V.R.SIDDHATHA ENGINEERING COLLEGE

DEPARTMENT OF COMPUTER APPLICATIONS

Scheme of Instruction (MCA20 Regulations)

Semester	Total Number of Credits
I	21.5
II	22
III	21.5
IV	15
Total Credits	80

SEMESTER – I

S. No.	Subject Code	Subject Title	L	T	P	C	CE	SE	Tot
1	20MCA2101	Data Structures	3	1	-	4	40	60	100
2	20MCA2102	Database Management Systems	3	1	-	4	40	60	100
3	20MCA1103	Discrete Mathematics	3	-	-	3	40	60	100
4	20MCA2104	Computer Networks	3	-	-	3	40	60	100
5	20MCA2105	Operating Systems	3	-	-	3	40	60	100
6	20MCA2151	Data Structures Using C Lab	-	-	3	1.5	40	60	100
7	20MCA2152	Database Management Systems Lab	-	-	3	1.5	40	60	100
8	20MCA1153	Professional Communication Skills Lab	-	-	3	1.5	40	60	100
9	20MCA4154	Personality Development Course (Logical Reasoning and English for Professionals)	-	-	2	0	100	-	100
			15	2	11	21.5	420	480	900

L: Lecture   **T**: Tutorial   **P**: Practical   **C**: Credits
CE: Continuous Evaluation   **SE**: Semester End Evaluation   **Tot**: Total Marks

SEMESTER – II

S. No.	Subject Code	Subject Title	L	T	P	C	CE	SE	Tot
1	20MCA2201	Python Programming	3	-	-	3	40	60	100
2	20MCA2202	Object Oriented Programming through Java	3	1	-	4	40	60	100
3	20MCA2203	Software Engineering	3	-	-	3	40	60	100
4	20MCA2204	Data Mining	3	1	-	4	40	60	100
5	20MCA2205	**Program Elective – I** A: Design and analysis of Algorithms B: Artificial Intelligence C: Cryptography & Network Security D: Information Retrieval Systems	3	-	-	3	40	60	100
6	20MCA2251	Python Programming Lab	-	-	3	1.5	40	60	100
7	20MCA2252	Object Oriented Programming Through Java Lab	-	-	3	1.5	40	60	100
8	20MCA2253	Statistics with R Programming Lab	-	1	2	2	40	60	100
9	20MCA4254	Personality Development Course (Aptitude and Campus Recruitment Training)	-	-	2	0	100	-	100
			15	3	10	22	420	480	900

 L: Lecture   **T**: Tutorial   **P**: Practical   **C**: Credits
CE: Continuous Evaluation   **SE**: Semester End Evaluation   **Tot**: Total Marks

SEMESTER – III

S. No.	Subject Code	Subject Title	L	T	P	C	CE	SE	Tot
1	20MCA2301	Machine Learning	3	1	-	4	40	60	100
2	20MCA2302	Cyber Security	3	1	-	4	40	60	100
3	20MCA2303	**Program Elective – II**	3	-	-	3	40	60	100
4	20MCA2304	Industrial Management	3	-	-	3	40	60	100
5	20MCA2305	Big Data Analytics	3	-	-	3	40	60	100
6	20MCA2351	Machine Learning with Python Lab	-	-	3	1.5	40	60	100
7	20MCA2352	Advanced Java Programming Lab	-	-	3	1.5	40	60	100
8	20MCA3353	Mini Project	-	-	3	1.5	40	60	100
			15	2	9	21.5	320	480	800

Program Elective – II

20MCA2303A: Computer Graphics
20MCA2303B: Distributed Systems
20MCA2303C: Advanced Database Technology
20MCA2303D: Human Computer Interaction

SEMESTER – IV

S. No.	Subject Code	Subject Title	L	T	P	C	CE	SE	Tot
1	20MCA2401	**Program Elective - III**	3	-	-	3	40	60	100
2	20MCA3451	Major Project	-	-	24	12	40	60	100
			3	-	24	15	80	120	200

Program Elective – III

20MCA2401A: Software Testing Methodologies
20MCA2401B: Angular JS
20MCA2401C: Cloud Computing
20MCA2401D: Any other MOOCS course offered by the department

L: Lecture   **T**: Tutorial   **P**: Practical   **C**: Credits
CE: Continuous Evaluation   **SE**: Semester End Evaluation   **Tot**: Total Marks

20MCA2101: DATA STRUCTURES

Lecture :	3 hrs/week	Internal Assessment:	40
Tutorial :	1 hr/week	Final Examination:	60
Practical:	-	Credits:	4

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Develop and implement basic programs by using C concepts.
	CO2	Choose appropriate data structures to represent data items in real world problems.
	CO3	Design programs using different linear and non-linear data structures
	CO4	Understand the tradeoffs between different implementation of data structures
	CO5	Analyze and implement various kinds of searching and sorting techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	L	M	H									
	CO2		M	H									
	CO3			H	H								
	CO4			M							M		
	CO5			M	M								

UNIT – I

Introduction to C: Constants, Variables and Data Types, Operators and Expressions, Managing Input and Output Operations, Decision Making-Branching and Looping, Arrays

UNIT – II

Functions, Pointers, Structures and Unions, File Management
Data structures: Definition, Types of data structures, Algorithm performance analysis and complexity.
Sorting : Bubble Sort, Selection Sort, Insertion Sort and Merge Sort and their time complexities
Searching: Sequential Search and Binary Search and their time complexities

UNIT – III

Linked list: Singly linked list, Double linked list and Circular linked list -implementation, insertion, deletion and traversal operations.
Stacks : Operations, Array and linked representation of stacks, applications of stacks

UNIT – IV

Queue: Linear Queues -Operations, Array and linked representation of queues, Applications of queues and Circular Queues –Operations and their implementation.
Trees: Trees: Introduction, Terminology, Representation of Trees
Binary Trees-Terminology, representation and traversals- pre, post and inorder traversals.
Search Trees: Binary Search Trees-Definition, Implementation, Operations- Searching, Insertion and Deletion

Graphs: Representation of graphs, Elementary Graph Operations-Depth First Search and Breadth First Search

Learning Resources

Text Books:

[1] E.Balaguruswamy ,**"Programming in ANSI C"**, Sixth Edition, McGraw-Hill Education.

[2] E.Horowitz, S.Sahni and Anderson Freed, **"Fundamentals of Data Structures in C"**, Second Edition, Universities Press.

[3] Y.Langsam, and M.J. Augenstein and A. M. Tanenbaum, "**Data Structures using C and C++"**, Second Edition, Pearson Education.

Reference Books:

[1] Byron.C.Gottfried, **"Programming with C (Schaum'sOutlines)",** Tata McGraw-Hill.

[2] Behrouz A.Forouzan, E.V.Prasad, Richard F.Gilberg, **"C Programming , A Problem-Solving Approach",** Cengage Learning.

[3] Debasis Samanta, **"Classic Data Structures", Second Edition**, PHI.

[4] Mark Allen Weiss, **"Data Structure and Algorithm Analysis in C",** Addison Wesley Publication.

20MCA2102: DATABASE MANAGEMENT SYSTEMS

Lecture :	3 hrs/week		Internal Assessment:	40
Tutorial :	1 hr/week		Final Examination:	60
Practical:	-		Credits:	4

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Identify the features of the DBMS that will meet the organizational needs.
	CO2	Familiarize on different ER models, Relational database constraints and able to write the SQL queries using Relational model concepts.
	CO3	Recognize the importance of design guidelines for relation schemas and Normal Forms.
	CO4	Judge the value of transaction transparency and Concurrency Control Techniques in the maintenance of data integrity.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1		M	H									
	CO2				H	H							
	CO3		H	H									
	CO4	L	M										

UNIT – I

Databases and Database Users: Introduction, An Example, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of 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 Architectures for DBMSs, Classification of Database Management Systems

UNIT – II

Data Modeling Using the Entity-Relationship(ER)Model: Using High-Level Conceptual Data models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types.

The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations.

SQL-99: Schema Definition, Constraints, Queries and Views: SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE Statements in SQL.

UNIT – III

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Relational Database Design Algorithms and Further Dependencies: Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

UNIT – 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.

CONTENT BEYOND THE SYLLABUS
Disk Storage, Basic File Structures, and Hashing: Hashing Techniques, Other Primary File Organizations, Parallelizing Disk Access Using RAID Technology.
Learning Resources

Text Book:

[1] Ramez Elmasri, Shamkant B. Navathe, **"Fundamentals of Database Systems",** Fifth Edition, Pearson Education (2007).

Reference Books:

[1] Peter Rob, A.Anand Rao, Carlos Coronel **,"Database Management Systems",** Cengage Learning.
[2] Abraham Silberschatz, Henry F.Korth, S.Sudarshan **,"Database System Concepts"**
[3] Raghu Rama Krishnan, **"Database Management Systems",** Fourth Edition
[4] P.K. Das Gupta, **"Database Management System Oracle SQL and PL/SQL"**, PHI.
[5] Peter Rob & Carlos Coronel **"Database System Concepts",** Cengage Learning, 2008.

Web Resource:
[1] https://nptel.ac.in/courses/106/105/106105175/

20MCA1103: DISCRETE MATHEMATICS

Lecture :	3 hrs/week		Internal Assessment:	40
Tutorial :	-		Final Examination:	60
Practical:	-		Credits:	3

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	To understand the concepts of statements, validate the arguments, verify the proofs and construct proofs.
	CO2	To understand different types of relations and apply basic rules of counting.
	CO3	To understand and solve different types of recurrence relations and apply wherever necessary.
	CO4	To understand various types of graphs, their properties and graph coloring.

Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	H	M					L					
	CO2	H	M					L					
	CO3	H	M					L					
	CO4	H	M					L					

UNIT – I

Propositional logic: Fundamentals of logic, Truth tables, Tautologies, Logical inferences, Methods of an implication, Pigeon hole principle, Normal forms: DNF, CNF, PDNF, and PCNF. First order logic and other methods of proof, Rules of inference for quantified propositions.

UNIT – II

Set Theory and Relations: Introduction, relations and ordering, Properties of binary relations, Equivalence relations, compatibility relations, partial ordering, Hasse diagrams, Lattices.
Elementary Combinatorics: Basic of counting, Combinations and permutations, enumeration of combinations and permutations, Enumerating combinations and permutations with repetitions, Binominal Coefficients, The binomial and multinomial theorems.

UNIT – III

Recurrence Relations: Generating functions of sequences, calculating coefficients of generating functions, recurrence relations, solving recurrence relations by substitution and generating, the method of characteristic roots, Solutions of inhomogeneous equations.

UNIT – IV

Graph Theory: Basic of concepts, isomorphism and sub graphs, planar graphs, Euler formula, multi graphs and Euler circuits, Hamiltonian graphs, chromatics numbers.

Learning Resources

Text Books:

[1] Joe L.Mott, Abraham Kandel, Theodore P. Baker **"Discrete Mathematics for Computer Scientists and Mathematicians"** , PHI
[2] J.P.Tembly, R. Manohar, **"Discrete Mathematical Structures with Applications to Computer Science",** TMH

Reference Books:

[1] Kenneth H. Rosen, **"Discrete Mathematical and its Applications"**, TMH
[2] C L Liu, D. P. Mohapatra**, "Elements of discrete Mathematics",** TMH

20MCA2104: COMPUTER NETWORKS

Lecture:	3hrs/week		InternalAssessment:	40
Tutorial:	-		FinalExamination:	60
Practical:	-		Credits:	3

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Familiarize the concepts of computer networks and structuring of computer networks using OSI and TCP/IP reference model.
	CO2	Compare and contrast different Transmission Media along with their characteristics and understand the methods for detecting and correcting errors in Data Link Layer Protocols.
	CO3	Understand the functionality of various routing algorithms.
	CO4	Understand the transport services, elements of transport protocols, TCP, UDP and DNS.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1		L										
	CO2					M							
	CO3											H	
	CO4											H	

UNIT–I

INTRODUCTION: Uses of Computer Networks: Business Applications, Home Applications, Mobile Users, Social Issues. Network Hardware: Personal Area Networks, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks. Network Software: Protocol Hierarchies, Design Issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, The relationship of Services to Protocols. Reference Models: The OSI Reference Model, The TCP/IP Reference Model, A Comparison of OSI and TCP/IP reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP reference model.

UNIT–II

PHYSICAL LAYER
Guided Transmission Media: Magnetic Media, Twisted Pair, Coaxial Cable,Power Lines and Fiber Optics.
DATA LINK LAYER
Data Link Layer Design Issues: Services Provided to the Network Layer, Framing, Error Control and Flow Control. **Error Detection and Correction:** Error-Correcting Codes, Error-Detecting Codes. **Elementary Data Link Protocols:** A Utopian Simplex Protocol, A simplex Stop-and–WLait Protocol for an Error Free Channel, A simplex Protocol for a Noisy channel. **Sliding Window Protocols:** A One-Bit sliding Window Protocol, A Protocol using Go Back N and Selective Repeat.

UNIT–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 Networks.

Routing Algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing.

Congestion Control Algorithms: Approaches to Congestion Control, Traffic-Aware Routing, Congestion Control, Traffic Throttling, Load Shedding.

The Network Layer in the Internet: The IP Version 4 Protocol, IP address.

UNIT–IV

THE TRANSPORT LAYER

The Transport Service: Services provided to the Upper Layers, Transport Services Primitives, and Berkeley Sockets. **Elements of Transport Protocols:** Addressing, Connection Establishment, Connection Release, Flow Control. **The Internet Transport Protocols: UDP:** Introduction to UDP, Remote Procedure Call.

The Internet Transport Protocols: TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP segment header, TCP connection establishment, TCP connection release, Modeling TCP connection management, TCP Transmission Policy, TCP congestion Control, TCP Timer Management, Wireless TCP and UDP, Transactional TCP.

THE APPLICATION LAYER

DNS - The Domain Name System: The DNS Name Space, Resource Records, Name Servers.

LearningResources

Text Book:

[1] Andrew S. Tanenbaum, "**Computer Networks**", 5th Edition, PHI.

Reference Books:

[1] Behrouz A Forouzan, **"Data Communications and Networking",** Fourth Edition, TMH (2007).
[2] James F. Kurose, Keith W. Ross, **"Computer Networking",** Third Edition, Pearson Education.
[3] Michael A. Gallo, William M. Hancock, **"Computer Communications and Networking Technologies",**Cengage Learning (2008).

Web Resource:
    https://nptel.ac.in/courses/106/105/106105081/

20MCA2105: OPERATING SYSTEMS

Lecture :	3 hrs/week		Internal Assessment:	40
Tutorial :	-		Final Examination:	60
Practical:	-		Credits:	3

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Understand the Operating System fundamentals, design concepts, and get familiar with the debugging and implementation of system structures.
	CO2	Interpret the need of Multithreaded programming and implement these concepts in Process Scheduling.
	CO3	Apply Synchronization, Deadlock Handling methods and identify the demand of Memory-Management concepts during the execution of a process.
	CO4	Recognize the importance of Virtual Memory Management Schemes and File System concepts.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1												M
	CO2	L	M										M
	CO3	L	M										H
	CO4	M	M										H

UNIT – I

Introduction: What Operating Systems Do, Computer-System Organization, Computer-System Architecture, Operating System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Kernel Data Structures.

System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating System Structure, Operating-System Debugging, Operating-System Generation, System Boot.

UNIT – II

Process Concept: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication.

Multithreaded Programming: Overview, Multithreading Models, Thread Libraries, Threading Issues.

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT – III

Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Semaphores, Classical Problems of Synchronization, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks,

Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
Memory-Management Strategies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging.

| **UNIT – IV** |

Virtual-Memory Management: Background, Demand Paging, Page Replacement, Thrashing.
File System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

Learning Resources

Text Book:

[1] Abraham Silberschatz, Peter B Galvin, Gerg Gagne, **"Operating System Concepts",** Ninth Edition, Wiley, 2016 India Edition.

Reference Books:

[1] William Stallings, **"Operating Systems – Internals and Design Principles",** Fifth Edition, Pearson Education (2007).
[2] Deitel & Deitel, **"Operating Systems",** Third Edition, Pearson Education (2008).

Web Resource:

[1] https://www.bing.com/videos/search?q=Deadlocks+nptel

20MCA2151: DATA STRUCTURES USING C LAB

Lecture :	-	Internal Assessment:	40
Tutorial :	-	Final Examination:	60
Practical:	3 hrs/week	Credits:	1.5

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Develop diversified solutions using C language.
	CO2	Compare various kinds of searching and sorting techniques.
	CO3	Implement various basic data structures and its operations.
	CO4	Develop applications using various data structures.
	CO5	Identify suitable data structure and algorithm to solve a real world problem..

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1			L	M								
	CO2	L		M									
	CO3		M	H									
	CO4				H								
	CO5					M					M		

LAB CYCLE - I

1. Write a C program to print various patterns (Ex: Pascal Triangle, Floyd's Triangle etc.)
2. Write a C program to print sine and cosine values using series expansion for given number of terms and angle in degrees.
3. Write a C program to print the Prime numbers in a given range.
4. Write a C program to perform Matrix addition and multiplication.
5. Write a C program to perform the following operations without using string handling functions:
    a)Length of a string   b) Concatenate two strings   c) Compare two strings
6. Write recursive and non-recursive C program for calculation of GCD.
7. Write recursive program which computes the nth Fibonacci number, for appropriate values of n.
8. Define a structure with real part and imaginary part of a complex number as its member data. Write a C program to perform the following operations over two complex numbers.
    a)Addition   b)Subtraction   iii) Multiplication

LAB CYCLE - II

9. Write a C-Program to count number of characters, spaces, words and lines in given file.
10. Write a C-Program to copy the contents of one file into another file.
11. Write C program that use both recursive and non-recursive functions to perform Binary search for a Key value in a given list.
12. Write a menu driven program that implement following sorting techniques to sort a given list of integers in ascending order.
    a)Bubble Sort   b) Insertion Sort   c) Merge Sort
13. Write a C program that uses functions to create a double linked list and perform various operations on it.

LAB CYCLE - III

14. Write a C program that implement stack using arrays. Perform the following operations on the stack
    a)Push   b)Pop   c) Display
15. Write a C program that uses Stack to convert infix expression intopostfix expression.
16. Write a C program that uses Stack for evaluating a postfix expression.
17. Write a C program that implement queues using linked list. Perform the following operations on the queue a)Push   b)Pop   c) Display

LAB CYCLE - IV

18. Write a recursive C program for traversing a binary tree in pre-order, in-order and post-order
19. Implementation of Binary Search trees- Insertion and deletion.
20. Write a C program to implement graph traversal techniques.

Learning Resources

[1] Behrouz A.Forouzan, E.V.Prasad, Richard F.Gilberg, **"C Programming , A Problem-Solving Approach",** Cengage Learning
[2] R. Kruse et al, "**Data Structures and Program Design in C",** Pearson Education Asia, Delhi, 2002.
[3] A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, **"Data Structures using C"** PHI/Pearson Education.
[4] Horowitz, S.Sahni and Susan Anderson Freed, "**Fundamentals of Data Structures in C"** Second Edition, University Press.

20MCA2152: DATABASE MANAGEMENT SYSTEMS LAB

Lecture :	-		Internal Assessment:	40
Tutorial :	-		Final Examination:	60
Practical:	3 hrs/week		Credits:	1.5

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Familiarize on different DDL commands
	CO2	Identify the features of the DML commands
	CO3	Recognize the importance of DCL Commands
	CO4	Gain the knowledge of PL/SQL.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1		M	H									
	CO2			H	H								
	CO3			H	H								
	CO4			M	M	H							

LAB CYCLE – I

1. List the products which have highest sales.
2. Find out the details of top 5 earners of company.
3. Determine the names of employee, who earn more than their managers.
4. Find the names of clients who have placed orders worth of Rs. 10,000/- or more.
5. Determine the names of employees, who take highest salary in their departments.
6. Find the names of clients who have placed orders before the month of may 2006.
7. Find the customer names and address for the clients, who placed the order '019001'.
8. Display names of the managers who is having maximum number of employees working under him.
9. Create a view, which contain employee names and their manager names working in sales department.
10. Find out if the product is '1.44 drive' is ordered by any client and print the client number, name to whom it is sold.

LAB CYCLE - II

11. Queries using Aggregate functions.
12. Nested Queries using ANY, ALL, EXISTS, NOTEXISTS.
13. Nested Queries using UNION, INTERSECT.
14. Create a user.
15. Grant/Revoke Privileges on/from Tables

LAB CYCLE – III

16. Create predefined exceptions.
17. Create user-defined exceptions.
18. Create an index for fast access.
19. .Lock table in Share/Exclusive mode.

LAB CYCLE – IV

20. Write a PL/SQL program to display top 10 rows in emp table based on their job and salary.
21. Write a PL/SQL procedure to read the data into table as per following description:
    a. EMP (Empno, Ename, Address(Object), Qualification, PhoneNum (varray)
22. Write a PL/SQL program to update the salary of a given employee using cursors.

	Salary	Increment
i.	Salary	Increment
ii.	---------	-------------
iii.	<=1000	5%
iv.	> 1000 &< = 2500	10%
v.	> 2500 &< = 4000	20%
vi.	> 4000	30%

23. Write a recursive function to calculate the nC_R value.

Learning Resources

Text Book:

[1] **"Introduction to SQL",** Rick F.Vander Lans, Pearson education.

Reference Books:

[1] **"Oracle PL/SQL",** B. Rosenzweig and E. Silvestrova, Pearson education.
[2] **"Oracle PL/SQL Programming",** Steven Feuerstein, SPD.
[3] **"SQL & PL/SQL for Oracle 10g",** Black Book, Dr.P.S.Deshpande, Dream Tech.
[4] **"Oracle Database 11g PL/SQL Programming",** M. Mc Laughlin, TMH.

Web Resource:

https://nptel.ac.in/courses/106/105/106105175/

20MCA1153: PROFESSIONAL COMMUNICATION SKILLS LAB

Lecture :	-		Internal Assessment:	40
Tutorial :	-		Final Examination:	60
Practical:	3 hrs/week		Credits:	1.5

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Develop active and authentic listening and reading skills relevant for the professional world.
	CO2	Execute web related (On-line) communication with felicity of expression.
	CO3	Apply relevant speech patterns including standard pronunciation.
	CO4	Demonstrate Proficiency in Interpersonal Communication with fluency and accuracy.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1								H				
	CO2												
	CO3							L					
	CO4							M			H		

UNIT – I

LISTENING &READING SKILLS:

Exposure to structured and open talks: Active listening, Appreciative listening, Biased listening, Critical listening Empathetic listening, Judgmental listening

Problems in comprehension & retention: Note-taking practice – Listening tests

Overcoming Barriers to listening: Physical & psychological – Steps to overcome them with demonstration and practice

Critical and Analytical Reading skills: Deductive, inductive and spatial patterns with illustrations

UNIT – II

PHONETICS AND SPEECH PATTERNS:

Speech Mechanism: Organs of speech and patterns of articulation of speech sounds.

Vowels, Consonants and Diphthongs: Transcription using International Phonetic Alphabet

Word Stress and Rhythm: practice

Intonation pattern practice: Tones , Tone group boundaries and Tonal variations

Strong forms and weak forms in Connected speech: Illustrations and Practice

UNIT – III

PROFESSIONAL AND ON-LINE DRAFTING SKILLS:

Professional drafting skills: Circular, Notice, Executive summary

E-mail etiquette: Awareness with Illustrations and practice

Elements of Chat-room interaction: courtesy, techniques of argumentation

Written Response to web-content: conciseness with accountability

Data interpretation: compiling analytical, comparative and critical observations by interpreting graphs, charts, etc.

UNIT – IV

INTERPERSONAL SPOKEN COMMUNICATION SKILLS:

Fluency & accuracy in speech: Improving self-expression
Listener oriented speaking: Interpersonal Conversation- Manner and Temper
Developing persuasive speaking skills: Role play
Overcoming Barriers to speaking: Building self-confidence - through Conversation practice
Improving responding capacity: Extempore speech practice

Learning Resources

Text Books:

[1] Garner, Bryan A, HBR, **"Guide to Better Business Writing",** Hardvard Business Review Press, Boston, Massachusetts, 2013.

[2] "**Exercises in Spoken English"**, Prepared by Department of Phonetics and Spoken English, CIEFL (Currently English and Foreign Languages University), OUP, 21st Impression, 2003.

Reference Books:

[1] Randolph Quirk, **"Use of English",** Longman, I Edition (1968) Reprinted 2004.

[2] Thomson A.J & A.V, Martinet, **"Practical English Grammar",** III Edition, Oxford University Press, 2001.

[3] V.Sethi and P.V. Dhamija, **"A Course in Phonetics and Spoken English",** II Edition, PHI, 2006.

Web Resources and Digital Material:

[1] ODll Language Learner's Software, Orell Techno Systems
[2] Visionet Spears Digital Language Lab software Advance Pro
[3] www.natcorp.ox.ac.uk, British National Corpus

20MCA4154: PERSONALITY DEVELOPMENT COURSE
(LOGICAL REASONING AND ENGLISH FOR PROFESSIONALS)

Lecture :	-			Internal Assessment:	100
Tutorial :	-			Final Examination:	-
Practical:	2			Credits:	-

Course Outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Assess their strengths and weaknesses, both in their personality development and productivity.											
	CO2	Solve problems in quantitative aptitude and reasoning.											
	CO3	Face interviews and group discussions with confidence and attain their realistic goals and objectives.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1					M	L					M	
	CO2		L	M									
	CO3					M	L					M	

UNIT – I

Introduction – Introducing one self.
"Shaping Young Minds" – A talk by Azim Premji – Listening activity and Discussion.
R.C. Tips Self-Analysis, Developing Positive Attitude.
Perception- Importance of analytical thinking. PPT – activity.
General Mental Ability: Series completion; Coding and decoding ; Blood relations ; Puzzle test; Sequential output tracing ; Direction sense test; Logical Venn diagrams; Alphabet test.

UNIT – II

Communication skills – Need and Methods. PPT – activity.
Body Language – I, How to interpret and understand – PPT.
Body Language – II, How to improve one's body language. PPT – activity.
Anger Management – PPT.
Stress Management – steps to reduce – Practical tips.
Time Management – Methods of using time effectively.
General Mental Ability: Number, Ranking& time sequence test; Mathematical operations; Logical sequence of words; Arithmetical reasoning; Inserting the missing character. Data sufficiency; Assertion and reason; Verification of the truth of the statement

UNIT – III

Social and Business etiquettes – Video clips.
Telephone and etiquette.
Logic reasoning: Statement- conclusions.

UNIT – IV

Team Building – Leadership Qualities – Importance of a Team.

Learning Resources

Text Books:

[1] Personality development - Wallace and Masters.
[2] Winning at interview - Edgar Thorpe, Showick Thorpe.
[3] Quantitative Aptitude - R. S. Aggarwal.
[4] A Modern approach to Verbal and Non verbal reasoning - R.S.Aggarwal.

Reference Books:

[1] Six thinking hats - Edward do bone.
[2] Communication skills in English - Shipa Sapre –Bharmal,Dinesh Kumar, Susmita Dey, Nilakshi Roy.
[3] Technical communication - Principles and Practice - Meenakshi Raman, Sangeetha Sharma.
[4] Personality Development and soft skills - Barun K. Mitra.

Web Resources:

[1] https://www.indiabix.com/aptitude/questions-and-answers/
[2] https://www.indiabix.com/aptitude/clock/
[3] https://www.indiabix.com/online-test/aptitude-test/

20MCA2201 : PYTHON POGRAMMING

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

		Upon successful completion of the course, the student will be able to											
Course Outcomes	CO1	Understand the basic concepts in development of applications using Python.												
	CO2	Create and use different libraries in Python.												
	CO3	Implement handling exceptions and files.												
	CO4	Implement basic data structures in Python.												
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	M	L	L		L		M							
	CO2	H	M	M		H		M							
	CO3	L	M	M		H		M							
	CO4	M	M	M		H		M							

UNIT – I

Introduction: Creativity and motivation, Computer hardware architecture, Understanding programming, Words and sentences, Conversing with Python, Terminology: interpreter and compiler, Writing a program, What is a program?, The building blocks of programs, What could possibly go wrong?

Variables, expressions and statements: Values and types, Variables, Variable names and keywords, Statements, Operators and operands, Expressions, Order of operations, Modulus operator, String operations, Asking the user for input, Comments, Choosing mnemonic variable names.

Conditional execution: Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Catching exceptions using try and except, Short-circuit evaluation of logical expressions.

UNIT – II

Functions Calls: Built-in functions, Type conversion functions, Random numbers, Math functions, Adding new functions, Definitions and uses, Flow of execution, Parameters and arguments, Fruitful functions and void functions, Why functions?

Iteration: Updating variables, The while statement, Infinite loops, "Infinite loops" and break, Finishing iterations with continue, Definite loops using for, Loop patterns.

UNIT – III

Strings: A string is a sequence, Getting the length of a string using len, Traversal through a string with a loop, String slices, Strings are immutable, Looping and counting, The in operator,

String comparison, String methods, Parsing strings, Format operator.

Files: Persistence, Opening files, Text files and lines, Reading files Searching through a file, Letting the user choose the file name, Using try, Except, and Open, Writing files.

UNIT – IV

Lists: A list is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Deleting elements, Lists and functions, Lists and Strings, Parsing lines, Objects and values, Aliasing, List arguments.

Dictionaries: Dictionary as a set of counters, Dictionaries and files, Looping and Dictionaries.

Tuples: Tuples are immutable, Comparing tuples, Tuple assignment, Dictionaries and tuples, Multiple assignment with dictionaries, The most common words example.

<u>Learning Resources</u>

Text Book:

[1] Charles Severance, **"Python for Informatics",** Exploring Information. (Unit I – Chapters 1,2,3; Unit II – Chapters 4,5; Unit III – Chapters 6,7 and Unit IV – Chapters: 8,9,10)

Reference Books:

[1] **Head First Python: A Brain-Friendly**,Paul Barry,2017.
[2] Allen Downey **"Think Python, How to Think Like a Computer Scientist**", 2nd edition, Green Tea Press, 2015
[3] Mark Lutz, ― **Learning Python**, 5th Edition , O'Rielly Media, 2017

Web Resources:

[1] https://www.coursera.org/course/pythonlearn
[2] https://www.edx.org/course/introduction-computer-science-mitx-6-00-1x-0
[3] https://www.thenewboston.com/videos.php?cat=36
[4] http://diveintopython.org/

20MCA2202: OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Lecture :	3 hrs/ week		Internal Assessment:	40
Tutorial :	1 hr/ week		**Final Examination:**	60
Practical:	-		**Credits:**	4
Course Outcomes	Upon successful completion of the course, the student will be able to:			
	CO1	Paraphrase the fundamental concepts of object oriented approach		
	CO2	Apply proficient knowledge of inheritance and polymorphism concepts in programming and able to work with Interfaces, Packages and Exceptions.		
	CO3	Understand and apply the Multithreaded Programming concepts and able to work with I/O Streams and Files.		
	CO4	Develop Networking enabled applications and Applets.		

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	L											
	CO2		M	H									
	CO3			M						H			M
	CO4			M						M			H

UNIT – I

History & Evolution of Java: Java's Lineage, The Birth of Modern Programming: C, C++: The Next Step, The Creation of Java, How Java Changed the Internet, Java Applets, Security, Portability, Java's Magic: The Byte code, The Java Buzzwords.

An Overview of Java: Object-Oriented Programming, Two Paradigms, Abstraction, The Three OOP Principles, A First Simple Program, Lexical Issues.

Data Types, Variables and Arrays: The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Arrays.

Operators: Arithmetic Operators, Bitwise Operators, Relational Operators, Boolean Logical Operators.

Control Statements: Java's Selection Statements, Iteration Statements, Nested Loops, Jump Statements.

Introducing Classes: Class Fundamentals, Declaring Objects, A Closer Look at new operator, Assigning Object Reference Variables, Introducing Methods, Constructors, this Keyword, Instance Variable Hiding, and Garbage Collection.

A Closer Look at Methods and Classes: Overloading Methods, Overloading Constructors, Using Objects as Parameters, Returning Objects, Recursion, Introducing Access Control, Understanding static, final, String Class, Command-Line Arguments.

UNIT – II

Inheritance: Inheritance Basics, Super class Variable-Reference a Subclass Object, Using super, using super to call Superclass Constructors, A Second use for Super, Creating a Multilevel Hierarchy,

Method Overriding, Dynamic Method Dispatch, Abstract Classes, Using final with Inheritance.
Packages and Interfaces: Defining a Package, Access Protection, Importing Packages, Interfaces: Defining an Interface, Implementing Interfaces, Variables in Interfaces, Interfaces can be Extended.
Exception Handling: Exception-Handling Fundamentals, Java's Built-in Exceptions, Creating Your Own Exception Subclasses.

UNIT – III

Multithreaded Programming: Creating a Thread: Implementing Runnable, Extending Thread, Creating Multiple threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Deadlock, Suspending, Resuming, and Stopping threads.
Input/Output: Exploring java.io - The I/O Classes and Interfaces, File- Directories, The Stream Classes, The Byte Streams- InputStream, OutputStream, FileInputStream, FileOutputStream Buffered Byte Streams, DataInputStream and DataOutputStream, RandomAccessFile, The Character Streams-Reader Writer FileReader, FileWriter, BufferedReader, PrintWriter, Serialization.

UNIT – IV

Networking: Networking Basics, The Networking Classes and Interfaces, InetAddress Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URLConnection, TCP/IP Server Sockets, Datagrams.
The Applet Class: Applet Basics, The Applet Class, Applet Architecture, An Applet Skeleton, Applet Initialization and Termination, A Simple Banner Applet, Using the Status Window, The HTML APPLET Tag, Passing Parameters to Applets, getDocumentBase() and getCodeBase().

Learning Resources

Text Book:
  [1] **"The Complete Reference Java"**, Eighth Edition, Herbert Schildt, TMH Publishing
      Company Ltd, New Delhi.

Reference Books:
  [1] **AVA How to program,** Eighth Edition, Paul Deitel,Harvey Deitel,PHI Learning
      Pvt.Ltd.,New Delhi
  [2] **Core Java 2,** Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Seventh
      Edition,Pearson Education.
  [3] **Core Java 2,** Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, Seventh Edition,
      Pearson Education.
  [4] **Thinking in Java**, 3rd Edition, Bruce Eckel
  [5] **Object Oriented Programming through JAVA,** P. Radha Krishna

Web Resources:
  [1] https://www.youtube.com/watch?v=OjdT2l-EZJA&list=PLfn3cNtmZdPOe3R_wO_h540QNfMkCQ0ho

20MCA2203: SOFTWARE ENGINEERING

Lecture	3 hrs /week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Demonstrate the basic concepts of software engineering and compare various software development life cycle models
	CO2	Classify different software engineering practice and Testing Tactics
	CO3	Organize the software project management estimation process
	CO4	Develop different software design models using unified modeling language

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	H										M			
	CO2		M												
	CO3		H		M				M						
	CO4			M		H									

UNIT – I

Introduction to Software Engineering: The Evolving Role of Software, Software, The Changing Nature of Software, Software Myths.
A Generic View of Process: Software Engineering-A Layered Technology, A Process Frame Work, The Capability Maturity Model Integration (CMMI).
Process Models: Prescriptive Models, The Waterfall Model, Incremental Process Models: The Incremental Model, The RAD Model, Evolutionary Process Model: Prototyping, The Spiral Model, The Concurrent Development Model.
An Agile View of Process: What is Agility? What is Agile Process? Agile Process Models: Extreme Programming, Scrum.

UNIT – II

Software Engineering Practice: Software Engineering Practice, communication practices, Planning Practices, Modeling Practices, Construction Practices, Deployment.
Testing Tactics: Software Testing Fundamentals, Black Box and White Box Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing.

UNIT – III

Project Management: The Management Spectrum, The People, The Product, The Process, The Project, The W5HH Principles.
Metrics for Process and Projects: Metrics in the Process and Project Domains, Software

Measurement¸ Metrics for Software Quality, Integrating Metrics within Software Process, Metrics for Small Organizations.

Estimation: Observations on Estimations, The project planning process, Software Scope and Feasibility, Resources, Software Project Estimation.

Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Software Reliability, The ISO 9000 Quality Standards, the SQA Plan.

UNIT – IV

Class Modeling: Object and Class Concepts, Link and Association concepts, Generalization and Inheritance, A Sample Class Model.

State Modeling: Events, States, Transitions and Conditions, state diagrams.

Interaction Modeling: Use Case Models, Sequence Models, Activity Models.

<u>**Learning Resources:**</u>

Text Books:

[1] Roger S Pressman, **"Software Engineering–A Practitioner's Approach",** Sixth Edition, TMH International. (UNIT - I, II, III)

[2] Michael Blaha, James Rumbaugh, **"Object Oriented Modeling and Design with UML",** Second Edition, PHI. (UNIT - IV)

Reference Books:

[1] Sommerville, **"Software Engineering",** Seventh Edition Pearson Education (2007).

[2] Kassem A. Saleh, **"Software Engineering",** Cengage Learning.

[3] S.A.Kelkar, **"Software Engineering – A Concise Study",** PHI.

[4] Waman S.Jawadekar**, "Software Engineering",** TMH.

[5] Ali Behforooz and Frederick J.Hudson, **"Software Engineering Fundamentals",**

[6] **"**Oxford (2008).**Object Oriented Analysis & Design with Applications", Grady Booch, 2nd Edition Pearson Education 1999.**

[7] Rumbaugh, Jacobson, Booch, **"Unified Modeling Language Reference Manual",** PHI.

[8] Jacobson et al., **"The Unified Software Development Process",** 1999.

[9] **"UML Bible" by** Tom Pender John Wiley & Sons.

Web Resources:

[1] **http://www-01.ibm.com/software/rational/announce/rose/**

[2] **http://www-01.ibm.com/software/rational/**

20MCA2204: DATA MINING

Lecture :	3 hrs/ week		**Internal Assessment:**	40
Tutorial :	1 hr/ week		**Final Examination:**	60
Practical:	-		**Credits:**	4

Course Outcomes:		Upon successful completion of the course, the student will be able to:		
	CO 1	Utilize a range of techniques for designing Data Mining and Data Warehousing Systems.		
	CO 2	Familiarize with the functionality of the various data mining and Data Warehousing components.		
	CO 3	Realize the strengths and limitations of various data mining and data warehousing models.		
	CO 4	Recognize the ability of Cluster Analysis and Hierarchical Methods.		

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1				H	L							M
	CO2	L	M		H	L							
	CO3	M	M		H	M							L
	CO4	H	M		H	M							M

UNIT – I

Data Mining: Introduction, Why Data Mining? What is Data Mining? What kinds of Data can be Mined? What kinds of Patterns Can be mined? Which Technologies are used? Which kinds of applications are Targeted? Major issues in Data Mining.
Getting to Know Your Data: Data Objects and Attribute Types, Measuring Data Similarity and Dissimilarity.
Data Preprocessing: Data Preprocessing an Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT – II

Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts. Data Warehouse Modeling: Data Cube and OLAP. Data Warehouse Design and usage. Data Warehouse Implementation.

UNIT – III

Mining Frequent Patterns, Associations and Correlations-Basic concepts and Methods: Basic Concepts. Frequent Itemset Mining Methods.
Classification: Basic Concepts: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification.
Classification Advanced Methods: Bayesian Belief Networks, Classification by Backpropagation, Other Classification Methods.

UNIT – IV

Cluster Analysis: Basic Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Outlier Detection: Outliers and Outlier Analysis.

Learning Resources

Text Book:

[1] Jiawei Han Micheline Kamber, **"Data Mining Concepts and Techniques",**Morgan Kaufmann Publishers, Third Edition.

Reference Books:

[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).

Web Resources:

https://nptel.ac.in/courses/106/105/106105174/

20MCA2205A: DESIGN AND ANALYSIS OF ALGORITHMS

Lecture :	3 hrs/week	**Internal Assessment:**	40
Tutorial :	-	**Final Examination:**	60
Practical:	-	**Credits:**	3

		Upon successful completion of the course, the student will be able to:
Course Outcomes	**CO1**	Describe the divide-and-conquer paradigm and explain when a particular algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms, and analyze them.
	CO2	Describe the greedy and dynamic programming paradigms and explain when a particular algorithmic design situation calls. Recite algorithms that employ the particular paradigm. Synthesize the greedy and dynamic programming algorithms, and analyze them.
	CO3	Describe the backtracking and basic traversal and search paradigms and explain when a particular algorithmic design situation calls. Recite algorithms that employ the particular paradigm. Synthesize the backtracking and basic traversal and search algorithms, and analyze them.
	CO4	Describe the branch-and-bound and NP-Hard and NP – Complete problems paradigms and explain when a particular algorithmic design situation calls. Recite algorithms that employ the particular paradigm. Synthesize the NP-Hard and NP – Complete problems algorithms, and analyze them.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	L	L	L		L						L	
	CO2	H	H	L		H							
	CO3	L	H	M	H	M						M	
	CO4		L			M							

UNIT – I

Introduction: What is an algorithm, Algorithm Specification: Pseudocode Conventions, Recursive Algorithms; Performance Analysis: Space Complexity, Time Complexity, Asymptotic notations

Divide and Conquer: General Method, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick sort, Strassen's Matrix Multiplication

UNIT – II

The Greedy Method: The general method, Knapsack Problem, Job sequencing with deadlines; Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm; Optimal Storage on tapes, Optimal Merge patterns, Single Source shortest paths.

Dynamic Programming: The general method, Multistage graphs, All-Pairs shortest paths, Single source shortest paths, , 0/1 Knapsack Problem, The Traveling Salesperson Problem

UNIT – III

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for graphs: Breadth First Search, Depth First Search traversals; Connected Components and Spanning Trees.
Backtracking: The general method, The 8-Queens problem, Sum of Subsets, Graph coloring, Hamiltonian cycles.

UNIT – IV

Branch and Bound: The Method: Least Cost search, Control abstractions for LC search, Bounding, FIFO Branch and Bound, LC Branch and Bound; LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling Salesperson problem.
NP-Hard and NP – Complete problems: Basic concepts: Non deterministic algorithms, The classes NP hard and NP Complete.

Learning Resources

Text Book:

[1] Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "**Fundamentals of Computer Algorithms",** Second Edition, Universities Press (2008).
Chapters: 1,3,4,5,6,7,8 and 11.

Reference Books:

[1] Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, **"Introduction to Algorithms",** Second Edition, McGraw Hill.
[2] Anany Levitin, **"Introduction to the Design and Analysis of Algorithms",** Second Edition, Pearson Education (2007).

Web Resources:
[1] https://nptel.ac.in/courses/106/101/106101060/
[2] http://www.nptelvideos.in/2012/11/design-analysis-of-algorithms.html

20MCA2205B: ARTIFICIAL INTELLIGENCE

Lecture :	3 hrs/ week								Internal Assessment:		40
Tutorial :	-								Final Examination:		60
Practical:	-								Credits:		3

Course Outcomes:	Upon successful completion of the course, the student will be able to:										
	CO 1	Use logic as a representation and reasoning strategy for AI effectively.									
	CO 2	Understand the representation schemas such as Procedural Representations, Network Representations and Structured Representations and apply these to case studies.									
	CO 3	Select and apply a variety of graph search algorithms underpinning AI applications.									
	CO 4	Undertake efficient searches and interpret the results of such searches.									

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1					M							
	CO2											H	
	CO3	M											
	CO4				M								

UNIT – I

What is AI: The AI Problems, The Underlying Assumption, What is AI Technique? The level of the Model, Criteria for Success.
Problems, Problem spaces & Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the design of Search Programs, Additional Problems.
Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Means Ends Analysis.

UNIT – II

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, The Frame Problem.
Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.
Representing knowledge using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

UNIT – III

Symbolic Reasoning under Uncertainty: Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem Solver, Implementation: Depth-First Search, Implementation: Breadth-First Search.
Weak slot & filler Structures: Semantic Nets, Frames.
Planning : Overview, An Example Domain : The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.

UNIT – IV

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing
Commonsense: Qualitative Physics, Commonsense Ontologies, Memory Organisation, Case-Based Reasoning.
Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Learning Resources

Text Book:

[1] Elaine Rich, Knight K, "**Artificial Intelligence**", TMH (1991)
 Chapters: 1 through 7, 9, 13, 15, 10 and 20.

Reference Books:

[1] Michael Negnevitsky, **"Artificial Intelligence – A Guide to Intelligent Systems",** Second Edition, Pearson Education (2008).
[2] Winston P.H, **"Artificial Intelligence",** Addision Wesley (1993).

Web Resource:

[1] https://nptel.ac.in/courses/106/105/106105077/

20MCA2205C: CRYPTOGRAPHY AND NETWORK SECURITY

Lecture	3 hrs/week	**Internal Assessment**	40
Tutorial	-	**Final Examination**	60
Practical	-	**Credits**	3

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Analyze the basic concepts of cryptography and network security and conventional cryptographic algorithms.
	CO2	Apply public cryptosystems and disseminate from conventional systems for the security.
	CO3	Analyze digital signature techniques and key management protocols to provide confidential and secure communication.
	CO4	Evaluate various network security and system security mechanisms to counter threats/ vulnerabilities.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
	CO1	M	H				M				H				
	CO2	M	M		M										
	CO3				M		M								
	CO4		H				H				M				

UNIT – I

Overview: The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.

Classical Encryption and the Data Encryption Standard: Symmetric Cipher Model, The Data Encryption Standard – DES Encryption, DES Decryption.

UNIT – II

Public Key Cryptography and RSA: Principles of Public Key Cryptosystems - Public-Key Cryptosystems, Applications for Public-Key Cryptosystems, Requirements for Public-Key Cryptography, Public-Key Cryptanalysis, The RSA Algorithm - Description of the Algorithm, Computational Aspects, The Security of RSA.

Other Public-Key Cryptosystems: Diffie-Hellman Key Exchange - The Algorithm, Key Exchange Protocols, Man-in-the-Middle Attack, ElGamal Cryptographic System.

UNIT – III

Digital Signatures: Digital Signatures – Properties, Attacks and Forgeries, Digital Signature Requirements, Direct Digital Signature, Digital Signature Standard - The DSS Approach, The Digital Signature Algorithm.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric

Encryption - A Key Distribution Scenario, Hierarchical Key Control, Session Key Lifetime, A Transparent Key Control Scheme, Decentralized Key Control, Controlling Key Usage, Symmetric Key Distribution Using Asymmetric Encryption - Simple Secret Key Distribution, Secret Key Distribution with Confidentiality and Authentication, A Hybrid Scheme, Distribution Of Public Keys - Public Announcement of Public Keys, Publicly Available Directory, Public-Key Authority, Public-Key Certificates.

UNIT – IV

Transport-Level Security: Secure Socket Layer - SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, Cryptographic Computations.

Firewalls: The Need for Firewalls, Firewall Characteristics, Types of Firewalls - Packet Filtering Firewall, Stateful Inspection Firewalls, Application-Level Gateway, Circuit-Level Gateway, Firewall Basing - Bastion Host, Host-Based Firewalls, Personal Firewall, Firewall Location and Configurations - DMZ Networks, Virtual Private Networks, Distributed Firewalls, Summary of Firewall Locations and Topologies.

Learning Resources

Text Book:

[1] William Stallings, **"Cryptography and Network Security Principles and Practice"**, Fifth Edition, PHI.

Reference Books:

[1] William Stallings, **"Network Security Essentials – Applications and Standards"**, Third Edition, Pearson Education (2007).
[2] Neal Krawety, **"Introduction to Network Security"**, Thomson (2007).
[3] Behrouz A.Forouzan, **"Cryptography & Network Security"**, The McGraw-Hill Companies (2007).

Web Resource:
[1] https://nptel.ac.in/courses/106/105/106105162/

20MCA2205D: INFORMATION RETRIEVAL SYSTEMS

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

		Upon successful completion of the course, the student will be able to:												
Course Outcomes	CO1	Interpret the functional processes and effectiveness of information storage and retrieval systems												
	CO2	Utilize techniques and architectures necessary to speed up the retrieval process for information retrieval systems												
	CO3	Apply metadata organization for effective information access.												
	CO4	Evaluate and use different information retrieval techniques in various application areas												
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1		L	L									
	CO2		L		M								
	CO3	L	M	M			H						
	CO4	L	M	M	M		H						

UNIT – I

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.
Information Retrieval System Capabilities: Search, Browse, Miscellaneous.

UNIT – II

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.
Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT – III

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages.
Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT – IV

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the Internet and hypertext.

Information Visualization: Introduction, Cognition and perception, Information visualization technologies.

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems

Learning Resources:

Text Book:

[1] M. T. M. Gerald J Kowalski, **"Information Storage and Retrieval Systems",** Springer International Edition, 2005.

Reference Books:

[1] G. G. Chowdhury, " **Introduction to Modern Information Retrieval"**, Neal-Schuman Publishers; Third edition , 2010
[2] Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, **" Introduction to Information Retrieval",** Cambridge University Press. 2008.

Web Resources:

[1] Information Retrieval,Prof.Pabitra Mitra,IIT Kharagpur, http://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html

[2] Information Retrieval,Prof.Pawan Goyal,IIT Kharagpur, http://cse.iitkgp.ac.in/~pawang/courses/IR16/lec1.html

[3] Natural Language Processing by Prof. Pushpak Bhattacharyya, Department ofComputer science & Engineering,IIT Bombay, https://www.youtube.com/watch?v=m0oiAOgSQFw

[4] Introduction to Information Retrieval https://www.youtube.com/watch?v=yluvahNq3wk

20MCA2251: PYTHON PROGRAMMING LAB

Lecture	-	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	3 hrs/week	Credits	1.5

		Upon successful completion of the course, the student will be able to:
Course Outcomes	**CO1**	Understand the basic concepts in development of applications using Python.
	CO2	Create and use different libraries in Python.
	CO3	Implement handling exceptions and files.
	CO4	Implement basic data structures in Python.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	M	L	L		L		M							
	CO2	H	M	M		H		M							
	CO3	L	M	M		H		M							
	CO4	M	M	M		H		M							

LAB CYCLE – I

1. Write a python code to read 'n' numbers and print their sum , mean.
2. Write a python program to swap two numbers without using third variable. Print the two variables before swap and after swap. (Without arithmetic Operators)
3. Write a python program which prompts the user for a Celsius temperature, convert the temperature in to Fahrenheit and print .
4. Write a python program to prompt for a score between 0.0 and 1.0. If the score is out of range, print an error message. If the score is between 0.0 and 1.0, print the grade.

LAB CYCLE – II

5. Write a python program demonstrating the usage type conversion functions and random.
6. Write a python program demonstrating the usage of math functions.
7. Write a python program contains a function that takes username and password as input and returns a string either valid user or not. Allow the user to check for maximum three times only and quits the program.
8. Write a python program that prompts for a list of numbers and at the end print both the maximum and minimum of the numbers and the average numbers. (without sorting)
9. Write a python program demonstrating break, continue keywords and infinite loop.

LAB CYCLE – III

10. Write a python program with user defined functions as below:
    (a)Count the number of characters of a given string
    (b)Count the number of words in a given line.
    Using above two functions, print the number of characters and number of words of the input.
11. Write a python program demonstrating the usage of string functions.
12. Write a python program to read through a file and print the contents of the file in upper case.
13. Write a python function which saves the first 1000 Fibonacci numbers r in a text file.
14. Write a python function which saves results in two files: random .txt file for store 100 random numbers and repetitions_random.txt to store those random numbers which got repeated.

LAB CYCLE – IV

15. Write a python program to demonstrate the usage of lists and its methods.
16. Write a python program to demonstrate the usage of lists in functions.
17. Write a python program involving the usage of dictionaries and its methods.
18. Write a python program mentioning the usage of Tuples and its methods.

Learning Resources

Text Book:

[1] Charles Severance, **"Python for Informatics",** Exploring Information

Reference Books:

[1] Paul Barry, "**Head First Python: A Brain-Friendly**, 2017.
[2] Allen Downey **"Think Python, How to Think Like a Computer Scientist"**, 2nd edition, Green Tea Press, 2015
[3] Mark Lutz, **"Learning Python‖",** 5th Edition , O'Rielly Media, 2017

Web Resources:

[1] https://www.coursera.org/course/pythonlearn
[2] https://www.edx.org/course/introduction-computer-science-mitx-6-00-1x-0
[3] https://www.thenewboston.com/videos.php?cat=36
[4] http://diveintopython.org/

20MCA2252: OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Lecture :	-			Internal Assessment:	40
Tutorial :	-			Final Examination:	60
Practical:	3 hrs/week			Credits:	1.5
Course Outcomes		Upon successful completion of the course, the student will be able to:			
	CO1	Know the language syntax and how to solve the problems using object oriented concepts.			
	CO2	Able to write the programs using Inheritance, Polymorphism, Interfaces, Abstract Class, Packages and Exceptions.			
	CO3	Proficient to write programs using the concepts of Multithreaded Programming.			
	CO4	Develop programs using Files, Networking enabled applications and Applets.			

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	L											
	CO2		M	H									
	CO3			M						H			M
	CO4			M						M			H

LAB CYCLE – I

1. a) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
   b) Write a Java program to find both the largest and smallest number in a list of integers.
2. Write a Java program to multiply two given matrices by checking the compatibility of multiplication.
3. a) Find Volume of a box using classes.
   b) Write a Java program to illustrate method overloading and constructor overloading.
   c) Write a Java program to demonstrate on static variables and methods.
4. Write a Java program to demonstrate objects as arguments.
5. Write a Java program using String class methods to perform the following operations
   a) Sort a list of names in ascending order by command line arguments.
   b)Develop a program that will take a string from a command line argument in order to check whether it is a palindrome.

LAB CYCLE – II

6. Design three classes: Student, Exam and Result. The student class has data members such as 6roll no, name etc. Create a class Exam by inheriting the Student class. The Exam class

adds data members representing the marks scored in six subjects. Derive the Result from class Exam and it has its own members such as total marks and average. Calculate the total marks and average.

7. a) Write a java program to implement Method Overriding.
    b) Write a java program to demonstrate constructor chaining in Inheritance.
    c) Write a java program to demonstrate the use of final.

8. a) Write a java program by implementing super class reference and subclass object (Implement Dynamic Binding).
    b) Write a Java program to create an abstract class named Shape that contains an empty method named numberOfSides( ).Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides( ) that shows the number of sides in the given geometrical figures.

9. Write a Java program that illustrates the following.
    a) Creation of simple package.   b) Accessing a package.

10. Develop a program to demonstrate multiple inheritance through interface

LAB CYCLE – III

11. Write Java programs that illustrates the following
    a) Handling predefined exceptions   b) Handling user defined exceptions
12. Write a Java program to create thread using Thread class and Runnable Interface.
13. Write a Java program to demonstrate Synchronization

LAB CYCLE – IV

10. a) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
11. b) Write a Java program that displays the number of characters, lines and words in a text file.
12. Write a Java program to demonstrate URL and URLConnection.
13. Write a Java program for establishing a socket connection.
14. Write a Java program to pass parameters to Applets.

Learning Resources

Text Books:

[1] **"The Complete Reference Java"**, Seventh Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
[2] **JAVA How to program,** Eighth Edition, Paul Deitel,Harvey Deitel,PHI Learning Pvt.Ltd., New Delhi**.**
[3] **Core Java 2,** Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
[4] **Core Java 2,** Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
[5] **Object Oriented Programming through JAVA,** P. Radha Krishna.

Web Resources:

[1] http://download.oracle.com/javase/tutorial/index.html
[2] http://www.javaj2ee.net/core-java-video-tutorial
[3] http://www.coderanch.com/forums/f-33/java
[4] http://www.javacertificate.net/
[5] http://www.deitel.com/Tutorials/Freetutorialsandarticles/tabid/1575/default.aspx
[6] http://www.herongyang.com/Java/

20MCA2253 : STATISTICS WITH R PROGRAMMING LAB

Lecture :	-			Internal Assessment:	40
Tutorial :	1hr/ week			Final Examination:	60
Practical:	2 hrs/week			Credits:	2
Course Outcomes	Upon successful completion of the course, the student will be able to:				
	CO1	Manipulate basic data in R			
	CO2	Find distribution tables and central tendency of the data in R			
	CO3	Perform basic data visualization in R			
	CO4	Analyze regression analysis and correlation in R			

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	H				H							
	CO2	H				H							
	CO3	H				H							
	CO4	H				H							

LAB CYCLE – I (Introduction to R software)

1. Installing R, Packages and Libraries
2. Cleaning up the windows, How to quit in R
3. Basics and R as calculator
4. Calculations with data vectors
5. Built-in commands and missing data handling
6. Operations with matrices
7. Data.frames, Lists and Arrays

LAB CYCLE – II (Introduction to descriptive statistics)

1. Variables and types of data
2. Absolute frequency, Relative frequency and Frequency distribution
3. Cumulative frequency distribution
4. Arithmetic mean for ungrouped data and grouped data
5. Median
6. Quantiles
7. Mode, Geometric mean and Harmonic mean.

8.Skewness and Kurtosis.

LAB CYCLE - III(Statistical graphics)

1. Histograms
2. Scatterplot
3. Boxplots
4. 3D pie diagram

LAB CYCLE – IV(Association of two variables)

1. Coefficient of correlation
2. Rank correlation coefficient
3. Simple linear regression
4. Multiple regression

Learning Resources

[1] R for Everyone, Advanced Analytics and Graphics – Jared P. Lander, Pearson

[2] An introduction to R - W. N. Venables, D. M. Smith and the R Core Team

[3] https://onlinecourses.nptel.ac.in/noc18_cs52/course

20MCA4254: PERSONALITY DEVELOPMENT COURSE
(APTITUDE AND CAMPUS RECRUITMENT TRAINING)

Lecture :	-			Internal Assessment:	100
Tutorial :	-			Final Examination:	-
Practical:	2 hrs/ week			Credits:	0

Course Outcomes	Upon successful completion of the course, the student will be able to:				
	CO 1	Assess their strengths and weaknesses, both in their personality development and productivity.			
	CO 2	Solve problems in quantitative aptitude and reasoning.			
	CO 3	Would face interviews and group discussions with confidence and attain their realistic goals and objectives.			

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1						L	H	M		M		
	CO2						L	M	M		H		
	CO3						M	M	M		M		H

UNIT – I

Introduction to topics.
Vocabulary: Analogies.
Sentence Completion – Sentence-Course of Action.
Sentences– Assumptions, Correction of sentences.
Analogy, Sentence and Arguments, Sentence and Conclusion.
Paragraph Writing.
Arithmetical ability: Numbers; H.C.F &L.C.M of numbers; Averages; Problem on numbers; Problem on ages; Percentages.

UNIT – II

Group Discussion – How to present yourself.
Group Discussion – Activity practical sessions with PPTs.
Arithmetical ability: Profit& loss; Ratio& Proportion; Partnership; Chain rule; Time& work; Pipes & cisterns.

UNIT – III

Letter Writing – Formal and Informal.
CV/Resume with Practice Session.
Arithmetical ability: Time & Distance; Problems on trains; boats & Streams; Allegation OR

mixtures; Simple interest; compound interest; Area.

UNIT – IV

Interview Questions – Problem questions and
Answers. Interview- Practice session with
student activity and video clips.
Arithmetical ability: Calendar; Clocks;
Permutations & Combinations; Probability.
Data interpretation: Bar graph, pie chart, Line
graph, table method.

Learning Resources

Text Books:

[1] **Personality Development** - Wallace and Masters.
[2] **Winning at Interview** - Edgar Thorpe, Showick Thorpe.
[3] **Quantitative Aptitude** - R. S. Aggarwal.
[4] **A Modern Approach to Verbal and Non-Verbal Reasoning** - R. S. Aggarwal.

Reference Books:

[1] **Six Thinking Hats** - Edward do bone.
[2] **Communication Skills in English** - Shipa Sapre – Bharmal, Dinesh Kumar, Susmita
 Dey, Nilakshi Roy.
[3] **Technical Communication - Principles and Practice** - Meenakshi Raman, Sangeetha
 Sharma.
[4] **Personality Development and Soft Skills** - Barun K. Mitra.

Web Resources:

[1] https://www.indiabix.com/aptitude/questions-and-answers/
[2] https://www.indiabix.com/aptitude/clock/
[3] https://www.indiabix.com/online-test/aptitude-test/

20MCA2301: MACHINE LEARNING

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	1 hr/week	Final Examination	60
Practical	-	Credits	4

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Recognize the characteristics of machine learning, binary classification.
	CO2	Apply the algorithms to a real problem
	CO3	Understand a wide variety of learning algorithm
	CO4	Analyze Genetic and Neural network algorithms.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1			M					H						
	CO2		H			M									
	CO3		M												
	CO4				M			M							

UNIT – I

Introduction to Machine Learning: Human learning and its types; Machine Learning and its types; Well posed learning problem; Applications of machine learning; Issues in machine learning

Feature Engineering: Feature construction; Feature extraction –PCA, SVD, LDA; Feature selection

UNIT – II

Bayesian concept learning: Bayes theorem- prior and posterior probability likelihood; concept learning; Bayesian Belief network

Supervised Learning: Regression-Linear , polynomial ,logistic

UNIT – III

Supervised Learning: KNN, Decision trees, SVM

UnSupervised Learning: Clustering-K-Means, DBSCAN

UNIT – IV

Basics of Neural Networks: Understanding biological neuron and artificial neuron; types of activation functions; early implementations-McCulloch Pitt's, Rosenblatt's perception, ADALINE: Architectures of neural network; learning process in ANN; Backpropagation.

Learning Resources

Text Book:

[1] **Machine Learning** by Saikat Dutt , Subramanian Chandramouli, , Amit Kumar Das,Pearson,2019

Reference Books:

[1] Tom M.Mitchell, "**Machine Learning"**, India Edition 2013,McGraw Hill Education.
[2] Ethem Alpaydin, " **Introduction to Machine Learning**, Second Eedition, MIT press.

Web Resource:

[1] https://nptel.ac.in/courses/106/104/106104189/

20MCA2302: CYBER SECURITY

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	1 hr/week	Final Examination	60
Practical	-	Credits	4

	Upon successful completion of the course, the student will be able to:
Course Outcomes	**CO1** Evaluate the issues related to different types of activities in cyber crime.
	CO2 Examine the security challenges on mobile devices.
	CO3 Analyze the tools and methods used in cybercrime.
	CO4 Interpret the strengths and weaknesses of Indian IT Act.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	M	H								H				
	CO2	H	M												
	CO3			M			H								
	CO4			H			M				H				

UNIT – I

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes - E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usenet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

UNIT – II

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security - Cryptographic Security for Mobile Devices, LDAP Security for Hand-Held Mobile Computing Devices, RAS Security for Mobile Devices, Media Player Control Security, Networking API Security for Mobile Computing Applications, Attacks on

Mobile/Cell Phones - Mobile Phone Theft, Mobile Viruses, Mishing, Vishing, Smishing, Hacking Bluetooth, Organizational security Policies and Measures in Mobile Computing Era - Importance of Security Policies relating to Mobile Computing Devices, Operating Guidelines for Implementing Mobile Device Security Policies, Organizational Policies for the Use of Mobile Hand-Held Devices, Laptops.

UNIT – III

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing - How Phishing Works?, Password Cracking - Online Attacks, Offline Attacks, Strong, Weak and Random, Random Passwords, Key loggers and Spywares - Software Keyloggers, Hardware Keyloggers, Antikeylogger, Spywares, Virus and Worms – Types of Viruses, Trojan Horses and Backdoors - Backdoor, How to Protect from Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks - DoS Attacks, Classification of DoS Attacks, Types or Levels of DoS Attacks, Tools Used to Launch DoS Attack, DDoS Attacks, How to Protect from DoS/DDoS Attacks.

UNIT – IV

Cybercrimes and Cybersecurity: The Legal Perspectives: Introduction, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act - Public-Key Certificate, Representation of Digital Signatures in the ITA 2000, Impact of Oversights in ITA 2000 Regarding Digital Signatures, Implications for Certifying Authorities, The Current Scenario Regarding Digital Signatures under the Indian IT Act, Amendments to the Indian IT Act - Overview of Changes made to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

Learning Resources

Text Book:

[1] "**Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives",** Nina Godbole, SunitBelapure, Wiley, April 2011 India Publications Released.

Reference Books:

[1] Harish Chander**, "Cyber Laws & IT Protection",** PHI learning pvt.ltd, 2012.
[2] Dhiren R Patel, **"Information Security Theory & Practice",** PHI learning Pvt Ltd. 2010.

Web Resource:

[1] https://onlinecourses.swayam2.ac.in/cec20_cs15/

20MCA2303A: COMPUTER GRAPHICS

Lecture :	3 hrs/week		**Internal Assessment:**	40
Tutorial :	-		**Final Examination:**	60
Practical:	-		**Credits:**	3

		Upon successful completion of the course, the student will be able to:												
Course Outcomes	**CO1**	Analyze the basics of Computer graphics and Graphical user interface												
	CO2	Apply computer graphics primitive operations and its attributes												
	CO3	Demonstrate different 2D/3D object transformations and viewing techniques												
	CO4	Create various concepts related to Animation and Multimedia												

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1		H	M									
	CO2	H	M										
	CO3	L				M							
	CO4					M		L					

UNIT – I

Overview of Computer Graphics: Introduction to Computer graphics & its applications, Video Display Devices, Raster Scan Displays, Random Scan Displays, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Displays, Raster Scan Systems, Random Scan Systems, Input Devices & output Devices.

Graphical User Interfaces and Interactive Input Methods: The User Dialogue, Windows and Icons, Input of Graphical Data, Input Functions.

UNIT – II

Output Primitives: Points and Lines, Line-Drawing Algorithms: DDA Algorithm, Bresenham's Line Algorithm, Circle Generation Algorithms, Ellipse Generation Algorithms.

Attributes of output Primitives: Line Attributes, Area Fill Attributes, Character Attributes, Bundled Attributes, Ant aliasing.

UNIT – III

Two Dimensional Geometric Transformations: Basic Transformations, Matrix Representation and Homogenous Coordinates, Composite Transformations, Other Transformations.

Two Dimensional Viewing: The Viewing pipeline, Viewing Coordinates Reference Frame, Window to Viewport Coordinate Transformations, Two Dimensional Viewing Functions, Clipping

Operations, Point Clipping, Line Clipping: Cohen-Sutherland Line Clipping, Polygon Clipping: Sutherland-Hodgeman Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping.

UNIT – IV

Three Dimensional Object Representations : Polygon Surfaces, Quadric Surfaces, Super quadrics.

Three Dimensional Geometric and Modeling Transformations: Translation, Rotation, Scaling, Composite Transformations. Three Dimensional Transformation Functions, Projections

Animations: Creating Animations**:** Creating Key frames, Layers in Animation, Steps for Creating Animation, Frame-by-Frame Animation, Tweened Animations.

Multimedia: Introduction to Multimedia, Multimedia Applications, Building Blocks of Multimedia, Visual elements, Sound Elements, Multimedia storage.

Learning Resources

Text Books:

[1] **"Computer Graphics",** 2ndEdition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education. (UNIT - I,II,III)

[2] **"Computer Graphics, Multimedia and Animation",** Malay K.Pakhira ,PHI publications. (UNIT –IV)

Reference Books:

[1] **"Computer Graphics C version"**, Donald Hearn and M.Pauline Baker, Pearson Education.

[2] "**Computer Graphics 2nd Edition"**, Zhigandxiang, Roy Plastock, Schaum's outlines, Tata Mc- Graw hill edition.

[3] **"Procedural elements for Computer Graphics"**, David F Rogers, Tata Mc Graw Hill, 2nd Edition.

20MCA2303B: DISTRIBUTED SYSTEMS

Lecture :	3 hrs/ week		**Internal Assessment:**	40
Tutorial :	-		**Final Examination:**	60
Practical:	-		**Credits:**	3

	Upon successful completion of the course, the student will be able to:
Course Outcomes	**CO1** List the principles of distributed systems and describe the problems and challenges associated with these principles
	CO2 Understand Distributed Computing techniques, synchronous and processes
	CO3 Design a distributed system that fulfills requirements with regards to key distributed systems properties.
	CO4 Apply Distributed web-based system.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	L	M	H									
	CO2	M	M	M									
	CO3			H								M	
	CO4	M		H									

UNIT – I

Introduction: Definition of a Distributed System, Goals, Hardware Concepts, Software Concepts, The Client-Server.
Communication: Layered Protocols, Remote Procedure Call- Basic RPC Operation, Parameter Passing.

UNIT – II

Processes: Threads, Clients, Servers, Code Migration.
Naming: Naming Entities -Names, Identifiers and Addresses, Name Resolution, The Implementation of a Name Space. Locating Mobile Entities, Removing Unreferenced Entities.

UNIT – III

Synchronization: Clock Synchronization. Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions.
Consistency and Replication: Introduction, Data- Centric Consistency Models, Client –Centric Consistency Models, Distribution Protocols, Consistency Protocols.

UNIT – IV

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery.
Distributed File Systems: Sun Network File System, The Coda File System.

Learning Resources

Text Book:

[1] Andrew S. Tanenbaum, Maarten Van Steen, **"Distributed Systems: Principles and Paradigms",** 2002, Pearson Education/PHI.

Reference Books:

[1] **"Distributed Systems: Principles and Paradigms"**, A S Tanenbaum & MartiSteen, 2/E, PHI, 2006.
[2] **"Distributed Systems Concepts & Design"**, Colouris, Dollimore, Kindberg, Pearson, 4/Ed. 2005.

Web Resources

[1] https://nptel.ac.in/courses/106/106/106106107/

20MCA2303C: ADVANCED DATABASE TECHNOLOGY

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

Course Outcomes		Upon successful completion of the course, the student will be able to
	CO1	Familiarize with EER models and Relational Algebra Operations.
	CO2	Analyze various techniques of Hashing and Indexing.
	CO3	Assess the importance of Database Tuning and Security.
	CO4	Create the data fragments for effective Query Processing.

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1		H										
	CO2			H									
	CO3							M					
	CO4				H								

UNIT – I

The Enhanced Entity-Relationship (EER) Model: Subclasses, Superclasses, and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization Hierarchies.
The Relational Algebra: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION.

UNIT – II

Disk Storage, Basic File Structures, and Hashing: Introduction, Buffering of Blocks, Placing File Records on Disk, Operations on Files, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Hashing Techniques.
Indexing Structures for Files: Types of Single-Level Ordered Indexes, Multilevel Indexes.

UNIT – III

Physical Database Design and Tuning: Physical Database Design in Relational Databases, An overview of Database Tuning in Relational Systems.
Database Security: Introduction to Database Security Issues, Discretionary Access Control Based on Granting and Revoking Privileges, Mandatory Access Control and Role-Based

Access Control for Multilevel Security, Introduction to Statistical Database Security, Introduction to Flow Control, Encryption and Public Key Infrastructures, Privacy Issues and Preservation, Challenges of Database Security.

UNIT – IV

Distributed Databases and Client-Server Architectures: Distributed Database Concepts, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design, Types of Distributed Database Systems, Query Processing in Distributed Databases, Overview of Concurrency Control and Recovery in Distributed Databases, An Overview of 3-Tier Client-Server Architecture, Distributed Databases in Oracle.

Learning Resources

Text Book:

[1] Ramez Elmasri, Shamkant B. Navathe, **"Fundamentals of Database Systems",** Fifth Edition, Pearson Education (2007).
   Chapters:　　UNIT – I -
   　　　　　　　　UNIT – II – 5, 6.1 to 6.3, 6.6, 6.7, 8
   　　　　　　　　UNIT – III – 10, 11.1 to 11.4
   　　　　　　　　UNIT – IV – 13.1, 13.3 to 13.10, 17.1 to 17.5, 18.1 to 18.3

Reference Books:

[1] "**Database Management Systems",** Peter Rob, A. Anand Rao, Carlos Coronel, Cengage Learning.
[2**] "Database System Concepts",** Abraham Silberschatz, Henry F. Korth, S. Sudarshan.
 [3**] "Database Management Systems",** Raghu Ramakrishnan, Fourth Edition.
[4] **"Database Management System Oracle SQL and PL/SQL",** P. K. Das Gupta, PHI.
[5] **"Database System Concepts",** Peter Rob & Carlos Coronel, Cengage Learning, 2008.

E-Books and Online Course Material:

[1] Silbertschat, Database System Concepts,
   www.mhhe.com/silbertschat, 2011
[2] Elmasri and Navathe : Fundamentals of Database Systems,
   http://www.aw.com/elmasri, http://www.aw.com/cssupport
[3] P .S. Gill, Database Management System,
   http://www.amazon.in/Database-Management-Systems-P-Gill/dp
[4] Raghu Ramakrishan, Database Management System,
   http://www.amfastech.com/2013/01/database-management-system-byraghu.html

NPTEL Web Resource:
[1] https://nptel.ac.in/courses/106/105/106105175/

20MCA2303D: HUMAN COMPUTER INTERACTION

Lecture	3hrs/week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

Course Outcomes		Upon successful completion of the course, the student will be able to
	CO1	Understand the human interaction characteristics in the design process.
	CO2	Recognize the screen elements for presenting information simply and effectively.
	CO3	Create an user interface using various software tools.

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	M	L			L							
	CO2	M	L			M							
	CO3	M		M		M							

UNIT – I

Introduction: Importance of user interface, definition, importance of good design, A brief history of Screen Design.
Graphical User Interface: Popularity of graphics, the concept of direct manipulation, graphical system, characteristics.
Web user Interface: popularity, characteristics- principles of user interface.

UNIT – II

Design Process: Human interaction with computers, importance of human characteristics, human considerations, human interaction speeds.
Screen designing: Interface design goals, screen meaning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presenting information simply and meaningfully, technological considerations in interface design.

UNIT – III

Windows: Characteristics, components, operations. Selection of device based and screen based controls.

Components: Icons and images, Multimedia, choosing proper colors.

UNIT – IV

Software Tools: Specification methods, interface, Building tools.

Interaction devices: Keyboard and function keys, pointing devices, speech recognition, digitization and generation, image and video displays, drivers.

Learning Resources

Text Books:

[1] Wilbert O Galitz, **"The Essential Guide to User Interface Design",** 2nd Edition, Wiley Dream Tech.
[2] Ben Shneidermann, **"Designing the User Interface",** 3rd Edition, Pearson Education Asia.

Reference Books:

[1] Alan Dix, Janet Fincay, Gre Goryd, Abowd and Russell Bealg, **"Human Computer Interaction",** 2nd Edition Pearson Education.
[2] Prece, Rogers, Sharps Interaction Design. Wiley Dreamatech Soren Lauesen, **"User Interface Design",** 2nd Edition Pearson Education.

20MCA2304: INDUSTRIAL MANAGEMENT

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

Course Outcomes		Upon successful completion of the course, the student will be able to
Course Outcomes	CO1	Gain knowledge on how to apply the managerial functions and principles in an organization. They also gain knowledge on objectives of business and Social Responsibilities of Business.
	CO2	Learn how to associate with peers, superiors and other employees in an organization?
	CO3	Understanding the financial goals and investment decisions based on the requirement of business through knowledge on financial management.
	CO4	Get knowledge on human resource planning, recruitment, selection, training, career development, performance appraisal and motivation.

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1						M	M			H		
	CO2						H	H				H	H
	CO3								H				
	CO4							M				M	M

UNIT – I

Management: Meaning, Management vs. Administration, Management Functions: Planning, Organizing, Staffing, Directing and Controlling, Management Levels, Scientific Management, Fayol's Principles of Management, Objectives of Business, Social Responsibilities of Business.

UNIT – II

Organizational Behavior: Meaning, Nature and Significance of Organizational Behavior, Values, Attitudes, Emotions and Moods, Personality: Traits, Determinants, Personality Development and Personality Theories, Perception: Perceptual Process, Learning: Characteristics and Process, Stress Management: Causes of Stress, How to manage stress?

UNIT – III

Financial Management: Meaning, Scope, Finance Function, Financial Goal, Profit Maximization vs. Wealth Maximization, Future Value, Present Value, Cost of Capital: Significance, Weighted Average Cost of Capital (WACC), Capital Budgeting Decisions: Nature and Features, Techniques of Capital Budgeting, Discounted Cash Flow Techniques: Net Present Value (NPV), Internal Rate of Return (IRR) and Profitability Index (PI), Non-Discounted Cash Flow Techniques: Payback, Discounted Payback and Accounting Rate of Return (ARR).

UNIT – IV

Human Resource Management: Nature and Scope, Functions, Objectives, Human Resource Planning: Importance and The Planning Process, Recruitment: Nature, Importance and Process, Selection: Nature and Process, Training, Development and Career Management: Nature of Training and Development, The Training Process, Performance Appraisal: Appraisal Process and Methods of Appraisal, Motivation: Meaning, Importance, Theories of Motivation: Maslow's Need Hierarchy Theory and Herzberg's Two Factor Theory.

CONTENTS BEYOND THE SYLLABUS

Marketing: Definition, significance, marketing Concepts, Role of Marketing in Indian Economy, Marketing Strategy, Marketing Mix, Segmentation, Targeting Positioning.

Learning Resources

Text Books:

[1] P.Subba Rao, "**Management and Organisational Behaviour, Text and Cases**", Himalaya Publishing House, Mumbai, 2012.
[2] I.M Pandey: "**Financial Management**", Vikas Publishing House Pvt. Ltd., 11th Edition, 2015.
[3] K Aswathappa: "**Human Resource Management, Text and Cases**", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

Reference Books:

[1] Gupta R S, Sharma B D Bhalla N S: "**Principles and Practice of Management**", Kalyani Publications, Hyderabad, 2008.
[2] Prasanna Chandra, "**Fundamentals of Financial Management**", McGraw Hill Education (India) Pvt. Ltd., New Delhi, 6th Edition.
[3] M.Y Khan, P K Jain: "**Financial Management-Text and Problems**", Tata McGraw Hill, New Delhi. 2003
[4] Gary Dessler: "**Human Resources Management**", PHI Private Limited, New Delhi, 2007.
[5] Ramaswamy V.S and Nama kumari S, **Marketing Management- Indian Context Global Perspective,** McGrawHill, NewDelhi, 2010

Web Resources:

[1] https://www.tutorialspoint.com/management_principles/management_principles_overview.htm
[2] https://www.tutorialspoint.com/organizational_behavior/index.htm
[3] https://www.tutorialspoint.com/human_resource_management/index.htm
[4] https://www.tutorialspoint.com/managerial_economics/investment_under_certainty.htm

20MCA2305: BIG DATA ANALYTICS

Lecture :	3 hrs/ week		Internal Assessment:	40
Tutorial :	-		Final Examination:	60
Practical:	-		Credits:	3
Course Outcomes	Upon successful completion of the course, the student will be able to:			
	CO1	It is expected that the students familiarize with traditional business intelligence and Big Data.		
	CO2	It is expected that the students recognize the challenges facing Big Data.		
	CO3	It is expected that learners identify the features of Hadoop and HDFS.		
	CO4	It is expected that the students able to differentiate RDBMS and Hadoop.		

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1			M									
	CO2		H			H			H				
	CO3		H								M		
	CO4				M			L					

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? Other Characteristics of Data which are not Definitional Traits of Big Data, Why Big Data? Are we just an Information Consumer or Do We also Produce Information?, Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment, What is New Today? What is changing in Realms of Big Data?

Big Data Analytics: Where do we Begin?, What is Big Data Analytics?, What Big Data Analytics isn't?, Why this Sudden Hype Around Big Data Analytics?, Classification of Analytics, Greatest Challenges that Prevent Businesses from Capitalizing on Big Data, Top Challenges Facing Big Data, Why is Big Data Analytics Important?, What Kind of Technologies are we Looking Toward to Help Meet the Challenges Posed by Big Data?, Data Science, Data Scientist, Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency, Few Top Analytics Tools

UNIT – II

The Big Data Technology Landscape: NoSQL, Hadoop.

Introduction to Hadoop: Introducing Hadoop, Why Hadoop?, Why not RDBMS?, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS, Processing Data with Hadoop, Managing

Resources and Applications with Hadoop YARN, Interacting with Hadoop Ecosystem.

UNIT – III

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing.
Understanding Big Data Technology Foundations: Exploring the Big Data Stack, Virtualization and Big Data, Virtualization Approaches.

UNIT – IV

Storing Data in Databases and Data Warehouses: RDBMS and Big Data, Non-Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouses, Big Data Analysis and Data Warehouse, Changing Deployment Models in Big Data Era.
Storing Data in Hadoop: Introducing HDFS, Introducing HBase, Combining HBase and HDFS, Selecting the Suitable Hadoop Data Organization for Applications.

Learning Resources

Text Books:

[1] Seema Acharya, Subhashini Chellappan, **"BIG DATA AND ANALYTICS",** Wiley Publications (2015)
UNIT I: Chapters**:** 1, 2, 3
UNIT II: Chapters**:** 4, 5
[2] **"BIG DATA Black Book",** DT Editorial Services, DreamTech Press (2015)
UNIT III: Chapters**:** 5, 6
UNIT IV: Chapters**:** 7, 8

Reference Books:

[1] **"Business Intelligence – Practice, Technologies and Management",** Rajiv Sabherwal, Irma Becerra – Fernandez, John Wiley 2011.
[2] **"Business Intelligence Roadmap"**, Lariss T.Moss, ShakuAtre, Addison-Wesley It Service.
[3] **"Oracle Business Intelligence: The Condensed Guide to Analysis and** Reporting**",** Yuli Vasiliev, SPD Shroff, 2012.

20MCA2351 : MACHINE LEARNING WITH PYTHON LAB

Lecture :	-		Internal Assessment:	40
Tutorial :	-		Final Examination:	60
Practical:	3 hrs/week		Credits:	1.5

	Upon successful completion of the course, the student will be able to:	
Course Outcomes	**CO1**	Recognize the characteristics of machine learning, binary classification.
	CO2	Apply the algorithms to a real problem
	CO3	Understand a wide variety of learning algorithm
	CO4	Analyze Genetic and Neural network algorithms.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	M											
	CO2	M	M	L		H							
	CO3	M	M	L									
	CO4	M		L		H							

LAB CYCLE -I

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result.

2. Extract the data from database using python.

LAB CYCLE -II

3. Implement k-nearest neighbours classification using python.
4. Implement SVD algorithm using python.

LAB CYCLE -III

5. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids).

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0

1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

6. **The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.**

   medium skiing design single twenties no ->highRisk
   high golf trading married forties yes ->lowRisk
   low speedway transport married thirties yes ->medRisk
   medium football banking single thirties yes ->lowRisk
   high flying media married fifties yes ->highRisk
   low football security single twenties no ->medRisk
   medium golf media single thirties yes ->medRisk
   medium golf transport married forties yes ->lowRisk
   high skiing banking single thirties yes ->highRisk
   low golf unemployed married forties yes ->highRisk

   Input attributes are (from left to right) income, recreation, job, status, age- group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

LAB CYCLE -IV

7. Implement linear regression using python.

8. Implement Naïve Baye's theorem to classify the English text.

Learning Resources

Text Book:

1. **Machine Learning** by Saikat Dutt , Subramanian Chandramouli, , Amit Kumar Das,Pearson,2019

Reference Books:

1. Tom M.Mitchell, **Machine Learning**, India Edition 2013,McGraw Hill Education.
2. Ethem Alpaydin, **Introduction to machine learning**, second edition, MIT press.

Web Resource:

[1] https://nptel.ac.in/courses/106/104/106104189/

20MCA2352: ADVANCED JAVA PROGRAMMING LAB

Lecture :	-				Internal Assessment:	40
Tutorial :	-				Final Examination:	60
Practical:	3 hrs/week				Credits:	1.5

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Create swing based applications.
	CO2	Create Java applications that interact with database using JDBC.
	CO3	Develop web applications with Servlets.
	CO4	Develop web applications using JSP.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	M	L			H							
	CO2		M	L		H							
	CO3		M	M		H							
	CO4		M	M		H							

LAB CYCLE -I

1. Write a swing program to create a login form that validates the user using the following components: **JLabel, JTextField and JButton.**
2. Write a sample swing application using ActionListener with the following components: JScrollPane, JList, JComboBox

LAB CYCLE -II

3. Write a JDBC program to execute a select query on database and display the results.
4. Write a JDBC program to execute an insert query on database and display the results.
5. Write a JDBC program to perform update ,delete operations on database and display the Results

LAB CYCLE -III

6. Write a HttpServlet that reads user name and prints "Hello USER NAME Welcome to Servlets concept" using doGet() method and doPost() method.
7. Write a servlet program to display the data in a table using JDBC.
8. Write a servlet program to check username and password entered by the user in database and redirect the user based on authentication.
9. Demonstrate session tracking in servlets using sessions.

LAB CYCLE -IV

10. Write a JSP page to greet the user by writing a simple function by using scripting elements.
11. Write a JSP page that performs arithmetic operations accepting data from user.
12. Write a factorial program in JSP using include directive.

Learning Resources

Text Books:

[1] "**Java: The Complete Reference**", Seventh Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi (Unit-I).
[2] "**Professional Java Server Programming**", J2EE 1.3 Edition, Subrahmanyam Allamaraju, Cedric Buest, APress Publications (Unit – II, Unit-III, and Unit-IV).

Reference Books:

[1] Robert W. Sebesta, "**Programming the World Wide Web**", Third Edition, Pearson Education.
[2] Chris Bates, "**Web Programming–Building Internet Applications**", Second Edition, Wiley.
[3] Jeffrey C. Jackson, "**Web Technologies – A Computer Science Perspective**", Pearson Education.

Web Resources: https://nptel.ac.in/courses/106/105/106105191/

20MCA3353: MINI PROJECT

Lecture	-	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	3hrs/week	Credits	1.5

Course Outcomes	Upon successful completion of the course, the student will be able to												
	CO1	Transform the theoretical knowledge studied so far into a working model of a computer/information system.											
	CO2	Gain experience in industry, academic institutions and research laboratories and implementation of a small project.											
	CO3	Acquire the necessary confidence to carry out main project in the final year.											

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	H	H	H		H				M			
	CO2	H	H	H		H				H			
	CO3	H	H	M		M				M			

20MCA2401A: SOFTWARE TESTING METHODOLOGIES

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

Course Outcomes		Upon successful completion of the course, the student will be able to
	CO1	Understand the principles of testing and software development life cycle models.
	CO2	Analyze the functional, non-functional and performance testing techniques.
	CO3	Solve the different testing problems using software test models and strategies.
	CO4	Evaluate the testing types and the key contributors to the success of testing organizations.

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	H											
	CO2		H			H							
	CO3			H									
	CO4					H							

UNIT – I

Principles of Testing: Context of Testing in Producing Software, The Incomplete Car, Dijkstra's Doctrine, A Test in Time!, The Cat and the Saint, Test the Tests First!, The Pesticide Paradox, The Convoy and the Rags, The Policemen on the Bridge, The Ends of the Pendulum, Men in Black, Automation Syndrome.
Software Development Life Cycle Models: Phases of Software Project, Quality, Quality Assurance, and Quality Control, Testing, Verification, and Validation, Process Model to Represent Different Phases, Life Cycle Models.

UNIT – II

System and Acceptance Testing: System Testing Overview, Why is System Testing Done?, Functional versus Non-Functional Testing, Functional System Testing, Non-Functional Testing, Acceptance Testing, Summary of Testing Phases.
Performance Testing: Introduction, Factors Governing Performance Testing, Tools for Performance Testing, Process for Performance Testing, Challenges.

UNIT – III

Regression Testing: What is Regression Testing, Types of Regression Testing, When to do Regression Testing?, How to do Regression Testing?, Best Practices in Regression Testing.
Ad hoc Testing: Overview of Ad Hoc Testing, Buddy Testing, Pair Testing, Exploratory Testing, Iterative Testing, Agile and Extreme Testing, Defect Seeding.

UNIT – IV

Usability and Accessibility Testing: What is Usability Testing?, Approach to Usability, When to do Usability Testing?, How to Achieve Usability?, Quality Factors for Usability, Aesthetics Testing, Accessibility Testing, Tools for Usability, Usability Lab Setup, Test Roles for Usability.
Organization Structures for Testing Teams: Dimensions of Organization Structures, Structures in Single-Product Companies, Structures for Multi-Product Companies, Testing Services Organizations, Success Factors for Testing Organizations.

Learning Resources

Text Book:

[1] **"Software Testing Principles and Practices",** Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Education.
   UNIT I: Chapters: 1.1, 1.3 to 1.13, 2.1 to 2.5
   UNIT II: Chapters: 6.1 to 6.7, 7.1 to 7.2, 7.4 to 7.6
   UNIT III: Chapters: 8.1 to 8.5, 10.1 to 10.7
   UNIT IV: Chapters: 12.1 to 12.10, 14.1 to 14.3, 14.5 to 14.6

Reference Books:
   [1] **"Software Testing Tools",** Dr. K.V.K.K.Prasad, Dream Tech Press.
   [2] **"The craft of software Testing",** Brian Marick, Pearson Education.
   [3] **"Software Testing in the Real World",** Edward Kit, Pearson.
   [4] **"Art of Software Testing",** Meyers, John Wiley.

NPTEL Web Resource:

   [1] https://www.digimat.in/nptel/courses/video/106105150/L01.html

20MCA2401B: ANGULAR JS

Lecture	3 hrs/week	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	3

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Understand the basic concepts of AngularJS, Ajax & jQuery.
	CO2	Understand of framework of AngularJS.
	CO3	Develop different AngularJS components of web application.
	CO4	Implement Single page web Application

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- High)		PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12
	CO1	L		L				H					
	CO2	L	M	M									
	CO3	M		H		M		M					
	CO4		M				M	M					

UNIT – I

AngularJS prerequisites (HTML, CSS, JavaScript), AngularJS and it features, Advantages and Disadvantages, AngularJS introduction, AngularJS setup.
JQUERY: Basics of JQuery, Effects using JQuery, JQuery HTML, JQuery traversing.
AJAX: Ajax Introduction, Methods in Ajax (load (), get (), post ()).

UNIT – II

Basics of AngularJS, Angular Expressions, Modules, Directives, Controllers.

UNIT – III

Angular Models, Data-Binding, Scopes, Filters, Forms, Events

UNIT – IV

Angular Tables, Services, Http (Ajax), Routing, AngularJS Dependency Injection, Build Sample AngularJS Applications.

<u>Learning Resources</u>

Text Books:

[1] AngularJS, JavaScript, and jQuery All in One, Sams Teach Yourself by Brad Dayley, Brendan Dayley,2015
[2] Angular Up and Running: Learning Angular, Step by Step, by Shyam Seshadri,2018

Web Resources:

[1] https://www.edureka.co/blog/angular-tutorial/
[2] https://www.w3schools.com/angular/
[3] https://www.guru99.com/angularjs-introduction.html
[4] https://thinkster.io/a-better-way-to-learn-angularjs
[5] https://www.w3schools.com/jquery/default.asp
[6] https://www.w3schools.com/js/js_ajax_intro.asp
[7] http://www.tutorialsteacher.com/angularjs/angularjs-tutorials
[8] https://www.javatpoint.com/angularjs-tutorial
[9] https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf
[10] https://coursetro.com/courses/12/Learn-Angular-4-from-Scratch
[11] https://www.youtube.com/watch?v=nO1ROKMjPqI&list=PLvZkOAgBYrsS_ugya msNpCgLSmtIXZGiz

20MCA2401C: CLOUD COMPUTING

Lecture :	3 hrs/ week		**Internal Assessment:**	40
Tutorial :	-		**Final Examination:**	60
Practical:	-		**Credits:**	3

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Analyze the architecture, services and models of cloud computing
	CO2	Deploy applications for storing data and accessibility in different cloud ecosystems
	CO3	Interpret local cloud and virtualization techniques based on application requirements
	CO4	Identify real time cloud applications in different scenarios appropriate to society

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
	CO1	L	L								H		
	CO2	L	M	H		L							
	CO3				H				L				
	CO4			L			H						

UNIT – I

Cloud Computing Basics: Cloud Computing Overview, Applications, Intranets and the cloud.
Your Organization and Cloud Computing: When you can use cloud computing, Benefits, Limitations.
Cloud computing with the Titans: Google, Microsoft, and Amazon.
The Business case for going to the cloud: Cloud computing services, How those applications help your business.

UNIT – II

Hardware and Infrastructure: Clients, Security, Network.
Accessing the Cloud: Platforms, Web Applications, Web APIs, Web Browsers.
Cloud Storage: Cloud Storage Providers
Standards: Application, Client.

UNIT – III

Software as a service: Overview, Driving Forces, Company offerings.
Software plus Services: Overview, Mobile Device Integration.
Developing Applications: Google, Microsoft, Intuit Quick Base, Cast Iron Cloud, Bungee Connect.

UNIT – IV

Local clouds and Thin Clients: Virtualization, Server Solutions, Thin Clients.
Migrating to the Cloud: Cloud Services for Individuals, Cloud services aimed at the mid-market.
Best practices and the future of cloud computing: Best Practices.

Learning Resources

Text Book:

[1] Anthony T.Velte, Toby.J Velte, Robert Elsenpeter, **"Cloud Computing: A Practical Approach",** Tata McGraw- Hill, 2010.

Reference Books:

[1] "**Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online**", Michael Miller, Que Publishing, 2008.

[2] George Reese **"Cloud Applications Architectures: Building Applications and Infrastructure in the cloud"**, O'Reilly.

[3] **"Cloud Computing implementation, management and security",** John W. Rittinghouse, James F.Ransome, CRC Press, Taylor & Francis group,2010.

[4] Beard Haley, **"Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs",** 2008, Emereo Pvt. Limited.

20MCA3451: MAJOR PROJECT

Lecture	-	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	24 hrs/week	Credits	12

		Upon successful completion of the course, the student will be able to
Course Outcomes	**CO1**	Develop quality software using the software engineering principles.
	CO2	Perform coding for the project using latest programming languages.
	CO3	Perform various systems testing techniques/strategies to include the phases of testing.
	CO4	Perform various systems testing techniques/strategies to include the phases of testing.

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	H	H	H		H				M			
	CO2	H	H	H		H				H			
	CO3	H	H	M		M				M			
	CO4	H	H	M		M				H			