Scheme of Instruction and Syllabus

For

MCA- I&II semester
Regulation : R-20
2020-21

Two years MCA Program

Master of Computer Applications

With effect from the academic year 2020-21

Mahatma Gandhi University

Nalgonda
Telangana State
508254

With effect from the academic year 2020-21

SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
[Regulation : R-20]
SEMESTER- I

SNo	Course Code	Course Title	Hours/ Week			Scheme of Examination			No of Credits
						Max Marks		Duration (hrs)	
THEORY			**L**	**T**	**P**	**CIE**	**SEE**	**SEE**	**Cr**
1	PCC101	Mathematical Foundations of Computer Science	**4**	**-**	**-**	**30**	**70**	**3**	**4**
2	PCC102	Data Structures using C	**4**	**-**	**-**	**30**	**70**	**3**	**4**
3	PCC103	Object Oriented Programming using Java	**3**	**-**	**-**	**30**	**70**	**3**	**3**
4	PCC104	Computer Architecture	**3**	**1**	**-**	**30**	**70**	**3**	**3**
5	PCC105	Probability & Statistics	**3**	**1**	**-**	**30**	**70**	**3**	**3**
6	MGC106	Managerial Economics and Accountancy	**3**	**1**	**-**	**30**	**70**	**3**	**3**
PRACTICALS									
7	LCC151	Data Structures using C Lab	**-**	**-**	**3**	**25**	**50**	**3**	**2**
8	LCC152	Java Programming Lab	**-**	**-**	**3**	**25**	**50**	**3**	**2**
9	HSC153	Soft Skills Lab	**-**	**-**	**3**	**25**	**50**	**3**	**2**
			20	**3**	**9**	**255**	**570**	**-**	**26**

Abbreviation	Full Form	Abbreviation	Full Form
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
MGC	Management Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2020-21

SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
[Regulation : R-20]
SEMESTER – II

Sno	Course Code	Course Title	Hours/ Week			Scheme of Examination			No of Credits
						Max Marks		Duration (hrs)	
THEORY			**L**	**T**	**P**	**CIE**	**SEE**	**SEE**	**Cr**
1	PCC201	Operating Systems	**3**	**1**	**-**	**30**	**70**	**3**	**3**
2	PCC202	Database Management System	**4**	**-**	**-**	**30**	**70**	**3**	**4**
3	PCC203	Design and Analysis of Algorithms	**3**	**1**	**-**	**30**	**70**	**3**	**3**
4	PCC204	Artificial Intelligence	**4**	**-**	**-**	**30**	**70**	**3**	**4**
5	PCC205	Machine Learning	**3**	**-**	**-**	**30**	**70**	**3**	**3**
6	MGC206	Operations Research	**3**	**1**	**-**	**30**	**70**	**3**	**3**
PRACTICALS									
7	LCC251	Operating Systems Lab	**-**	**-**	**3**	**25**	**50**	**3**	**2**
8	LCC252	DBMS Lab	**-**	**-**	**3**	**25**	**50**	**3**	**2**
9	LCC253	AI Lab with python	**-**	**-**	**3**	**25**	**50**	**3**	**2**
			20	**3**	**9**	**255**	**570**	**-**	**26**

Abbreviation	Full Form	Abbreviation	Full Form
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
HSC	Humanities and Social Science Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2021-22

SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
[Regulation : R-20]
SEMESTER- III

SNo	Course Code	Course Title	Hours/ Week			Scheme of Examination			No of Credits
						Max Marks		Duration (hrs)	
THEORY			**L**	**T**	**P**	**CIE**	**SEE**	**SEE**	**Cr**
1	PCC301	Software Engineering	**4**		**-**	**30**	**70**	**3**	**4**
2	PCC302	Computer Networks	**4**		**-**	**30**	**70**	**3**	**4**
3	PCC303	Data Science	**3**	**1**	**-**	**30**	**70**	**3**	**3**
4	PCC304	Web Technologies	**3**	**-**	**-**	**30**	**70**	**3**	**3**
5	**PEC****	**Professional Elective–I**	**3**	**-**	**-**	**30**	**70**	**3**	**3**
6	**PEC****	**Professional Elective–II**	**3**	**-**	**-**	**30**	**70**	**3**	**3**
PRACTICALS									
7	LCC351	Computer Networks Lab	**-**		**3**	**25**	**50**	**3**	**2**
8	LCC352	Software Engineering Lab	**-**		**3**	**25**	**50**	**3**	**2**
9	LCC353	Data science Lab	**-**		**3**	**25**	**50**	**3**	**2**
10	PS3541	Project Seminar	**-**		**2**	**25**	**-**	**-**	**1**
			20	**1**	**11**	**280**	**570**	**-**	**27**

Professional Electives

Course Code-PEC**	Professional Elective -1
PEC311	Information Security
PEC312	Network Security
PEC313	Cyber Security
PEC314	Soft computing

Course Code-PEC**	Professional Elective – II
PEC321	Distributed Systems
PEC322	Cloud Computing
PEC323	Enterprise Architecture
PEC324	Natural Language Processing

Abbreviation	Full Form	Abbreviation	Full Form
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
PS	Project Seminar	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2021-22

SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
[Regulation : R-20]
SEMESTER- IV

SNo	Course Code	Course Title	Hours/ Week		Scheme of Examination			No of Credits
					Max Marks		Duration (hrs)	
THEORY			**L**	**P**	**CIE**	**SEE**	**SEE**	**Cr**
1	**PEC****	**Professional Elective –III**	**3**	**-**	**30**	**70**	**3**	**3**
2	**PEC****	**Professional Elective –IV**	**3**	**-**	**30**	**70**	**3**	**3**
3	**OE****	**Open Elective**	**3**	**-**	**30**	**70**	**3**	**3**
PRACTICALS								
4	Proj401	Project Work	**-**	**24**	**100**	**200**	**3**	**12**
		Total	**9**	**24**	**190**	**410**	**-**	**21**

Professional Electives

Course Code-PEC**	Professional Elective – III
PEC411	Big Data Analytics
PEC412	Deep Learning
PEC413	Information Retrieval System
PEC414	Optimization techniques

Course Code-PEC**	Professional Elective – IV
PEC421	Block Chain Technologies
PEC422	Software Testing
PEC423	Internet of Things
PEC424	Digital Forensics

Course Code-OE**	Open Elective
OE 411	Professional Ethics
OE 412	Constitution of India
OE 413	Disaster Management
OE 414	Management Information System
OE 415	Intellectual Property & Cyber Law
OE 416	Environmental Science
OE 417	E-Commerce

With effect from academic year 2020-21

PCC101 Mathematical Foundations of Computer Science

Credits : 4

Instruction	4L hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. To learn logic theory and Boolean algebra related to computer science
2. To understand relations and functions
3. To gain insights into recurrence relation
4. To comprehend algebraic structure
5. To study graph theory and concepts of trees

Course Outcomes – Students will learn to

1. Solve logic problems
2. Represent the relations and functions
3. Create recurrence relation
4. Apply algebraic structures
5. Work on various graph and tree concepts

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. Jr. 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 Mohiddin Shaw, **Mathematical Foundation of Computer Science,** BSP, 2016
5. Ralph P. Grimaldi **Discrete and Combinatorial Mathematics**, 5th Edition, Pearson, 2004.

With effect from academic year 2020-21

PCC102 Data Structures using C

Credits : 4

Instruction	4L hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. To learn the features of C
2. To learn the linear and non-linear data structures
3. To explore the applications of linear and non-linear data structures
4. To learn to represent data using graph data structure
5. To learn the basic sorting and searching algorithms

Course Outcomes - Upon completion of the course, students will be able to:

1. Implement linear and non-linear data structure operations using C
2. Suggest appropriate linear / non-linear data structure for any given data set.
3. Apply hashing concepts for a given problem
4. Modify or suggest new data structure for an application
5. 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 Readings

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.

With effect from academic year 2020-21

PCC103 Object Oriented Programming using Java

Credits : 3

Instruction	3L hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Learn the basics of object oriented programming
2. Study Java I/O mechanisms
3. Explore Java API
4. Develop graphics based Java programs
5. Learn swing framework

Course Outcomes

1. Explain OOPs features and concepts
2. Write basic Java programs
3. Write I/O programs in Java
4. Use various built-in Java classes and methods
5. 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 Readings

1. Herbert Schildt, **The Complete Reference Java**, 9th Edition, Tata McGraw Hill, 2005.
2. Bruce Eckel, **Thinking in Java**, 4th Edition, Pearson Education
3. Dietel and Dietel, **Java: How to Program,** 5th Edition, Prentice Hall
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.
6. Kathy Sierra, Bert Bates ,**Head First Java**, 2nd Edition, **A Brain-Friendly Guide**, Publisher: O'Reilly Media, February 2005.

With effect from academic year 2020-21

PCC104 Computer Architecture

Credits : 3

Instruction	4(3L+1T) hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Learn the basics of data representation
2. Study register transfer microoperations
3. Explore CPU
4. Comprehend computer arithmetic algorithms
5. Learn I/O organization

Course Outcomes

1. Apply data representation methods
2. Write logic diagrams for microoperations
3. Write general register organization diagrams
4. Analyze computer arithmetic algorithms.
5. Explain I/O organization

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 Readings

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

With effect from academic year 2020-21

PCC105 Probability and Statistics

Credits : 3

Instruction	4(3L+1T) hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Grasping Linear Algebra concepts through vector spaces.
2. Basic concepts of probability and concepts of various discrete and continuous probability distributions.
3. Learning sampling procedure and various kinds of estimate techniques.
4. Learning hypotheses testing and acquiring knowledge of basic statistical Inference and its applications.
5. The concept of association between two variables and forecast future values by regression equations.

Course Outcomes

1. Understanding of Linear Algebra will boost the ability to understand and apply various data science algorithms.
2. Calculate probabilities by applying probability laws and theoretical results, knowledge of important discrete and continuous distributions, their inter relations with real time applications.
3. Understanding the use of sample statistics to estimate unknown parameters.
4. Become proficient in learning to interpret outcomes.
5. 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, 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 Hypotheses - one sample tests - Hypotheses 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

References

1. S lang, Introduction to Linear Algebra
2. Gilbert Strang, Linear Algebra and its Applications
3. Robert V Hogg and Allen T Craig, Introduction to Mathematical statistics. Prentice Hall
4. Fundamentals of Mathematical Statistics, V. K. Kapoor and S. C. Gupta, Sultan Chand & Sons, New Delhi.

PCC106 Managerial Economics and Accountancy

Credits : 3

Instruction	4(3L+1T) hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 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.
3. To evaluate the factors that affect production
4. To understand the concepts of capital budgeting and payback period.
5. To study the concepts of various book-keeping methods.

Course Outcomes

1. Apply the fundamental concepts of managerial economics to evaluate business decisions Understand types of Demand and factors related to it.
2. Identify different types of markets and determine price –output under perfect competition.
3. Determine working capital requirement and payback
4. 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, Equimarginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

UNIT – II

Consumer Behavior: Law of Demand, Determinants, Types of Demand; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply and Concept of Equilibrium. (Theory questions and small numerical problem can be asked)

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 (theory and problems can be asked)

UNIT – IV

Capital Management: Significance, determination and estimation of fixed and working capital requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems. (Theory questions and numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked)

UNIT – V

Book-keeping: Principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance, concept and 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 Readings

1. Mehta P.L., Managerial Economics —Analysis, Problems and Cases ,Sulthan 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

With effect from academic year 2020-21

LCC151 Data Structures using C Lab

Credits : 2

Instruction	3P hrs per week	Duration of SEE	3 hours
CIE	25 marks	SEE	50 marks

Course Objectives

1. To understand and implement basic data structures using C
2. To apply linear and non-linear data structures in problem solving.
3. To learn to implement functions and recursive functions by means of data structures
4. To implement searching and sorting algorithms

Course Outcomes - Upon completion of the course, the students will be able to:

1. Write basic and advanced programs in C
2. Implement functions and recursive functions in C
3. Implement data structures using C
4. Choose appropriate sorting algorithm for an application and implement it in a modularized way

Programs

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

With effect from academic year 2020-21

LCC152 Java Programming Lab

Credits : 2

Instruction	3P hrs per week	Duration of SEE	3 hours
CIE	25 marks	SEE	50 marks

Course Objectives

1. Learn how to write simple java programs
2. Learn how to write multithreaded programs
3. Learn how to write I/O programs
4. Learn how to write serialization programs
5. Learn how to write program using URL class

Course Outcomes

1. Be able to write simple java programs
2. Be able to write multithreaded programs
3. Be able to write I/O programs
4. Be able to write serialization programs
5. Be able to write URL class program

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.

With effect from academic year 2020-21

HSC153 Soft Skills Lab

Credits : 3

Instruction	3P hrs per week	Duration of SEE	3 hours
CIE	25 marks	SEE	50 marks

Course Objectives

1. Learn conversational skills
2. Learn reading strategies
3. Learn time management
4. Learn stress management
5. Learn career planning

Course Outcomes

1. Express conversational skills
2. Specify reading strategies
3. Perform time management
4. Perform stress management
5. Explore career planning

Activities

1. Conversation skills, Listening dialogues from TV/radio/Ted talk/Podcast
2. Group 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 and et al. “Developing Soft Skills” 4th edition, New Delhi: 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

With effect from academic year 2020-21

PCC201 Operating Systems

Credits : 3

Instruction	4(3L+1T) hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. To gain the understanding of operating system
2. To comprehend the details of process.
3. To learn the types and architecture of computer memory
4. To study file system and its implementation
5. To realize the operating system concepts into case studies.

Course Outcomes – Learners on completion of the course, be able to

1. Explain operating systems and illustrate the workings of various components.
2. Analyze the process, its states and process scheduling algorithms.
3. Demonstrate paging, demand paging, page replacement and segmentation with illustrations.
4. Elaborate the file access and allocation methods and mass storage structures.
5. Describe concrete implementations of Linux system and Windows 7.

UNIT-I

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.

With effect from academic year 2020-21

PCC202 Database Management System

Credits : 4

Instruction	4L hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Introduce database concepts along with ER modelling
2. Learn about relational databases and SQL query language
3. Define advanced SQL
4. Study DB transactions
5. Explore concurrency concepts

Course Outcomes

1. Explain the DB concepts and model requirements as ER-model
2. Suggest relational algebra queries from text specification
3. Write SQL queries for the given questions
4. Elaborate indexing and hashing
5. Describe concurrency control concepts

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

Suggested Readings

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

With effect from academic year 2020-21

PCC203 Design and Analysis of Algorithms

Credits : 3

Instruction	4(3L+1T) hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Learn algorithms time complexity
2. Learn divide and conquer approach
3. Learn greedy method
4. Learn dynamic programming
5. Learn backtracking

Course Outcomes

1. Carry out algorithms time complexity
2. Explain divide and conquer approach
3. Illustrate greedy method
4. Elaborate dynamic programming
5. Explore backtracking

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 Readings

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.

With effect from academic year 2020-21

PCC204 Artificial Intelligence

Credits : 4

Instruction	4L hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Learn problem solving strategies
2. Learn propositional, predicate calculus and knowledge representation
3. Learn probability theory
4. Learn machine learning
5. Learn NLP

Course Outcomes

1. Solve search problems
2. Apply propositional, predicate calculus and knowledge representation
3. Analyze probability theory
4. Explore machine learning
5. Explain NLP

Unit - 1

Introduction: History Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of Al, Applications. **Problem Solving - State - Space Search and Control Strategies:** Introduction, General Problem Solving Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative - Deepening A*, Constraint Satisfaction.
Game Playing, Bounded Look - ahead Strategy and use of Evaluation Functions, Alpha Beta Pruning.

Unit – II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

Unit - III

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools.

Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster - Shafer Theory.

Unit - IV

Machine - Learning Paradigms: Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering, Support Vector Machines. **Artificial Neural Networks:** Introduction Artificial Neural Networks, Single - Layer Feed Forward Networks, Multi - Layer Feed Forward Networks, Radial - Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks.

Unit - V

Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web.

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge.

Suggested Readings

1. Saroj Kaushik, Artificial Intelligence, Cengage Learning India, First Edition, 2011.
2. Russell, Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 2nd Edition, 2004.
3. Rich, Knight, Nair , Artificial Intelligence, Tata McGraw Hill, 3rd Edition 2009.

PCC205 Machine Learning

Credits : 3

Instruction	3L hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Learn regression techniques
2. Learn dimensionality reduction methods
3. Learn classification schemes
4. Learn clustering mechanisms
5. Learn evaluation metrics

Course Outcomes

1. Solve regression problems
2. Apply dimensionality reduction methods
3. Analyze classification schemes
4. Explore clustering mechanisms
5. Explain 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 Squares

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

Miscellaneous topics: Expectation Maximization, GMMs, Learning theory Intro 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. ISBN: 0 262 01211 1
2. Tom M. Mitchell, Machine Learning McGraw Hill Education, 2013

With effect from academic year 2020-21

PCC206 Operations Research

Credits : 3

Instruction	4(3L+1T) hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

Course Objectives

1. Learn linear programming
2. Learn transportation problem
3. Learn assignment problem
4. Learn dynamic programming
5. Learn gaming theory

Course Outcomes

1. Solve linear problems
2. Apply transportation problems
3. Analyze assignment problems
4. Explore dynamic programming
5. Explain gaming theory

UNIT I

Linear Programming: Introduction, Concept of Liner 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.

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 Reading:

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. JK Sharma, "*Operations Research*", Fourth Edition, MacMillan, 2009.

With effect from academic year 2020-21

LCC251 Operating Systems Lab

Credits : 2

Instruction	3P hrs per week	Duration of SEE	3 hours
CIE	25 marks	SEE	50 marks

Course Objectives

1. Learn CPU scheduling algorithms
2. Learn memory management algorithms
3. Learn synchronization problems
4. Explore file allocation strategies
5. Explore disk scheduling algorithms

Course Outcomes

1. Be able to write programs on CPU scheduling
2. Be able to create memory management algorithms
3. Be able to execute programs to demonstrate synchronization problems
4. Be able to implement file allocation methods
5. Be able to create disk scheduling algorithms

Programs

1. Simulate the following CPU scheduling algorithms.
    a. FCFS
    b. SJF
    c. Round Robin
    d. Priority.
2. Write a C program to simulate producer-consumer problem using Semaphores
3. Write a C program to simulate the concept of Dining-philosophers problem.
4. Simulate MVT and MFT.
5. Write a C program to simulate the following contiguous memory allocation techniques
    a. Worst fit
    b. Best fit
    c. First fit.
6. Simulate following page replacement algorithms
    a. FIFO
    b. LRU
    c. OPTIMAL
7. Simulate following File Organization Techniques
    a. Single level directory
    b. Two level directory
8. Simulate following file allocation strategies

a. Sequential
b. Indexed
c. Linked.

9. Simulate Bankers Algorithm for Dead Lock Avoidance.
10. Simulate Bankers Algorithm for Dead Lock Prevention.
11. Write a C program to simulate disk scheduling algorithms.
    a. FCFS
    b. SCAN
    c. C-SCAN

With effect from academic year 2020-21

LCC252 DBMS Lab

Credits : 2

Instruction	3P hrs per week	Duration of SEE	3 hours
CIE	25 marks	SEE	50 marks

Course Objectives

1. Learn SQL queries
2. Learn PL/SQL stored procedures
3. Learn Triggers
4. Learn report generation methods
5. Learn database application creation

Course Outcomes

1. Write SQL queries
2. Write stored procedures
3. Write triggers
4. Use file locking and table locking facilities
5. Create small full-fledged database application

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.

With effect from academic year 2020-21

LCC253 AI Lab with python

Credits : 2

Instruction	3P hrs per week	Duration of SEE	3 hours
CIE	25 marks	SEE	50 marks

Course Objectives

1. Learn machine learning algorithms in python
2. Learn supervised algorithm programming
3. Learn unsupervised algorithm programming
4. Learn NLP programming
5. Learn neural network programming

Course Outcomes

1. Write machine learning algorithms in python
2. Write supervised algorithm programming
3. Write unsupervised algorithm programming
4. Write NLP programming
5. Write neural network programming

AI with Python – Getting Started

Python for AI
Features of Python
Installing Python
Setting up PATH
Running Python
Script from the Command-line
Integrated Development Environment

AI with Python – Machine Learning

Types of Machine Learning (ML)
Most Common Machine Learning Algorithms

AI with Python – Data Preparation

Preprocessing the Data
Techniques for Data Preprocessing
Labeling the Data

AI with Python – Supervised Learning: Classification

Steps for Building a Classifier in Python
Building Classifier in Python
Logistic Regression
Decision Tree Classifier
Random Forest Classifier
Performance of a classifier
Class Imbalance Problem

Ensemble Techniques

AI with Python – Supervised Learning: Regression
Building Regressors in Python

AI with Python – Unsupervised Learning: Clustering
Concept of Clustering
Algorithms for Clustering the Data
Measuring the Clustering Performance
Calculating Silhouette Score
Finding Nearest Neighbors
K-Nearest Neighbors Classifier

AI with Python – Natural Language Processing
Components of NLP
Difficulties in NLU
NLP Terminology
Steps in NLP

AI with Python – NLTK package
Importing NLTK
Downloading NLTK's Data
Installing Other Necessary Packages
Concept of Tokenization, Stemming, and Lemmatization
Chunking: Dividing Data into Chunks
Types of chunking
Bag of Word (BoW) Model
Concept of the Statistics
Building a Bag of Words Model in NLTK
Solving Problems
Topic Modeling: Identifying Patterns in Text Data
Algorithms for Topic Modeling

AI with Python – Heuristic Search
Concept of Heuristic Search in AI
Difference between Uninformed and Informed Search
Real World Problem Solved by Constraint Satisfaction

AI with Python – Gaming
Search Algorithms
Combinational Search
Minimax Algorithm
Alpha-Beta Pruning
Negamax Algorithm
Building Bots to Play Games
A Bot to Play Last Coin Standing
A Bot to Play Tic Tac Toe

AI with Python – Neural Networks
Artificial Neural Networks (ANN)

Installing Useful Packages
Building Neural Networks
Perceptron based Classifier
Single - Layer Neural Networks
Multi-Layer Neural Networks