JavaScript:** Introduction to Scripting, Control Statements I, Control Statements II, Functions, Arrays, Objects, Document Object Model, Event Handling.	**12**

III	**JQuery Basics**: String, Numbers, Boolean, Objects, Arrays, Functions, Arguments, Scope, Built-in Functions. jQuery – Selectors: CSS Element Selector, CSS Element ID Selector, CSS Element Class Selector, CSS Universal Selector, Multiple Elements E, F, G Selector, Callback Functions. jQuery – DOM Attributes: Get Attribute Value, Set Attribute Value. jQuery – DOM Traversing : Find Elements by index, Filtering out Elements, Locating Descendent Elements, JQuery DOM Traversing Methods.	**12**	
IV	**JQuery CSS Methods :** Apply CSS Properties, Apply Multiple CSS Properties, Setting Element Width & Height, JQuery CSS Methods. jQuery – DOM Manipulation Methods: Content Manipulation, DOM Element Replacement, Removing DOM Elements, Inserting DOM elements. jQuery – Events Handling: Binding event handlers, Removing event handlers, Event Types, The Event Object, The Event Attributes. jQuery – Effects: JQuery Effect Methods, jQuery Hide and Show, jQuery Toggle, jQuery Slide – slideDown, slideUp, slideToggle, jQuery Fade – fadeIn, fadeOut, fadeTo, jQuery Custom Animations.	**12**	
V	Databases: SQL, MYSQL. PHP: Introduction, Simple PHP Program, Converting Between Data Types, Arithmetic Operators, Initializing and Manipulating Arrays, String Comparisons, String Processing with Regular Expressions, Form Processing and Business Logic, Reading from a Database, Using Cookies, Dynamic Content.	**12**	

Text books

	Author	Title	Publisher
1	Harvey M. Deitel and Paul J. Deitel	Internet and World Wide Web How To Program, 5e	Prentice Hall; 4th edition
2	Robert W Sebesta	Programming with World Wide Web	Pearson Education; 4th edition.
3	Jon Duckett	JavaScript & j Query	Wiley

22MCA204.1: Cloud Computing

Course code	22MCA204.1	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES	
	Upon successful completion of the course, the student will be able to:	
1	Articulate the *Main Concepts*, *Key Technologies*, *Strengths*, and *Limitations* of *Cloud Computing* and the core issues of *Virtualization*.	
2	Understand the *Open Source Architectures* and *Services of Cloud Computing*.	
3	Develop and deploy *Cloud Applications* using *Popular Cloud Platforms*.	
4	Explore the *Risks*, *Consequences* and *Costs of Cloud Computing* and understand the implementations of *AAA Model* in the *Cloud*.	
5	Introduce the broad perspective of *Mobile Cloud Computing*.	

Syllabus

Unit		
I	Era of Cloud Computing : Getting to know the cloud - Peer-To-Peer, Client-Server, and Grid Computing – Cloud computing versus Client-server Architecture - Cloud computing versus Peer-To-Peer Architecture - Cloud computing versus Grid Computing - How we got to the Cloud - Server Virtualization versus cloud computing - Components of Cloud computing – Cloud Types – Cloud Computing Service delivery Models. Introducing Virtualization : Introducing Virtualization and its benefits – Implementation levels of Virtualization – Virtualization at the OS Level – Virtualization Structure – Virtualization Mechanisms – Open Source Virtualization Technology – Binary Translation with Full Virtualization – Virtualization of CPU, Memory and I/o Devices – Hardware support for Virtualization in Intex x86 Processor.	**12**
II	Cloud Computing Services: Infrastructure as a Service – Platform as a Service – Language and Pass – Software as a Service – Database as a Service. Open Source Cloud Implementation and Administration: Open-source Eucalyptus Cloud Architecture – Open-source Open stack Cloud Architecture.	**12**

III	Application Architecture for Cloud: Cloud Application Requirements – Recommendations for Cloud Application Architecture – Fundamental Requirements for Cloud Application Architecture – Relevance and use of Client-server architecture for Cloud Applications – Service oriented Architecture for Cloud Applications. Cloud Programming: Programming support for Google Apps Engine – Big Table as Google's NOSQL System – Chubby as Google Distributed Lock Service – Programming support for Amazon EC2 – Elastic Block Store (ESB).	12
IV	Risks, Consequences and Costs for Cloud Computing : Introducing Risks in Cloud Computing – Risk Assessment and Management – Risk of Vendor Lock-in– Risk of Loss Control – Risk of Not Meeting Regulatory Compliances – Risk of Resource Scarcity – Risk in Multi Tenant Environment – Risk of Failure – Risk of Failure of Supply Chain – Risk of Malware and Internet attacks – Risk of Inadequate SLA – Risk of Management of Cloud Resources – Risk of Network Outages – Risks in the Physical Infrastructure – Legal Risk due to Legislation – Risks with Software and Application Licensing – Security and Compliance Requirements in a Public Cloud – Direct and Indirect Cloud Costs – Calculating Total cost of Ownership for Cloud Computing – Cost Allocations in a Cloud . AAA administration for clouds : The AAA Model, Single Sign-on for Clouds – Industry Implementations for AAA- Authentication management in the Cloud – Authorization management in the Cloud .	12
V	Application Development for cloud : Developing On-Premise Versus Cloud Applications – Modifying Traditional Applications for Deployment in the Cloud - Stages during the development process of Cloud Application - Managing a Cloud Application – Using Agile Software Development for Cloud Applications Cloud Applications : What Not to do - Static code analysis for cloud applications – Developing Synchronous and Asynchronous Cloud Applications . Mobile Cloud Computing : Definition of Mobile Cloud Computing – Architecture of Mobile Cloud Computing – Benefits of Mobile Cloud Computing Mobile Cloud Computing Challenges.	12

Text books

	Author	Title	Publisher
1	Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde Dr. Deven Shah	Cloud Computing, Black Book	Dreamtech press

Reference books

	Author	Title	Publisher
1	Thomas Erl, Zaigham Mahmood, Ricardo Puttini	Cloud Computing - Concepts Technology and Architecture	Pearson
2	Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi	Mastering Cloud Computing, Foundations and Application Programming	TMH

22MCA204.2: Data Mining Techniques

Course code	22MCA204.2	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES	
	Upon successful completion of the course, the student will be able to:	
1	Understand *Fundamentals of Data Mining* & *Data Preprocessing*.	
2	Learn Data *Warehousing and Online Analytical Processing* concepts.	
3	Understand various *Mining Frequent Patterns Methods* &*Various Association Rules*.	
4	Lean different Classification & Prediction Methods.	
5	U*nderstand &apply* various Clustering Algorithms.	

Syllabus

Unit		
I	**Introduction:** What is Data mining -*What Kind of Data can be Mined* (Database Data, Data Warehouses Transactional Data, Other Kinds of Data) -*What kinds of Patterns can be Mined* (Class/Concept Description: Characterization and Discrimination, Mining Frequent Patterns, Associations and Correlations, Classification and Regression for Predictive Analysis , Cluster Analysis , Outlier Analysis, Are All Patterns Interesting?) -*Which Technologies are Used?* (Statistics, Machine Learning, Database Systems and Data Warehouses, Information Retrieval) -*Major Issues in Data Mining* (Mining Methodology User Interaction, Efficiency and Scalability, Diversity of Database Types, Data Mining and Society) **Data Preprocessing**: *An Overview of Data Preprocessing* (Why Preprocess the Data?, Major Tasks in Data Preprocessing) -*Data Cleaning* (Missing Values, Noisy Data, Data Cleaning as a Process) -*Data Integration* (Entity Identification Problem, Redundancy and Correlation Analysis,Tuple Duplication, Data Value Conflict Detection and Resolution) -*Data Reduction* (Overview of Data Reduction Strategies, Attribute Subset Selection, Regression and Log Linear Models, Histograms, Sampling and Datacube Aggregation) -*Data Transformation* (Data Transformation strategies Overview, Data Transformation by Normalisation, Discretization by Binning).	**12**

II	**Data Warehousing and Online Analytical Processing:** *Data Warehouse Basic Concepts* (What Is a Data Warehouse?, Difference between Operational Database Systems and Data Warehouses, Why have a separate Data warehouse?, Data Warehousing: A Multiered Architecture, Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse, Extraction, Transformation and Loading, Metadata Repository, Datawarehouse Modeling: Datacube and OLAP, Data Cube: A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations Schemas for Multidimensional Data Models, Dimensions: The Role of Concept Hierarchies, Measures: Their Categorisation and Computation, Typical OLAP Operations, A Starnet Query Model for Querying Multidimensional Databases) - *Data Warehouse Implementation* (Efficient Data Cube Computation: An Overview Indexing OLAP, Data: Bitmap Index and Join Index, OLAP Server Architectures: ROLAP versus MOLAP versus HOLAP).	12
III	**Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods:** *Basic Concept* (Market Basket Analysis: A Motivational Example, Frequent Itemsets, Closed Itemsets and Association Rules) -*Frequent itemset Mining Methods* (Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, A Pattern Growth Approach for Mining Frequent Itemsets, Mining Frequent Itemsets Using Vertical Data Format) **Advanced Pattern Mining:** *Pattern Mining: A Road Map*-*Pattern Mining in Multilevel*, *Multidimensional Space* (Mining Multilevel Association Rules, Mining Multi Dimensional Associations, Mining Quantitative Association Rules).	12
IV	**Classification: Basic Concepts**: *Basic Concepts* (What Is Classification?, General Approaches to Classification) -*Decision Tree Induction* (Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction) -*Bayes Classification Methods* (Bayes Theorem, Naïve Bayesian Classification) -*Model Evaluation and Selection* (Metrics for Evaluating Classifier Performance, Holdout Method and Random Subsampling, Cross - Validation and Bootstrap). **Classification: Advanced Methods**: *Bayesian Belief Networks* (Concepts and Mechanisms, Training Bayesian Belief Networks) - *Classification by Back Propagation* (A Multilayer Feed Forward Neural Network, Defining a Network Topology, Backpropagation).	12
V	**Cluster Analysis: Basic Concepts and Methods:** *Cluster Analysis* (What is Cluster Analysis? Requirements for Cluster Analysis) -*A Partitioning Methods (k-Means* and K-Medoid) -*Hierarchical Methods* (Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, BRICH:Multiphase Hierarchical Clustering using Clustering Feature Trees, Chameleon: Multiphase Hierarchical Clustering Using Dynamic Modeling Hierarchical Clustering) -*Density Based Method* (DBSCAN). **Outlier Detection:** *Outliers and Outlier Analysis* (What are Outliers Analysis?, Types of Outliers) -*Statistical Approaches* (Parametric Methods, Nonparametric Methods).	12

Reference Text Books:
1. Jiawei Han, Micheline Kamber, Data Mining: Concepts & Techniques, 2012.
2. Ralph Kimball, The Data Warehousing Toolkit, Wiley, Thomson, July 2013.
3. S.N. Sivanandam and S.Sumathi, Data Mining Concepts, Tasks and Techniques, Springer, October 2006.

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA

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22MCA204.3: Unix Programming

Course code	22MCA204.3	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100

S.NO	COURSE OUTCOMES	
	Upon successful completion of the course, the student will be able to:	
1	Describe the architecture and features of UNIX Operating System and distinguish it from other Operating Systems	
2	System Demonstrate UNIX commands for file handling and process control	
3	Write Regular expressions for pattern matching and apply them to various filters for a specific task .	
4	Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem.	

Syllabus

Unit		
I	**Introduction to Unix:** Brief History-What is Unix-Unix components-Using Unix-Commands in Unix-Some Basic Commands-command Substitution-Giving Multiple Commands. **The File system** –The Basics of Files-What's in a File-directories and File Names-Permissions-INodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.	12
II	**Using the Shell-**Command Line Structure-Met characters-relating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables-More on I/O Redirection-Looping in Shell Programs.	12
III	**Filters-**The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.	12
IV	**Shell Programming-**Shell Variables-The Export Command-The Profile File a Script Run During Starting-the first Shell Script-The read Command-Positional parameters-The$?Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<) – The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command	12
V	**The Process-**The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control	12

Reference Text Books:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkatesh murthy, Pearson.
3. Unix and shell programming by B.M. Harwani, OXFORD university press.

Master of Computer Applications (M.C.A.)

22MCA205P : Data Structures Lab

List of Programs

1. Java program to implement Stack operations using Arrays
2. Java program to implement Queue operations using Arrays
3. Java program to implement linked list operations using Arrays
4. Java Program to implement tree traversal techniques
5. Java program to convert infix expression to postfix expression
6. Java program to evaluate postfix expression
7. Java program to implement Binary search.
8. Java program to implement Selection sort
9. Java program to implement Insertion sort
10. Java program to implement quick sort
11. Java program to implement Merge Sort.

Master of Computer Applications (M.C.A.)
22MCA206P – Web Technologies Lab

List of Programs

1. Write an HTML code to display your education details in a tabular format.
2. Write an HTML code to display your CV on a web page.
3. Write an HTML code to display the name of the University and Department name using inline, internal and external CSS.
4. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
5. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
6. Write a JavaScript code that displays text with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays in BLUE color. Then the font size decreases to 5pt.
7. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
8. Write a PHP program to display a digital clock which displays the current time of the server.
9. Write the PHP program to multiply two matrices.
10. Write the PHP to find the transpose of the matrix.
11. Write a PHP program to sort the student records which are stored in the database using selection sort.
12. Using jQuery find all text areas, and makes a border. Then adds all paragraphs to the jQuery object to set their borders red.
13. Using jQuery add a new class to an element that already has a class.
14. Using jQuery insert some HTML after all paragraphs.

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA
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Master of Computer Applications (M.C.A)
I year - II Semester - 22MCA201 : Computer Networks

Time : 3 Hours   **Max. Marks: 70**

SECTION-A
Answer any five questions. 5 × 4 = 20 Marks

1. Differentiate connection oriented and connection less Services.
2. Explain about Sliding windows protocol.
3. Explain about Bluetooth Architecture.
4. Differentiate Virtual Circuits and Datagram Subnets.
5. Explain about Hierarchical Routing.
6. Explain about addressing in Transport Protocols.
7. Explain about TCP Protocol header format.
8. Explain static web documents.

SECTION-B
Answer all questions. 5 × 10 = 50 Marks

9. (a) Explain about OSI Reference Model in detail.

(OR)

(b) Explain about error detection and error correction codes.

10. (a) Explain about repeaters, bridges and routers in detail.

(OR)

(b) Explain about Switched Ethernet.

11. (a) Explain about Network Layer Design Issues.

(OR)

(b) Explain about Routing algorithms.

12. (a) What are the Services provided by the Transport Layer to the Upper Layers.

(OR)

(b) Explain about Connection Establishment and Connection Release.

13. (a) Explain about DNS in detail.

(OR)

(b) Explain about Architecture and Services of Electronic Mail.

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA

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Master of Computer Applications (M.C.A)
I year - II Semester - 22MCA202 : Data Structures

Time : 3 Hours   **Max. Marks: 70**

SECTION-A
Answer any five questions. 5 × 4 = 20 Marks

1. Define Data Structure. Explain different data structures.
2. What is Time-Space trade off?
3. State different String Operations with examples.
4. Discuss insertion and deletion operations in a Linked List.
5. Explain AVL trees with an example.
6. Write an algorithm for Heap Sort.
7. Explain Graph Traversal techniques with an example.
8. How do we perform radix sort? Give an example.

SECTION-B
Answer all questions. 5 × 10 = 50 Marks

9. a) Explain how to analyse the complexity of an algorithm using various Asymptotic Notations with examples.

   (OR)

   b) Explain various Control Structures.

10. a) Explain Binary Search and Linear Search Algorithms with an example.

    (OR)

    b) Discuss the Second Pattern Matching Algorithm with an example.
    .
11. a) Explain operations of Queue and write algorithms.

    (OR)

    b) Write an algorithm for evaluating an arithmetic expression.

12. a) Discuss in detail about Binary Tree Traversal techniques using Stack.

    (OR)

    b) Briefly discuss about the insertion and deletion operations in a Binary Search Trees with example.

13. a) Explain the process of Topological Sorting.

    (OR)

    b) Discuss about Merge Sort with an example.

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA

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Master of Computer Applications (M.C.A)
I year - II Semester - 22MCA203 : Web technologies

Time : 3 Hours   **Max. Marks: 70**

SECTION-A
Answer any five questions. 5 × 4 = 20 Marks

1. What are Hyper Links?
2. Write about Text Shadow Properties.
3. Explain how do you register an event.
4. Write about functions in jQuery.
5. How do you find an element by index in jQuery.
6. Write the different ways to find a selector.
7. Explain about PHP arrays.
8. Write about regular Expression in PHP.

SECTION-B
Answer all questions. 5 × 10 = 50 Marks

9. A) How do you add Tables and Images to HTML page?
                              (OR)
   B) Distinguish Client side scripting versus Server side scripting.
10. A) Write short notes on user style sheets.
                              (OR)
    B) Explain control statements in java script with example.
11. A) What are jQuery Selectors? Give some examples.
                              (OR)
    B) Explain jQuery DOM attributes with an example.
12. A) Explain jQuery CSS methods with an example.
                              (OR)
    B) What are the effect methods used in jQuery?
13. A) Differentiate between SQL and MYSQL databases.
                              (OR)
    B) How to read data from a database in PHP? Explain with an example.

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Master of Computer Applications (M.C.A)
I year - II Semester - 22MCA204.1: Cloud Computing

Time : 3 Hours   Max. Marks: 70

SECTION-A
Answer any five questions. 5 × 4 = 20 Marks

1. Explain the Various Types of Cloud with neat diagrams
2. Explain Virtualization and its benefits and levels.
3. Explain about Open-source Eucalyptus Cloud Architecture.
4. Summarize the requirements of Cloud Application.
5. Explain Elastic Block Store.
6. Explain the different Risk Factors in Cloud.
7. How can we use Agile Software Development for Cloud Applications?
8. What are the components in Mobile Cloud Computing?

SECTION-B
Answer all questions. 5 × 10 = 50 Marks

9. a) Compare and contrast Cloud Computing Architecture with Peer to Peer
        Architecture.
                                        (OR)
    b) Explain the Virtualization Structures and Virtualization Mechanisms

10. a) Explain Cloud Computing Services.
                                        (OR)
     b) Explain Open Source Cloud Architectures.
     .
11. a) Explain Service Oriented Architecture for Cloud Applications
                                        (OR)
      b) Explain the Big Table as Google's NoSQL System.

12 a) Explain the Risks in Cloud Computing.
                                        (OR)
     b) Describe the AAA Model for Clouds.

13 a) What are the Stages during the Development Process of Cloud Applications?
                                        (OR)
     b) What are the benefits and challenges of Mobile Cloud Computing?

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Master of Computer Applications (M.C.A)
I year - II Semester - 22MCA204.2 : Data Mining Techniques

Time : 3 Hours   **Max. Marks: 70**

SECTION-A
Answer any five questions. 5 × 4 = 20 Marks

1. What are Major issues of Data Mining?
2. Define Data Preprocessing and its steps.
3. What is difference between OLAP Server and RLAP Server.
4. What is Pattern Mining and list out different Methods for Pattern Mining.
5. Explain Classification?
6. Explain is Bayes Theorem?
7. What is Cluster Analysis? and Different types Cluster Analysis?
8. What is Outliers Analysis and its method?

SECTION-B
Answer all questions. 5 × 10 = 50 Marks

9. a) Discuss about Data Warehouse on user's perspective and developer 's perspective.

(OR)

   b) Explain about the work Breakdown structure.

10. a) Explain about Data Warehouse Architecture.

(OR)

   b) Discuss about the ETL design in detail.

11. a) Explain about data mining functionalities.

(OR)

   b) Explain about the FP Growth algorithm with example.

12. a) Discuss about decision tree induction.

(OR)

   b) Briefly discuss about the back propagation.

13. a) Explain about the partitioning clustering

(OR)

   b) Discuss about DBSCAN & STING.

Master of Computer Applications (M.C.A)
I year - II Semester - 22MCA204.3 : Unix Programming

Time : 3 Hours   **Max. Marks: 70**

SECTION-A
Answer any five questions. 5 × 4 = 20 Marks

1. What is a System call in UNIX?
2. Which command will list the hidden files in UNIX?
3. Compare different loops used in Shell script.
4. Write about Filters.
5. Write about AWK Pattern.
6. Define Shell Variables.
7. Write about Eval, Exec Commands.
8. What are Parent and Child Processes?

SECTION-B
Answer all questions. 5 × 10 = 50 Marks

9. a) With a neat sketch, explain the architecture of UNIX operating system.
                                       OR
   b) Describe the attributes and permissions of a file in UNIX file system.

10.a) What is a Shell? Explain the two different duties of a Shell. How can you
       create a sub shell? How can you move to the parent shell after creating a sub
       shell?
                                       OR
   b) Write a Shell Script to display result based on the value returned from a function
      call.

11.a) List out the different string functions of awk utility and explain any three.
                                       OR
    b) With a neat diagram, describe an awk utility's view of a file and also explain the
       file buffers and record buffers of awk

12.a) Explain the purpose of set command with an example.
                                       OR
   b) How we know the exit status of a command in C shell? Explain.

13.a) Explain in sequence the steps to convert a background process to a foreground
       process.
                                       OR
   b) Explain in detail about the internal and external commands in UNIX.

22MCA301: Data Science

Course code	22MCA301	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

Course Objective: Understand data analysis techniques for applications handling large data. Understand various machine learning algorithms used in data science process. Visualize and present the inference using various tools. Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making in real time problems of data science.

Course Outcomes:

Upon successful completion of the course, a student will be able to:
1. To understand the fundamental concept of Data science.
2. Infer various data visualization tool
3. Demonstrate various Data driven technique and perform predictive analysis
4. Solve the Deep Reinforcement Learning problem.
5. Solve the Explore the fundamental concepts of data science.

Unit 1	**Introduction to NumPy** - Understanding Data Types in Python, The Basics of Numpy Arrays, Computation on NumPy Arrays, Aggregations, Computation on Arrays, Comparisons, Masks and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data.
Unit 2	**Data Manipulation with Pandas** – Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets, Aggregation and Grouping, Pivot Tables, Vectorized String operations, High-Performance Pandas.
Unit 3	**Visualization with Matplotlib** – General Matplotlib Tips, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density.
Unit 4	**Customizing Matplotlib** – Customizing Plot Legends, Customizing Colorbars, Text and Annotation, Customizing Matplotlib, Three-Dimensional Plotting in Matplotlib, Visualization with Seaborn.

Unit 5	**Machine Learning** – What is Machine Learning, Categories of Machine Learning, Qualitative Examples of Machine Learning Applications, Introducing Scikit-Learning, Feature Engineering, Naive Bayes Classification, Linear Regression, Decision Trees and Random Forests, In Depth: Principal Component Analysis Introducing Principal Component Analysis, PCA as Noise Filtering, Example: Eigen faces, Principal Component Analysis Summary, In Depth: k-Means Clustering, k-Means Algorithm, Examples.

Text books

	Author	Title	Publisher
1	Jake VanderPlas-	Python Data Science Handbook	OReilly

Reference books

	Author	Title	Publisher
1	Peters Morgan	Data Analysis From Scratch With Python: Beginner Guide using Python, Pandas, NumPy, Scikit-Learn, IPython,TensorFlow and Matplotlib	AI Sciences LLC

22MCA302.1: Design and Analysis of Algorithms

Course code	22MCA302.1	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

Course Objectives: This course is designed to introduce the students to design and analyse algorithms in terms of efficiency and correctness. The course focuses on highlighting difference between various problem solving techniques for efficient algorithm design.

Course Outcomes:

Up on completion of this course, the student will be able to

- Analyze the asymptotic performance of algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Develop algorithms for sorting, searching, insertion and matching.
- Acquire knowledge in NP Hard and complete problem

Unit 1	Introduction to Algorithm, Algorithm definition, properties, Different areas to study about Algorithms, Pseudo code expressions for an algorithm, Performance Analysis, Time Complexity & Space Complexity, Asymptotic notations Introduction to Divide and Conquer – Binary search, Quick sort, Merge sort, Strassen's matrix multiplication, Finding Maximum and minimum.
Unit 2	Greedy Method introduction, General method, Knapsack problem, Tree Vertex Splitting, single source shortest path problem, Optimal storage on tapes, Optimal Merge patterns, Minimum cost spanning trees – Prim's Algorithm, Kruskal's Algorithm.
Unit 3	Dynamic Programming, Multi stage graphs, All pairs shortest path, Optimal Binary search tree, 0/1 Knapsack problem, Travelling salesperson problem, Flow shop scheduling, Reliability Design
Unit 4	Basic search and Traversal Techniques, Tree Traversals, Bi-connected components, DFS, BFS Introduction to backtracking - General method, N-queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycle

Unit 5	Introduction to Branch and Bound, Travelling salesperson problem, 0/1 Knapsack problem, LCBB, FIFOBB. Introduction to NP-Hard& NP-Complete, Example problems, Non deterministic Algorithms, Maximum Clique problem, Node Cover Decision problem, Chromatic Number Decision problem.

Text books

	Author	Title	Publisher
1	Sartaj Sahni	Fundamentals of Computer Algorithms	Second Edition, Universities Press (2008) **Chapters :** 1 to 8 and 11

Reference books

	Author	Title	Publisher
1	I.Chandra Mohan	Design and Analysis of Algorithms	PHI.
2	Prabhakar Gupta, Vineet Agrawal	Design and Analysis of Algorithms	PHI.
3	Anany Leviton	Introduction to the Design & Analysis of Algorithms	Second Edition, Pearson Education (2007)

22MCA302.2: Object Oriented Software Engineering

Course code	22MCA302.2	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

Course Objectives: The aim of this course is to train the students on Object Oriented Software Engineering features. It helps the students to develop projects using object-oriented analysis, design and testing techniques.

Course Outcomes:

Up on completion of this course, the student will be able to

- Plan a software engineering process life cycle.
- Able to elicit, analyze and specify, design and develop the code.
- Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.
- Use modern engineering tools necessary for software project management, time management and software reuse.
- Plan a software engineering process life cycle.

Unit 1	**The Scope of Object Oriented Software Engineering:** Historical Aspects, Economic Aspects, Maintenance Aspects, Requirements, Analysis and Design Aspects, The Object Oriented Paradigm, Terminology, Ethical Issues. **Software Life-Cycle Models :** Software Development In Theory, Risks and other aspects of Iteration and Incrementation, Managing Iteration and Incrementation, Other Life-Cycle Models : Code-and-Fix, Waterfall, Rapid-Prototyping, Open Source, Agile Processes, Synchronize-and-Stabilize, Spiral Model s, Comparison of Life-Cycle Models.
Unit 2	**The Software Process :** The Unified Process, Iteration and Incrementation, The Requirements Workflow, The Analysis workflow, The Design workflow, The Implementation Workflow, The Test workflow, Post Delivery Maintenance, Retirement, The Phases of the unified Process, One- versus Two-Dimensional Life cycle models, Improving the Software process, Capability Maturity Models, Costs and Benefits of software process improvement. **Teams:** Team Organization, Democratic Team Approach, Chief Programmer Team Approach, Synchronize and Stabilize Teams, Teams for Agile Processes, Open Source Programming Teams, People Capability Maturity Model, Choosing an appropriate Team.

Unit 3	**Testing:** Quality Issues, Non -Execution-Based Testing, Execution-Based Testing, What should be Tested?, Testing versus Correctness proofs, who should perform Execution Based Testing ?, When Testing Stops.
	Modules to Objects: What is a Module ?, Cohesion, Coupling, Data Encapsulation, Abstract Data Types, Information Hiding, Objects, Inheritance , Polymorphism and Dynamic Binding, The Object-Oriented Paradigm.
	Reusability and Portability: Objects and Reuse, Reuse during design and Implementation, Reuse and Post Delivery Maintenance, Portability, Techniques for achieving portability.
	Planning and Estimating: Planning and the software Process, Estimating Duration and Cost, Components of a software project Management plan , Software project Management Plan Framework, Planning Testing, Training Requirements, Documentation Standards.
Unit 4	**The Requirements Workflow:** Determining what client needs, Overview of the Requirements, Understanding the Domain, The Business Model, Initial requirements, What are Object-oriented Requirements, Rapid Prototyping, Human Factors, Reusing the rapid prototype, Metrics for the Requirement Workflow, Challenges of the Requirements Workflow.
	The Analysis Workflow: The Specification Document, Informal Specifications, The Analysis Workflow, Extracting the Entity Classes, Challenges of the Analysis workflow.
	The Design Workflow: Object-Oriented Design, The Design Workflow, Formal techniques for Detailed Design, Real-time Design Techniques, CASE tools for Design, Metrics for Design, Challenges of the Design Workflow.
Unit 5	**The Implementation workflow:** Choice of Programming Language, Good Programming practice, Coding Standards, Code Reuse, Integration, The Implementation Workflow, Test case selection, Black-Box Unit Testing Techniques, Glass-Box Unit Testing Techniques, Code walkthroughs and Inspections, Comparison of Unit testing techniques, Clean room, Testing Issues, Integration Testing, Product Testing, Acceptance Testing, Metrics for the Implementation workflow, Challenge of the Implementation Workflow.
	Postdelivery Maintenance: Why postdelivery maintenance IS necessary, what is required of postdelivery Maintenance Programmers? Management of Postdelivery Maintenance, Maintenance Issues, Reverse Engineering, Testing during postdelivery Maintenance, Metrics for Postdelivery Maintenance, Challenges for the Postdelivery Maintenance.

Text books

	Author	Title	Publisher
1	Stephen R.Schach	Object Oriented Software Engineering	Mc Graw Hill Higher Education

Reference books

	Author	Title	Publisher
1	Timothy C.Lethbridge, Robert Laganiere	Object Oriented Software Engineering	Mc Graw Hill, 2nd Edition

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22MCA302.3: Cryptography & Network Security

Course code	22MCA302.3	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

Course Objectives: This Course focuses towards the introduction of network security using various cryptographic algorithms. Underlying network security applications. It also focuses on the practical applications that have been implemented and are in use to provide email and web security.

Course Outcomes:

Up on completion of this course, the student will be able to

- Identify the security issues in the network and resolve it.
- Analyse the vulnerabilities in any computing system and hence be able to design a security solution.
- Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions.
- Demonstrate various network security applications, IPSec, Firewall, IDS, Web Security, Email Security and Malicious software etc.

Unit 1	**Introduction:** Security trends, the OSI security architecture, security attacks, security services, security mechanisms, a model for network security. **Classical encryption techniques**: Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machines, Steganography. **Block cipher and the data encryption standard:** Block cipher principles, the strength of DES, Differential and linear cryptanalysis, Block cipher design principles. **Confidentiality using Symmetric Encryption:** Placement of encryption function, Traffic confidentiality, key distribution, random number generator.
Unit 2	**Public key cryptography and RSA:** Principles of public key crypto systems, The RSA algorithm **Key management: Other public-key crypto systems:** Key management, Diffie-Hellman key exchange. **Message authentication and hash functions:** Authentication requirements, Authentication functions, message authentication codes, Hash functions, security of hash functions and MAC s.
Unit 3	**Digital signatures and authentication protocols:** Digital signatures, Authentication protocols, Digital Signature standard **Authentication Applications:** Kerberos, X.509 authentication service
Unit 4	**Email Security:** Pretty good privacy, S/MIME

Unit 5	**IP security:** IP security overview, IP security architecture, Authentication header, Encapsulating security payload, combining security associations, key management. **Web security:** Web security considerations, Secure Socket Layer and transport layer security, Secure electronic transaction.
Unit 5	**Intruders:** Intruders, Intrusion detection, password management **Malicious Software:** Viruses and related threads, virus counter measures, distributed denial of service attacks. **Firewalls:** Firewall Design principles, trusted systems, common criteria for information technology, security evaluation.

Text books

	Author	Title	Publisher
1	William Stallings	Cryptography and Network Security	Fourth edition, PHI **Chapters:** 1,2,3,7,9,10,11,13,14,15,16,17,18,19,20

Reference books

	Author	Title	Publisher
1	William Stallings	Network Security Essentials – Applications and Standards	Third Edition, Pearson Education (2007)
2	Chris McNab	Network Security Assessment	2nd Edition, OReilly (2007).
3	Jon Erickson	Hacking – The Art of Exploitation	SPD, NOSTARCH Press (2006).
4	Neal Krawety	Introduction to Network Security	Thomson (2007)
5	Ankit Fadia	Network Security – A Hackers Perspective	Macmillan (2008)

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22MCA301.4: DEEP LEARNING

Course code	22MCA301.4	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

Course Objectives:
To gain familiarity in basics of Deep Leaning. To understand the concepts of Memory Augmented Neural Networks .To acquire knowledge Deep Reinforcement Learning. To implement Neural Networks in Tensor Flow To understand the Applications of Deep Learning.

Course Outcomes:
Up on successful completion of the course, the student will be able to:
1. Gain familiarity in Basics of Deep Leaning.
2. Understand the concepts of Memory Augmented Neural Networks.
3. Acquire knowledge Deep Reinforcement Learning.
4. Implement Neural Networks in Tensor Flow.
5. Understand the Applications of Deep Learning.

Unit 1	**Basics of Deep Leaning- Deep learning architectures:** Convolutional Neural Networks: Neurons in Human Vision - The Shortcomings of Feature Selection - Vanilla Deep Neural Networks Don't Scale - Filters and Feature Maps - Full Description of the Convolutional Layer - Max Pooling - Full Architectural Description of Convolution Networks - Closing the Loop on MNIST with Convolutional Networks - Image Preprocessing Pipelines Enable More Robust Models - Accelerating Training with Batch Normalization -Building a Convolutional Network for CIFAR 10 - Visualizing Learning in Convolutional Networks - Leveraging Convolutional Filters to Replicate Artistic Styles - Learning Convolutional Filters for Other Problem Domains - Training algorithms.
Unit 2	**Memory Augmented Neural Networks:** Neural Turing Machines - Attention Based Memory Access - NTM Memory Addressing Mechanisms - Differentiable Neural Computers - Interference Free Writing in DNCs-DNC Memory Reuse - Temporal Linking of DNC Writes - Understanding the DNC Read Head - The DNC Controller Network - Visualizing the DNC in Action-Implementing the DNC in Tensor Flow - Teaching a DNC to Read and Comprehend.
Unit 3	**Deep Reinforcement Learning:** Deep Reinforcement Learning Masters Atari Games - What Is Reinforcement Learning? - Markov Decision Processes (MDP) - Explore

	Versus Exploit - Policy versus Value Learning - Pole Cart with Policy Gradients- Q Learning and Deep Q Networks - Improving and Moving Beyond DQN.
Unit 4	**Implementing Neural Networks in Tensor Flow:** What Is Tensor Flow? - How Does Tensor Flow Compare to Alternatives? - Installing Tensor Flow - Creating and Manipulating Tensor Flow Variables - Tensor Flow Operations-Placeholder Tensors-Sessions in Tensor Flow - Navigating Variable Scopes and Sharing Variables - Managing Models over the CPU and GPU - Specifying the Logistic Regression Model in Tensor Flow - Logging and Training the Logistic Regression Model.
Unit 5	**Applications:** Large Scale Deep Learning - Computer Vision - Speech Reorganization - Natural Language Processing - Other Applications.

Text books

	Author	Title	Publisher
1	Nikhil Buduma, Nicholas Locascio	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms.	O'Reilly Media, 2017
2	Ian Goodfellow, YoshuaBengio, Aaron Courville	Deep Learning (Adaptive Computation and Machine Learning series).	MIT Press, 2017

Reference books

	Author	Title	Publisher
1	Douwe Osinga	Deep learning Cook Book, Practical Recipes to Get Started Quickly	O'Reilly

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22MCA302.5: Internet of Things

Course code	22MCA302.5	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

Course Objectives: Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

Course Outcomes:

Up on completion of this course, the student will be able to
- Apply the concepts of IOT in different applications.
- Identify the different technology
- Analysis and evaluate protocols used in IOT and data received through sensors.
- Design and develop smart city in IOT.

Unit – 1	**IoT Ecosystem Concepts and Architectures :** Internet of Things Definition Evolution : IoT Emergence – Internet of Everything – Industrial IoT – Smartness in IoT; IoT Architectures: SOA based architecture, API Oriented Architecture; Resource Management: Resource Partitioning – Computation Offloading – Identification and Resources/Service discovery; IoT Data Management and Analytics: IoT and the Cloud – Real time analysis in IoT and Fog Computing ; Communication Protocols : Network Layer (RFID, IEEE 802.11, WPAN, M2M, IPV4, IPV6)– Transport and Application Layer(UDP,TCP); Internet of Things Applications- Monitoring and Actuating - Business process and Data Analysis – Information Gathering and collaborative consumption .**Open Source Semantic Web Infrastructure for Managing IoT Resources in the Cloud :** Open IoT Architecture for IoT/Cloud Convergence, Scheduling process and IoT life cycle, Scheduling and Resource Management
Unit – 2	**Fog Computing :** Introduction – Definition and Characteristics – Reference Architecture – Applications : Health Care – Augmented Reality – Caching and Reprocessing. **IoT Enablers and Solutions :** Embedded Device Programming Languages (nesC ,Keil C ,Dynamic C, B#) – Message Passing in Devices(RPC, REST, CoAP) – Coordination Languages(Linda and Elinda , Orc, Jolie) – Polyglot Programming – IoT Approaches –Existing IoT Frameworks.

Unit – 3	**IoT Data Knowledge and Management :** The Foundations of Stream Processing in IoT , Continuous Logic Processing System **Framework for Distributed Data Analysis :** Preliminaries - Anomaly Detection – Problem statement and Definitions – Distributed Anomaly Detection – Efficient Incremental Local Modelling
Unit – 4	**Governing IoT:** IoT Governance : Overview - An Integrated Governance Idea – Governance Models – Important Governance Issues – Existing Approaches – New Paradigms . **IoT Applications: Applied Internet of Things :** Scenario – Architecture Overview – Sensors – The Gateway – Data Transmission.
Unit – 5	**Case Study :** Socket Programming , Developing a simple Math Server; Internet of Things: Programming IoT Devices, Web Services and IoT Clients

Text books

	Author	Title	Publisher
1	Rajkumar Buyya & Amir Vahid Dastjerdi Morgan Kaufmann	Internet of Things , Principles and Paradigms (Topics : 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3, 1.4, 1.5, 1.6, 1.7, 2.3, 2.4, 2.5, 4.1, 4.3, 4.4, 4.5, 5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.3.2, 5.3.3, 8.2, 8.3, 9.2, 9.3, 9.4, 9.5, 9.6, 12.3, 15.2, 15.3, 15.4, 15.5, 15.6).	Elsevier

Reference books

1.	Web Reference : https://www.codeproject.com/Articles/853183/Internet-of-Things-Programming-IoT-Devices-Web-Ser
2.	Socket Programming - Raj Kumar Buyya (Chapter 13)

22MCA302.6: Block Chain Technologies

Course code	22MCA302.6	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

Course Objective : The objective of this course is to provide conceptual understanding of block chain technology and how it can be used in Industry 4.0 The course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using Ethereum.

Course Outcomes:
Up on completion of this course, the student will be able to
- Understand basic concepts of block chain technology and its platforms
- To develop various types of environments in block chain technology
- To provide security prospects in an organization.

Unit – 1	**Basics**: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.
Unit – 2	Blockchain: Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.
Unit – 3	Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.
Unit – 4	Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit – 5	Cryptocurrency Regulation: Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain. **Tutorial & Practical**: Naive Blockchain construction, Memory Hard algorithm - Hashcash implementation, Direct Acyclic Graph, Play with Go-ethereum, Smart Contract Construction, Toy application using Blockchain, Mining puzzles

Text books

	Author	Title	Publisher
1	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction	Princeton University Press (July 19, 2016)

Reference books

	Author	Title	Publisher
1	Antonopoulos, Mastering Bitcoin	Unlocking Digital Cryptocurrencies	
2	Satoshi Nakamoto, Bitcoin	A Peer-to-Peer Electronic Cash System	
3	DR. Gavin Wood, "ETHEREUM	A Secure Decentralized Transaction Ledger	Yellow paper.2014
4	Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli	A survey of attacks on Ethereum smart contracts	

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Master of Computer Applications (M.C.A.)
22MCA301P: DATA SCIENCE LAB

1. Write a python program to perform various computational Operations using NumPy.

2. Write a python program to demonstrate fancy index.

3. Write a python program to demonstrate data indexing and selection using pandas.

4. Write a python program to demonstrate aggregation and grouping operations using pandas.

5. Write a python program to generate line plots from the given data.

6. Write a python program to generate Scatter plots from the given data

7. Write a python program to display plot legends using matplotlib

8. Write a python program to classify given data set using regression

9. Write a python program to demonstrate navy based classification

10. Write a python program to read excel sheet containing student data with columns, roll no, name, subject 1 marks, subject 2 marks, subject 3 marks into data frames in pandas and find out whether the total marks and avg each student should be generate and also at their normal distribution curve for total marks

Master of Computer Applications (M.C.A.)
22MCA302.2P: Object Oriented Software Engineering Lab

Case Studies : Design Following Systems in Object Oriented Approach using UML with open source tools (Eclipse UML2 or any other Open source tools) :

1. Online Examination System

2. Online Railway Reservation

3. Library Maintenance System

4. Any E-Commerce Portal

5. Biometric Attendance System

Note: Student is expected to analyze the system in object oriented manner and design the system in object oriented approach using UML with open source tools

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MODEL PAPER
22MCA301: DATA SCIENCE

Time 3 Hours   **Max. Marks: 70**

SECTION-A
Answer any five questions.   **5 × 4 = 20 Marks**
1. Explain Numpy?
2. Enlist different data types in Python.
3. Define Dataset.
4. How to import Numpy library in your code?
5. Can Numpy be used with other libraries?
6. Explain Machine Learning?
7. How to convert a DataFrame to an array in Pandas?
8. Explain Python pandas

SECTION-B
Answer all questions.   **5 × 10 = 50 Marks**

UNIT I
9. a) What are the features of Numpy Library.
(OR)
  b))What are the advantages of Numpy Arrays over Python arrays and lists?
UNIT II
10. a) Explain data index and selection in Pandas.
(OR)
  b) Explain string operations in Pandas with examples.
UNIT III
11. a) How to create a Simple Line Plots with Matplotlib?
(OR)
  b) Explain the steps to create Histograms with Matplotlib.
UNIT IV
12. a) Explain Three-Dimensional plotting.
(OR)
  b) How to use Seaborn Data visualization in Matplotlib?
UNIT V
13. a) Briefly explain Categories of Machine Learning.
(OR)
  b) Explain Naïve Bayes Classification.

MODEL PAPER

22MCA302.1: Design and Analysis of Algorithms

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Properties of an algorithm.
2. Binary search algorithm.
3. General abstraction of Greedy method.
4. Define BFS technique.
5. Principle of optimality.
6. Implicit and Explicit constraints.
7. Hamiltonian cycle.
8. Non-deterministic algorithm.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT I

9. a) Define an Algorithm. Discuss about the asymptotic notations used for analysis of algorithms.

(OR)

b) Discuss about general method of Divide and Conquer. Write an algorithm for finding maximum and minimum of an array using divide and conquer technique.
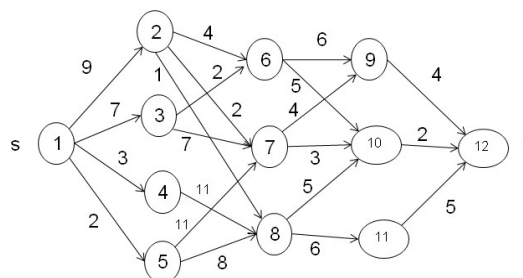
UNIT II

10. a) Explain Kruskal's algorithm to compute minimum cost spanning tree with suitable example.

(OR)

b) Explain Tree Vertex Splitting problem with an example and write algorithm

UNIT III

11. a) Find the minimum cost path from s to t in the multistage graph below using forward approach.

(OR)

b) Constrict an optimal Travelling sales person tour using Dynamic programming for the

TSP instance : $\begin{bmatrix} 0 & 10 & 9 & 3 \\ 5 & 0 & 6 & 2 \\ 9 & 6 & 0 & 7 \\ 7 & 3 & 5 & 0 \end{bmatrix}$

UNIT IV

12. a) Explain n-queens problem with an algorithm.

(OR)

b) Discuss about Bi-Connected components with suitable example.

UNIT V

13. a) Solve the following instance of 0/1 knapsack problem using Branch and Bound technique
M = 15, n = 4, (P1, P2, P3, P4) = (10, 10, 12, 18), (W1, W2, W3, W4) = (2, 4, 6, 9).

(OR)

b) Discus about NP Hard and NP complete problems.

MODEL PAPER

22MCA302.2: Object Oriented Software Engineering

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain software engineering? Explain Maintenance aspects.
2. Explain about improving of software process.
3. Explain teams of organization.
4. Explain about what should be tested.
5. Explain Analysis workflow.
6. Explain Block Box and White Box Testing.
7. Write about Reverse Engineering.
8. What are the components of a software project management plan?

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT I

9. a) Explain about the Historical ,Economic and Maintenance Aspects.

(OR)

    b) Explain about any two Life cycle Models

UNIT II

10. a) Discuss about the Design workflow, Implementation workflow and test workflow.

(OR)

    b) Explain in detail about the People Capability Maturity Model.

UNIT III

11. a) Explain in detail who should perform Execution-Based Testing.

(OR)

    b) Explain about the Modules of Object-Oriented Paradigm.

UNIT IV

12. a) Explain what the Object-Oriented Requirements for workflow are.

(OR)

    b) Explain about the Design workflow and it's Challenges.

UNIT V

13. a) Explain in detail the methods for Test case design for object oriented software.

(OR)

    b) Explain post delivery Maintenance? Explain Post delivery maintenance is necessary.

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MODEL PAPER

22MCA302.3: Cryptography & Network Security

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Differentiate between Active and Passive attacks.
2. Compare Stream Cipher and Block Cipher.
3. What are the requirements of Cryptographic hash functions?
4. Compare DES and AES.
5. How Digital Signature differ from Authentication Protocols?
6. List out the requirements of Kerberos.
7. Illustrate the services provided by IPSec.
8. List us three classes of Intruders.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT I
9. a) a) List and briefly define the categories of Security Services and Mechanisms.
OR
b) Explain about the in detail process of DES.

UNIT II
10. a) Explain the RSA algorithm in detail with an example.
OR
b) Explain about the Security of Hash functions and MACS.

UNIT III
11. a) Explain about Kerberos V4 message exchanges.
OR
b) Explain the approaches of Digital Signatures.

UNIT IV
12. a) Explain about PGP Message Generation and MIME Content types.
OR
b) Explain about IPsec ESP and AH Format.

UNIT V
13. a) Explain about Statistical anomaly and Rule based intrusion detection.
OR
b) Explain about three common types of Firewalls.

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MODEL PAPER

22MCA302.4: Deep Learning

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. List out different Filters in Feature Map.
2. Explain Max Pooling.
3. Explain use of Neural Turing Machines.
4. Explain DNC Read Head .
5. Explain Reinforcement Learning.
6. Explain Improving Beyond DQN.
7. List out Tensor Flow Operations.
8. Explain Natural Language Processing.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT I
9. a) Explain Filters & Feature Maps in detail.

OR

b) Explain building Convolution Network for CIFAR-10.

UNIT II
10. a) Explain Interference Free writing in DNCs.

OR

b) Explain visualizing the DNC in Action.

UNIT III
11. a) Explain Agent and Building the model and Optimizer.

OR

b) Explain Setting Up Training Operations and Updating our Target Q - Network.

UNIT IV
12. a) Discuss Sessions in Tensor Flow.

OR

b) Discuss specifying the Logistic Regression Model in Tensor Flow.

UNIT V
13 (a) Explain Pre Processing and Data Set Augmentation in Computer Vision.

OR

(b) Explain use of Shortlist and Hierarchical Soft max in NLP.

MODEL PAPER

22MCA302.5: Internet of Things

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain IOT.
2. Explain Resource partitioning.
3. Explain RFID.
4. Write about Caching and Reprocessing
5. Explain Keil C.
6. Explain different IOT frameworks.
7. Explain IOT Data Knowledge.
8. Explain data transmission.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT I

9. a) Discuss the role of open IOT Architecture for IOT/Cloud convergence.

(OR)

b) Distinguish between SOA based and API oriented IOT Architectures.

UNIT II

10. a) Briefly explain about Fog Computing.

(OR)

b) Describe the embedded device programming languages. Explain message passing in devices.

UNIT III

11. a) Explain in detail about continuous logic processing system.

(OR)

b) Explain Distributed Anomaly Detection? Write the efficient incremental local modelling process.

UNIT IV

12. a) Briefly discuss about various IOT Governance models.

(OR)

b) Write short note on IOT-scenario, sensors and the gateway

UNIT V

13. a) Explain all the basic operations of a system that handles communication between web services and IOT clients.

(OR)

b) How to develop a simple Math server?

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MODEL PAPER

22MCA302.6: Block Chain Technologies

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain Distributed Database?
2. Explain Digital Signature?
3. Define Chain Policy.
4. Define Merkle Patricia Tree.
5. Explain Sybil Attack?
6. Explain Energy utilization.
7. GHOST
8. Explain about Stake holders.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT I
9. a) Explain about HDFS.

(OR)

b) Explain Memory Hard Algorithm.

UNIT II
10. a) Write about Block chain Network and Mining Mechanism.

(OR)

b) Describe Private and Public block chain.

UNIT III
11. a) Write about Proof of Work and Proof of Stake.

(OR)

b) Explain in detail about Nakamoto consensus.

UNIT IV
12. a) Explain in detail about the Bitcoin protocols.

(OR)

b) Discuss about the Attacks & Side chain.

UNIT V
13. a) Explain about Applications of Cryptocurrency

(OR)

b) Discuss Naive Block chain construction.

22MCA401: Machine Learning

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	Explain the definition and usage of the term 'the internet of things' in different contexts.	1
2	Demonstrate on various network protocols used in IoT.	2
3	Analyze on various key wireless technologies used in IoT systems, such as WiFi, 6LoWPAN, Bluetooth and ZigBee.	3
4	Illustrate on the role of big data, cloud computing and data analytics in IoT system.	4
5	Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software.	5

Syllabus

Course details:-

Unit		
I	**Introduction**-Components of Learning, Learning Models, Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.	**12**
II	**Supervised and Unsupervised Learning** Decision Trees: ID3, Classification and Regression Trees. Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perception, Multilayer Perception, Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors. Introduction to clustering, K-means clustering, K-Mode Clustering.	**12**
III	**Ensemble and Probabilistic Learning** Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking. Gaussian mixture models – The Expectation-Maximization (EM) Algorithm, Information Criteria, Nearest neighbour methods – Nearest Neighbour Smoothing, Efficient Distance computations: the KD-Tree, Distance Measures.	**12**

IV	**Reinforcement Learning and Evaluating Hypotheses** Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning. Motivation, Basics of Sampling Theory: Error Estimation and Estimating Binomial Proportions, The Binomial Distribution, Estimators, Bias, and Variance	12
V	**Genetic Algorithms:** Motivation, Genetic Algorithms: Representing Hypotheses, Genetic Operator, Fitness Function and Selection, An Illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning: Lamarkian Evolution, Baldwin Effect, Parallelizing Genetic Algorithms.	12

Text books

	Author	Title	Publisher
1	Ethem Alpaydın	Introduction to Machine Learning, Second Edition	The MIT Press Cambridge, Massachusetts London, England.

Reference books

	Author	Title	Publisher
1	Ethem Alpaydın	Introduction to Machine Learning, Third Edition	PHI Learning Ltd.

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22MCA402.1: Artificial Intelligence

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	To Understand the history of Artificial Intelligence and its foundations.	1
2	Apply various Artificial Intelligence Techniques for problem solving.	2
3	Formalization of knowledge using the framework of predicate logic.	3
4	Ability to apply knowledge representation and reasoning to real world problems.	4
5	Derive conclusions from uncertain knowledge and quantify the uncertainty in the conclusions obtained.	5

Syllabus
Course details:-

Unit		
I	Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.	**12**
II	Problem Solving: State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction	**12**
III	Logic Concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic.	**12**
IV	Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.	**12**

V	Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems. Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of Membership functions.	**12**

Text books

	Author	Title	Publisher
1	Saroj Kaushik	Artificial Intelligence	CENGAGE Learning

Reference books

	Author	Title	Publisher
1	Deepak Khemani	Artificial Intelligence	TMH, 2013

22MCA402.2: Social Media Analytics

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	Evaluate social media messaging and data	1
2	Understanding the tools and techniques used in social media analytics	2
3	Work on data processing algorithms	3
4	Spread of information among interconnected nodes or entities in a network	4
5	Understanding the Behaviour Analysis of Social Media	5

Syllabus

Course details:-

Unit		
I	Introduction: What is Social Media Mining - New Challenges for Mining. Graph Essentials: Graph Basics - Graph Representation - Types of Graphs - Connectivity in Graphs - Special graphs - Graph Algorithms. Web Scraping: What Is Web Scraping? - Why Web Scraping for Data Science - Web Scraping Uses - Getting Ready - Setting Up A Quick Python Primer.	12
II	Network Measures: Centrality - Transitivity, Reciprocity - Balance and Status - Similarity. Network Models: Properties of Real World Networks - Random Graphs - Small World Models - Preferential Attachment Model.	12
III	Data Mining Essentials: Data - Data Preprocessing - Supervised Learning Algorithms - Unsupervised Learning Algorithms. Communities and Interactions: Community Analysis - Community Detection - Community Evolution - Community Evaluation.	12

IV	Information Diffusion in Social Media: Herd Behaviour - Information Cascades - Diffusion of Innovations - Epidemics. Influence and Homophily: Measuring Assortativity - Influence - Homophily - Distinguishing Influence and Homophily.	**12**
V	Recommendation Social Media: Challenges - Classical Recommendation Algorithms - Recommendation Using Social Context - Evaluating Recommendations. Behaviour Analysis: Individual Behaviour - Collective Behavior - Events Analytics in Social Media.	**12**

Text books

	Author	Title	Publisher
1	Reza Zafarani, Mohammad Ali Abbasi, and Huan Liu	Social Media Mining	An Introduction Cambridge University Press, 2014

Reference books

	Author	Title	Publisher
1	Seppe Vanden Broucke, BartBaesens	Practical Web Scraping for Data Science	Apress, 2018

22MCA402.3: Mobile Applications

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	Install and configure Android application development tools.	1
2	Create activities and fragments and communicate with them	2
3	Design and develop user Interfaces for the Android platform.	3
4	Save state information and work on multimedia	4
5	Interact with phone and place toast messages.	5

Syllabus

Course details:-

Unit		
I	**Getting Started with Android Programming:** The Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, Android Studio, Android SDK, Creating Android Virtual Devices, The Android Developer Community, Launching your first Android Application. **Using Android Studio for Android Development:** Exploring the IDE, Using code completion, Debugging your Application, Publishing your application.	12
II	**Understanding Activities:** Life cycle of an activity, Applying Styles and Themes to activity, Displaying Dialog window, Progress Dialog. **Link Activities using Intents:** Returning results from an Intent, Passing data using Intent object. **Fragments:** Life cycle of fragments, Interactions between fragments, Understanding the Intent object, Intent filters.	12

III	**Getting to know the Android User Interface:** Understanding components of a screen, Adapting to display orientations, Utilizing the Action Bar, Creating the user interface programmatically, Listening for UI notifications. **Designing User Interface with Views:** Using Basic Views, Picker Views, List Views, Dialog Fragment, Preference Fragment, Using Image Views, Using Menus.	12
IV	**Data Persistence:** Saving and loading user preferences, Persisting data to files, Creating and using Databases. **Content Providers:** Sharing Data in Android, Using content provider, Creating and using your own content providers. **Multimedia:** Playing Audio and Video, Recording Audio, Recording Video.	12
V	**Telephony:** Exploring Telephony background and terms, Accessing telephony information, Interacting with phone, working with SMS Messaging. **Notifications:** Introducing Toast, Placing your Toast message, Making a custom toast, Introducing Notifications, Making custom Notifications.	12

Text books

	Title	Author	Publisher
1	Beginning Android Programming with Android Studio(Chapters: 1,2,3,4,5,6,7,8,10) Wrox, Fourth Edition	J.F. DiMarzio	John Wiley & Sons Inc,
2	Android in Action (Chapters: 7,8,10)	W. Frank Ableson, Robisen, Chris King, C. Enrique Ortiz	Manning Publications

Reference books

	Title	Author	Publisher
1	Expert Android Studio	Murat Yener, Onur Dundar, Wrox edition	John Wiley & Sons Inc,
2	Android App Development in Android Studio, Java+ Android Edition for Beginners	J. Paul Cradle	Manchester Academic Publishers

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22MCA402.4: Technical Report Writing

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	To demonstrate rhetorical knowledge to create effective technical writing documents for end-users	1
2	To apply and adapt flexible writing process strategies to produce clear, high-quality deliverables in a multitude of technical writing genres	2
3	To use professional technical writing conventions of clean and clear design, style, and layout of written materials	3
4	To write clear and concise technical reports and research articles	4
5	To communicate effectively through written reports, oral presentations and discussion	5

Syllabus

Course details:-

Unit		
I	Communicating in Science and Technology, Writers and Experts, General versus Scientific/technical writing	12
II	Scientific and technical style, pitfalls in scientific/ technical writing, Scientific and technical documents	12
III	Reports and Proposals: Specific types of reports Research Articles and Papers: Structure of Research papers, Writing for Readers and Writing for listeners	12
IV	Instructions and Manuals: The audience, the writers, structure and layout, laconic development	12
V	Language a rid rapport, A writing-editing sequence to maximize us ability	12

Text books

	Author	Title	Publisher
1	Baden Eunson	Communicating in the 21st century	3rdEdition, Wiley publications

22MCA402.4: Big Data Analytics

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	Understand Big Data and its analytics in the real world	1
2	Analyse the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics	2
3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm	3
4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics	4
5	Understand Big Data and its analytics in the real world	5

Syllabus

Course details:-

Unit		
I	**Types of Digital data:** Classification of Digital Data, Introduction to Big Data: Characteristics of data, Evolution of Big Data, Definition of big data, Challenges with Big data, What is Big Data?, Why Big Data?, Traditional Business Intelligenceversus Big Data, A typical Data Warehouse Environment, A typical Hadoop Environment	**12**
II	**Big data analytics:** What is Big Data Analytics?, Top challenges facing Big Data Analytics, Why Big Data Analytics is important?, Data Science, Terminologies used in Big Data Environments.	**12**
III	**The Big Data Technology Landscape:** NoSQL, Hadoop, Why Hadoop?, Why not RDBMS?, RDBMS versus Hadoop, Hadoop Overview, HDFS, Processing Data with Hadoop, Interacting with Hadoop Ecosystem	**12**

IV	**Introduction to MongoDB:** What is MongoDB?, Why MongoDB? Terms used inRDBMS and MongoDB, Data types in MongoDB, MongoDB query language. **Introduction to Mapreduce programming:** Introduction, Mapper, Reducer,Combiner, Partitioner, Searching, Sorting and Compression	**12**
V	**Introduction to Pig:** What is Pig?, Pig on Hadoop, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, HDFS commands, Relational Operators, Eval function, Complex Data Types, User-Defined Functions, Parameter Substitution, Word Count Example using Pig. **JasperReport using Jaspersoft:** Introduction to Jasper Reports, Connecting to MongoDB NoSql Database.	**12**

Text books

	Author	Title	Publisher
1	Seema Acharya and Subhashini Chellappan	Big Data and Analytics	Wiley India Pvt. Ltd., 2016

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22MCA403.2: Dynamic Web Programming using Python

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	Creating the Django admin interface, and learning about Django URL patterns and views	1
2	Recognize problems that can be solved using dynamic programming,	2
3	Dynamic programming solutions using Python, using dynamic programming for coding interview puzzles and practical applications	3
4	Improving your problem-solving skills, and becoming a better developer	4
5	Understanding Django fundamentals and using its concepts to build and deploy robust web applications and apps	5

Syllabus

Course details:-

Unit		
I	The World's Smallest Django Project Basic Steps for Installing Django, Creating the View, the URL Patterns, the Settings, Running the Example and Hello World Program in Django	12
II	Templates in Django Templates in Django, Static Templates in Django , Dynamic Templates in Django , Integrating Variables in Django , Filters, Dry Url's in Django .	12
III	Databases & Models in Django MVT Architecture, Databases in Django, Admin Module, Creating Simple Model, Creating Super User in Django , Establish the Connection between Django and MySQL, Program to insert the value in to Database using Models.	12

IV	Forms in Django Forms in Django, Uses of Forms, Develop Student Feedback Form in Django , Django Model Forms, Develop Student Marks Submission Form in Django .	12
V	Session & Authentication Django Rest api, Session Management, Session Management using Cookies, Develop Page Count application using Session Management, limitations of Cookies, Develop an Authentication and Authorization application in Django .	12

Text books

	Author	Title	Publisher
1	Julia Elman & Mark	Lightweight Django " using Rest and Web Sockets & Backbone	Lavin Oreilly Publications

Reference books

	Author	Title	Publisher
1	Samuel Dauzon,AidasBendoraitis	Django Web Development with python	

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22MCA403.3: Software Testing and Project Management

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	Understanding the process of testing and fundamentals of debugging .	1
2	Verify different documents and Object Oriented metrics used in testing.	2
3	Test the software using functional testing techniques.	3
4	Test the software using Structural Testing techniques.	4
5	Understand the concepts of Object Oriented Testing techniques.	5

Syllabus

Course details:-

Unit		
I	Introduction: Some Software Failures, Testing Process, Terminologies, Limitations of Testing, The V Shaped Software Life Cycle Model Software Testing Activities : Levels of Testing : Unit Testing, Integration Testing, System Testing, Acceptance Testing; Debugging, Software Testing Tools, Software Test Plan	12
II	Software Verification : Verification Methods, SRS Document Verification, SDD Document Verification, Source Code Reviews, User Documentation Verification. Metrics and Models in Software Testing: Software Metrics, Categories of Metrics, Object Oriented Metrics used in Testing, What should we measure during Testing?	12
III	Functional Testing : Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause-Effect Graphing Technique	12
IV	Structural Testing : Control Flow Testing, Data Flow Testing, Slice Based Testing, Mutation Testing.	12

V	Object Oriented Testing: What is Object Orientation? , What is Object Oriented Testing? , Path Testing, State based Testing, Class Testing.	**12**

Text books

	Author	Title	Publisher
1	Yogesh Singh	Software Testing	Cambridge University Press

Reference books

	Author	Title	Publisher
1	Aditya P.Mathur	Foundations of Software Testing	2nd Edition, Pearson Education

22MCA(MOOCS): Data Mining Techniques

Course code	22MCA202	Course Delivery method	Class Room/Blended mode - Both
Credits	4	CIA Marks	30
No. of lecture Hours/week	4	Semester End Exam Marks	70
Total number of lecture hours	60	Total Marks	100
Year of Introduction:1991	Year of Offering : 2022-23	Year of Revision: 2022-23	Percentage of Revision : 40%

S.NO	COURSE OUTCOMES	POs
	Upon successful completion of the course, the student will be able to:	
1	Distinguish the basics of data warehouse and Data Mining concepts, functionalities and Patterns	1
2	Construct the data warehouse, its techniques and concepts.	2
3	Fundamentals of data mining	3
4	Classify the data by implementing various algorithms.	4
5	Categorization of major clustering methods, partitioning methods, hierarchical methods	5

Syllabus

Course details:-

Unit		
I	Warehouse: What is it, Who Need It, and Why?, Things to Consider, Managing the Data Warehouse, Getting ready for your project, Picking a target and moving forward, Project management benefits, The Scope statement, Work breakdown structure, Project estimating, Scope creep & tracking project's progress	**12**
II	Data Warehouse Design Methodology: The preferred Architecture, Alternate warehouse architectures, Data Marts and Start Schema Design, Fundamentals of ETL Architecture, Partitioning Data.	**12**
III	Data mining : Introduction, Data mining on what kind of data , Data mining functionalities classification of Data mining systems, Major issues in Data mining. Mining Association rules in large databases: Association rule mining, Mining single-Dimensional Boolean association rules from Transactional databases, Mining multi-Dimensional Association rules from relational Databases and Data Warehouses	12

IV	Classification and Prediction: Introduction classification by decision tree induction, Bayesian Classification. Other classification methods, classification by back propagation, Prediction, classifier accuracy.	**12**
V	Cluster analysis: Introduction, types of data in cluster analysis, a categorization of major clustering methods, partitioning methods, hierarchical methods. Density based methods: DBSCAN, Grid-based method : STING , Model based clustering method: Statistical Approach.	**12**

Text books

	Author	Title	Publisher
1	Michael Corey, Michael Abbey, Ian Abramson, Ben Taub	Oracle 8i Data Warehousing	TMH (Unit – I & II)
2	Jiawei Han Micheline Kamber	Data mining & Techniques	Morgan Kaufmann Publishers (Unit-III to V)

Reference books

	Author	Title	Publisher
1	S.N.Sivanandam, S.Sumathi	Data Mining – Concepts, Tasks and Techniques	Thomson (2006).
2	Ralph Kimball	The Data Warehousing Toolkit	Wiley
3	Margaret H. Dunham	Data mining - Introductory and advanced topics	Pearson Education
4	D.Hand, H. Mannila and P.Smyth	Principles of Data mining	PHI (2001)

Master of Computer Applications (M.C.A.)
22MCA404P: Machine Learning Lab

1. Write a program to open Data Sets in Python.

   Importing CSV Files, Importing Excel Files, Importing Text Files

2. Explain various Plotting Technique of Python
   Line Graph OR Line Plot, Bar chart, Histogram, Pie chart, Scatter Plot, Box Plot

3. Demonstrate Simple Linear Regression in Python with Sample Data Sets. # importing Libraries.

4. Demonstrate Multiple Linear Regression In Python With Sample Data Sets # importing Libraries.

5. Demonstrate Decision Tree Regression in Python with Sample Data Sets. # import libraries

6. Demonstrate Support Vector Regression in Python with Sample Data Sets.. # import libraries

7. Demonstrate Random Forest Regression in Python with Sample Data Sets # Importing the Essential Libraries

8. Demonstrate Logistic Regression in Python with Sample Data Sets. # importing libraries

9. Demonstrate Support Vector Classification in Python with Sample Data Set # importing Libraries

10. Demonstrate Random Forest Classification in Python with Sample Data Set. # importing Libraries

11. Demonstrate K-Means Clustering with Sample Data Set. # Importing the dataset

12. Demonstrate Hierarchical Clustering with Sample Data Set. # Importing the libraries

13. Demonstrate Polynomial Regression with Sample Data Set. # importing libraries

14. Implement different Activation Functions in Neural Network

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MODEL PAPER

22MCA401: Machine Learning

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

9. Explain Supervised Learning.
10. What is Grouping and Grading.
11. Explain K-means.
12. Explain Linear Regression.
13. Explain about distance measures.
14. Explain active reinforcement learning.
15. Explain genetic operator.
16. Explain Baldwin effect.

SECTION-B
Answer all questions.   **5 × 10 = 50 Marks**

UNIT I
9.a) Explain about different types of learning techniques.
(OR)
   b) Explain about Version spaces.
UNIT – II
10. a) Explain about decision tree.
(OR)
   b) Explain about K-mode clustering and K-nearest neighbors.
UNIT – III
11. a) Explain about Gaussian mixture models.
(OR)
   b) What are the error correction output codes? Explain.
UNIT – IV
12. a) Explain about Binomial Distribution.
(OR)
   b) Discuss about Q Learning and Generalization in reinforcement learning.
UNIT – V
13. a) Explain about Genetic Algorithms.
(OR)
   b) Describe about models of Evolution and learning.

MODEL PAPER

22MCA402.1: Artificial Intelligence

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. List out various applications of AI.
2. Categorize intelligent systems based on their working principle.
3. Explain the working of A*Algorithm with an example.
4. Discuss the implementation of all the exhaustive searches
5. Discuss the procedure of converting WFF to the clause form.
6. Write the significance of using CYC in capturing human commonsense database.
7. Write the significance of Bayes's theorem in AI
8. Explain Dempster-Shafer Theory

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT – I

9. a) What are the advantages & disadvantages of AI?

(OR)

b) Elaborate the implementation of Tic-Tac-Toe game with 3 approaches.

UNIT – II

10. a) Write the productions involved in solving a Water-Jug Problem.

(OR)

b) Explain the procedure to implement Hill Climbing.

UNIT – III

11. a) Explain Propositional Calculus (PC).

(OR)

b) Trace the Resolution Algorithm by taking an example.

UNIT – IV

12. a) Discuss the procedure to represent knowledge using Semantic Network

(OR)

b) Write about Conceptual Dependency theory .How it will be used for Knowledge Representation?

UNIT – V

13. a) Differentiate Expert Systems versus Traditional Systems.

(OR)

b) Explain the significance of various Fuzzy Set Operations.

MODEL PAPER
22MCA402.1: Social Media Analytics

Time 3 Hours   Max. Marks: 70
SECTION-A
Answer any five questions.   5 × 4 = 20 Marks
1. Discus Social Media Mining.
2. Discuss Transitivity Network Measures.
3. Discuss Random Graphs Network Model.
4. Explain Data Pre processing in Data Mining.
5. Discuss Herd Behaviour.
6. Explain Influence and Homophily.
7. Evaluating Recommendations in social media .
8. Explain Collective Behavior.

SECTION-B

Answer all questions.   5 × 10 = 50 Marks

UNIT – I
9. a) What are various types of Graphs in Graph Mining? Explain.
OR
   b) What is Social Media Mining? State different Challenges for Mining.
UNIT – II
10. a) Explain Network Measures Transitivity &Reciprocity.
OR
   b) State and explain Small World Models and its Properties.

UNIT – III
11. a) State and explain Small World Models and its Properties
OR
   b) Explain Community Detection in Evolving Networks.

UNIT – IV
12. a) Write about Information Diffusion and Herd Behavior with Diners Example.
OR
   b)) How to measure and Model Homophily

UNIT - V
13. a) Explain commendation of Social Media Context.
OR
   b) Explain Collective Behavior Analysis, Features and Prediction.

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MODEL PAPER
22MCA402.3: Mobile Applications

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain the features of Android
2. Explain the uses of code completion.
3. Write about Intent filters?
4. Explain about list view.
5. What is content provider?
6. Explain how do you save data to internal storage.
7. Explain about intercepting outbound calls.
8. Explain how to receive an SMS messages.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT - I

9. a) Explain the steps for Creating Android Virtual Devices.
   OR
   b) Briefly explain how do you publish your application.

UNIT - II

10. a) Briefly explain about applying styles and themes to the activity.
    OR
    b) Explain the life cycle of fragment.

UNIT - III

11. a) Write the steps for creating the user interface programmatically?
    OR
    b) Explain about the basic views of Android application.

UNIT - IV

12. a) Briefly explain about saving and loading user preferences.
    OR
    b) Explain about recording videos in Android

UNIT - V

13. a) Explain about accessing telephony information
    OR
    b) Briefly explain about making custom notifications.

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MODEL PAPER
22MCA402.34: Technical Report Writing

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Differentiate writers and experts.
2. Explain about Technical writing
3. Explain about pitfalls in scientific/ technical writing.
4. Explain about Technical documents,
5. Explain about Specific types of reports
6. Explain about Structure of Research papers
7. Explain about the audience and the writers
8. Explain about Language a rid rapport.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT - I

9. a) Explain about Communicating in Science and Technology
                    OR
   b) Explain about General versus Scientific/technical writing

UNIT - II

10. a) Explain about Scientific and technical style
                    OR
    b) Explain about Scientific and technical documents

UNIT - III

11. a)   Explain about Reports and Proposals
                    OR
    b) Explain about Writing for Readers and Writing for listeners

UNIT - IV

12. a) Explain about Instructions and Manuals
                    OR
    b) Explain about laconic development

UNIT - V

13. a) Explain in detail about Language a rid rapport.
                    OR
    b) Explain about A writing-editing sequence to maximize us ability

MODEL PAPER
22MCA403.1: Big Data Analytics

Time 3 Hours   **Max. Marks: 70**
SECTION-A
Answer any five questions.   **5 × 4 = 20 Marks**
1. Describe any five characteristics of Big Data.
2. What is HDFC? List and explain all the components of HDFC.
3. Explain different Challenges of big data.
4. Explain MongoDB.
5. Write differences between RDBMS and Hadoop
6. Explain MapReduce
7. Explain data serialization.
8. Explain the need of big data analytics

SECTION-B
Answer all questions.   **5 × 10 = 50 Marks**
UNIT I

9.a) Explain different Types of digital data: Unstructured, Semi-structured and Structured.
(OR)
 b) Explain Need and Challenges in Big Data Environment?

UNIT – II

10. a) What is Business Intelligence? List different business Intelligence applications with a suitable example.
(OR)
 b) Explain Classification of Analytics with suitable example.
UNIT – III

11. a) Describe characteristics of a NoSQL database.
(OR)
 b) Explain the types of NoSQL Data Stores in detail.
UNIT – IV

12. a) Explain Hadoop architecture and its components with proper Diagram
(OR)
 b) Explain the essentials of Hadoop Ecosystem.
UNIT – V

13. a) Explain working of the following phases of Map Reduce with one common example
    (i) Map Phase (ii) Combiner phase (iii) Shuffle and Sort Phase (iv) Reducer Phase.
(OR)
 b) Explain HDFS commands.

MODEL PAPER

22MCA403.2.: Dynamic Web Programming using Python

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Explain the features of Django.
2. Write about URL patterns.
3. Explain how templates are used in Django.
4. What is dry URL?
5. Write about models in Django.
6. What are forms?
7. Explain the limitations of cookies.
8. What is session management?

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT - I

9. a) Explain the basic steps for installing Django.
                    OR
    b) Briefly explain the views.

UNIT - II

10. a) Write about templates in Django.
                    OR
    b) Briefly explain about filters.

UNIT - III

11. a) Explain about MVT architecture.
                    OR
    b) Write the steps for creating connection between Django and MySQL.

UNIT - IV

12. a) Develop a student feedback form.
                    OR
    b) Develop student marks submission form in Django.

UNIT - V

13. a) Explain about Session Management using Cookies.
                    OR
    b) Develop an Authentication and Authorization application in Django.

MODEL PAPER
22MCA403.3: Software Testing and Project Management

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Define alpha and beta testing.
2. Explain why we should test the software.
3. What are dynamic software testing tools?
4. Explain how checklist are used in the process of verification.
5. Explain the categories of metrics.
6. Explain about functional testing.
7. What are Definition use path and Definition clear path.
8. What is object orientation?

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT - I

9. a) What are the limitations of testing? Explain.
                          OR
   b) Explain about the debugging process.

UNIT - II

10. a) Briefly explain about SDD document verification.
                          OR
    b) What should we measure during testing?

UNIT - III

11. a) Explain decision table based testing with example.
                          OR
    b) Explain equivalence Class Testing with an example.

UNIT - IV

12. a) Briefly explain about slice based testing with an example.
                          OR
     b) Write about Mutation testing?

UNIT - V

13. a) Explain about path testing with an example?
                          OR
     b) Explain about state based testing with an example.
                          ***

MODEL PAPER
22MCA: MOOCS (Data Mining Techniques)

Time 3 Hours   **Max. Marks: 70**

SECTION-A

Answer any five questions.   **5 × 4 = 20 Marks**

1. Define data warehouse.
2. Explain Data Mart.
3. What is snowflake schema?
4. Explain partitioning data.
5. Explain data mining.
6. Explain classification and prediction.
7. Define linear regression.
8. Define outlier analysis.

SECTION-B

Answer all questions.   **5 × 10 = 50 Marks**

UNIT - I

9. a) Discuss about Data Warehouse on user's perspective and developer 's perspective.

   OR

   b) Explain about the work Breakdown structure.

UNIT - II

10. a) Explain about Data Warehouse Architecture.

    OR

    b) Discuss about the ETL design in detail

UNIT - III

11. a) Explain about data mining functionalities

    OR

    b) Explain about the FP Growth algorithm with example.

UNIT - IV

12. a) Discuss about decision tree induction.

    OR

    b) Briefly discuss about the back propagation.

UNIT - V

13. a) Explain about the partitioning clustering.

    OR

    b) Discuss about DBSCAN & STING.

***

22OE301: Python Programming

Course Objective: The main objective of the course is to provide students with the basic concepts of Python, its syntax, functions and modules to enable them to write scripts for data manipulation and analysis. The course develops skills of writing and running a code using Python.

Course Outcomes:

Up on successful completion of the course, a student will be able to:

1. Understand the usage of Python scripting language for developers.
2. Use standard programming constructs like selection and repetition.
3. Use aggregated data(list, tuple, and dictionary).
4. Implement functions and modules.
5. Understand the concepts of Classes and objects

Unit 1	**Basics of Python Programming**-Features of Python, History of Python, The Future of Python, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion.
Unit 2	**Decision Control Statements**-Conditional Branching Statements, Basic Loop Structures, Nested Loops, The break statement, The continue statement, The pass statement. The else statement used with loops. **Functions and Modules**- Function Definition, Function Call, Variable Scope and Lifetime, The return statement, More on Defining Functions, Recursive functions, Modules, Packages in Python, Standard Library Modules.
Unit 3	**Python Strings Revisited**-Concatenating, Appending and Multiplying Strings, String formatting operator, Built in String Methods and Functions, Comparing Strings, Regular Expressions. **Data Structures**- Sequence, Lists, Functional Programming, Tuple, Sets, Dictionaries.
Unit 4	**Classes and Objects**- Classes and Objects, Class Method and self Argument, Class variables and Object Variables, Public and Private Data Members, Private Methods, Calling a Class Method from Another Class Method, Built-in Class Attributes, Class Methods, Static Methods.
Unit 5	**Inheritance**- Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces.

	Error and Exception Handling- Introduction to Errors and Exceptions, Handling Exceptions, Raising Exceptions, Built- in and User defined Exceptions **Operator Overloading-** Concept of Operator Overloading, Advantage of Operator Overloading, Implementing Operator Overloading.	

Text Books:

	Author	Title	Publisher
1	Reema Thareja	Python Programming Using Problem Solving Approach	Oxford University Press

Reference Books:

	Author	Title	Publisher
1	Wesley Chun	Core Python Programming	Prentice Hall

22OE302: Python Programming
MODEL PAPER

Time: 3Hours   Max.Marks:70 M

SECTION – A

Answer Any Five questions   5 X 4= 20 M

1. Explain Features of Python.
2. Explain Variables and Identifiers.
3. Explain Nested Loops.
4. Discuss about Modules.
5. Explain Concatenating.
6. Explain Functional Programming.
7. Explain Classes and Objects.
8. Explain types of Inheritance.

SECTION – B

Answer Five Questions. Choose one Question from each Unit.
ALL Questions carry equal Marks   5 X 10 = 50 M

UNIT-I

9. a) Briefly explain about Operators and Expressions.
(OR)
b) Explain Type Conversion.

UNIT-II

10. a) Briefly explain about the else statement used with loops.
(OR)
b) Explain Packages in Python.

UNIT-III

11. a) Explain String formatting operator.
(OR)
b)Explain Tuple.

UNIT-IV

12. a) Briefly explain Built-in Class Attributes with an example.
(OR)
b) Explain Class Methods and Static Methods.

UNIT-V

13. a) Explain Handling Exceptions.
(OR)
b) Explain Operator Overloading.

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22OE302 : OFFICE TOOLS

Course Descriptive and purpose:

The primary objective of these courses is to help learners understand the fundamental principles and concepts of office tools. Upon completion of the course, learners will be able to use office tools effectively for their work. They will also be able to develop professional documents, spreadsheets, and presentations using the Microsoft suite of office tools.

Course Objectives:

➢ To provide an understanding of the fundamental principles and concepts of office tools.
➢ To teach learners how to use office tools effectively for their work.
➢ To equip learners with the skills required to develop professional documents, spreadsheets, and presentations using the Microsoft suite of office tools.

Course outcomes:

Up on successful completion of the course, a student will be able to:

➢ Gain insights about fundamental office tool concepts and its underlying mechanism.
➢ Use office tools effectively for their work.
➢ Develop professional documents, spreadsheets, and presentations using the Microsoft Suite of Office Tools

Unit-I	**MS word:** Word processing-Features-Advantages and Applications-parts of word window-Toolbar, Creating, saving, closing, opening and editing of a document-Moving and Coping a text, Formatting of Text and paragraph-bullets and Numbering-Find and Replace-Insertion of objects, Headers and footers-page formatting-auto correct-spelling and grammar-mail merge-macros
Unit-II	**MS Power point:** Introduction – Starting-parts-Creating of tables-create presentation-templates-Auto content Wizard-Slide show-Editing of presentation-Inserting objects and charts
Unit-III	**MS-Excel:** Features of MS-Excel, Parts of MS-Excel window, Entering and Editing data in Worksheet, Number Formatting in Excel, Different cell References, How to Enter and edit formula in excel, auto fill and custom fill, Printing Options. **Formatting options:** Different formatting options, change row height, formulae and functions, Functions: Meaning and advantages of functions, different types of functions available in Excel
Unit-IV	**Charts:** Different types of charts, Parts if chart, chart creation using wizard, chart operations, data maps, graphs, data sorting, filtering. Excel sub totals, scenarios, what-if analysis Macro: Meaning and advantages of Macros, creation, editing and deletion of macros – Creating a macro, how to run, how to delete a macro.
Unit-V	**MS Access: Creating a Simple Database and Tables:** Features of Ms-Access, Creating a Database, Parts of Access. **Tables:** table creation using design view, table wizard, data sheet view, import table, link table. **Forms:** The Form Wizard, design view, columnar, tabular, data sheet, chart wizard.

| | **Finding, Sorting and Displaying Data:** Queries and Dynasts, Creating and using select queries, Returning to the Query Design, Multi-level sorts, Finding incomplete matches, showing All records after a Query, saving queries - Crosstab Queries.

Printing Reports: Form and Database Printing. |
|---|---|

Prescribed Text Book

	Author	Title	Publisher
1	Ron Mansfield	Working in Microsoft Office	Tata McGraw Hill(2008)

Reference Text Book

	Author	Title	Publisher
1	Ed Bott	Woody Leonhard, Using Microsoft Office 2007	Pearson Education (2007)
2	Sanjay Saxena	Microsoft Office	TMH

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22OE302: OFFICE TOOLS
MODEL PAPER

Time: 3Hours   Max.Marks:70 M

SECTION – A

Answer Any Five questions   5 X 4 = 20 M

1. Explain Word processing and its applications.
2. How to find and Replace text in Word?
3. How to insert Clip Arts in Power point?
4. Explain about Auto fill in Excel.
5. How to change cell Height and Width in Excel?
6. Explain filtering of data in Excel.
7. Explain Features of MS-Access.
8. Explain Creating and using select queries.

SECTION – B

Answer Five Questions. Choose one Question from each Unit.
ALL Questions carry equal Marks   5 X 10 = 50 M

UNIT-I
9. a) Briefly explain step by step procedure of Mail Merge.
   (OR)
   b) Explain Headers and footers-page formatting.

UNIT-II
10. a) Briefly explain viewing presentation in slideshow.
    (OR)
    b) Explain about presentation-templates.

UNIT-III
11. a) What are the Parts of MS-Excel Window.
    (OR)
    b) Explain about formulae and functions.

UNIT-IV
12. a) Explain chart creation using Wizard.
    (OR)
    b) Explain creating and deleting a Macro.

UNIT-V
13. a) Explain Table Creation using design view.
    (OR)
    b) Explain Printing Reports.

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22OE303: Mobile Computing

Course Objectives: Students taking this course will develop an understanding of the ways that mobile technologies can be used for teaching and learning. They will also consider the impact of mobile computing on the field of education.

Course Outcomes:

Up on completion of this course, the student will be able to

- Define the basic concepts of worldwide networks, wireless transmission and generations of Mobile systems.
- Perceive the architecture and common technologies for mobile communication.
- Grasp the IP network protocols and methods used in IP routing of packets.
- Apprehend the working of Mobile IP.
- Describe NGNs, operating systems, application development using WML, XML in Mobiles.

Unit 1	**Mobile Computing:** Architecture of Mobile Computing, Mobile Computing Applications, Limitations of Mobile Computing, and Issues related to Mobile Computing Systems, Generation of Mobile Computing Systems.
Unit 2	**Wireless Transmission:** Frequencies for radio transmission, multiplexing. **Medium Access Control (MAC):** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals),SDMA, FDMA, TDMA, CDMA
Unit 3	**Global system for mobile communications (GSM):** GSM Architecture, GSM Entities, Call routing in GSM, network aspects in GSM. **General packet radio service (GPRS):**GPRS and packet data network, GPRS network architecture and operations, data services in GPRS.
Unit 4	**Mobile Network Layer:** Mobile IP- Goals, assumptions, entities and terminology, IP packet delivery, tunneling and encapsulation. **Mobile Transport Layer:** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transaction oriented TCP.
Unit 5	**Wireless LAN:** Introduction, wireless LAN advantages, IEEE 802.11 standards, wireless LAN Architecture, mobility in wireless LAN. **Forthcoming Technologies:** UMTS, 4G-LTE, 5G, Wireless Personal Area Networks (WPAN), Future Networks (FN).

Text books

	Author	Title	Publisher
1	Jochen Schiller	Mobile Communications	Addison-Wesley, 2nd edition, 2004
2	Rajkamal	Mobile computing	Second Edition, Oxford University Press

Reference books

	Author	Title	Publisher
1	Asoke K talukder and Roopa R yavagal	Mobile Computing	Mc Graw Hill, 2008

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22OE303: Mobile Computing

MODEL PAPER

Time: 3Hours   **Max.Marks:70 M**

SECTION – A

Answer Any Five questions   **5 X 4= 20 M**

1. Explain Mobile computing
2. Explain radio transmission.
3. Explain Medium Access Control.
4. Explain network aspects in GSM.
5. Explain tunneling.
6. Explain Encapsulation.
7. Explain Mobile TCP.
8. Explain 5G technology.

SECTION – B

Answer Five Questions. Choose one Question from each Unit.
ALL Questions carry equal Marks   **5 X 10 = 50 M**

UNIT-I

9. a) Explain limitations of Mobile Computing and issues related to Mobile Computing Systems

(OR)

  b) Explain Generation of Mobile Computing Systems.

UNIT-II

10. a) Explain about Multiplexing.

(OR)

  b) Explain briefly about CDMA.

UNIT-III

11. a) Explain GSM Architecture in detail.

(OR)

  b) Explain data services in GPRS

UNIT-IV

12. a) Explain about Snooping TCP and Mobile TCP.

(OR)

  b) Explain about Selective retransmission and Transaction oriented TCP

UNIT-V

13. a) Explain advantages of wireless LAN.

(OR)

  b) Explain about Future networks and WPAN.

22OE304: R PROGRAMMING

Course Objectives:

The objective of this module to make students exercise the fundamentals of statistical analysis in R environment. They would be able to analysis data for the purpose of exploration using Descriptive and Inferential Statistics. Students will understand Probability and Sampling Distributions and learn the creative application of Linear Regression in multivariate context for predictive purpose.

Course Outcomes:

Up on completion of this course, the student will be able to

- Install, Code and Use R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frame.
- Describe key terminologies, concepts and techniques employed in Statistical Analysis.
- Define, Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
- Conduct and Interpret a variety of Hypothesis Tests to aid Decision Making.
- Understand, Analyse, Interpret Correlation and Regression to analyse the underlying relationships between different variables.

Unit 1	Evolution of R, Features of R, Environment setup, *Data Types:* Vectors, Lists, Matrices, Arrays, Factors, Data Frames, Variables, *Operators:* Arithmetic operators, Relational operators, Logical operators, Assignment operators, Miscellaneous operators.
Unit 2	*Decision making statements* – if statement, if…else statement, switch statement; *Loops* – for loop, while loop, repeat loop; Loop control statements – break, next; Functions; *Strings:* String manipulation.
Unit 3	Vectors; Lists; Matrices; Arrays; Factors; Data Frames.
Unit 4	*Charts* – Pie Charts, Bar Charts, Boxplots, Histograms, Line Graphs, Scatterplots.
Unit 5	Mean, Median & Mode; Linear Regression; Multiple Regression; Logistic Regression; Normal Distribution; Binomial Distribution.

Text Books:

	Author	Title	Publisher
1	Norman Matloff	The Art of R Programming	No Starch Press
2	R for Everyone	Lander	Pearson

Reference Books:

	Author	Title	Publisher
1	Paul Teetor,	R Cookbook	Oreilly
2	Rob Kabacoff	R in Action	Manning

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22OE304: R PROGRAMMING

MODEL PAPER

Time: 3Hours   Max.Marks:70 M

SECTION – A

Answer Any Five questions   5 X 4= 20 M

1. Explain features of R.
2. Write any few Miscellaneous operators in R programming.
3. Discuss about user defined functions.
4. Explain paste() function.
5. Explain lists.
6. Write the differences between histogram and bar graph.
7. Explain scatterplots.
8. Explain dbinom().

SECTION – B

Answer Five Questions. Choose one Question from each Unit.
ALL Questions carry equal Marks   5X10=50M

UNIT-I
9. a) Explain different data types in R programming.

(or)

b) Briefly explain about operators used in R programming.

UNIT-II
10. a) Explain decision making statements with examples.

(or)

b) Explain loop statements with examples.

UNIT-III
11. a) Explain about vectors.

(or)

b) Briefly explain matric operations.

UNIT-IV
12. a) Explain about Pie charts.

(or)

b) Briefly explain about Line graphs.

UNIT-V
13. a) Write about linear regression.

(or)

b) Explain normal distribution.

22OE305 : Web Development

COURSE OBJECTIVES: To introduce the fundamentals of Internet, and the principles of web design. To construct basic websites using HTML and Cascading Style Sheets. To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms. To develop modern interactive web applications using PHP, XML and MySQL.

COURSE OUTCOMES:

Up on completion of this course, the student will be able to
- Describe the concepts of World Wide Web, and the requirements of effective web design.
- Develop web pages using the HTML and CSS features with different layouts as per need of applications.
- Use the JavaScript to develop the dynamic web pages.
- Construct simple web pages in PHP and to represent data in XML format.
- Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.

Unit 1	**Introduction to Internet**: Networking Concepts, Data Communication –Types of Networking, Internet and its Services, Internet Addressing –Internet Applications–Computer Viruses and its types–Browser–Types of Browsers.
Unit 2	**Internet Applications:** Using Internet Explorer, Standard Internet Explorer Buttons, Entering a Web Site Address, Searching the Internet–Introduction to Social Networking : twitter , tumblr, Linked in, facebook, flickr, skype, yahoo!, google+, youtube, WhatsApp etc.
Unit 3	**E-mail :** Definition of E-mail, Advantages and Disadvantages, User Ids, Passwords, Email Addresses, Domain Names, Mailers, Message Components, Message Composition, Mail Management, Email Inner Workings. WWW-Web Applications, Web Terminologies, Web Browsers, URL–Components of URL, Searching WWW–Search Engine sand Examples.
Unit 4	**HTML**: Basic HTML, Document body, Text, Hyper links, adding more formatting, Lists, Tables using colors and images. **More HTML**: Multimedia Objects, Frames, Forms towards interactive, HTML document heading.
Unit 5	**Cascading Style Sheets**: Introduction, Using Styles, simple examples, your own styles, properties and values in styles, style sheet, formatting blocks of information, layers.

Text Books:

	Author	Title	Publisher
1	Bible by John Walkenbach, Herb Tyson, Michael R. Groh and Faithe Wempen.	Microsoft Office 2010	Wiley

Reference Books:

	Author	Title	Publisher
1	Paul Teetor,	In-line/On-line : Fundamentals of the Internet and the World Wide Web,2/e-by	Raymond Greenlawand EllenHepp, TMH

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22OE305: Web Development

MODEL PAPER

Time: 3Hours   **Max.Marks:70 M**

SECTION – A

Answer Any Five questions   **5 X 4= 20 M**

1. Explain network.
2. What is a browser? Explain any few browsers.
3. Explain Internet.
4. Discuss about flickr
5. Explain message components
6. Explain any five text formatting tags
7. Explain tags for embedding multimedia objects.
8. Explain any five properties and values used in CSS.

SECTION – B

Answer Five Questions. Choose one Question from each Unit.
ALL Questions carry equal Marks   **5 X 10 = 50 M**

UNIT-I

9. a) Briefly explain about computer viruses.

(OR)

b) Explain different types of browsers.

UNIT-II

10. a) Briefly explain about standard Internet Explorer buttons.

(OR)

b) Explain about any five social networks.

UNIT-III

11. a) Define of e-mail? Write the advantages and disadvantages of e-mail.

(OR)

b) What is URL? Explain the components of URL.

UNIT-IV

12. a) Briefly explain the basic structure of HTML with an example.

(OR)

b) Explain HTML forms with an example.

UNIT-V

13. a) Explain different types of CSS.

(OR)

b) Explain about layers in style sheets.