UG Degree
Bachelor in Computer Applications (AI&DS)

R24 REGULATIONS

COURSE STRUCTURE & SYLLABUS

DISTRIBUTION OF CREDITS

S.No	Semester 1	Semester 2	Total
I Year	20	20	40
II Year	20	20	40
III Year	21	19	40
		Total	120

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
CC	Core Courses
AEC	Ability Enhancement Courses
MDE	Multi-Disciplinary Elective course
VAC	Value added Courses
SEC	Skill Enhancement courses
DSE	Discipline Specific Elective
OE	Open Elective

BACHELOR IN COMPUTER APPLICATIONS

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

SEMESTER - I

S.No	Course Code	Course Name	Hours Per week			Credits
			L	T	P	
1	24BCCA01T	Computer Fundamentals and Organization	3	0	0	3
2	24BCCA02T	Programming Using “C”	3	0	0	3
3	24BCCA03T	Operating Systems	3	0	0	3
4	24BCHS02T	Discrete Mathematics	3	1	0	4
5	24BCHS01T	English	2	0	0	2
6	24BBBA05T	Introduction to Social Work	2	0	0	2
7	24BCCA01P	Office tools Laboratory	0	0	3	1.5
8	24BCCA02P	Programming Using “C” Laboratory	0	0	3	1.5
					Total	**20**

SEMESTER - II

S.No	Course Code	Course Name	Hours Per week			Credits
			L	T	P	
1	24BCCA04T	Data Structures using C	3	0	0	3
2	24BCCA05T	Oops through JAVA	3	0	0	3
3	24BCCA06T	Software Engineering	3	0	0	3
4	24BCHS05T	Probability & Statistics	3	1	0	4
5	24BCHS04T	Analytical Skills	1	1	0	2
6	24BCHS03T	Communication Skills	1	1	0	2
7	24BCCA03P	Data Structures using C Laboratory	0	0	3	1.5
8	24BCCA04P	Oops through JAVA Laboratory	0	0	3	1.5
					Total	**20**

students who wish to quit after successfully completing the 1st Year will be issued with a **“Certificate in Computer Applications”**

SEMESTER – III

S.No	Course Code	Course Name	Hours Per week			Credits
			L	T	P	
1	24BCCA07T	Data Base Management Systems	3	0	0	3
2	24BCCA08T	Artificial Intelligence	3	0	0	3
3	24BCCA09T	Python Programming	3	1	0	4
4	24BCCA01S	Web Technologies	3	0	0	3
5	24BCCA01D	Professional Elective – I Basics of Data Analytics using Spread Sheet	2	0	0	2
6	24BCCE01T	Disaster Management	2	0	0	2
7	24BCCA05P	Data Base Management Systems Laboratory	0	0	3	1.5
8	24BCCA06P	Python Programming Laboratory	0	0	3	1.5
					Total	**20**

SEMESTER - IV

S.No	Course Code	Course Name	Hours Per week			Credits
			L	T	P	
1	24BBBA06T	Introduction to Accounting and Startup echo System	3	0	0	3
2	24BCCA10T	Computer Networks	3	0	0	3
3	24BCCA11T	Design and Analysis of Algorithm	4	0	0	4
4	24BCCA12T	Machine Learning	3	0	0	3
5	24BCCA03D	Professional Elective – II	2	0	0	2
6	24BCCA02S	Design Thinking	2	0	0	2
7	24BCCA07P	Computer Networks Laboratory	0	0	3	1.5
8	24BCCA08P	Machine Learning Laboratory	0	0	3	1.5
					Total	**20**

SEMESTER - V

S.No.	Course Code	Course Title	L	T	P	Credits
1	24BCCA13P	Cloud Computing	3	0	0	3
2	DSE301	Professional Elective – III	3	0	0	3
3	DSE302	Professional Elective – IV	4	0	0	4
4	DSE303	Professional Elective – V	3	0	0	3
5	SEC301	Mobile Application Development	3	0	0	3
6	SEC302	Industrial Training/ Internship/Capstone Project	2	0	0	2
8	Lab 301	Data Science Laboratory	0	0	3	1.5
9	Lab 302	Mobile Application Development Laboratory	0	0	3	1.5
10	SEC303	Major Project [evaluation in sixth semester]	-	-	-	0
					Total	**21**

Summer Training / Internship / Apprenticeship / Capstone Project after the fourth semester of minimum 8 weeks of duration. This component will be evaluated during 5th Semester.
The Students who wish to quit after successfully completing the 2nd Year will be issued with a **"Under Graduate Diploma in Computer Applications.**

SEMESTER - VI						
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	CC302	Generative AI	4	0	0	4
2	DSE304	Professional Elective – VI Big Data Analytics	3	0	0	3
3	DSE305	Professional Elective – VII Information Retrieval System	3	0	0	3
4	AEC301	Soft Skills	0	1	0	1
5	SEC304	Major Project [Initiated in 5th Semester]	0	0	16	8
					Total	**19**

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**Total**
Credits	**20**	**20**	**20**	**20**	**21**	**19**	**120**

The Students who wish to quit after successfully completing the 3rd Year will be issued Degree in **"Bachelor of Computer Applications (BCA)".**

Professional Electives (Artificial Intelligence & Data Science)

S.no	Professional Elective	Course Code	Name of the Subject
	I	24BCCA01D	Basics of Data Analytics using Spreadsheet
		24BCCA02D	Future Engineering
	II	24BCCA03D	Data Visualization
		24BCCA04D	Data Mining & Warehousing
	III	24BCCA05D	Data Science & Analytics using Python
		24BCCA06D	Neural Network
	IV	24BCCA07D	Time Series Analysis
		24BCCA08D	Digital Image Processing
	V	24BCCA09D	Cloud Computing for Data Analytics
		24BCCA10D	Quantitative Techniques
	VI	24BCCA11D	Big Data Analytics
		24BCCA12D	Deep Learning for Computer Vision
	VII	24BCCA13D	Information Retrieval System
		24BCCA14D	Predictive Analysis

Course Code	COMPUTER FUNDAMENTALS AND ORGANIZATION	L	T	P	C
24BCCA01T		3	0	0	3
		SEMESTER - I			

COURSE OUTCOMES:

CO1: Understand the concepts of computer organization for several engineering applications.
CO2: The ability and confidence to use the fundamentals of computer organization as a tool in the engineering of digital systems.
CO3: To identify, formulate, and solve hardware and software computer engineering problems using sound computer engineering principle
CO4: To impart the knowledge on micro programming
CO5: Comprehend the concepts of advanced pipelining techniques

Unit-I **9 Lectures**

Functional Units of Computer System: CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR,MR, bar code reader, web camera, monitor, printer, plotter.

Unit-II **9 Lectures**

Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.

Unit-III **9 Lectures**

Basic Computer Organization and Design: Arithmetic Operations**,** Logic Microoperation Shift, Microoperation**,** Computer Registers, Computer instructions, Instruction cycle. Instruction codes, Timing and Control, Types of Instructions: Memory Reference Instructions, Input – Output and Interrupt. Machine Language, Assembly Language, Program Loops.

Unit-IV **9 Lectures**

Basic Computer Organization and Design: Arithmetic Operations**,** Logic Microoperation Shift, Microoperation**,** Computer Registers, Computer instructions, Instruction cycle. Instruction codes, Timing and Control, Types of Instructions: Memory Reference Instructions, Input – Output and Interrupt. Machine Language, Assembly Language, Program Loops.

Unit-V **9 Lectures**

Central Processing Unit organization: General Register Organization, Stack organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, Program Control, CISC and RISC processors

Memory Organization: Semiconductor Memory Technologies**,** Memory hierarchy, Interleaving, Main Memory-RAM and ROM chips, Address map, Associative Memory-Hardware organization.

TEXT BOOKS:

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, 5th Edition, Pearson/PHI

REFERENCE BOOKS:

1. “Computer Architecture and Organization”, 3rd Edition by John P. Hayes,WCB/McGraw-Hill
2. “Computer Organization and Architecture: Designing for Performance”, 10th Edition by William Stallings, Pearson Education.
3. “Computer System Design and Architecture”, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course Code	PROGRAMMING USING "C"	L	T	P	C
24BCCA02T		3	0	0	3
		SEMESTER - I			

COURSE OUTCOMES:

CO1: choose appropriate algorithms for problem solving.
CO2: demonstrate modular programs involving input output operations, decision making and looping constructs by choosing the appropriate data types for writing programs in C language.
CO3: apply the concept of arrays and string handling in problem solving.
CO4: apply the concept of pointers for dynamic memory management.
CO5: demonstrate programs to store data in structures and files.

Unit-1 **9 Lectures**

INTRODUCTION TO C LANGUAGE: Overview of C Language – Constants, Variables and Data Types – Operators, Expressions and Assignment statements – Managing Input/Output Operations – Formatted I/O – Decision Making - Branching – IF, Nested IF – Switch – go to - Looping- While, do, for statements.

Unit-2 **9 Lectures**

ARRAYS AND FUNCTIONS: Arrays – dynamic and multi-dimensional arrays - Character arrays and Strings – String handling Functions - User-defined Functions – Categories of Functions – Recursion.

Unit-3 **9 Lectures**

STRUCTURES AND UNIONS: Basics of Structures-Declaring a Structure – Array of Structures –Passing Structure elements to Functions- Passing entire Structure to Function – Structures within Structures - Union – Union of Structures – Enumerated Data Types – The difference between Structures and Unions.

Unit-4 **9 Lectures**

POINTERS: Pointers – Declaration, Accessing a variable, dynamic memory allocation, Pointers versus Arrays, Array of pointers, Pointers to functions and structure Pointers.

Unit-5 **9 Lectures**

FILE MANAGEMENT: File Management in C – Data hierarchy- Files and Streams – Sequential access file- Random access file - Preprocessors.

Text Books:

1. Yashavant P. Kanetkar,"Pointers In C", BPB Publications, New Delhi, 2002.
2. E.Balagurusamy, " Programming in ANSI C ", Tata McGraw Hill, 2004.

Reference Books:

1. V. Rajaraman "Computer Programming in C" PHI, New Delhi, 2001.
2. Kamthane, A.N., "Programming with ANSI and Turbo C", Pearson Education, Delhi, 2006.
3. Deitel and Deitel, "C How to Program," Addison Wesley, 2001.
4. Kernighan, B.W and Ritchie D.M, "The C Programming language", Second Edition, Pearson Education, 2006.

Course Code	OPERATING SYSTEMS	L	T	P	C
24BCCA03T		3	0	0	3
		SEMESTER - I			

Course Objectives:

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks

Course Outcomes (CO): Student will be able to

- Realize how applications interact with the operating system
- Analyze the functioning of a kernel in an Operating system.
- Summarize resource management in operating systems
- Analyze various scheduling algorithms
- Examine concurrency mechanism in Operating Systems

UNIT - I **9 Lectures**

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

UNIT - II **9 Lectures**

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples.

UNIT - III **9 Lectures**

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Dining philosophers problem, Readers and writers problem.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.

UNIT - IV **9 Lectures**

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame
allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

UNIT - V **9 Lectures**

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks.

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)

Course Code	DISCRETE MATHEMATICS	L	T	P	C
24BCHS02T		3	1	0	4
		SEMESTER - I			

Course Objectives:

- Introduces the elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions

Course Outcomes (CO): Student will be able to

- Demonstrate the ability to understand and construct precise mathematical proofs
- Demonstrate the ability to use logic and set theory to formulate precise statements
- Acquire the knowledge to analyse and solve counting problems on finite and discrete structures
- Demonstrate the ability to describe and manipulate sequences
- Demonstrate the ability to apply graph theory in solving computing problems

UNIT – I **12 Lecture Hrs:**

The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic,
Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT – II 12 Lecture Hrs:

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences &
Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT – III **12 Lecture Hrs:**

Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms.
Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive
Definitions and Structural Induction, Recursive Algorithms, Program Correctness

UNIT – IV **12 Lecture Hrs:**

Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance.
Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-
Conquer Algorithms and Recurrence Relations.

UNIT – V **12 Lecture Hrs:**

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing
Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar
Graphs, Graph Coloring.

TEXTBOOKS

1. Discrete Mathematics and Its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7^{th}Edition, TMH.

REFERENCES

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2nd ed., Pearson Education.
3. Discrete Mathematics- Richard Johnsonbaugh, 7th ed., Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.

Course Code	ENGLISH	L	T	P	C
24BCHS01T		2	0	0	2
		SEMESTER - I			

COURSE OUTCOMES:

- Understand the importance of listening and practice effective listening.
- Use grammar effectively for accuracy in writing and speaking.
- Use relevant vocabulary in everyday communication.
- Acquire ability to use Soft Skills in professional and daily life.
- Confidently use the skills of communication.

Unit - I Listening Skills 10 Lectures

Listening Skills: Importance of Listening, Types of Listening, Barriers to Listening, Effective Listening

Unit – II Speaking Skills 10 Lectures

Speaking Skills: Greetings & Introduction, Asking and Giving Information Yes, We Can - Barack obama, Agreeing/Disagreeing, A Leader Should Know How to Manage Failure- Dr. A.P.J. Abdul Kalam

Unit – III Reading Skills 10 Lectures

Reading Skills: Importance of Reading, Types of Reading, SQ3R Method, Comprehension

Unit – IV Writing Skills 10 Lectures

Writing Skills: Letter writing, Types of Letter writing,
Grammar: Concord, Articles, Prepositions, Tenses, Question tags

Unit – V Soft Skills 10 Lectures

Soft Skills: SWOC, Attitude, Emotional Intelligence, Netiquette, Interpersonal Skills

References:

1. Soft Skills, Dr. Alex (New Delhi: S. Chand & Company Ltd) 2009.
2. Interpersonal SkillsTraining, PhilipBurnard (NewDelhi:VivaBooksPrivate Ltd)
3. Soft Skills for Everyone, JeffButterfield (NewDelhi: Cengage Learning India Pvt Ltd) 2012
4. Emotional Intelligence, Daniel Goleman (London: Bloomsbury Publishing) 1996
5. A Text Book of English Phonetics for Indian Students, Balasubramanian
6. A Hand book for English Language Labor, E. Suresh Kumar, P. Sreehari
7. Communication Skills (2nd Edition), Sanjay Kumar& Pushpa Lata, Oxford UniversityPress, 2016.

Activities:
Make the students listen to news
concepts Watch interviews and speeches
on YouTube
Role plays on formal and informal conversations.

Course Code	INTRODUCTION TO SOCIAL WORK	L	T	P	C
24BBBA05T		2	0	0	2
		SEMESTER - I			

COURSE OUTCOMES:

- Understand the basic concepts relating to social work practice, values, principles of social work and social problems in India
- List out different approaches of providing help to the people in need.
- Acquaint the process of primary methods of social work
- Get to know the skills of working with individuals, groups and communities.

Unit – I **10 Lectures**

Introduction to social work and concepts related to social work

Introduction to Social Work- Definition and Scope
Objectives and Functions of social work
Social welfare services, Social Reforms, Major social problems in India.

Unit - II **10 Lectures**

Methods of Working with Individuals and Groups

Definition-scope and importance of social case work
Principles and process of social case work
Tools and techniques in social .case work
Counselling skills.

Unit – III **10 Lectures**

Working with Communities and Field Work in social work

Community - definition, characteristics and types
Community organization as a method of social work
Definition-objectives, principles and phases of community organization
Concepts of community development

Unit – IV **10 Lectures**

Philosophy and Principles

Basic values, Philosophy and Principles of social work

Unit – V **10 Lectures**

Problems faced by social work profession

Problems faced by social work profession in India, Misconceptions about professional social work.

Suggested Co-curricular Activities: (6 hours)

1. Divide the students into groups, each group containing not exceeding 10 students Depending upon the total number of students in a class or section. Each group can search In Internet about any one of the institutions which work for the welfare of children or women or elderly or scheduled caste and scheduled tribe children or differently abled persons or Juvenile homes or Correctional homes or hospitals or Mahila Pragathi pranganam or Swadhar project or any social welfare project or non-governmental organizations (NGOs) to have an idea about welfare agencies working for the needy.

2. Ask each group to exchange and discuss the information with other groups in the classroom with the information they collected on Internet.

3. Group Discussion with the students- what type of community problems they observe in their Villages/towns/cities? Ask them to tell what are the line departments which will help to solve the problems of their communities and suggest them what type strategies help the communities to empower.

4. Invited lectures/Training by local experts

5. Visit to a community

6. Assignments, Quiz etc.

Textbooks:

1. Chowdhary, Paul. D. (1992). Introduction to Social Work. New Delhi: Atma Ram and Sons.
2. Friedlander W.A. (1955). Introduction to social welfare, New York, Prentice Hall.

Reference Books:

3. Government of India, (1987). Encyclopedia of Social Work in India (Set of 4 Volumes).

   New Delhi, Publications Division, Ministry of Information and Broadcasting.

4. Lal Das, D.K. (2017): Practice of Social Research - Social Work Perspective, Jaipur,
5. Rawat Publications.
6. Madan, G.R. (2009). Indian Social Problems (Volume 1 & 2). New Delhi: Allied publishers Private Limited.

Course Code	OFFICE TOOLS LABORATORY	L	T	P	C
24BCCA01P		0	0	3	1.5
		SEMESTER - I			

COURSE OUTCOMES:

CO1: Perform trouble shooting.
CO2: Understand Hardware components and inter dependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task 1: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 2: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

WORD

Task 1: Table Practice Document.
In this practice project for Word, students create a document with a title and table. The table has two columns that have different font alignment and includes various fonts.

Task 2: Create a document exactly like the one shown here and save a copy of it in your folder.

Task 3:
i. Make the word “MS-WORD” as the watermark of the document.
ii. Set the background color of the document as RED using page color option.
iii. Change the border of the page using page border option.
iv. Choose the indents tab.
v. Change the spacing between paragraphs by adding space above the paragraph

EXCEL

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete
sentences to see how the model completes
them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003.
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)

5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition.
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

Course Code	Programming Using "C" Laboratory	L	T	P	C
24BCCA02P		0	0	3	1.5
		SEMESTER - I			

COURSE OBJECTIVES:

- To make the student learn a programming language.
- To learn problem solving techniques.
- To teach the student to write programs in C and to solve the problems.

COURSE OUTCOMES:

After Completion of this course the student would be able to

- Read, understand and trace the execution of programs written in C language.
- Write the C code for a given algorithm.
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.

Course Contents / Syllabus

Exercise1: Basics

1. Write a program to print sample strings like "hello world", "Welcome to C Programming" with different formats using escape sequences.
2. Write a Program to print different data types in 'C' and their ranges.
3. Write a Program to initialize, assignment & printing variables of different data types.

Exercise2: Operators

1. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%)
2. Write a Program to demonstrate logical operators.(logical AND, logical OR)
3. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation.
4. Write a Program to calculate simple interest.
5. Write a Program to convert temperature. (Fahrenheit –Centigrade and vice-versa)

Exercise3: Decision Statements

1. Write a Program to read marks of a student in six subjects and print whether pass or fail (using if-else).
2. Write a Program to calculate roots of quadratic equation (using if-else).
3. Write a Program to calculate electricity bill. Read starting and ending meter reading. The charges are as follows.

No. of Units Consumed	Rate in(Rs)
1-100	1.50 per unit
101-300	2.00 per unit for excess of 100 units
301-500	2.50 per unit for excess of 300 units
501-above	3.25 per unit for excess of 500 units

Exercise4: Switch operations

1. Write a Program to perform arithmetic operations using switch case.
2. Write a Program to display colors using switch case (VIBGYOR).

Exercise5: Basic Loop operations

1. Write a program to calculate sum of individual digits of a given number.
2. Write a program to check whether given number is palindrome or not.
3. Write a program to print prime numbers in the given range.
4. Write a program to display multiplication tables from 1 to 10 except 3 and 5.
5. Write a program to print the Fibonacci series for given 'N' value.
4. Write a program to print the following formats.

1	*
1 2	* *
1 2 3	* * *
1 2 3 4	* * * *

Exercise 6: Arrays

1. Write a program to store 10 elements in the 1-D array and print sum of the array.
2. Write a program to print minimum and maximum elements in the 1-D array.
3. Write a program to perform matrix addition and matrix subtraction.
4. Write a program to perform matrix multiplication by checking the compatibility.

Exercise 7: Functions

1. Write a program to find sum of two numbers using functions.
2. Write a program to find product of two numbers using functions without arguments, without return type.
3. Write a program to swap two numbers using
   a) Call By Value B) Call By Reference.
4. Write a program to calculate factorial, gcd using recursion and non-recursion functions.

Exercise 8: Structures

1. Write a program to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of five account holders.
2. Write a program to find total marks of individual student and average marks for 10 students using structures.

Exercise15: File operations using command line arguments

1. Write a program which copies the contents of one file to another file using command line arguments.

Course Code	DATA STRUCTURES USING C	L	T	P	C
24BCCA04T		3	0	0	3
		SEMESTER - II			

COURSE OUTCOMES:

- Understand the concepts of Data Structures to develop solutions for particular problems.
- Apply the algorithms such as Queues and types of Queues.
- Design and implement abstract data types such as linked list by using the programming language for dynamic implementations.
- Implement the concepts of Trees and Graphs to handle the real time problems.
- Demonstrate the ability to plan, design, execute and document sophisticated technical Programs to handle various sorts and searching of data structures.

Unit – I Introduction to Data Structures, Stack 9 Lectures

Introduction to Data Structures: Introduction to Data Structure, Classification of Data Structure: Linear, Non-Linear, Operations on Data Structure, Algorithms Analysis, Approach to solve algorithm design Problems, Types of Case Analysis, Big-O Notation, Abstract Data Type. Stack: Introduction, Implementation of Stack, Operations on Stacks: Empty, Full, Push & Pop, Applications of stack, Conversion from Infix, Prefix to Postfix Expressions, Evaluation of postfix expression using stack.

Unit - II Queue 9 Lectures

Queue: Introduction, Implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty Queue, Circular Queue: Introduction, Implementation of Circular Queues, Operations on Circular Queues, Deques: Introduction, Implementation, Operations on Dequeues and Priority Queue: Introduction, Implementation of Priority Queues, Operations.

Unit – III Link Lists 9 Lectures

Link Lists: Linear List concept, Linked List Terminology, Representation of Linked List in Memory, Types of Linked List, Single Linked List, Doubly Linked List, Single Circular Linked list, Circular Doubly Linked List, Operations on Linked List: Creation, Traversing, Insert a node (empty list, beginning, middle, end), Delete a node (first, Last, at any position), Traversing node, Searching node, Print list, Count Nodes, Sort Lists, Linked list based polynomial addition.

Unit – IV Trees 9 Lectures

Trees: Introduction to Tree & its Terminology, Binary trees, Types of Binary trees, Representation of Binary Tree, Traversals (Inorder, Preorder, Post order), Expression Tree, Binary Search Tree, Insertion and Deletion in BST, Heap: Min Heap, Max Heap. Graph: Terminology, Representation of Graph: Adjacency Matrix, Traversals (BFS, DFS).

Unit – V Sorting & Searching Techniques 9 Lectures

Sorting & Searching Techniques: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Sequential/Linear Search, Binary Search.

TEXTBOOKS

1. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
2. Richard F. Gilberg&Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”,Second Edition, CENGAGE Learning

Course Code	OOPS THROUGH JAVA	L	T	P	C
24BCCA05T		3	0	0	3
		SEMESTER - II			

COURSE OUTCOMES:

- Understand the concept of object-oriented programming and implement it in Java.
- Comprehend building blocks of OOPs language, class, objects and method etc.
- Implement the inheritance, package and interfaces.
- Analyze the exceptions and multithreading in object-oriented programs.
- Design GUI using Applets understanding about events.

Unit – I **9 Lectures**

Object Oriented Programming Concepts –Abstraction, Encapsulation, Inheritance and Polymorphism.

Introduction to Java: Evolution of Java, Features of Java, Byte Code and Java virtual machine, JDK, Structure of Simple Java Program, Compiling and Interpreting Applications

Java Tokens: Java Character set, Keyword and Identifiers. Data Types, Operators and Expression, Control Statements, Looping.

Array and String: Single and Multidimensional Arrays, String Class, String Buffer Class, Operations on String, Command Line Argument.

Unit - II **9 Lectures**

Classes, Objects & Methods: Class, Object, Object Reference, Methods in Java, Method Overloading, Constructor, Constructor Overloading, Passing and Returning Object from method, new Operator, this & Static Keyword, finalize()method, Visibility modifiers, Nested Class, Inner Class.

Unit – III 9 Lectures

Inheritance and Polymorphism: Inheritance in Java, Types of Inheritance, Member Access Rule, Use of this and Super Keyword, Abstract class, Dynamic Method Dispatch, Use of final Keyword Package & Interface: Defining and Importing Packages, Defining and Implementing Interfaces, Extending Interfaces.

Unit – IV Trees **9 Lectures**

I/O STREAM: Concept of Streams, Streams Classes: Byte and Character Stream, Reading Console Input & Writing Console output.

Exception Handling: Exception Type, Usage of try, catch, throw, throws and finally Keywords, Creating Own Exception Classes.

Multi-Threading: Concept of Thread, Thread Life Cycle, Creating Thread Using Thread Class and Runnable Interface, Thread Priority, synchronization, Inter thread communication.

Unit – V **9 Lectures**

Java Utilities: Type wrappers: Number, Double, Float, Byte, Short, Integer and Long, Character, Boolean, Math class. Collections: Collection interfaces, collection classes, legacy classes and interfaces: Enumeration interface. Applets: Applet basics, Applet architecture, an applet skeleton, Applet display method, Repainting, Using Status window, HTML APPLET tag, passing parameters to applet.

TEXTBOOKS

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

Course Code	SOFTWARE ENGINEERING	L	T	P	C
24BCCA06T		3	0	0	3
		SEMESTER - II			

COURSE OUTCOMES:

- Obtain basic software life cycle activity skills.
- Design software requirements specifications for given problems.
- Implement structure, object-oriented analysis and design for given problems.
- Design test cases for given problems.
- Apply quality management concepts at the application level.

Unit – I Basic concepts in software engineering and software project management **9 Lectures**

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing,
Organization and team structure, risk management, configuration management.

Unit - II Requirements analysis and specification **9 Lectures**

The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE guidelines, representing complex requirements using decision tables and decision trees.

Unit – III **9 Lectures**

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function-oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object-oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, User Guidance and Online Help, Mode-based vs Mode-less Interface.

Unit – IV **9 Lectures**

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

Unit – V **9 Lectures**

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost.

Textbooks:

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. Pressman R, "Software Engineering- Practioner Approach", McGraw Hill.

Reference Books:

1. Somerville, "Software Engineering", Pearson 2.
2. Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill.
3. JalotePankaj, "An integrated approach to Software Engineering", Narosa

Course Code	PROBABILITY & STATISTICS	L	T	P	C
24BCHS05T		3	1	0	4
		SEMESTER - II			

COURSE OUTCOMES:

- Acquire knowledge in finding the analysis of the data quantitatively or categorically and various statistical elementary tools.
- Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems.
- Apply the regression and correlation analysis in the relevant application areas.
- Analyze to test various hypotheses included in theory and types of errors for large samples.
- Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.

Unit – I **12 Lectures**

Data Science and Probability: Data Science: Statistics introduction, Population vs Sample, collection of data, primary and secondary data, types of variable: dependent and independent Categorical and Continuous variables, data visualization, Measures of central tendency, Measures of dispersion (variance). Probability: Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem (without proof).

Unit - II **12 Lectures**

Random Variable and Probability Distributions: Random variables (discrete and continuous), probability density functions, probability distribution - Binomial, Poisson and normal distribution-their properties (mathematical expectation and variance).

Unit – III **12 Lectures**

Correlation, Regression and Estimation: Correlation, correlation coefficient, rank correlation, regression, lines of regression, regression coefficients, principle of least squares and curve fitting (straight Line, parabola and exponential curves). Estimation: Parameter, statistic, sampling distribution, point estimation, properties of estimators, interval estimation.

Unit – IV **12 Lectures**

Testing of Hypothesis and Large Sample Tests: Formulation of null hypothesis, alternative hypothesis, the critical region, two types of errors, level of significance, and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Unit – V **12 Lectures**

Small Sample Tests: Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes

Text Books

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012

Reference Books

1 S. Ross, A First Course in Probability, Pearson Education India, 2002.
2.W. Feller, An Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968

Course Code	ANALYTICAL SKILLS	L	T	P	C
24BCHS04T		1	1	0	2
		SEMESTER - II			

COURSE OUTCOMES:

- Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning, business computations and data interpretation and obtain the associated skills.
- Acquire competency in the use of verbal reasoning.
- Apply the skills and competencies acquired in the related areas.
- Solve problems pertaining to quantitative ability, logical reasoning and verbal ability inside and outside the campus.

Unit – I **10 Lectures**

Arithmetic ability: Algebraic operations BODMAS, Fractions, LCM & GCD (HCF).

Unit - II **10 Lectures**

Logical Reasoning: Number Series, Coding & Decoding, Blood relationship, Clocks, Calendars

Business computations: Percentages, Profit & loss, Simple compound interest

Unit – III **10 Lectures**

Quantitative aptitude: Averages, Ratio and proportion, Time-distance, Time and Work.

Data Interpretation: Tabulation, Bar Graphs, Pie Charts.

Unit – IV **10 Lectures**

Analytical Reasoning -I: Seating Arrangement, Puzzles Syllogisms, Analogies , Coded Inequalities

Unit – V **10 Lectures**

Analytical Reasoning – II : Venn Diagrams, Logical Diagrams, Statements & Assumptions, Statements & Conclusions, Dices & Cubes

Textbooks:

1. Quantitative Aptitude for Competitive Examination by R.S. Agrawal, S.Chand Publications.

Reference Books:

2. Analytical skills by Showick Thorpe, published by S Chand And Company Limited, Ramnagar, New Delhi-110055
3. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata McGrawHill Publications.

Course Code	COMMUNICATION SKILLS	L	T	P	C
24BSHA03T		1	1	0	2
		SEMESTER - II			

COURSE OBJECTIVES & OUTCOMES:

Upon the completion of the course the students will be able to:

- Learn the process involved in communication.
- Develop interview skills.
- Acquire presentation skills.
- Effectively play their roles in group discussions.
- Enhance the skills of public speaking.

Unit – I BASICS OF COMMUNICATION **10 Lectures**

1. Nature and importance of communication
2. Process of Communication
3. Principles of communication
4. Barriers to effective communication

Unit – II PRESENTATION SKILLS **10 Lectures**

1. Preparation of a good presentation
2. Verbal communication in presentation
3. Non-verbal communication in presentation

Unit – III INTERVIEWS AND GROUP DISCUSSIONS **10 Lectures**

1. Interview and its types
2. Before, during and after an interview
3. Do's and Don'ts in an interview
4. Basic Interview questions

Recommended Activities: (6 hours)

1. Presenting seminar papers.
2. Mock interviews.
3. Using Power point presentations in seminars.

References:

- Working in English, Jones, Cambridge
- Business Communication, Raman -Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill
- Jermy Comfort, Speaking Effectively, et.al, Cambridge

Course Code	DATA STRUCTURES USING C LABORATORY	L	T	P	C
24BCCA03P		0	0	3	1.5
		SEMESTER - II			

COURSE OUTCOMES(CO): Student will be able to

CO1: Develop C programs for computing and real-life applications using basic elements data structures like stacks, queues, linked lists, trees and graphs.

CO2: Implement searching and sorting algorithms

List of exercises able to do the students.

1. Write a program in 'C' to perform various operations on Stacks using Arrays.
2. Write a program in 'C' to perform to evaluate the Postfix Expression using Stacks.
3. Write a program in 'C' to perform various operations on Queues using Arrays.
4. Write a program in 'C' to perform various operations on Singly linked list.
5. Write a program in 'C' to perform various operations on doubly linked list.
6. Write a program in 'C' on Binary Tree creation and Traversals.
7. Write a program in 'C' on Graph Traversals using
   a) Breadth-First-Search Traversal
   b) Depth-First-Search Traversal
8. Write a program in 'C' to sort 'N' numbers in ascending order using Insertion Sort.
9. Write a program in 'C' to sort 'N' numbers in ascending order using Selection Sort.
10. Write a program in 'C' to sort 'N' numbers in ascending order using Bubble Sort
11. Write a program in 'C' to search for a given item using Linear Search.
12. Write a program in 'C' to search for a given item using Binary Search.

Course Code	OOPS THROUGH JAVA LABORATORY	L	T	P	C
24BCCA04P		0	0	3	1.5
		SEMESTER - II			

Course Outcomes (CO):

After completion of the course, students will be able to

- Develop efficient programs using multithreading.
- Design reliable programs using Java exception handling features.
- Apply appropriate programming constructs to solve a problem.

Exercise-1

a. Write Java program on use of inheritance, preventing inheritance using final, abstract classes.

b. Write Java program on dynamic binding, differentiating method overloading and overriding.

c. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen) using Interfaces.

Exercise-2

a. Write Java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read, display it only if it's not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.

b. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

c. Write a Java program to read the time intervals (HH:MM) and to compare system time if the system Time between your time intervals print correct time and exit else try again to repute the same thing.

Exercise-3

a. Write a Java program to implement user defined exception handling.
b. Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.

Exercise-4

Write a Java program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

Exercise- 5

a. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part where n is the sequence number of the part file.

b. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

Exercise-6

a. Write a Java program that correctly implements the producer-consumer problem using the concept of inter thread communication.

b. Develop a Java application for stack operation using Buttons and JOptionPane input and Message dialog box

References:

1. P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4th Edition, 2007.

2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, 2nd Edition, 2007

3. Bruce Eckel, "Thinking in Java", Pearson Education, 4th Edition, 2006.

4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 5th Edition, 2010.

Course Code	DATA BASE MANAGEMENT SYSTEMS	L	T	P	C
24BCCA07T		3	0	0	3
		SEMESTER - III			

COURSE OUTCOMES:
CO1: Core Concepts of DBMS
CO2: Proficiency in Database Design and SQL
CO3: Application of Advanced Database Techniques
CO4: To impart the knowledge on Relational Databases
CO5: Comprehend the concepts of Database transactions

Unit-I **9 Lectures**

Introduction to Databases : Definition of Data, Database, and DBMS, Overview of Database Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Unit-II **9 Lectures**

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus.

BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

Unit-III **9 Lectures**

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

Unit-IV **9 Lectures**

Schema Refinement (Normalization):Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

Unit-V **9 Lectures**

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

TEXT BOOKS:

1. Data base System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition.(All UNITS except III th)
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition.

REFERENCE BOOKS:

1. Fundamentals of Database Systems, Elmasri Navathe Pearson Education.
2. An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight
Edition for UNIT III.

Course Code	ARTIFICIAL INTELLIGENCE	L	T	P	C
24BCCA08T		3	0	0	3
		SEMESTER - III			

COURSE OUTCOMES:
CO1: To develop semantic-based and context-aware systems
CO2: Achieve semantic interoperability between Web resources and services
CO3: The field of Robotics is a multidisciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic.
CO4: H/W and S/W and issues germane to all these
CO5: demonstrate programs to show the capabilities of generative AI

Unit-1 **9 Lectures**

AI OVERVIEW: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

Unit-2 **9 Lectures**

BASIC ALOGRITHMS: Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search.
Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem
reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

Unit-3 **9 Lectures**

KNOWLEDGE REPRESENTATION: Knowledge representation issues, predicate logic-logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dempstershafer theory.

Unit-4 **9 Lectures**

INFERENCE AND STATISTICAL METHODS: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

Unit-5 **9 Lectures**

Expert systems: Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web

Text Books:

1. "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
2. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers

Reference Books:-

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education

2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press.

Course Code	PYTHON PROGRAMMING	L	T	P	C
24BCCA09T		3	0	0	3
		SEMESTER - III			

COURSE OUTCOMES:

- Basic introduction to python programming
- Core functionalities of python
- Exploration of modern ways to represent data
- Understanding modern ways to compute using python
- Introduction to python usage in different sectors

Unit – I **09 Lectures**

Introduction to Python: What is Data Science and why Data Science? Applications and Components of data Science, Why Python for Data Science? Basics of Algorithm/ Pseudocode , Program, Kinds of Programming Languages, Compilers, and Interpreters Introduction to Python, Types of IDE (Anaconda/PyCharm) Identifiers, Variables, Operators, Data Types, Conditions, Loops

Unit – II **09 Lectures**

Introduction to Data Structures using Python: Strings: Introduction, functions, and operations on Strings, Application Programs on Strings. List: Introduction, functions and operations on List, Application Programs on Lists Tuple: Introduction, functions, and operations on Tuple Dictionaries: Introduction, functions and operations on Dictionaries, Application Programs on Dictionaries. Sets: Introduction, functions, and operations on Sets, Applications on Sets, Frozensets List Comprehension, Dictionary Comprehension.

Unit – III **09 Lectures**

Functions, Modules and Collections : Functions Defining and Invoking functions, Scope, Parameter types Recursive functions, Built in Functions such as enumeration, zip, sorted, map, filter and Applications Modules in Python, creating custom modules and calling them Lambda functions , Collections, Iterators, Generators, Decorators, OrderedDict, default dict etc

Unit – IV **09 Lectures**

Working with Databases and Text: File I/O operations: Reading and Writing data from various formats,Regular Expressions, Identifiers, Quantifiers. Application Programs on Regular Expressions Working with Databases: Databases and Data Science, SQLite database and Insert, Update, Delete, Retrieve operations, Exception Handling: Need for Exception handling, Raising exceptions.

Unit – V **09 Lectures**

Object Oriented Programming using Python : Need for Static, Static members, Static functions Need for Encapsulation and Abstraction, Private Attributes, Getter, and Setter Methods– Python Implementation Inheritance: Need for Inheritance, Kinds of Inheritance Polymorphism Abstract methods, Overloading and Overriding.

TEXT BOOKS

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition,
Updated for Python 3, Shroff/O‘Reilly Publishers, 2016.

2.R. Nageswara Rao, “Core Python Programming”, dreamtech 3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

REFERENCE BOOKS

1. Core Python Programming, W.Chun, Pearson.
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Learning Python, Mark Lutz, Orielly

Course Code	WEB TECHNOLOGIES	L	T	P	C
24BCCA01S		3	0	0	3
		SEMESTER - III			

COURSE OBJECTIVES:

- Understand the Web essentials
- Develop web pages using HTML
- Apply style to web pages using CSS
- Write scripts for client side
- Develop and transform XML, documents

UNIT – I **9 Lecture Hrs:**

The Internet. Basic Internet protocols. WWW. HTTP request message. HTT'P response message. Web clients. Web Servers, Case study.

UNIT – II **9 Lecture Hrs:**

An introduction to HTML Basic XHTML syntax and semantics. fundamental HTML elements Relative URLs. Lists. Tables. Frames. Forrns. Defining XHTML's abstract syntax. Creating HTML documents.

UNIT – III **9 Lecture Hrs:**

Introduction, features. core syntax, style sheets HTML. Style rule cascading and text properties. Box model. normal flow box layout. beyond the normal flow. lists. tables. cursor styles.

UNIT – IV **9 Lecture Hrs:**

Basic syntax. variables and data types, statements, operators. literals. functions. objects. Arrays. built-in objects, JavaScript debuggers.

UNIT – V **9 Lecture Hrs:**

Documents and vocabularies, Versions and declaration, Namespaces, Ajax, DOM and SAX parsers, transforming XML documents, XPath. XSLT, Displaying XML in Web browsers.

Textbooks

1. Discrete Mathematics and Its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7thEdition, TMH. I. J.C. Jackson, Web technologies: A computer science perspective, Pearson.

Reference Books:

I. Sebesta. Programming Wide web. Pearson.
2. Dietel and Nieto . Internet and World Wide Web — How to program. Pearson Education
3. Chris Bates . Web Programming. building internet applications. 2nd edition. WILEY. Dreamtech

Course Code	Professional Elective - I BASICS OF DATA ANALYTICS USING SPREADSHEET	L	T	P	C
24BCCA01D		2	0	0	2
		SEMESTER - III			

COURSE OUTCOMES:

- Understand the basics of data analytics and its applications.
- Develop proficiency in using spreadsheet software for data manipulation and analysis.
- Build and use spreadsheet models for decision making & Communicate data insights effectively.
- Confidently use of spreadsheet technologies like google sheet and excel in different formats.

UNIT I: Introduction to Data Analytics **9 Lectures**

Understanding data and its types (structured, unstructured, semi-structured)-What is Data Analytics- Types of data Analytics-Importance of Data Analytics- Applications of Data Analytics.

UNIT II: Data, Ethics, and Industry: Case Studies **9 Lectures**

Data Collection Methods - Different Data Sources & format - Data Cleaning and Transformation - Handling Missing Data and Outliers. - Ethical considerations in data analytics. - Real-world Applications of Data Analytics- Industry-specific applications (finance, marketing, operations) - Case Study

UNIT III: Basic Data Exploration & Visualization **9 Lectures**

Using Pivot Tables - Summarizing and analyzing large datasets. Filtering and Sorting – Quickly finding relevant data., Charting Basics – Creating bar charts, line graphs, pie charts (introduction). Understanding Data Types in Charts: Choosing the right chart type for your analysis.

UNIT IV: Data Analysis & Basic Reporting **9 Lectures**

Using Formulas – Adding and manipulating values within spreadsheets, Conditional Formatting - highlighting important data points, Basic Text Functions – Adding text, formatting, and calculations, Creating a Simple Report - Summarizing the key findings from the analysis. (e.g., a basic sales report.

UNIT V :Advanced Spreadsheet Techniques & Data Communication **9Lectures**

Conditional Formatting - More advanced options for formatting data visually Creating a simple chart with multiple variables, Using macros (introduction) – Basic automation. (Optional, depending on student interest and time), Communication Skills – Presenting results clearly and concisely through charts and tables.

Text books:

8. . “Beginner's Guide for Data Analysis using R Programming” by Jeeva Jose, Khanna Publishing House, 2024.
9. “Data Analytics” by V.K. Jain, Khanna Book Publishing Company, 2024.
10. “Excel Data Analysis For Dummies" by Stephen L. Nelson and E. C. Nelson, John Wiley & Sons; 3rd edition, 2016

Reference Books

1. "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, John Wiley & Sons, 25 Sept 2018
2. "Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics" by Cliff T Ragsdale, Cegage learning asia pet. 2015.
3. “Mastering Excel” by WebTech Solutions, Khanna Publishing House, 2024.

Course Code	Professional Elective - I	L	T	P	C
24BCCA01D	Future Engineering	2	0	0	2
		SEMESTER - III			

Prerequisite: Basic knowledge of data analytics/machine learning and familiarity with any programming language.

COURSE CONTENT:

UNIT I: Introduction to Feature Engineering

Introduction to Data and Features: Importance of Features in Machine Learning. Data types and features: Numerical, Categorical, Ordinal, Discrete, Continuous, Interval and Ratio. Basic Feature Preprocessing: Handling Missing Data, Data Cleaning, Feature Scaling, Normalization, and Transformation.

UNIT II: Feature Engineering Techniques

Techniques for Numerical Data: Binning and Discretization, Polynomial and Interaction Features. Categorical Data Techniques: One Hot Encoding, Label Encoding. Feature extraction vs. feature selection, Steps in feature selection. Feature Selection Methods: Filter, Wrapper, and Hybrid. Feature Reduction: Introduction and application of Principal Components Analysis**.**

Text Books

1. M.C. Trivedi, Data Science and Data Analytics Using Python Programming, Khanna Publishing House, 2024.
2. Zheng, Alice, & Casari, Amanda. (2018). Feature engineering for machine learning: Principles and techniques for data scientists. O'Reilly Media, Inc.
3. Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2023). Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN-13: 9780323917780.

Reference Books:

1. Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley & Sons, ISBN-13: 978-8126511167.
2. N. Bhaskar, Vasundhara, Machine Learning, Khanna Publishing House, 2024.
3. M.C. Trivedi, Deep Learning and Neural Network_MC Trivedi, Khanna Publishing House, 2024.
4. Ng, Andrew. (2018). Machine learning yearning (Draft, MIT Licensed). GitHub. ISBN-10: 199957950X, ISBN-13: 978-1999579500.
5. Han, Jiawei, Kamber, Micheline, & Pei, Jian. (2011). Data mining: Concepts and techniques (3rd ed.). Morgan Kaufmann Publishers. ISBN 978-0123814791.
6. Tan, Pang-Ning, Steinbach, Michael, Karpatne, Anuj, & Kumar, Vipin. (2021). Introduction to data mining (2nd ed.). Pearson. ISBN 978-9354491047.

Course Code	DISASTER MANAGEMENT	L	T	P	C
24BCCE01T		2	0	0	2
		SEMESTER - III			

COURSE OUTCOMES:

- To provide understanding of the concepts related to disaster
- To highlight the importance and role of disaster management
- To enhance awareness of institutional processes and management strategies to mitigate
  the impacts of disasters.

Unit – I **9 Lectures**

Concepts and Terminologies

- Understanding key concepts of Hazards, disasters
- Disaster types and causes (Geophysical, Hydrological, Meteorological, Biological and Atmospheric; Human-made)
- Global trends in disasters - Impacts (Physical, Social, Economic, Political, Environmental and Psychosocial)
- Defining Vulnerability (Physical Vulnerability; Economic Vulnerability; Social Vulnerability)

Unit - II **9 Lectures**

Key concepts of Disaster Management Cycle

- Components of disaster management cycle (Phases: Response and recovery, Risk assessment, Mitigation and prevention, Preparedness planning, Prediction and warning); Disaster risk reduction (DRR),
- Community based disaster risk reduction

Unit – III **9 Lectures**

Initiatives at national and international level

- Disaster Risk Management in India and at international level
- Related policies, plans, programmes and legislation
- International strategy for disaster reduction and other initiatives

Unit – IV **9 Lectures**

Emergency Management

- Explosion and accidents (Industrial, Nuclear, Transport and Mining)
- Spill (Oil and Hazardous material)
- Threats (Bomb and terrorist attacks) - Stampede and conflicts

Unit – V **9 Lectures**

Disaster Risk Assessment & Preparedness

- What is Disaster Management? – Why it's crucial.
- Common Disaster Types: Detailed explanation of each with illustrative examples. (Focus on explaining why they occur, not just listing them.)
- Risk Assessment - Factors influencing risk (population density, building codes, infrastructure vulnerability, climate change impacts). Introduction to simple risk matrices.
- Defining a "Hazard Map" – Basic understanding of hazard zones and their implications.

Readings

1. Sharma, S.C. (2022), Disaster Management, Khanna Book Publishing.

2. Clements, B. W., (2009): Disasters and Public Health: Planning and Response, Elsevier Inc.

3. Dunkan, K., and Brebbia, C. A., (Eds.) (2009): Disaster Management and Human Health Risk: Reducing Risk, Improving Outcomes, WIT Press, UK.
4. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.
5. Ramkumar, Mu, (2009) Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency, New Delhi.
6. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.
7. Carter, N. (1991) Disaster Management: A Disaster Management Handbook. Asian Development Bank, Manila.
8. Govt. of India (2008) Vulnerability Atlas of India. BMTPC, New Delhi.
9. Govt. of India (2011) Disaster Management in India. Ministry of Home Affairs, New Delhi.
10. Matthews , J.A., (2002) Natural Hazards and Environmental Change, Bill McGuire, Ian Mason.

Course Code	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
24BCCA05P		0	0	3	1.5
		SEMESTER - III			

COURSE OUTCOMES:

- Design database for any real world problem
- Implement PL/SQL programs
- Define SQL queries

LIST OF EXPERIMENTS

Week-1: Working With Tables

Week-2: Queries Using Ddl And Dml

Week-3: Working Tcl Queries And Constraints

Week-4: Working With Queries Using Aggregate Functions

Week-5: Conditional Statements In Pl/Sql

Week-6: Looping Statements In Pl/Sql

Week-7: Function With Tables

Week-8: Function Using User Inputs

Week-9: Working With Procedures In Pl/Sql

Week-10: Case Study: Book Publishing Company

Week-11: Case Study: Student Progress Monitoring System

Week-12: Case Study: General Hospital

Week-13: Case Study: Car Rental Company

Course Code	PYTHON PROGRAMMING	L	T	P	C
24BCCA06P		0	0	3	1.5
		SEMESTER - III			

COURSE OBJECTIVES:

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES:

CO1: Design solutions to mathematical problems
CO2: Develop, run and manipulate python programs using core data structures, files and object-oriented programming (OOP) principles.
CO3: Develop various applications using Python libraries and frameworks such as JSON, XML, NumPy, and pandas for efficient data manipulation and processing.

Course Contents / Syllabus

Exercise1: Basics

1. Write a program to find the largest element among three Numbers.

2. Write a Program to display all prime numbers within an interval

3. Write a program to swap two numbers without using a temporary variable.

4. Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators.

5. Write a program to add and multiply complex numbers

6. Write a program to print multiplication table of a given number.

Exercise2: Operators

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list: i. Addition ii. Insertion iii. slicing 12. Write a program to perform any 5 built-in functions by taking any list.

Exercise3: Decision Statements

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed)
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary. 1-100 1.50 per unit

101-300	2.00 per unit for excess of 100 units
301-500	2.50 per unit for excess of 300 units
501-above	3.25 per unit for excess of 500 units

Exercise4: Switch operations

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

Exercise5: Basic Loop operations

24. Python program to check whether a JSON string contains complex object or not.

25. Python Program to demonstrate NumPy arrays creation using array () function.

26. Python program to demonstrate use of ndim, shape, size, dtype.

27. Python program to demonstrate basic slicing, integer and Boolean indexing.

28. Python program to find min, max, sum, cumulative sum of array

29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows: a) Apply head () function to the pandas data frame b) Perform various data selection operations on Data Frame

30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib.

Course Code	Introduction to Accounting and Startup echo System	L	T	P	C
24BBBA06T		3	0	0	3
COURSE OUTCOMES		SEMESTER – IV			

CO1	Understand entrepreneurial behaviours entrepreneurial motivation
CO2	Understand managerial problems of new enterprises: production, financing and labour and marketing problems
CO3	Analyse the economic costs and benefits of startups
CO4	Evaluate the process of becoming a start-up with current trends and Regulatory environment
CO5	Create a business plan for a business idea

UNIT-I **LHrs: 9**

Entrepreneurial traits, types and significance, Definitions, characteristics of entrepreneurial types, qualities and functions of entrepreneurs, entrepreneurial behaviours and entrepreneurial motivation, Achievement and management success, Entrepreneurial success in rural area, Innovation and entrepreneur. Role of entrepreneurship in a developing economy.

UNIT-II **LHrs: 9**

Mechanics of setting of new enterprises – size and location, industrial location factors determining the industrial location. Search for business idea, sources of ideas, idea processing, input requirements, Business plans: Components and Preparation of ~~business~~ plans, Sources of finance.

UNIT-III **LHrs: 9**

Feasibility Studies: Technical, marketing and financial: managerial problems of new enterprises: production, financing and labor and marketing problems, Preparation of Feasibility reports and legal process and documentation, establishing entrepreneur systems

UNIT-IV **LHrs: 9**

The new model of Entrepreneurship- Business incubators and startups, Start up's- Concepts, models, characteristics, startup communities, startup terminologies and funding options of start-up's. Startups in India: Profile, Causes, Effects, Process of becoming a startup, Current trends, Regulatory environment, Budget, Plans and Policies.

UNIT-V **LHrs: 9**

Strategic planning and financial performance of start-ups, Economic costs and benefits of startups. Role of Business Planning in Startup's. Startup's- Key to unemployment or reason for future unemployed youth, impact of education and training, Resource constraints, Emerging, young and high potential start-ups. Government initiatives- assistance towards Startup's, women initiatives and other backward groups. Startup India program

TEXT BOOKS

1. Barringer, Bruce R. (2015) Preparing Effective Business Plans : An Entrepreneurial Approach. Second edition, Pearson Education.
2. Blank, Steven G., and Dorf, Bob (2012). The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company.KetS Ranch, Inc.

REFERENCE BOOKS

1. Baron, R. A. (2014). Essentials of Entrepreneurship: Evidence and Practice. Edward Elgar Publishing.
2. Kuratko, D. F. (2016). Entrepreneurship: Theory, Process, and Practice. Cengage Learning.

Course Code	Computer Networks	L	T	P	C
24BCCA10T		3	0	0	3
		SEMESTER - IV			

COURSE OUTCOMES:

To introduce the fundamental components and principles of data communication, including network configurations, topologies, and standard communication models.

To explain various types of transmission media, signal impairments, and the theoretical limits of data transmission.

To provide an understanding of telecommunication techniques such as multiplexing and switching, and to introduce error detection and correction methods.

To familiarize students with network devices and the functioning of the network layer, including routing and congestion control mechanisms.

To describe the services and functions of transport and upper layers of the OSI model, and explore real-world protocols used in application layer communications.

UNIT-I

Basic Concepts: Components of data communication, distributed processing, standards and organizations. Line configuration, topology, Transmission mode, and categories of networks.
OSI and TCP/IP Models: Layers and their functions, comparison of models.
Digital Transmission: Interfaces and Modems: DTE- DCE Interface, Modems, Cable modems.

UNIT-II

Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon capacity, comparison of media

UNIT-III

Telephony: Multiplexing, error detection and correction: Many to one, One to many, WDM, TDM, FDM, Circuit switching, packet switching and message switching.
Data link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures.
Point to point controls: Transmission states, PPP layers, LCP, Authentication, NCP.
ISDN: Services, Historical outline, subscriber's access, ISDN Layers and broadcast ISDN.

UNIT-IV

Devices: Repeaters, bridges, gateways, routers, The Network Layer; Design issues, Routing algorithms, Congestion control Algorithms, Quality of service, Internet working, Network Layer in the internet.

UNIT-V

Transport and upper layers in OSI Model: Transport layer functions, connection management, functions of session layers, presentation layer and application layer.

Text Books:

1. A.S.Tanenbaum, "Computer Networks"; Pearson Education Asia, 4th Ed. 2003.
2. Behrouz A.Forouzan, "Data Communication and Networking", 3rd Ed. Tata MCGraw Hill, 2004.
3. William stallings, "Data and computer communications", Pearson education Asia, 7 th Ed., 2002.

Course Code	Design and Analysis of Algorithm	L	T	P	C
24BCCA11T		4	0	0	4
		SEMESTER - IV			

COURSE OUTCOMES:

- Ability to analyze the performance of algorithms in terms of their time and space complexities.
- Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design)
- To understand the different algorithm designing technique for solving problems.
- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Solve problems using algorithm design strategies like the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound etc.

UNIT- I

Introduction: Algorithm Specification-Simple example of design and analysis of time complexity-Performance Analysis: Space Complexity and Time complexity, Asymptotic Notation - Polynomial Vs Exponential Algorithms.

UNIT - II

Divide and Conquer algorithm: Introduction to Divide and Conquer Algorithms - Master Theorem – Sorting - Insertion Sort, Merge Sort using links, Quick Sort- Analysis of linear and binary search algorithm.Horner's method of evaluation a polynomial at a given point, Strassen's Matrix Multiplication.

UNIT III

Dynamic programming: Design and analysis, Computing a Binomial Coefficient, Multistage graphs, Traveling salesman problem.

Greedy approach: General method, Dijkstra's Algorithm, Knapsack problem, Minimum cost Spanning trees, Single source shortest path problem.

UNIT IV

Back tracking: General method - Sum of subsets - 4-Queen Problem using backtracking. **Branch and Bound method**- 4-queens - Least Cost Search, Traveling Salesman problem using Branch and Bound method.

UNIT V

Limitations of Algorithm- Introduction to lower bound theory, Decision trees, Introduction to P, NP and NP complete problems, NP hard problems.

REFERENCES:

1. Ellis Horowitz, SartajSahniSanguthevarRajasekaran. Fundamentals of Computer Algorithms. Universities Press (India) Private Limited. Second edition.
2. AnanyLevitin. Introduction to the design and Analysis of Algorithms. Dorling Kindersley (India) Pvt.Ltd. Second edition
3. Gav PAI, Data Structures and Algorithms, Tata McGraw Hill, Jan 2008.
4. Donald E. Knuth. The art of Computer Programming,Volume 1: Fundamental Algorithms.Addison Wesley

Course Code	Machine Learning	L	T	P	C
24BCCA12T		3	0	0	3
		SEMESTER - IV			

COURSE OUTCOMES:

- Learn the basics of machine learning, understanding its uses, challenges, and various applications.
- Build practical data skills, covering data collection, analysis, visualization, and preparation.
- Become skilled in using classification and regression algorithms, including selecting, training, and evaluating models.
- Dive into advanced clustering and specialized applications, using methods like KMeans, DBSCAN, and others.

UNIT I: Fundamentals of Machine Learning

Introduction to Machine Learning: What is Machine Learning? Why Use Machine Learning? Types of Machine Learning Systems, Main Challenges of Machine Learning, Applications of Machine Learning.

UNIT II: Data Preparation

Working with Real Data, look at the Big Picture, Get the Data, Discover and Visualize the Data to Gain Insights, Prepare the Data for Machine Learning Algorithms, Select and Train a Model.

UNIT III: Supervised Learning

Classification and Regression, Some Sample Datasets, k-Nearest Neighbours, Linear Models, Naive Bayes Classifiers, Decision Trees.

UNIT IV: Supervised Learning: Regression

Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT V: Unsupervised Learning

Clustering, K-Means, Limits of K-Means, using clustering for image segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Other Clustering Algorithms.

Textbooks:

1. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

1. EthernAlpaydin, “Introduction to Machine Learning”, MIT Press, 2004.
2. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
3. Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, Oreilly.

Course Code	Professional Elective-II	L	T	P	C
24BCCA03D	**Data Visualization**	2	0	0	2
		SEMESTER - IV			

COURSE OUTCOMES:

On completion of this course, the student will be able to

- Identify and recognize visual perception and representation of data.
- Illustrate about projections of different views of objects.
- Apply various Interaction and visualization techniques.
- Analyze various groups for visualization.
- Evaluate visualizations

UNIT-I

INTRODUCTION TO DATA VISUALIZATIONS AND PERCEPTION: Introduction of visual perception, visual representation of data, Gestalt principles, Information overload.

UNIT-II

VISUAL REPRESENTATIONS: Creating visual representations, visualization reference model, visual mapping,visual analytics, Design of visualization applications.

UNIT-III

CLASSIFICATION OF VISUALIZATION SYSTEMS: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV

VISUALIZATION OF GROUPS: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.

UNIT-V

VISUALIZATION OF VOLUMETRIC DATA AND EVALUATION OF VISUALIZATIONS: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations.

Text Books:

1. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition, A K Peters, Ltd 2015.

Reference Books:

1. Tamara Munzner, Visualization Analysis & Design ,1st edition, AK Peters Visualization Series 2014
2. Scott Murray, Interactive Data Visualization for the Web ,2nd Edition, 2017

Course Code	Professional Elective-II	L	T	P	C
24BCCA03D	**Data Mining & Warehousing**	3	0	0	3
		SEMESTER - IV			

COURSE OBJECTIVES:

- To learn about data mining Concepts
- To study the different data mining techniques

COURSE OUTCOMES:

- To have knowledge in Data mining concepts
- To apply Data mining concepts in different fields

III YEAR / VI SEM

UNIT - I

Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery in Data Bases – Data Mining Issues – Data Mining Matrices – Social Implications of Data Mining – Data Mining from Data Base Perspective.

UNIT - II

Data Mining Techniques – a Statistical Perspective on data mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms.

UNIT - III

Classification: Introduction – Statistical – Based Algorithms – Distance Based Algorithms – Decision.

UNIT - IV

Clustering Tree – Based Algorithms – Neural Network Based Algorithms – Rule Based
Algorithms – Combining Techniques: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms. Partitioned Algorithms.

UNIT - V

Association Rules: Introduction - Large Item Sets – Basic Algorithms – Parallel & Distributed
Algorithms – Comparing Approaches – Incremental Rules – Advanced Association Rules
Techniques – Measuring the Quality of Rules.

TEXT BOOKSS:

1. Jiawei Han & Micheline Kamber, "Data Mining Concepts & Techniques", 2011, 3rd Edition.

REFERENCE BOOKS:

1. Margaret H.Dunbam, "Data Mining Introductory and Advanced Topics", Pearson Education 2003.

WEB REFERENCES:

- NPTEL & MOOC courses titled Data Mining
- https://nptel.ac.in/courses/106105174/

Course Code	DESIGN THINKING	L	T	P	C
24BCCA03D		2	0	0	2
		SEMESTER - IV			

COURSE OBJECTIVES:

Operating under turbulent and uncertain business environment, 'innovation' has become the key driver of organizational success for all companies. Managers are expected to be leading this change by navigating companies into rapid evolution of new products/services and business models.

The primary focus of DTI is to help learners develop creative thinking skills and apply design based approaches/tools for identifying and implementing innovation opportunities into implementable projects. Following a learning-by-doing approach, the objectives of the course are

1. Introduce students to design-based thinking approach to solve problems
2. Observe and assimilate unstructured information to well framed solvable problems
3. Introduce student to templates of ideation
4. Understand the importance of prototyping in the innovation journey
5. Implementing innovation projects

COURSE OUTCOMES:

By the end of the course, students will be able to –

- Propose real-time innovative product designs and Choose appropriate frameworks, strategies, techniques during prototype development.
- Know wicked problems and how to frame them in a consensus manner that is agreeable to all stakeholders using appropriate frameworks, strategies, techniques during prototype development.
- Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products

COURSE CONTENT:

UNIT-1: Basics of Design Thinking

1. Understand the concept of innovation and its significance in business
2. Understanding creative thinking process and problem solving approaches
3. Know Design Thinking approach and its objective
4. Design Thinking and customer centricity – real world examples of customer challenges, use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product.
5. Discussion of a few global success stories like AirBnB, Apple, IDEO, Netflix etc.
6. Explain the four stages of Design Thinking Process – Empathize, Define, Ideate, Prototype, Implement

UNIT-2: Learning to Empathize and Define the Problem

1. Know the importance of empathy in innovation process – how can students develop empathy using design tools
2. Observing and assimilating information
3. Individual differences & Uniqueness Group Discussion and Activities to encourage the understanding, acceptance and appreciation of individual differences.
4. What are wicked problems
5. Identifying wicked problems around us and the potential impact of their solutions

UNIT-3 : Ideate, Prototype and Implement

1. Know the various templates of ideation like brainstorming, systems thinking
2. Concept of brainstorming – how to reach consensus on wicked problems
3. Mapping customer experience for ideation

UNIT-4 : Feedback, Re-Design & Re-Create

1. Feedback loop, focus on User Experience, address ergonomic challenges, user focused design
2. Final concept testing,

UNIT-5 : Feedback, Re-Design & Re-Create

1. Know the methods of prototyping, purpose of rapid prototyping.
2. Implementation
3. Final Presentation – Solving Problems through innovative design concepts & creative solution

Text Books (Latest Edition):

1. E Balaguruswamy (2023), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company
2. Tim Brown, (2008), "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", *Harvard Business Review*
3. 8 steps to Innovation by R T Krishnan & V Dabholkar, Collins Publishing

Reference Book

1. Design Thinking by Nigel Cross, Bloomsbury

Course Code	Computer Networks Laboratory	L	T	P	C
24BCCA07P		3	0	0	3
		SEMESTER - IV			

COURSE OBJECTIVES:

- To understand the different types of networks
- To discuss the software and hardware components of a network
- To enlighten the working of networking commands supported by operating system To impart knowledge of Network simulator 2/3
- To familiarize the use of networking functionality supported by JAVA
- To familiarize with computer networking tools.

COURSE OUTCOMES(CO): After completion of the course, students will be able To Design scripts for Wired network simulation

- Design scripts of static and mobile wireless networks simulation
- Analyze the data traffic using tools
- Design JAVA programs for client-server communication
- Construct a wired and wireless network using the real hardware

Lab Programs:

1. Configure Basic Network Settings:
   A. IP Address Configuration
   B. Subnet Mask and Gateway Settings
2. 2. Implement Network Protocols:
   A. Write a simple Python script to perform DNS resolution.
   B. Implement a basic HTTP client-server application.
3. Network Simulation:
   A. Use network simulation tools (e.g., Cisco Packet Tracer) to design and simulate network topologies.
   B. Configure routers and switches in a simulated environment.
4. Performance Measurement:
   a) Measure network performance using tools like `ping`, `traceroute`, and `iperf`.
   b) Analyze network traffic using Wireshark.
5. Implement VLANs:
   a) Configure VLANs on a switch and verify using simulation tools.
6. Set Up a Simple Web Server:
   a) Deploy a basic web server and configure HTTP/HTTPS access.
7. Network Security Lab:
   a) Implement basic firewall rules and VPN configurations.
   b) Perform vulnerability scanning and analyze results.
8. Network Troubleshooting:
   a) Diagnose and resolve common network issues.
   b) Use troubleshooting commands and techniques to fix connectivity problems.

References:

1. ShivendraS.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, “TCP/IP Essentials A Lab-Based Approach”, Cambridge University Press, 2004.
2. Cisco Networking Academy, “CCNA1 and CCNA2 Companion Guide”, Cisco Networking Academy Program, 3rd edition, 2003.
3. Elloitte Rusty Harold, “Java Network Programming”, 3rd edition, O’REILLY, 2011.

Course Code	Machine Learning Laboratory	L	T	P	C
24BCCA08P		3	0	0	3
		SEMESTER - IV			

COURSE OBJECTIVES:

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

COURSE OUTCOMES(CO):

After completion of the course, students will be able to

- Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming
- Appreciate the importance of visualization in the data analytics solution.
- Derive insights using Machine learning algorithms

List of Experiments:

Note

a. The programs can be implemented in either JAVA or Python.

b. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.

c. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

References:

1. Python Machine Learning Workbook for beginners, AI Publishing, 2020.

Course Code	Cloud Computing	L	T	P	C
24BCCA13P		3	0	0	3
		SEMESTER - V			

COURSE OBJECTIVES:
This module gives students the skills and knowledge to understand how Cloud Computing Architecture can enable transformation, business development and agility in an organization

COURSE OUTCOMES(CO):

- Describe cloud computing concepts
- Identify various cloud services
- Evaluate various cloud delivery models
- Assess cloud characteristics and service attributes, for compliance with enterprise objectives
- Contrast the risks and benefits of implementing cloud computing

Unit-1 **9 Lectures**

Cloud Computing Overview – Origins of Cloud computing, Cloud components, Essential characteristics, On-demand self-service, broad network access, Location independent resource pooling, Rapid elasticity, measured service.
Cloud architecture: Cloud delivery model – SPI framework, SPI evolution, SPI vs. traditional IT
Model

Unit-2 **9 Lectures**

Cloud Computing Architecture: Introduction - The cloud reference model - Types of clouds - Economics of the cloud. Cloud Deployment Model: Public clouds, Private clouds, Community clouds, Hybrid clouds, Advantages and Disadvantages, Comparison models.

Unit-3 **9 Lectures**

Software as a Service (SaaS): Introduction to Infrastructure as a Service delivery model, Characteristics, Architecture, Applicability of IaaS in the industry. SaaS service providers, Google App Engine, Salesforce.com and Google Platform, Benefits, Operational benefits, Economic benefits, Evaluating SaaS.

Unit-4 **9 Lectures**

Platform as a Service (PaaS): Introduction to Platform as a Service delivery model, Characteristics, patterns, Architecture. PaaS service providers: Right Scale, Salesforce.com, Services and Benefits.

Unit-5 **9 Lectures**

Infrastructure as a Service (IaaS): Introduction to Software as a Service delivery model, characteristics, Architecture, Applicability of SaaS in the industry. IaaS service providers, Amazon EC, Amazon EC2 service level agreement, Recent developments. Benefits: Future directions a. Cloud Domain and scope of work, Cloud as PaaS, SaaS, Cloud Computing Programming Introduction Trends and market of cloud.

Text Books

1. Cloud Computing: Concepts, Technology & Architecture, Erl, Pearson Education India; 1 edition, 2014
2. Cloud Computing: Fundamentals By Timothy Chou's.

Reference Books

1. The Basics of Cloud Computing: Understanding the Fundamentals of Cloud Computing in Theory and Practice 1st Edition byDerrick Rountree (Author), Ileana Castrillo (Author)
2. Cloud Computing, A Practical Approach‖ Toby Velte, Anthony Velte, Robert Elsenpeter, McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.

Course Code	Professional Elective - III	L	T	P	C
DSE301	**Data Science & Analytics using Python**	3	0	0	3
		SEMESTER - V			

COURSE OBJECTIVES:

This module gives students the skills and knowledge to understand how Cloud Computing Architecture can enable transformation, business development and agility in an organization

COURSE OUTCOMES(CO):

- Analyze the libraries for data manipulation and conduct hypothesis tests for statistical inference.
- Synthesize data to fit linear and nonlinear models.
- Apply Tree based and Linear learning models to real world problems
- Analyze Bayesian classifiers, Distance based classification and clustering algorithms
- Analyze the libraries for data manipulation and conduct hypothesis tests for statistical inference.

Unit-1 **9 Lectures**

Introduction of PYTHON: What is Python, its advantages and disadvantages, How to run python scripts, How to use variables, String operator and functions, Inputting the data, Working with Boolean and other statements, Use of pandas library for data analysis, Different types of errors that one can encounter while working with Python.

Unit-2 **9 Lectures**

Introduction to Data Science: What is Data Science, what does a data scientist do, various examples of Data Science in the industries, How Python is deployed for Data Science applications, Various steps in Data Science process like wrangling, data exploration and selecting the model.

Unit-3 **9 Lectures**

Data Manipulation and Visualization: Introduction to NumPy, Pandas and Matplotlib, How to Import NumPy module, What is a Data Manipulation using Panda's library? Series object in pandas, Data Frame in Pandas, Loading an handling data with Pandas, Introduction to Matplotlib, Using Matplotlib for plotting Graphs and charts like Scatter, Bar, Pie, Line, Histogram and more.

Unit-4 **9 Lectures**

Supervised and Unsupervised Learning: Linear Regression, Logistic Regression, Classification, Decision Tree, Confusion Matrix, Random Forest, Naïve Bayes classifier, support vector machine, use cases of unsupervised learning, Clustering, K-Means Clustering and Hierarchical Clustering.

Unit-5 **9 Lectures**

Classification: Introduction to Classification, Decision Tree Induction, Bayes Classification methods, Rule-Based classification, Model evaluation and classification, Techniques to Improve Classification Accuracy, Support Vector Machines, Lazy Learners (or learning from neighbors).

Text Books

1. Vijay Kotu and Bala Desh pandey, "Data Science Concept and Practice", Morgan Kaufmann, 2nd Edition, 2019.
2. Jiawei Han, Micheline Kamber, Jian Pie, "Data Ming Concept and Techniques", Morgan Kaufmann, 3rd Addition, 2011.
3.Analytics: Data Science, Data Analysis and Predictive Analytics for Business" by Daniel Covington.

Online Resources

1. https://www.youtube.com/playlist?list=PL15FRvx6P0OWTlNBS_93NHG2hIn9cynVT
2. https://www.youtube.com/watch?v=7Dv8Ke5FJOM&list=PLmNPvQr9Tf-b_SuBdoRsuNhTmaHJ0eKab

Course Code	Professional Elective - III	L	T	P	C
DSE301	**Neural Networks**	3	0	0	3
		SEMESTER - V			

COURSE OBJECTIVES:

- Understand the role of neural networks in engineering, artificial intelligence, and cognitive
- modeling.
- Provide knowledge of supervised learning in neural networks.
- Provide knowledge of computation and dynamical systems using neural networks.
- Provide knowledge of reinforcement learning using neural networks.
- Provide knowledge of unsupervised learning using neural networks.
- Provide hands-on experience in selected applications.

Unit I

Introduction -what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

LEARNING PROCESS 1 –Error Correction learning, Memory based learning, Hebbianlearing

Unit II

Learning Process 2: Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

SINGLE LAYER PERCEPTRONS – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perception –convergence theorem, Relation between perception and Bayes classifier for a Gaussian Environment

Unit III

Multilayer Perceptron –Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection,

BACK PROPAGATION -back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

Unit IV

Self Organization Maps – Two basic feature mapping models, Self-organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification, Hierarchal Vector quantilizer, contexmel Maps.

Unit V

NeuroDynamics –Dynamical systems, stavility of equilibrium states, attractors, neurodynamical models, manipulation of attractors' as a recurrent network paradigm.

HOPFIELD MODELS –Hopfield models, computer experiment.

Text Books:

1. Neural networks a comprehensive foundations, Simon Hhaykin, Pearson Education 2nd Edition 2004
2. Artificial neural networks -B.Vegnanarayana Prentice Halll of India P Ltd 2005
3. Neural networks in Computer intelligence, Li Min Fu TMH 2003
4. Neural networks James A Freeman David M S Kapura Pearson Education.

Course Code	Professional Elective IV	L	T	P	C
DSE302	**Time Series Analysis**	4	0	0	4
		SEMESTER - V			

COURSE OBJECTIVES:

- To introduce various components of time series and time series models which cater to the real-world
- To help students explore and use the various criteria used for performance evaluation

COURSE OUTCOMES(CO):

- Analyze the principles and process of Time Series.
- Apply and analyze Univariate ARIMA methods for real world problems.
- Apply and analyze Smoothing methods for real world problems.
- Apply various criteria for evaluating model quality.
- Apply and analyze multivariate methods for real world problems.

Unit-1 **9 Lectures**

Time Series Data, Decomposition of Series, Characteristics of Time Series, Database Applications, Measures of Dependence, Stationary Time Series, Estimation of Correlation, Vector-Valued and Multi-Dimensional Series.

Unit-2 **9 Lectures**

Components of Time Series, Additive and Multiplicative models, Measuring Trend: Graphic, Semi-Averages, Moving Average, Method of Least Squares, Correlation, Variance function, correlogram, covariance of sum of random variables.

Unit-3 **9 Lectures**

Seasonal Variation: Method of Simple Averages, Ratio-to-Trend Method, Link relative method, Cyclical and Random Fluctuations.

Index Numbers and their Definitions: Construction and Uses of Fixed and Chain based Index Numbers, Simple and Weighted Index Numbers, Optimum Tests for Index Numbers, Cost of Living Index Numbers.

Unit-4 **9 Lectures**

Time series Regression and Exploratory Data Analysis: Classical Regression, Exploratory Data Analysis, generalized least square method, linear models with seasonal variables, Harmonic seasonal models, logarithmic transforms.

Unit-5 **9 Lectures**

Linear Models: Moving Average models, Fitted MA Models, Autocorrelation and Partial Correlation, Forecasting & Estimation, Non-stationary Models.

Text Books

1. Vijay Kotu and Bala Desh pandey, “Data Science Concept and Practice”, Morgan Kaufmann, 2nd Edition, 2019.
2. Jiawei Han, Micheline Kamber, Jian Pie, “Data Ming Concept and Techniques”, Morgan Kaufmann, 3rd Addition, 2011.
3.Analytics: Data Science, Data Analysis and Predictive Analytics for Business” by Daniel Covington.

Online Resources

1. https://www.youtube.com/playlist?list=PL15FRvx6P0OWTlNBS_93NHG2hIn9cynVT
2. https://www.youtube.com/watch?v=7Dv8Ke5FJOM&list=PLmNPvQr9Tf-b_SuBdoRsuNhTmaHJ0eKab

Course Code	Professional Elective IV	L	T	P	C
DSE302	**Digital Image Processing**	3	0	0	3
		SEMESTER - V			

COURSE OBJECTIVES/COURSE DESCRIPTION

Learn the concepts of basic image processing techniques includes preprocessing, segmentation, and object recognition

COURSE OUTCOME

CO1: Comprehend the knowledge of image processing techniques
CO2: Analyze image processing techniques in spatial domain
CO3: Design algorithms to solve classification and compression techniques

Unit 1 **Teaching Hours:9**

Fundamentals of Image Processing

The origins of Digital Image Processing, Elements of Digital Image Processing System. Image Sampling and Quantization, Basic relationships: Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations**.**

Unit 2 **Teaching Hours:9**

Image Enhancement Techniques

Gray Level Transformations, Histogram Processing, Histogram equalization. Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters.

Unit 3 **Teaching Hours:9**

Image Compression and Image restoration techniques

Huffman coding and Run Length encoding and decoding techniques. A model of the Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise

Unit 4 **Teaching Hours:9**

Image Segmentation

Region Based Segmentation – Region Growing and Region Splitting and Merging. Representation – Chain codes. Point, Line and Edge detection. Thresholding – Global thresholding

Unit 5 **Teaching Hours:9**

Object recognition

Introduction to Patterns and Pattern Classes. Minimum distance classifier, K-NN classifier and Bayes. Boundary descriptors –Regional and Topological descriptors

Text Books And Reference Books:

[1] R. C. Gonzalez & R. E. Woods, Digital Image Processing, 3rd Edition.PearsonEducation, 2009. [2] A.K. Jain, Fundamental of Digital Image Processing, 4th Edition.PHI, 2011.

Essential Reading / Recommended Reading

[1] M. A. Joshi, Digital Image Processing: An algorithmic approach, 2nd Edition. PHI 2009.

[2] B.Chanda, D. DuttaMajumdar, Digital Image Processing and analysis, 1st Edition, PHI,2011.

Course Code	Professional Elective - V	L	T	P	C
DSE303	**Cloud Computing for Data Analytics**	4	0	0	4
		SEMESTER - V			

Goal:

The primary learning outcomes of this course are five-fold. Students will be able to:

- To understand the principles of cloud computing
- To learn about the various cloud deployment options
- To learn the cloud computing paradigms
- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

Objective:

This course introduces cloud services, cloud management, cloud virtualization technologies

- To understand cloud services and solutions
- To know about cloud virtualization technologies and cloud management
- To understand the relevance of Cloud, SOA and benchmarks

Unit 1

Introduction: Introduction, Essentials, Benefits, Business and IT Perspective, Cloud and Virtualization, Cloud Services Requirements, Cloud and Dynamic Infrastructure, Cloud Computing Characteristics, Cloud Adoption.

Unit 2

Cloud Models: Cloud Characteristics, Measured Service, Cloud Models, Security in a Public

Cloud, Public versus Private Clouds, Cloud Infrastructure Self Service.

Unit 3

Cloud Services and Solutions: Gamut of Cloud Solutions, Principal Technologies, Cloud Strategy, Cloud Design and Implementation using SOA, Conceptual Cloud Model, Cloud Service Defined.

Unit 4

Cloud Solutions: Introduction, Cloud Ecosystem, Cloud Business Process Management, Cloud

Service Management, Cloud Stack, Computing on Demand (CoD), Cloud sourcing.

Course Code	Professional Elective - V	L	T	P	C
DSE303	**Quantitative Techniques**	4	0	0	4
		SEMESTER - V			

COURSE OBJECTIVES:

This module gives students the Quantitative skills and knowledge to understand how to solve the Problem Solving.

COURSE OUTCOMES:

- Understand the Quantitative Approaches to decision making and general method of solving quantitative models.
- Calculate the minimum transportation cost and allocation of resources.
- Understand the concept of Decision-making under uncertainty, Theory of games-formulation of game models and its solution methods
- Understand the Replacement Theory in decision making
- Understand the concept of Queuing Theory, Simulation and application in queuing, inventory, finance, marketing and HR areas.

Unit-1 **9 Lectures**

Statistics: Definition, Scope in Economics, Significance, Limitations. Tabulation, Classification and Graphical representation of data (Pie Chart, Bar Diagram, Histogram, Frequency Polygon, Ogive Curve, etc.)

Unit-2 **9 Lectures**

Concepts and Measures of Central Tendency: Mean, Median and Mode; Concepts and Measures of Relative Dispersion.

Unit-3 **9 Lectures**

Correlation Analysis: Introduction, Importance, Karl-Pearson's Coefficient of Correlation, Spearman's Rank Correlation Coefficient, Simple Regression Analysis; Difference between Correlation and Regression, Lines of Regression, Properties of Correlation and Regression Cofficients (Stress on numerical examples).

Unit-4 **9 Lectures**

Index Numbers: Concept of Index Number, Purpose Construction & Problems, Laspeyre, Paasche and Fisher's Formulae, Tests of Consistency.

Unit-5 **9 Lectures**

Analysis of Time Series: Definition, Components of Time Series, Measurement of Trend by different methods; stress on examples.

Text Books

1.Gupta, S.P.: Statistical Methods.
2. Croxton, Cowden & Klein: Applied General Statistics.
3. Ya-lun-chou: Statistical Analysis.
4. Kapur and Sexena: Mathematical Statistics.
5. Murry, R. Speigal: Theory and Problems of Statistics.

Course Code	Mobile Application Development	L	T	P	C
SEC301		3	0	0	3
		SEMESTER - V			

COURSE OBJECTIVES:

This course is gaining importance in today's digital era. This course aims to cover various methods of mobile application development that are required to become a professional app developer. This course provides hands-on experience and exposure to the required tools and techniques to produce industry-standard mobile apps using android and flutter

COURSE OUTCOMES:

- Understand Android & flutter architecture, activities and their life cycle.
- Use View Groups comprising layouts and Views in application.
- Manage data binding, user interface events, maps
- Work with graphics, animation, still images and video.
- Publish and distribute Android Application

Unit-1 **9 Lectures**

Overview of Android: Introducing Android, The Android Application Components, the manifest file, Downloading and Installing Android, Exploring the Development Environment,
Developing and Executing the first Android Application.

Unit-2 **9 Lectures**

Using Activities, Fragments, and Intents in Android: Working with activities, Using Intents, Fragments, Using the Intent Object to Invoke Built –in Application

Unit-3 **9 Lectures**

Working with the User Interface Using View and ViewGroups: Working with View Groups, building data with the AdapterView Class, Designing AutoTextCompleteView, Implementing Screen Orientation, Designing the views programmatically, Handling UI events, Creating Menus

Unit-4 **9 Lectures**

Storing the Data Persistently: Introducing the Data Storage Options, Using the internal storage, Using the external storage, Using the SQLite Database, Working with content Provider.

Unit-5 **9 Lectures**

Working with Location Services and Maps: Working with Google Maps, Working with Geocoding and Reverse Geocoding. Use Media Player, Recording and Playing sound, creating a sound pool, Using Camera, Recording Video.

Text Books

- Android Application Development Black Book by Pradeep Kothari, DreamTech
- Beginning Android 4 Application Development by Wei Meng Lee, Wrox
- Android Wireless Application Development by Lauren Darcey, Shane Conder, Pearson
- Flutter for beginners by Alessandro Biessek, Packt publication

Links:

- https://developer.android.com/
- https://flutter.dev/

Course Code	Data Science Laboratory	L	T	P	C
Lab 301		0	0	3	1.5
		SEMESTER - V			

COURSE OBJECTIVES:

- To develop data analytic code in python
- To be able to use python libraries for handling data
- To develop analytical applications using python
- To perform data visualization using plots

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Write python programs to handle data using Numpy and Pandas
- Perform descriptive analytics
- Perform data exploration using Matplotlib
- Perform inferential data analytics
- Build models of predictive analytics

LIST OF EXPERIMENTS:

Tools Required

Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

1. Working with Numpy arrays
2. Working with Pandas data frames
3. Basic plots using Matplotlib
4. Frequency distributions, Averages, Variability
5. Normal curves, Correlation and scatter plots, Correlation coefficient
6. Regression
7. Z-test
8. T-test
9. ANOVA
10. Building and validating linear models
11. Building and validating logistic models
12. Time series analysis

Course Code Lab 302	Mobile Application Development Laboratory	L	T	P	C
		0	0	3	1.5
		SEMESTER - V			

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Design and develop user interfaces for mobile apps using basic building blocks, UI components and application structure using Emulator
- Develop applications with multiple activities using intents, array adapter, exceptions and options menu
- Implement activities with dialogs, spinner, fragments and navigation drawer by applying themes

LIST OF EXPERIMENTS:

1. Installation of Android studio.
2. Development of Hello World Application
3. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button
4. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout).
5. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity
6. Design an android application Send SMS using Intent
7. Create an android application using Fragments
8. Design an android application Using Radiobuttons
9. Design an android application for menu.
10. Create a user registration application that stores the user details in a database table.

Course Code	Generative AI	L	T	P	C
CC302		4	0	0	4
		SEMESTER - VI			

COURSE OUTCOMES:

- Able to understand different types of neural network architectures used in Generative AI.?
- Able to understand the mathematics behind design of Generative AI models .?
- Able to design models for Generative AI
- Able to implement deep learning models for Generative AI applications?

Unit-1 **9 Lectures**

Generative Modeling, Generative Versus Discriminative Modeling, Generative Model Taxonomy, Deep Neural Networks, Multilayer Perceptron (MLP), Convolutional Neural Network (CNN), Autoencoders, Variational Autoencoders, Exploring the Latent Space.

Unit-2 **9 Lectures**

Generative Adversarial Networks (GANs): Core concepts of GANs: generator and discriminator, Training process and challenges, Applications of GANs: image generation, style transfer, data augmentation.

Unit-3 **9 Lectures**

Variational Autoencoders (VAEs): Introduction to VAEs and their architecture, Encoding and decoding process, Applications of VAEs: anomaly detection, dimensionality reduction, data generation.

Unit-4 **9 Lectures**

Diffusion Models: Understanding the diffusion process, Forward and reverse diffusion, Applications of diffusion models: image generation, text generation, audio synthesis.

Unit-5 **9 Lectures**

Applications of Generative AI: Image generation and manipulation, Natural language processing (text generation, translation, summarization), Music composition and audio generation, Drug discovery and materials science, Other emerging applications.

Text Books

- Generative AI: The Insights You Need from Harvard Business Review (2023)
- Generative Ai for Everyone | Karthikeyan Sabesan | Bpb (2024)
- Generative AI for Enterprises: Essential insights for decision makers (English Edition) (2024)

Course Code	Professional Elective - VI	L	T	P	C
DSE304	**Big Data Analytics**	3	0	0	3
		SEMESTER - VI			

COURSE OBJECTIVES:

- To implement MapReduce programs for processing big data.
- To realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
- To analyze big data using machine learning techniques?

Unit-1 **9 Lectures**

Dawn of the Big Data Era, Definition and Features of Big Data, Big Data Value, The Development of Big Data, Challenges of Big Data.

RELATED TECHNOLOGIES: Cloud Computing - Cloud Computing Preliminaries, Relationship Between Cloud Computing and Big Data, IoT - IoT Preliminaries, Relationship Between IoT and Big Data, Data Center, Hadoop - Hadoop Preliminaries, Relationship between Hadoop and Big Data.

Unit-2 **9 Lectures**

BIG DATA GENERATION AND ACQUISITION:

Big Data Generation-Enterprise Data,IoT Data, Internet Data, Bio- medical Data, Data Generation from Other Fields, Big Data Acquisition- Data Collection, Data Transportation, Data Pre-processing.

Unit-3 **9 Lectures**

BIG DATA STORAGE: Storage System for Massive Data,Distributed Storage System,Storage

Mechanism for Big Data - Database Technology, Design Factors, Database Programming Model

HADOOP & MAP REDUCE: Data Storage and Analysis, Comparison with Other Systems, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem, A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop (Map and Reduce, Java MapReduce), Scaling Out, Hadoop Streaming, Hadoop Pipes.

Unit-4 **9 Lectures**

BIG DATA ANALYSIS: Traditional Data Analysis, Big Data Analytic Methods, Architecture for Big Data Analysis - Real-Time vs. Offline Analysis, Analysis at Different Levels, Analysis with Different Complexity, Tools for Big Data Mining and Analysis.

Unit-5 **9 Lectures**

BIG DATA APPLICATIONS: Application Evolution, Big Data Analysis Fields - Structured Data Analysis, Text Data Analysis, Web Data Analysis, Multimedia Data Analysis, Network Data Analysis, Mobile Traffic Analysis, Key Applications - Application of Big Data in Enterprises, Application of IoT Based Big Data, Application of Online Social Network-Oriented Big Data, Applications of Healthcare and Medical Big Data, Collective Intelligence, Smart Grid

Text Books

- Min Chen, Shiwen Mao, Yin Zhang,Victor C.M. Leung, “Big Data: Related Technologies, Challenges and Future Prospects”, Springer; 2014 edition.

REFERENCES

- Tom White, “Hadoop- The Definitive Guide”, O’reilly, 2nd Edition.
- VigneshPrajapati,”Big Data Analytics with R and Hadoop”, PACKT Publishing,November 2013.

Course Code	Professional Elective - VI	L	T	P	C
DSE304	**Deep Learning for Computer Vision**	3	0	0	3
		SEMESTER - VI			

COURSE OBJECTIVES

This course provides an in-depth introduction to deep learning techniques for computer vision applications. Students will learn the fundamental concepts of neural networks, convolutional neural networks, and their applications in image recognition, object detection, and image segmentation. The course will also cover various deep learning architectures and optimization techniques for training deep neural networks.

Unit-1 **Lecture hours: 9**

Introduction to Deep Learning and Computer Vision: What is Deep Learning and Why is it Important, Overview of Computer Vision and Its Applications, History of Deep Learning and its Applications in Computer Vision.

Unit-2 **Lecture hours: 9**

Introduction to Neural Networks: Biological Inspiration for Artificial Neural Networks, Basic Structure and Components of a Neural Network, Activation Functions and Loss Functions. Convolutional Neural Networks: Introduction to Convolutional Neural Networks (CNNs), Convolutional Layers, Pooling Layers, and Fully Connected Layers, Popular CNN Architectures (LeNet, AlexNet, VGG, ResNet, etc).

Unit-3 **Lecture hours: 9**

Training Convolutional Neural Networks: Data Pre-processing and Augmentation Techniques, Optimizers and Learning Rate Scheduling, Regularization Techniques (Dropout, L1/L2
Regularization.

Unit-4 **Lecture hours: 9**

Object Detection: Object Detection and Localization Techniques, Popular Object Detection Architectures (RCNN, Fast RCNN, Faster RCNN, YOLO, etc.), Training Object Detection Models and Fine-tuning Pretrained Models. Semantic Segmentation: Introduction to Semantic Segmentation, Fully Convolutional Networks (FCN), Popular Semantic Segmentation Architectures (U-Net, SegNet, DeepLab, etc.)

Unit-5 **Lecture hours: 9**

Sequential models: RNN, LSTM, Encoder – Decoder Models, Attention Mechanism. Recent Trends in Deep Learning for Computer Vision: Spatial Transformers, Transformer Networks, Deep Generative Models: GANs, VAEs; GAN for Image Synthesis, Transfer Learning and Domain Adaptation, Introduction to GNN, Recent Advances and Future Directions in Deep Learning for Computer Vision.

Text Book / References

1. Goodfellow I, Bengio Y, Courville A. Deep learning. MIT press; 2016.
2. Patterson J, Gibson A. Deep learning: A practitioner's approach. " O'Reilly Media, Inc."; 2017.
3. Adrian Rosebrock. "Deep Learning for Computer Vision with Python." PyImageSearch, 2021.
4. Kaiming He, et al. "Deep Residual Learning for Image Recognition." CVPR, 2016.
5. Research Papers on Relevant Topics and Internet Resources

Course Code	Professional Elective - VII	L	T	P	C
DSE305	**Information Retrieval System**	3	0	0	3
		SEMESTER - VI			

COURSE OBJECTIVES:

- To learn about the relationships to data base management system and libraries.
- To understand the important concepts, algorithms, and data/file structures.
- To learn about clusters, searching techniques and visualization.

COURSE OUTCOMES:

- Analyze the retrieval information systems and its capabilities.
- Analyze and apply appropriate data structures and indexing concepts.
- Use the various searching techniques for improving the information visualization.
- Apply the searching algorithms to evaluate information systems.
- Use the multimedia information retrieval of query languages.

Unit-1 **9 Lectures**

Introduction to Information Retrieval Systems: Definition, Objectives, Functional overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

Information Retrieval System Capabilities: Search, Browse, and Miscellaneous.

Unit-2 **9 Lectures**

Catalog and Indexing: Objectives, Indexing Process, Process, Automatic Indexing, Information Extraction.

Data Structures: Introduction, Streaming Algorithms, Inverted file structures, N-gram data structure, and PAT data structure, Signature file structure, Hidden Markov Models.

Unit-3 **9 Lectures**

Document and Term Clustering: Introduction, Thesaures Generation, Item Clustering, Hierarchy of Clusters.

User Search Techniques: Search statements and Binding, Similarity Measures and Ranking, Retrieval Feedback, Selective Dissemination of Information Search,

Unit-4 **9 Lectures**

Text Search Algorithms: Introduction, Software Text Search Algorithms, Hardware Text Search Systems.

Information System Evaluation: Introduction, Measures used in System Evaluation, Measurement Example-TREC results.

Unit-5 **9 Lectures**

Multimedia Information Retrieval: Models and Languages, Data Modeling, Query Languages, Indexing and Searching.

Libraries and Bibliographical Systems: Online IR Systems, OPACs, Digital Libraries.

Text Books

1. Gerald J. Kowalski, Mark T. Maybury(2000), Information Storage and Retrieval Systems: Theory and Implementation, 2nd Edition, Springer International Edition, USA.
2. Information Retrieval: Algorithms and Heuristics By David A Grossman and Frieder, 2nd Edition, Springer.

Course Code	Professional Elective - VII	L	T	P	C
DSE305	**Predictive Analysis**	3	0	0	3
		SEMESTER - VI			

LEARNING OUTCOME:

The students should be able to assess the suitability of Predictive models for effective business decisions.

The students will enable valid and reliable ways to collect analyze and visualize data; thereby utilize it in decision making.

To enhance the skills on linear and logistic regression.

To apply forecasting techniques in making effective business decisions

UNIT-I:

Simple Regression Analysis: Concept Fundamentals of Regression Analysis - Requirements in Regression Model Building - Model Diagnostics - Interpretation of Regression results for Management Decision.

Multiple Regression Analysis: Concept - Significance of Multiple Regression Analysis - Structure of Model Estimation - Testing Rule of Multiple Regression Analysis Unit-II: Non-linear Regression and Regression Modeling

UNITII:

Non-Linear Regression Analysis: Concept - Types of Non-linear Regression Models - Model Transformation - Difference between Linear and Non-linear Regression Models.

Diagnostics of Regression Modelling: Model Diagnostics - Multicollinearity - Autocorrelation

Unit-III:

Dummy modelling and Panel Data Model Dummy modeling: Dummy independent modelling-linear probability Model-Logit model-Probit model

Panel Data Model: Concept - Panel Data Models - Fixed Effects Model - Random Effects Model - Forms of Panel Data Models - Applications to use Panel Data Models.

Unit-IV:

Forecasting and Machine Learning: Time Series Forecasting: Concept - Forecasting Techniques - Measures of Forecast Error - Trend Analysis - Time Series Models - Auto Regressive Model - Applications of Time Series Models.

Machine Learning: Concept - Predictive Analysis under Machine Learning - Model of Artificial Neural Networks (ANN) - Model of Random Forest - Model of Support Vector Machine - Assumptions under Machine Learning.

Unit-V:

Data Mining and Simulation: Data Mining: Concept - Data Interpretation - Data Reduction - Classification and Clustering Techniques - Association Rule Mining - Cause and Effect Model.

Simulation: Concept - Monte Carlo Simulation - Discriminant Event Simulation - Application Using Simulation.

Course Code	Soft Skills	L	T	P	C
AEC301		3	0	0	3
		SEMESTER - VI			

OBJECTIVES:

- To enrich the students' interpersonal skills
- To make the students feel optimistic
- To inform the students about the importance of projecting a positive
- social image
- To insist on the aspects of effective planning and goal-setting
- To provide an in-depth view to the students about building self-esteem and confidence
- To motivate the students to become winning personalities
- To inculcate leadership qualities in the young minds
- To enable the students understand the importance of employing
- perfect body language in communication

COURSE CONTENT

Public Speaking

- The power of Public Speaking
- Developing confidence
- Planning
- Preparation
- Successful and effective delivery of speech

Group Discussion

- What is group discussion?
- Why are group discussions held?
- Preparation for a group discussion
- Skills for effective participation
- Traits tested in a group discussion
- Initiating a group discussion
- Non-verbal communication in group discussion
- Types of group discussions

Interviews

- Interviewing in the 21st century
- Developing an Interview Strategy
- Taking Care of the Details
- Practicing for the Interview
- During the Interview
- Stress Interviews
- Traditional Interviews

Writing Skills

- Basics of writing
- Writing paragraphs
- Writing research articles
- Report writing
- Writing a CV

PERSONALITY DEVELOPMENT

Course Content

Introduction

- Introduction to personality
- Dimensions of personality
- Determinants of personality
- Winning personality
- Human behaviour

Personality and the Self

- Positive self image and negative self image
- Problems of maladjustment
- Building self-esteem and confidence

Attitude and Motivation

- Importance of possessing the right attitude
- Factors affecting attitudes
- Positive and negative attitudes
- Internal and external motives
- Importance of self-motivation
- Factors leading to de-motivation
- Goal setting and prioritisation
- Effective planning
- Time management
- Discipline in problem solving

Communication

- Inter-personal communication
- Relationships
- Leadership
- Team building

Projecting a Positive Social Image

- Grooming
- Body language
- Eye contact
- Social etiquette
- Manners in conversations