DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Scheme of Instruction

and

Syllabus of

M.C.A (Master of Computer Applications)

Full-Time

2023-24

UNIVERSITY COLLEGE OF ENGINEERING
(Autonomous)
Osmania University
Hyderabad – 500 007, TS, INDIA

INSTITUTE

Vision

The Vision of the institute is to generate and disseminate knowledge through harmonious blending of science, engineering and technology. To serve the society by developing a modern technology in students‟ heightened intellectual, cultural, ethical and humane sensitivities, fostering a scientific temper and promoting professional and technological expertise.

Mission

- To achieve excellence in Teaching and Research
- To generate , disseminate and preserve knowledge
- To enable empowerment through knowledge and information
- Advancement of knowledge in Engineering, Science and Technology
- Promote learning in free thinking and innovative environment
- Cultivate skills, attitudes to promote knowledge creation
- Rendering socially relevant technical services for the community
- To impart new skills of technology development
- To inculcate entrepreneurial talents and technology appreciation programmes
- Technology transfer and incubation

DEPARTMENT

Vision

To be a leading academic department in the area of Computer Science and Information Technology with Learning and research processes of global standards that contribute to innovations in various scientific disciplines and societal needs and also motivate young engineers to face future technological challenges.

Mission

- To achieve excellence in teaching in the field of Computer Science and Engineering
- To promote learning in free thinking and innovative environment with the state-of-art-technologies
- To cultivate skills to promote information and communication technology
- Advancement of knowledge in various specializations of Computer Science and Engineering
- To impart skills to develop technical solutions for societal needs and inculcate Entrepreneurial talents

Programme Educational Objectives (PEO)

The graduating students of the Computer Science and Engineering program will be able:

PEO 1	To understand the principles and methods in computer science and their applications in various fields.
PEO 2	To acquire systems thinking to evaluate alternate computing solutions with economics and environmental considerations.
PEO 3	To acquire research and technical communication skills.
PEO 4	To impart professional ethics and lifelong learning skills for professional advancement.

Programme Outcomes (PO)

PO 1	An ability to apply principles, methods in design and development of software systems.
PO 2	An ability to analyze problems, developing algorithmic solutions in multiple domains
PO 3	To demonstrate the usage of software tools and technologies, industry practices in the design of software system
PO 4	Able to apply system thinking in designing and evaluation of sustainable solutions with professional ethics.
PO 5	Able to do research and develop solutions to practical problems
PO 6	Able to do systematic literature survey, identify emerging trends and prepare technical reports.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, U.C.E., O.U

MASTER OF COMPUTER APPLICATIONS (MCA)

Type of course	Course Code	Course Name	Contact Hours Per Week			Scheme of Evaluation		Credits
			L	T	P	CIE	SEE	
SEMESTER-I								
Core-I	PCC 101	Mathematical Foundations of Computer Science	4	-	-	40	60	4
Core-II	PCC 102	Data Structures using C	4	-	-	40	60	4
Core-III	PCC 103	Object Oriented Programming Using Java	3	-	-	40	60	3
Core-IV	PCC 104	Computer Architecture	3	1	-	40	60	3
Core V	PCC 105	Probability and Statistics	3	1	-	40	60	3
Core VI	MGC 106	Managerial Economics and Accountancy	3	1	-	40	60	3
Lab-I	LCC 151	Data Structures using C Lab	-	-	3	25	**50**	2
Lab -II	LCC 152	Java Programming Lab	-	-	3	25	**50**	2
Lab-III	HSC 151	Soft Skills Lab	-	-	3	25	**50**	2
TOTAL			**20**	**3**	**9**	**315**	**510**	**26**
SEMESTER-II								
Core – VII	PCC 201	Operating Systems	3	-	-	40	60	3
Core – VIII	PCC 202	Database Management Systems	3	-	-	40	60	3
Core – IX	PCC 203	Design and Analysis of Algorithms	3	-	-	40	60	3
Core – X	PCC 204	Data Engineering with Python	3	-	-	40	60	3
Core – XI	PCC 205	Machine Learning	3	-	-	40	60	3
Core – XII	MGC206	Operations Research	3	-	-	40	60	3
Lab-IV	LCC 251	Operating Systems Lab	-	-	3	25	**50**	2
Lab-V	LCC 252	Data Engineering with Python Lab	-	-	3	25	**50**	2
Lab- VI	LCC 253	Database Management Systems Lab	-	-	3	25	**50**	2
Mini Project	LCC 254	Mini Project	-	-	4	25	**50**	2
TOTAL			**18**	**-**	**13**	**340**	**560**	**26**
SEMESTER-III								
Core-XIII	PCC 301	Software Engineering	3	-	-	40	60	3
Core-XIV	PCC 302	Computer Networks	3	-	-	40	60	3
Core- XV	PCC 303	Artificial Intelligence	3	-	-	40	60	3
Core –XVI	PCC 304	Web Technologies	3	-	-	40	60	3
Professional Elective- I	PEC 311	Software Quality & Testing	3	-	-	40	60	3
	PEC 312	Distributed Systems						
	PEC 313	Internet of Things						
	PEC 314	Image Processing						
Professional Elective-II	PEC 321	Network Security	3	-	-	**40**	**60**	3
	PEC 322	Cyber Security						
	PEC 323	Information Retrieval System						
	PEC 324	Natural Language Processing						
Lab-VII	LCC351	Computer Networks Lab	-	-	3	25	50	2
Lab-VIII	LCC352	Software Engineering Lab	-	-	3	25	50	2
Lab-IX	LCC353	Web Technologies Lab	-	-	3	25	50	2

TOTAL			**18**		**9**	**315**	**510**	**24**
SEMESTER-IV								
Professional Elective- III	PEC411	Block Chain Technologies	3	-	-	40	60	3
	PEC412	Big Data Analytics						
	PEC413	Cloud Computing						
	PEC414	Deep Learning						
Professional Elective- IV	PEC421	Distributed Database Systems	3	-	-	40	60	3
	PEC422	Digital Forensics						
	PEC423	Optimization Techniques						
	PEC424	Enterprise Architecture						
Open Elective	OE 431	Professional Ethics	3	-	-	40	60	3
	OE 432	Constitution of India						
	OE 433	Disaster Management						
	OE 434	Organization Behaviour						
	OE 435	Intellectual Property & Cyber Law						
	OE 436	Environmental Science						
Project	Proj 401	Project Work	-	-	24	50	100	12
TOTAL			**9**	**-**	**24**	**170**	**280**	**21**
GRAND TOTAL			**65**	**3**	**55**	**1140**	**1860**	**98**

PCC : Professional Core Course
PEC: Professional Elective Course
OE: Open Elective
LCC: Laboratory Core Course
MGC: Management Course

CIE: Continuous Internal Evaluation
SEE: Semester End Examination
L:Lecture
P: Practical
T: Tutorial

PCC 101	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE					
CORE - I						
Pre-requisites			**L**	**T**	**P**	**C**
			4	-	-	4
Evaluation	**SEE**	**60 Marks**	**CIE**		**40** Marks	

Course Objectives:	
1	To learn logic theory and relations and functions
2	To study graph theory and concepts of trees
3	To gain insights into recurrence relation

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Understand the basic functions and relations and solve problems
CO-2	Solve the recurrence relations
CO-3	Apply various algebraic structures.
CO-4	Analyze the different applications of Computer science as graph theory problems

UNIT – I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.
Set Theory: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams.
Properties of the Integers: The well – ordering principle, Recursive Definitions, Division Algorithms, Fundamental theorem of Arithmetic.

UNIT – II

Relations and Functions: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.
Relations: Partial Orders, Equivalence Relations and Partitions.
Principle of Inclusion and Exclusion: Principles of Inclusion and Exclusion, Generalization of Principle.

UNIT – III

Generating Functions: Introductory Examples, Definition And Examples, Partitions of Integers.
Recurrence Relations: First – order linear recurrence relation, second – order linear homogenous recurrence relation with constant coefficients..

UNIT – IV

Algebraic Structures: Algebraic System – General Properties, Semi Groups,

Monoids, Homomorphism, Groups, Residue Arithmetic.

UNIT –V
Graph Theory: Definitions and examples, sub graphs, complements and graph Isomorphism, Vertex degree, Planar graphs, Hamiltonian paths and Cycles. **Trees:** Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

Suggested Reading:

1	Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, **Discrete Mathematics for Computer Scientists & Mathematicians**, Prentice Hall NJ, 2nd Edition, 2015
2	P. Tremblay and R Manohar **Discrete Mathematical Structures with Applications to Computer Science**, McGraw Hill, 1987
3	R.K.Bisht and H.S.Dhami, **Discrete Mathematics** Oxford Higher Education, 2015
4	Bhavanari Satyanarayana, Tumurukota Venkata Pradeep Kumar and Shaik MohiddinShaw, **Mathematical Foundation of Computer Science,** BSP, 2016

PCC 102	DATA STRUCTURES USING C					
	CORE - II					
Pre-requisites			L	T	P	C
			4	-	-	4
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
1	To learn the linear and non-linear data structures
2	To learn how to represent data using graph data structure
3	To learn the basic sorting and searching algorithms

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Implement linear and non-linear data structure operations using C
CO-2	Apply hashing concepts for a given problem
CO-3	Modify or suggest new data structure for an application
CO-4	Appropriately choose the sorting algorithm for an application.

UNIT – I

C PROGRAMMING BASICS : Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT – II

FUNCTIONS, POINTERS, STRUCTURES AND UNIONS: Functions – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic. Structures and unions – definition – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives.

UNIT – III

LINEAR DATA STRUCTURES: Arrays and its representations : Stacks and Queues – Applications, Linked lists – Single, circular and doubly Linked list-Application.

UNIT – IV

NON-LINEAR DATA STRUCTURES: Trees – Binary Trees – Binary tree representation and traversals , – Applications of trees. Binary Search Trees , AVL trees. Graph and its representations – Graph traversals.

UNIT –V
SEARCHING AND SORTING ALGORITHMS: Linear Search – Binary Search. Sorting: Selection Sort, Bubble Sort, Insertion sort , Merge sort , Quick Sort Hashing, Types of Hashing. Collision resolution techniques

Suggested Reading:

1	Brian W. Kernighan / Dennis Ritchie ,The C Programming Language ,Second Edition , Pearson 2015.
2	Pradip Dey and Manas Ghosh, ―Programming in C, Second Edition, Oxford University Press, 2011
3	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C, Second Edition, University Press, 2008
4	Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
5	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms, Pearson Education, 1983.

PCC 103	OBJECT ORIENTED PROGRAMMING USING JAVA					
CORE - III						
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1	To Learn the basics of object oriented programming
2	To study Java I/O mechanisms and develop graphics based JAVA programs
3	To learn the basic of Swing framework.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Explain OOPs features and concepts
CO-2	Use various built-in Java classes and methods
CO-3	Create window based Java programs

UNIT – I

Object Oriented System Development: Understanding Object Oriented Development, Understanding Object Concepts, Benefits of Object Oriented Development.

Java Programming Fundamentals: Introduction, Overview of Java, Data Type, Variables and Arrays, Operators, Control statements, Classes, Methods, Inheritance, Packages and Interfaces, Inner Classes.

UNIT – II

I/O basics, Stream and Byte classes, Character Streams, Reading Console input and output, Print Writer Class, String Handling, Exceptions Handling, Multithreaded Programming.

UNIT – III

Exploring Java Language, Collections Overview, Collections Interfaces, Collections Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy classes and interfaces, Sting Tokenizer, BitSet, Date, Calendar, Timer.

UNIT – IV

Introducing AWT working With Graphics: AWT Classes, Working with Graphics.
Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces.

AWT Controls: Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, CheckboxGroup, Choice Controls, Using Lists, Managing Scroll Bars, Using TextField, Using TextArea, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, FileDialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

UNIT –V
Introduction to Swing Package, Java I/O classes and interfaces, Reading and Writing Files, Serialization, Introduction to Java Network Programming, Object Class, Exploring Image package.

Suggested Reading:

1	Herbert Schildt, **The Complete Reference Java**, 9th Edition, Tata McGra Hill, 2005.
2	Bruce Eckel, **Thinking in Java**, 4th Edition, Pearson Education, 2009
3	Dietel and Dietel, **Java: How to Program,** 5th Edition, Prentice Hall, 2007
4	James M Slack, **Programming and Problem solving with JAVA**, Thomson Learning, 2002
5	C Thomas Wu, **An Introduction to Object Oriented programming with Java**, Tata McGraw Hill, 2005

PCC 104	COMPUTER ARCHITECTURE					
	CORE - IV					
Pre-requisites			L	T	P	C
			3	1	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
1	To Learn the basics of data representations and register micro operations
2	To study CPU architecture and Computer Arithmetic algorithms
3	To learn the basics of I/O organization.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Apply data representation methods
CO-2	Understand the CPU architecture and write Computer Arithmetic algorithms
CO-3	Analyze the I/O operations basics

UNIT – I

Data Representation: Data types, Complements, Fixed and Floating Point representations, and Binary codes.
Overview of Computer Function and Interconnections: Computer components, Interconnection structures, Bus interconnection, Bus structure, and Data transfer.

UNIT – II

Register Transfer Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro operations, Arithmetic Logic Shift Unit. **Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instruction, Input-Output and Interrupt.

UNIT – III

Micro programmed Control: Control memory, Address Sequencing, Micro program example, Design of Control Unit.
Central Processing Unit: General Register Organization, Stack Organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, and Program control. **Computer Arithmetic:** Addition and Subtraction, Multiplication, Division, and Floating Point Arithmetic Operations.

UNIT – IV

Memory Organization: Memory Hierarchy, Main Memory, RAM and ROM, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory

Management hardware.

UNIT –V
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), I/O Processor, Serial Communication. **Pipeline Processing:** Arithmetic, Instruction and RISC Pipelines. **Assessing and Understanding Performance:** CPU performance and its factors, Evaluating performance.

Suggested Reading:

1	Morris Mano M, **Computer System Architecture**, Pearson Education India, 3rd Edition, 2007.
2	William Stallings, **Computer Organization and Architecture**, PHI, 7th Edition, 2008.
3	David A Patterson, John L Hennessy, **Computer Organization and Design**, Morgan Kaufmann, 5th Edition, 2013.
4	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, **Computer Organization,** Tata McGraw-Hill Education, 5th Edition, 2002.

PCC 105	**PROBABILITY AND STATISTICS**					
CORE - V						
Pre-requisites			**L**	**T**	**P**	**C**
			3	1	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1	To Understand the Linear Algebra concepts through vector spaces.
2	To learn concepts of probability, discrete and continuous probability distributions
3	To learn the hypotheses testing and acquiring knowledge of basic statistical Inference and its applications..

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Calculate probabilities by applying probability laws and theoretical results, knowledge of important discrete and continuous distributions, their inter relations with real time applications.
CO-2	Understand the use of sample statistics to estimate unknown parameters.
CO-3	Compute and interpret Correlation Analysis, regression lines and multiple regression analysis with applications

UNIT – I

Vector Spaces - Vector Spaces and Subspaces -Null Spaces, Column Spaces and Linear Transformations. Linearly Independent Sets - Bases - Coordinate Systems.

UNIT – II

Probability - Basic terminology, Three types of probability, Probability rules, Statistical independence, statistical dependency, Bayes' theorem.
Probability Distributions - Random variables, expected values, binomial distribution, Poisson distribution, normal distribution, choosing correct distribution

UNIT – III

Sampling and Sampling Distributions - Random sampling, Non-Random Sampling distributions, operational considerations in sampling.
Estimation - Point estimates, interval estimates, confidence intervals, calculating interval estimates of the mean and proportion, t-distribution, determination of sample size in estimation.

UNIT – IV

Testing Hypothesis - **one sample tests** - Hypothesis testing of mean when the population standard deviation is known, powers of hypotheses test, hypotheses

testing of proportions, hypotheses testing of means when standard deviation is not known.

Testing Hypotheses - Two sample tests - Tests for difference between means - large sample, small sample, with dependent samples, testing for difference between proportions – Large sample.

UNIT –V

Chi-square and Analysis of Variance - chi-square as test of independence, chi-square as a test of goodness of fit, analysis of variance, inferences about a population variance, inferences about two population variances.

Regression and Correlation – Simple Regression - Estimation using regression line, correlation analysis, making inferences about population parameters, limitations, errors and caveats in regression and correlation analysis. Multiple Regression and correlation analysis. Finding multiple regression equations and making inferences about population parameters.

Suggested Reading:

1	David C Lay, Linear Algebra and its Applications 4e.
2	Richard I Levin, David S Rubin - Statistics for Management, Seventh Edition, PHI -1997.
3	R D Sharma " Theory and Problems of Linear Algebra", International Publishing House Pvt. Limited, 2011.
4	A K Sharma, " Linear Algebra", Discovery Publishing House Ltd., 2019
5	Gilbert Strang, Linear Algebra and its Applications, 2010
6	S. C. Gupta and V. K. Kapoor , Fundamentals of Mathematical Statistics Sultan Chand &Sons, New Delhi.

PCC 106	MANAGERIAL ECONOMICS AND ACCOUNTANCY					
CORE - VI						
Pre-requisites			L	T	P	C
			3	1	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
1	To learn important concepts of Managerial Economics and apply them to evaluate business decisions.
2	To understand various parameters that determine the consumers' behavior and to evaluate the factors that affect production
3	To understand the concepts of capital budgeting and payback period and concepts of various book-keeping methods.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Apply the fundamental concepts of managerial economics to evaluate business decisions Understand types of Demand and factors related to it..
CO-2	Identify different types of markets and determine price –output under perfect competition
CO-3	Determine working capital requirement and payback and Analyze and interpret financial statements through ratios

UNIT – I

Meaning and Nature of Managerial Economics: Managerial Economics and its usefulness to Engineers, Fundamental Concepts of Managerial Economics-Scarcity, Marginalism, Equi-marginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

UNIT – II

Law of Demand and Supply: Law of Demand, Determinants, Types of Demand; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply and Concept of Equilibrium.

UNIT – III

Theory of Production and Markets: Production Function, Law of Variable Proportion, ISO quants, Economics of Scale, Cost of Production (Types and their measurement), Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price - Output determination under Perfect Competition and Monopoly

UNIT – IV

Working Capital Management and Capital Budgeting: Concepts, Significance, determination and estimation of fixed and **variable**, working capital requirements, sources of capital. Introduction to capital budgeting, methods – traditional and modern methods with problems.

UNIT –V
Accounting: Meaning-Significance-Principles of double entry book keeping, Journal, Ledger accounts , Subsidiary books, , Trial Balance, preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios. (Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios)

Suggested Reading:

1	Mehta P.L., Managerial Economics —Analysis, Problems and Cases , Sultan Chand & Sons Educational Publishers, 2011
2	Maheswari S.N., Introduction to Accountancy , Vikas Publishing House, 2005
3	Pandey I.M., Financial Management , Vikas Publishing House, 2009
4	S P Jain and K L Narang, "Financial Accounting" , Kalyan Publishers, 2018
5	M Hanif and A Mukherjee "Modern Accountancy", McGraw Hill, 3rd Edition, 2018

LCC 151	**DATA STRUCTURES USING C LAB**					
LAB – I						
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	3	2
Evaluation	**SEE**	**50 Marks**	**CIE**		**25 Marks**	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Understand and implement basic data structures using C
2	Apply linear and non-linear data structures in problem solving
3	Implement searching and sorting algorithms

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Use appropriate linear data structure in a given application
CO-2	Implement functions and recursive functions in C for a given application
CO-3	Use different search trees for practical problems
CO-4	Application string matching algorithms in different domains

1. Basic C Programs – looping, data manipulations, Arrays
2. Programs using strings – string function implementation
3. Programs using structures and pointers
4. Programs involving dynamic memory allocations
5. Array implementation of stacks and queues
6. Linked list implementation of stacks and queues
7. Application of Stacks and Queues
8. Implementation of Trees, Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Linear search and binary search
11. Implementation Insertion sort, Bubble sort, Quick sort and Merge Sort
12. Implementation Hash functions, Collision resolution techniques

LCC 152	**JAVA PROGRAMMING LAB**					
LAB – II						
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	3	2
Evaluation	**SEE**	**50 Marks**	**CIE**		**25 Marks**	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Understand and implement basic programs using Java
2	Apply multithreaded concepts in problem solving
3	Implement serialization programs

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Use appropriate data structure in a given application
CO-2	Implement functions and multi threaded concepts for a given application
CO-3	Write URL class programs
CO-4	Write serialization programs

Programs

1. Write a program to calculate salary of n employees using concept of classes with constructors and methods.
2. Write a program to demonstrate e-commerce website using inheritance, abstract class and dynamic polymorphism.
3. Write a program to demonstrate various arithmetic calculations using packages.
4. Write a program to demonstrate client-server environment using multithreading.
5. Write a program to demonstrate mutual exclusion using thread synchronization.
6. Write a program to demonstrate Linked list class.
7. Write a program to demonstrate Hash set and Iterator classes.
8. Write a program to demonstrate Enumeration and Comparator interfaces.
9. Write a program to accept data and display output in key, value pair.
10. Write a program to create a registration form with different controls, menus and demonstrate event handling.
11. Write a program to copy data from one file to another file.
12. Write a program to merge contents of two files and display output on console.
13. Write a program to illustrate Serialization.
14. Write a program to retrieve web page using URL class.
15. Write a program to load and display image and perform gray scale.

HSC 153	**SOFT SKILLS LAB**					
	LAB – III					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	3	2
Evaluation	**SEE**	**50 Marks**	**CIE**		**25 Marks**	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Conversation skills and reading strategies
2	Time management and stress management

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Express conversational skills and Specify reading strategies
CO-2	Perform time management and Perform stress management
CO-3	Explore career planning

Activities

1. Conversation skills, Listening dialogues from TV/radio/Ted talk/Podcast
2. **G**roup discussion
3. Interview skills, Making presentation
4. Listening to Lectures and News Programmes, Listening to Talk show
5. Watching videos on interesting events on Youtube,
6. Reading different genres of tests ranging from newspapers to philosophical treatises
7. Reading strategies – graphic organizers, Reading strategies – summarizing
8. Reading strategies – interpretation, Reports
9. Cover letter, Resume,
10. Writing for publications, Letters, Memos, Emails and blogs
11. Civil Service (Language related), Verbal ability
12. Motivation, Self image
13. Goal setting, Managing changes
14. Time management, Stress management
15. Leadership traits
16. Team work
17. Career and life planning.
18. Multiple intelligences
19. Emotional intelligence
20. Spiritual quotient (ethics)
21. Intercultural communication
22. Creative and critical thinking
23. Learning styles and strategies

Suggested Readings:

1	Business English Certificate Materials, Cambridge University Press
2	Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London
3	International English Language Testing System Practice Tests, Cambridge University Press.
4	Interactive Multimedia Programs on Managing Time and Stress
5	Personality Development (CD-ROM), Times Multimedia, Mumbai
6	Robert M Sherfield "Developing Soft Skills" 4th Edition, Pearson Education, 2009.

Web Sources

http://www.slideshare.net/rohitjsh/presentation-on-group-discussion
http://www.washington.edu/doit/TeamN/present_tips.html
http://www.oxforddictionaries.com/words/writing-job-applications
http://www.kent.ac.uk/careers/cv/coveringletters.htm
http://www.mindtools.com/pages/article/newCDV_34.htm

SEMESTER – II

PCC 201	OPERATING SYSTEMS					
	CORE - VII					
Pre-requisites			L	T	P	C
			3	1	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
1	To gain the understanding of operating system the details of process.
2	To learn the types and architecture of computer memory and file system and its implementation
3	To realize the operating system concepts into case studies

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Illustrate the workings of various OS components and process states.
CO-2	Demonstrate paging, demand paging, page replacement and segmentation with illustrations
CO-3	Elaborate the file access and allocation methods

UNIT – I
Unix: Introduction, commands, file system, security and file permission, regular expression and grep, shell programming, awk. **Introduction to Operating Systems**: OS structure and strategies, Process concepts, Multithreaded Programming, Process scheduling, Process synchronization, Deadlocks.

UNIT – II
Memory management strategies with example architectures: Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging, Virtual memory management, Demand paging, Page replacement, Thrashing.

UNIT – III
File System Interface: File concepts, Access methods and protection. File system implementation: File system structure, Allocation methods, Directory implementation of file systems, Mass storage structures, I/O systems

UNIT – IV
System Protection : Principles and Domain, Access Matrix and implementation, Access control and access rights, Capability based systems, Language based Protection, **System Security**: Problem, Program threats, cryptography, user authentication, implementing security defenses, Firewalling, Computer security Classification

UNIT –V
Case Studies: The Linux System–Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and Output, Inter process communication. Windows 7 –Design principles, System components, Terminal services and fast user switching File systems, Networking, Programmer interface.

Suggested Reading:

1	Abraham Silberschatz, Peter B Galvin, Operating System Concepts, 9th Edition, Wiley, 2016
2	William Stallings, Operating Systems-Internals and Design Principles, 8th Edition, Pearson, 2014
3	Andrew S Tanenbaum, Modern Operating Systems, 4th Edition, Pearson, 2016.

PCC 202	**DATABASE MANAGEMENT SYSTEM**					
CORE - VII						
Pre-requisites			**L**	**T**	**P**	**C**
			3	1	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1	To learn concepts along with ER modeling and about relational databases
2	To learn SQL query language and advanced SQL
3	To understand the transactions and explore NoSQL

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Explain the concepts and model requirements as ER-model.
CO-2	Suggest relational algebra queries from text specification
CO-3	Elaborate indexing and hashing and describe concurrency control concepts NoSQL technology

UNIT – I

Introduction: Database System Applications, Purpose of Database Systems, View of Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database, Joined Relations Data, Database Languages, Relational Databases, Database Design, Object–based and Semi-structured Databases, Data Storage and Querying, Transaction Management, Data Mining and Analysis, Database Architecture, Database Users and Administrators. Database Design and the **E-R Model**: Overview of the Design Process, The Entity- Relationship Model, Constraints, Entity-Relationship Diagrams, Entity – Relationship Design Issues, Weak Entity Sets, Extended E-R Features, Database Design for Banking Enterprise, Reduction to Relational Schemas, Other Aspects of Database Design

UNIT – II

Relational Model: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational – Algebra Operations, Extended Relational - Algebra Operations, Null Values, Modification of the Databases. Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null

UNIT – III

Advanced SQL: SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL, Functions and Procedural Constructs, Recursive Queries, Advanced SQL Features. Relational Database Design: Features of Good Relational Design, Atomic Domains and First Normal Form,

Functional-Dependency Theory, Decomposition using Functional Dependencies.

UNIT – IV
Indexing and Hashing: Basic Concepts, Ordered Indices, B+-tree Index Files, B-tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices. Index Definition in SQL Transactions: Transaction Concepts, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability

UNIT –V
Concurrency Control: Lock-based Protocols, Timestamp-based Protocols, Validation-based Protocols, Multiple Granularity, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations, Weak Levels of Consistency, Concurrency of Index Structures. Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems **NoSQL:** Need for NoSQL, aggregate data models, more details on data models, distribution models, consistency, version stamps, map-reduce, key-value databases, document databases, column-family stores, graph databases, Schema Migrations

Suggested Reading:

1	Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw-Hill International Edition, 6th Edition, 2010.
2	Ramakrishnan, Gehrke, Database Management Systems, McGraw-Hill International Edition, 3rd Edition, 2003.
3	Elmasri, Navathe, Somayajulu, Fundamentals of Database Systems, Pearson Education,4th Edition, 2004
4	Shashank Tiwari, "Professional NoSQL", 1st Edition , Wiley publishers, 2011.

PCC 203	DESIGN AND ANALYSIS OF ALGORITHMS					
	CORE - IX					
Pre-requisites			L	T	P	C
			3	1	-	4
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
1	To learn algorithms time complexity and various data structures.
2	To learn divide and conquer approach and greedy method
3	To learn dynamic programming and backtracking methods

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Understand the algorithms time complexity and various data structures.
CO-2	Apply divide and conquer approach and greedy method based on the applications
CO-3	Analyze the dynamic programming and backtracking techniques

UNIT – I

Introduction to Algorithms: Algorithm Specification, Performance Analysis, Randomized Algorithms. **Elementary Data Structures**: Stacks and Queues, Trees, Dictionaries, Priority Queues, Sets and Disjoint Set Union, Graphs.

UNIT – II

Divide and Conquer: Binary Search, Finding the Maximum and Minimum, Merge Sort; Quick Sort, Selection sort, Strassen's Matrix Multiplication, Convex Hull.
The Greedy Method: Knapsack Problem, Tree Vertex Splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths.

UNIT – III

Dynamic Programming: General Method, Multistage Graphs, All-Pairs Shortest Paths, Single-Source Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, The Traveling Salesperson Problem.
Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees, Biconnected Components and DFS.

UNIT – IV

Back Tracking: General Method, 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles, Knapsack Problem. **Branch-Bound**: The Method, 0/1 Knapsack Problem, Traveling Sales Person.

UNIT –V
NP-Hard and NP-Complete Problems: Basic Concepts, Cook's Theorem, NP-Hard. Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation, Some Simplified NP-Hard Problems.

Suggested Reading:

1	E Horowitz, S Sahni, S Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2007.
2	R. Pannerselvam, "Design and Analysis of Algorithms", PHI, 2007.
3	Hari Mohan Pandey, "Design, Analysis and Algorithm", University Science Press, 2009.
4	TH Cormen, CE Leiserson, RL Rivert, C Stein, "Introduction to Algorithms", Third Edition, PHI, 2010.

PCC 204	DATA ENGINEERING WITH PYTHON					
	CORE - X					
Pre-requisites			L	T	P	C
			3	1	-	4
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
1	To learn how to extract raw data and clean data and basics of Python programming
2	To perform transformations on data
3	To load data and visualize the data

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Understand the python fundamentals and regular expressions
CO-2	Apply relational databases and file operations to extract data.
CO-3	Analyze the tabular numeric data and visualize data using Pyplot libraries

UNIT – I

Introduction, Parts of Python Programming Language, Control Flow Statements, Functions, Strings , Lists, Dictionaries, Tuples and sets, Files, Regular expressions

UNIT – II

Introduction to Data Science, Data Science: Data Analysis Sequence, Data Acquisition Pipeline, Report Structure **Files and Working with Text Data:** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.pathModules.
Working with Text Data: JSON and XML in Python

UNIT – III

Working with Text Data: Processing HTML Files, Processing Texts in Natural Languages
Regular Expression Operations: Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with *glob* Module
Working with Databases: Setting Up a MySQL Database, Using a MySQL Database: Command Line, Using a MySQL Database, Taming Document Stores: MongoDB

UNIT – IV

Working with Data Series and Frames: Pandas Data Structures, Reshaping Data, Handling Missing Data, Combining Data, Ordering and Describing Data, Transforming Data, Taming Pandas File I/O **Plotting**: Basic Plotting with PyPlot, Getting to Know Other Plot Types, Mastering Embellishments, Plotting with Pandas

UNIT –V
Probability and Statistics: Reviewing Probability Distributions, Recollecting Statistical measures, Doing Stats the Python way Machine Learning: Designing a Predictive Experiment, Fitting a linear regression, Grouping Data with K- means Clustering. Surviving in Random Decision Forests.

Suggested Readings:

1	Data Science Essentials in Python: Collect, Organize, Explore, Predict, Value. Dmitry Zinoriev, The Pragmatic Programmers LLC, 2016
2	Python for Everybody: Exploring Data Using Python 3. Charles R Severance, 2016
3	Python Data Analytics – Data Analysis and Science using Pandas, matplotlib and the Python Programming Language. Fabio Nelli, Apress, 2015
4	Website Scraping with Python. Using BeautifulSoup and Scrapy. GáborLászlóHajba, Apress, 2018
5	Machine Learning with Python Cookbook:.Practical Solutions from Preprocessing to Deep Learning. Chris Albon, O'Reilly 2018.

PCC 205	MACHINE LEARNING					
	CORE - XI					
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	60 Marks	CIE		40 Marks	

Course Objectives:	
1	To learn regression techniques and dimensionality reduction methods
2	To learn classification and clustering methods
3	To understand the evaluation metrics

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Solve the regression problems and dimensionality reduction methods
CO-2	Analyze the clustering mechanisms
CO-3	Explore various classification methods and evaluation metrics

UNIT – I
Basic Maths: Probability, Linear Algebra, Convex Optimization **Background**: Statistical Decision Theory, Bayesian Learning (ML, MAP, Bayes estimates, Conjugate priors)

UNIT – II
Regression: Linear Regression, Ridge Regression, Lasso **Dimensionality Reduction**: Principal Component Analysis, Partial Least Square

UNIT – III
Classification: Linear Classification, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Perceptron, Support Vector Machines + Kernels, Artificial Neural Networks + Back Propagation, Decision Trees, Bayes Optimal Classifier, Naive Bayes.

UNIT – IV
Evaluation measures: Hypothesis testing, Ensemble Methods, Bagging, Adaboost Gradient Boosting, Clustering, K-means, K-medoids, Density-based Hierarchical, Spectral

UNIT –V
Expectation Maximization, GMMs, Learning theory, Introduction to Reinforcement Learning **Graphical Models**: Bayesian Networks.

Suggested Readings:

1	Ethem Alpaydin. Introduction to Machine Learning 3e(Adaptive Computation and Machine Learning Series). The MIT Press, 2004.
2	Tom M. Mitchell, Machine Learning McGraw Hill Education, 2013

PCC 206	OPERATIONS RESEARCH					
	CORE - XII					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1	To learn linear programming and transportation problems
2	To learn classification and assignment problems and its solutions
3	To understand the gaming theory and its applications

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Solve the linear programming problems and transportation problems
CO-2	Analyze the assignment problems and its solutions
CO-3	Explore various gaming theories and its applications

UNIT – I

Linear Programming: Introduction, Concept of Linear Programming Model, Development of LP models, Graphical Method, Linear Programming Methods, Special cases of Linear Programming, Duality, Sensitivity Analysis.

UNIT – II

Transportation Problem: Introduction, Mathematical Model for 'Transportation Problem, Types of Transportation Problem, Methods to solve Transportation Problem, Transshipment Model.

UNIT – III

Assignment Problem: Introduction, Zero-One Programming Model, Types of Assignment Problem, Hungarian Method, Branch-and-Bound Technique for Assignment Problem.
Integer Programming: Introduction, Integer Programming Formulations, The Cutting-Plane Algorithm, Branch-and-Bound Technique, Zero-One Implicit Enumeration Algorithm.

UNIT – IV

Dynamic Programming: Introduction, Applications of Dynamic Programming, Solution of Linear Programming Problem through Dynamic Programming. Basics of Queuing theory.

UNIT –V

Game Theory: Introduction, Game with Pure Strategies, Game with Mixed Strategies,

Dominance Property, Graphical Method for 2 x n or m x 2 Games, Linear Programming Approach for Game Theory.

Suggested Readings:

1	Pannarselvam, "*Operations Research*", 3rd Edition, PHI, 2009
2	Prem Kumar Gupta, DS Hira, "*Problems in Operations Research*", S. Chand, 2010.
3	Rathindra P Sen, "*Operations Research - Algorithm and Application*", PHI, 2010.
4	J K Sharma, "*Operations Research*", Fourth Edition, MacMillan, 2009.

LCC 251	**OPERATING SYSTEMS LAB**					
	LAB – IV					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	3	2
Evaluation	**SEE**	**50 Marks**	**CIE**		**25 Marks**	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Understand and implement shell scripting and CPU scheduling algorithms
2	Apply memory management algorithms and synchronization methods
3	Explore file allocation strategies and disk scheduling algorithms

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Use appropriate CPU scheduling algorithms for a given application
CO-2	Implement memory management algorithms and synchronization methods
CO-3	Write disk scheduling algorithms
CO-4	Write file allocation strategies

Programs

1. Unix Shell Commands
   a) File handling commands b) Directory handling commands c) General purpose commands
2. Unix Shell Scripts
   a) Print Multiplication table of a given no. using all loops
   b) Perform all arithmetic operations
   c) Print the type of a file
   d) Rename all files whose names end with .c as .old
   e) Display the no. of lines in each of text file in a given dir
3. Simulate the following CPU scheduling algorithms.
   a. FCFS b. SJF c. Round Robin d. Priority.
4. Write a C program to simulate producer-consumer problem using Semaphores
5. Write a C program to simulate the concept of Dining-philosophers problem.
6. Simulate MVT and MFT.
7. Write a C program to simulate the following contiguous memory allocation techniques a. Worst fit b. Best fit c. First fit.
8. Simulate following page replacement algorithms
   a. FIFO
   b. LRU
   c. OPTIMAL

9. Simulate following File Organization Techniques
    a. Single level directory
    b. Two level directory
10. Simulate following file allocation strategies
    a. Sequential b. Indexed c. Linked.
11. Simulate Bankers Algorithm for Dead Lock Avoidance.
12. Simulate Bankers Algorithm for Dead Lock Prevention.
13. Write a C program to simulate disk scheduling algorithms.
    a. FCFS b. SCAN c.C-SCAN

LCC 252	DATA ENGINEERING WITH PYTHON LAB					
	LAB – V					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	3	2
Evaluation	**SEE**	**50 Marks**	**CIE**		**25 Marks**	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Understand the process of Importing and Exporting the data.
2	Identify different techniques for data analysis and data visualization
3	Learn how to collect, store and manage data from multiple data sources

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Demonstrate various data types in python and develop programs using files, exception handling, functions, classes in Python.
CO-2	Examine the process for importing and exporting the data.
CO-3	Demonstrate data visualization techniques for Data Analysis
CO-4	Apply appropriate data collection and pre-processing methods

Programs

Libraries

In this course students are expected to extract, transform and load input data that can be text files, CSV files, XML files, JSON, HTML files, SQL databases, NoSQL databases etc.,. For doing this, they should learn the following Python libraries/modules:
pandas, numpy, BeautifulSoup, pymysql, pymongo, nltk, matplotlib

Datasets

For this laboratory, appropriate publicly available datasets, can be studied and used.
Example:
MNIST (http://yann.lecun.com/exdb/mnist/),
UCI Machine Learning Repository(https://archive.ics.uci.edu/ml/datasets.html),
Kaggle(https://www.kaggle.com/datasets)
Twitter Data

Exercises

1. Write programs to parse text files, CSV, HTML, XML and JSON documents and extract relevant data. After retrieving data check any anomalies in the data, missing values etc.
2. Write programs for reading and writing binary files
3. Write programs for searching, splitting, and replacing strings based on pattern matching using regular expressions

4. Design a relational database for a small application and populate the database. Using SQL do the CRUD (create, read, update and delete) operations.
5. Create a Python MongoDB client using the Python module pymongo. Using a collection object practice functions for inserting, searching, removing, updating, replacing, and aggregating documents, as well as for creating indexes
6. Write programs to create numpy arrays of different shapes and from different sources, reshape and slice arrays, add array indexes, and apply arithmetic, logic, and aggregation functions to some or all array elements
7. Write programs to use the pandas datastructures: Frames and series as storage containers and for a variety of data-wrangling operations, such as:
    - Single-level and hierarchical indexing
    - Handling missing data
    - Arithmetic and Boolean operations on entire columns and tables
    - Database-type operations (such as merging and aggregation)
    - Plotting individual columns and whole tables
    - Reading data from files and writing data to files

Additional Exercises (for learning and practice) :

1. Introduction to Python Programming:
    A. Running instructions in Interactive interpreter and a Python Script.
    B. Write a program to purposefully raise Indentation Error and Correct it
    C. Write a program to compute distance between two points taking input from the user
    D. Write a program add python that takes 2numbers as command line arguments and prints its sum.
    E. Program to display the following information: Your name, Full Address, Mobile Number, College Name, Course Subjects
    F. Write a Program for checking whether the given number is a even number or not.
2. Control Structures, Lists
    A. Program to find the largest three integers using if-else
    B. Program that receives a series of positive numbers and display the numbers in order and their sum
    C. Program to find the product of two matrices and
    D. Program to display two random numbers that are to be added, the program should allow the student to enter the answer.
    E. If the answer is correct, a message of congratulations should be displayed.
    F. If the answer is incorrect, the correct answer should be displayed.
    G. Write a program that prints out the decimal equivalents of 1/2,1/3,1/4, .1/10.
    H. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
3. Functions and Recursion
    A. Write recursive and non-recursive functions for the following
    B. To find GCD of two integers
    C. To find the factorial of positive integer
    D. To print Fibonacci Sequence up to given number n
    E. To display prime number from 2 to n.

F. Function that accepts two arguments: a list and a number n. It displays all of the numbers in the list that are greater than n

G. Functions that accept a string as an argument and return the number of vowels and consonants that the string contains

4 Files, Exceptions, Lists, Sets, Random Numbers

A. Program to write a series of random numbers in a file from 1 to nanddisplay.

B. Program to write the content in a file and display it with a line number followed by a colon

C. Program to display a list of all unique words in a textfile

D. Program to analyse the two text files using set operations

E. Write a program to print each line of a file in reverse order.

F. Write a program to count frequency of characters in a given file. Can you use character frequency total whether the given file is a Python program file, C program file or a text file?

G. Write a program combine lists that combines these lists in to a dictionary.

5 Object Oriented Programming

A .Program to implement the inheritance

B. Program to implement the polymorphism

6. Demonstrate data analysis using NumPy
   a. Create an array of 10 zeros
   b. Create an array of even integers upto 50
   c. Create a 3x3 matrix
   d. Generate an array of 25 random numbers sampled from a standard normal distribution.
   e. Create an array of 20 linearly spaced points between 0 and 1
   f. Demonstrate slicing and indexing operations
   g. Get the sum of all columns in matrix

7. Write a Program in Python to create and combine student and subject data frames in Pandas.
8. Create a data frame 'Book' that contains three vectors [Name, Price, Author]. Convert this data frame into a matrix and list the object using the operator 'as'.
9. Performing Exploratory data analysis on web scraped data of 2021-22 NBA player stats (http://www.basketball-reference.com/)

   Perform data cleaning

   Handle missing values by replacing with 0

   Write to CSV file

   Which player scored the most points per game?

   Which player had the highest 3-point field goals per game?

   Demonstrate Group By() function

10. Data visualization through Sea born for the above program 9.

    Box plot of points scored grouped by position

    Compute the correlation matrix

11. To determine the mean of a set of numbers. To plot the numbers in a bar plot and have a straight line run through the plot at the mean.
12. To determine the median of a set of numbers. To plot the numbers in a barplot and have a straight line run through the plot at the median.
13. To determine the standard deviation. To plot the numbers in a bar plot and have a straight line run through the plot at the mean and another straight line run through the plot at mean + standard deviation.

More dataset to perform data analysis

Source of the Data: https://www.kaggle.com/chirin/africa-economic-banking-and-systemic-crisis-data/downloads/africa-economic-banking-and-systemic-crisis-data.zip/1

Data set: https://www.kaggle.com/khalidative/crimeanalysis

LCC 253	DATABASE MANAGEMENT SYSTEMS LAB					
	LAB – VI					
Pre-requisites			L	T	P	C
			-	-	3	2
Evaluation	SEE	50 Marks	CIE		25 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Learn SQL queries and PL/SQL stored procedures
2	Learn Triggers and report generation methods
3	Learn database application creation

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Write SQL queries and PL/SQL stored procedures
CO-2	Apply Triggers and report generation methods
CO-3	Analyze the database application creation

Programs

Creation of database (exercising the commands for creation)

1. Simple to Complex condition query creation using SQL Plus.
2. Usage of Triggers and Stored Procedures.
3. Creation of Forms for Student information, Library information, Pay roll etc.
4. Writing PL/SQL procedures for data validation.
5. Report generation using SQL reports.
6. Creating password and security features for applications.
7. Usage of File locking, Table locking facilities in applications.
8. Creation of small full- fledged database application spreading over 3 sessions.

Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

LCC 254	MINI PROJECT					
	Mini Project					
Prerequisites			**L**	**T**	**P**	**C**
			-	**-**	**4**	**2**
Evaluation	**SEE**	**50 Marks**	**CIE**		**25 Marks**	

Course Objectives

1	To develop capability to analyze and solve real world problems with an emphasis on applying/integrating knowledge acquired.
2.	To learn the communication and presentation of the project work

Course Outcomes

After completion of the course , Student will be able to	
CO-1	Analyze and solve real world problems.
CO-2	Implement the system using SQL, data structures, C/C++, JAVA, Python and different software engineering models.

The department will appoint a project coordinator who will coordinate the following: Collection of project topics/ descriptions from faculty members (Problems can also be invited from the industries) Grouping of students (max 3 in a group)

Allotment of project guides

The aim of mini project to develop solutions to realistic problems applying the knowledge and skills obtained in different courses, new technologies and current industry practices. This requires students to understand current problems in their domain and methodologies to solve these problems.

To get awareness on current problems and solution techniques, the first Two (2) weeks of semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R&D institutions.

After completion of these seminars each group has to formalize the project proposal based on their own ideas or as suggested by the project guide.

Seminar schedule will be prepared by the coordinator for all the students from the 5th week to the last week of the semester which should be strictly adhered to.

Each group will be required to:

1. Submit a one page synopsis before the seminar for display on notice board.
2. Give a 30 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the talk.

At least two teachers will be associated with the Mini Project to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

The seminar presentation should include the following components of the project:

*Problem definition and specification

*Literature survey

*Broad knowledge of available techniques to solve a particular problem.

*Planning of the work, preparation of bar (activity) charts

*Presentation- oral and written.

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