

KONERU LAKSHMAIAH EDUCATION FOUNDATION

BACHELOR OF COMPUTER APPLICATIONS

**PROGRAMME
CURRICULUM
2025-2026**

BCA

Course Curriculum

BCA PROGRAM SEMWISE STRUCTURE

SEM	SNO	COURSE CODE	COURSE TITLE	L	T	P	S	CR	CH
I	1	23MT1112O	MATHEMATICS FOR COMPUTER SCIENCE	2	2	0	0	4	4
	2	24UC1103O	LANGUAGE SKILLS	0	0	4	0	2	4
	3	22UC0009O	ECOLOGY & ENVIRONMENT	2	0	0	0	0	2
	4	24CA1101O	COMPUTER ORGANIZATION	2	2	0	0	4	4
	5	24CA1102O	ESSENTIALS OF INFORMATION TECHNOLOGY	3	0	2	0	4	5
	6	24CA1103O	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	3	0	2	0	4	5
	7	24SDCA01O	WEB AND SOCIAL MEDIA TECHNOLOGIES	1	0	0	4	2	5
TOTAL				13	4	8	4	20	29
II	1	23MT1213O	PROBABILITY AND STATISTICS	2	2	0	0	4	4
	2	24UC2105O	COMMUNICATION SKILLS	0	0	4	0	2	4
	3	24CA1204O	ESSENTIALS OF OPERATING SYSTEM	3	1	0	0	4	4
	4	24CA1205O	DATA STRUCTURES	3	0	2	0	4	5
	5	24CA1206O	DATABASE MANAGEMENT SYSTEMS	3	0	2	0	4	5
	6	24SDCA02O	OBJECT ORIENTED PROGRAMMING	1	0	0	4	2	5
	7	22UC0021O	SOCIAL IMMERSIVE LEARNING – 1	0	0	0	4	1	4
TOTAL				12	3	8	8	21	31
III	1	24CA2107O	DESIGN AND ANALYSIS OF ALGORITHMS	3	1	0	0	4	4
	2	24CA2108O	COMPUTER NETWORKS	3	1	0	0	4	4
	3	24SDCA03O	WEB DEVELOPMENT USING PYTHON	1	0	0	4	2	5
	4	24UC1203O	DESIGN THINKING & INNOVATION	2	0	2	0	3	4
	5	22UC0008O	INDIAN CONSTITUTION	2	0	0	0	0	2
	6	22UC0022O	SOCIAL IMMERSIVE LEARNING – 2	0	0	0	4	1	4
	7	23UC0013O	GLOBAL LOGIC BUILDING CONTEST PRACTICAL1	0	0	0	2	0	2
	8		PROFESSIONAL ELECTIVE - 1	3	0	2	0	4	5
TOTAL				14	2	4	10	18	30
IV	1	24CA2209O	OBJECT ORIENTED ANALYSIS & DESIGN	3	0	2	0	4	5
	2	24CA2210O	SOFTWARE ENGINEERING	3	1	0	0	4	4
	3	24SDCA04O	JAVA FULL STACK DEVELOPMENT	1	0	0	4	2	5
	4	23UC0026O	HUMAN VALUES, GENDER EQUALITY AND PROFESSIONAL ETHICS	2	0	0	0	2	2
	5	22UC0023O	SOCIAL IMMERSIVE LEARNING – 3	0	0	0	4	1	4
	6	23UC0014O	GLOBAL LOGIC BUILDING CONTEST PRACTICAL-2	0	0	0	2	0	2
	7		PROFESSIONAL ELECTIVE - 2	3	0	0	0	3	3
	8		PROFESSIONAL ELECTIVE - 3	3	0	0	0	3	3
TOTAL				15	1	2	10	19	28

SEM	SNO	COURSE CODE	COURSE TITLE	L	T	P	S	CR	CH
V	1	24CA3111O	CONTINUOUS DELIVERY AND DEPLOYMENT WITH DEVOPS	3	0	2	0	4	5
	2	24CA3112O	NETWORK AND INFRASTRUCTURE SECURITY	3	0	2	0	4	5
	3	24SDCA05O	ASPECTS OF MOBILE APPLICATION	1	0	0	4	2	5
	4	23FL3055O	FOREIGN LANGUAGE ELECTIVE (HSS6)- GERMAN LANGUAGE	3	0	0	0	3	3
	5		PROFESSIONAL ELECTIVE – 4	3	0	2	0	4	5
	6		PROFESSIONAL ELECTIVE - 5	2	0	2	0	3	4
TOTAL				15	0	8	4	20	27
VI	1	24IE3204O	MAJOR PROJECT	0	0	6	8	5	14
	2	23OEBT01O IPR AND PATENT LAWS	OPEN ELECTIVE - 1	4	0	0	0	4	4
	3	23OEEC11O - IMAGE PROCESSING	OPEN ELECTIVE - 2	3	0	0	0	3	3
	4	24MB5105O - MARKETING MANAGEMENT	MANAGEMENT ELECTIVE	4	0	0	0	4	4
	5	23UC0029O	LEADERSHIP AND MANAGEMENT SKILLS	0	0	4	0	2	4
	TOTAL			11	0	10	8	18	29

Professional Electives

SNO	COURSE CODE	COURSE NAME	SPECIALIZATION	L	T	P	S	Cr	CH
1	24CA21C1O	Cloud Architectures	CLOUD COMPUTING	3	0	2	0	4	5
2	24CA22C2O	Cloud Serverless Computing		3	0	0	0	3	3
3	24CA22C3O	Cloud Native Application Development		3	0	0	0	3	3
4	24CA31C4O	Cloud Security		3	0	2	0	4	5
5	24CA31C5O	Design and Development of Cloud Application		2	0	2	0	3	4
6	24CA21AD1O	Machine Learning	AI&DS	3	0	2	0	4	5
7	24CA22AD2O	Data Management & Big Data Analytics		3	0	0	0	3	3
8	24CA22AD3O	Deep Learning		3	0	0	0	3	3
9	24CA31AD4O	Natural Language Processing and Large Language Models		3	0	2	0	4	5
10	24CA31AD5O	Data Visualization Techniques		2	0	2	0	3	4
11	24CA21S1O	Cyber Security and Ethical Hacking	CYBER SECURITY	3	0	2	0	4	5
12	24CA22S2O	Cyber Forensics		3	0	0	0	3	3
13	24CA22S3O	Malware Analysis		3	0	0	0	3	3
14	24CA31C4O	Cloud Security		3	0	2	0	4	5
15	24CA31S5	SECURITY GOVERNANCE AND MANAGEMENT		2	0	2	0	3	4

SYLLABUS

SEM I SYLLABUS

23MT1112O - MATHEMATICS FOR COMPUTER SCIENCE

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23MT1112O	MATHEMATICS FOR COMPUTER SCIENCE	MCS	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Ability to understand the conceptualize the basic concepts of Matrices and its Applications	3	PO1
CO2	Ability to understand the applications of truth tables to logic gates usage in digital circuit design and identify the logical expressions and their minimization techniques for logical circuit Optimization	3	PO1
CO3	Ability to understand identify the operations on sets and properties. Relations and functions	3	PO1
CO4	Ability to understand Graph and Graph theory applications in Circuits and Networking Theory	3	PO1

Syllabus

Basic Definitions matrix operations addition multiplication transpose Adjoint and inverse. Determinant of a square matrix up to 3X3 matrix Rank of matrix Echelon form System of linear equations.

Fundamental logic Statements Propositions Logical Operations Truth Table Tautologies Contradiction Logical Equivalence Algebra of Propositions Conditional and biconditional Statement Argument Logical Implication Propositional Functions Quantifiers Negation of Quantifiers Statements.

Sets Introduction Sets and their representations empty set Finite infinite sets equal sets subsets power sets universal sets complements of a set. Cartesian products of sets. Relations Types of relations reflective symmetric transitive and equivalence relations. Functions one to one and onto functions composite functions inverse of a function Binary operations recursively defined functions.

Graphs and Trees Definition of a graph theory incidence and degree walks paths circuits Connectedness Eulerian and Hamiltonian graphs Trees basic properties of trees Binary trees Spanning and Minimal spanning trees.

Reference Books

- 1 Discrete Mathematical Structures with Applications to Computer Science , J.P. Tremblay, R. Manohar, 1997,
TATA Mc Graw Hill.
- 2 Discrete Mathematics Schaum's Series, SEYMOUR LIPSCHUTZ, MARC LARS LIPSON, Third, TATA Mc Graw Hill.
- 3 Engineering Mathematics, S.S. Sastry, Volume I, Prentice Hall of India.
- 4 Mathematics, R.D. Sharma, Volume I, Dhanpat Rai.

24UC11030 - LANGUAGE SKILLS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24UC11030	LANGUAGE SKILLS	LS	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the essential listening, speaking, and reading skills	2	PO10
CO2	Apply and produce essential writing and non-verbal communication skills	3	PO10

Syllabus

Techniques of Effective Listening, Listening and Comprehension Probing Questions, Barriers to Listening. Speaking: Pronunciation, Enunciation, Vocabulary Fluency, Common Errors Reading: Techniques of Effective Reading, Gathering Ideas and Information from a Given Text

Writing Writing: Clearly State the Claims, Avoid Ambiguity, Vagueness, Unwanted Generalizations, and Oversimplification of Issues, provide Background Information, Effectively Argue the Claim, Provide Evidence for the Claims. , Non- verbal Communication

Reference Books

- 1 On Writing Well: The Classic Guide to Writing Nonfiction, William Zinsser, 1st Edition, 2016, Harper Perennial.
- 2 Speaking English Effective (English), Krishna Mohan & N P Singh, 2nd Edition, 2005, Laxmi Publications-New Delhi.
3. Effective speech, Richard W. Clark, 1st Edition, 1988, Glencoe Pub.
4. The Ace of Soft skills, Mr. Gopaldaswamy Ramesh et al Mr. Gopaldaswamy Ramesh et al, 1st edition,2010, Pearson Publications.
5. Body Language: How to Read Others' Thoughts by Their Gestur, Allan Pease, 1st Edition, Sheldon Press.

22UC00090 - ECOLOGY AND ENVIRONMENT

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
22UC00090	ECOLOGY AND ENVIRONMENT	E&E	R	2	0	0	0	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Discuss natural resources and importance of environmental science.	2	PO7
CO2	Describe various ecosystems and applications of biodiversity.	2	PO7
CO3	Identify and discuss causes, preventive measures of environmental pollution.	2	PO7
CO4	Summarize connotational acts for environmental science, knowledge on solid waste management and disaster management.	2	PO7

Syllabus

The Multidisciplinary nature of Environmental Studies Introduction to Environment Definition scope importance Multidisciplinary nature of Environmental Studies, Need for public awareness. Institutions and people in Environment. Natural Resources Renewable and Non-Renewable Resources Forest resources Uses Deforestation causes, effects, and impacts, Afforestation Programme-Socio-forestry, Agro forestry, Vanasamrakshana programs. Mining its impact on the environment mining, dams and their effects on forests and tribal people. Water resources: Distribution of surface and groundwater, Aquifers, floods drought conflicts over water, dams benefits and problems, Water conservation rainwater harvesting watershed management, Cloud seeding Mineral resources: Use exploitation environmental effects. Food resources Changes in agricultural methodologies, comparison between old and new methods of farming, Green Revolution, Environmental Impact Assessment of conversion of agricultural lands effects of modern agriculture, Drip Irrigation fertilizer-pesticide problems, Eutrophication, Vermicompost water logging, blue baby syndrome Energy resources Growing energy needs renewable and non-renewable energy sources Solar, wind, geothermal, tidal, bio energies. Land resources Land as a resource land degradation Soil erosion: Importance of soil, Types of soil erosion, Causes and effects of soil erosion. How to control soil erosion. Role of an individual in conservation of natural resources.

Ecosystems Concept of an ecosystem Structure and function of an ecosystem Producers consumers decomposers with examples, Energy flow in the ecosystem Ecological succession Food chains food webs and ecological pyramids. Types of ecosystems characteristic features, structure, and function of the following ecosystem a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem e. Aquatic ecosystems ponds, streams, lakes, rivers, oceans, estuaries. Biodiversity and its Conservation: Introduction Definition: genetic, species and ecosystem diversity. Biogeographical classification of India Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values Biodiversity at global, National, and local levels India as a mega-diversity nation Hotspots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution Definition Causes, effects, and control measures of a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution. e. Noise pollution f. Thermal pollution g. nuclear hazards Solid waste

Management Causes, effects, and control measures of urban and industrial wastes. Role of an individual in the prevention of pollution. Pollution case studies. Disaster management floods, earthquakes, cyclones, and landslides. Social Issues and the Environment from Unsustainable to Sustainable development Urban problems related to energy Water conservation. rainwater harvesting, watershed management.

Resettlement, and rehabilitation of people its problems and concerns. Case studies Environmental ethics issues and possible solutions. Climate change global warm acid rain, ozone layer depiction. nuclear accidents and holocaust. Case studies. Wasteland reclamation. Environmental Protection Act, Air (Prevention and Control of Pollution) Act Water (Prevention and control of Pollution) Act Wildlife Protection Act Forest Conservation Act Issues involved in the enforcement of environmental legislation. Public awareness Human Population and the Environment Population growth, Population explosion Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV AIDS Case Studies.

Reference Books

1. Textbook of Environmental Studies, Erach Bharucha, 2010, 4, United Grants Commission, Universities Press (India) Pvt Ltd., Hyderabad.
2. Environmental Studies, Benny Joseph, 2009, 5, The McGraw-Hill Companies, New Delhi.
3. Textbook of Environmental Studies, Deeksha Deve and S.S. Kateswa , 2009, 3, Cengage Learning India Pvt Ltd, New Delhi .
4. Environmental Studies, Anubha Kaushik, C.P. Kaushik , 2007, 4, New Age International.
5. Environmental Biology, P.D. Sharma, 2009, 7, Rastogi Publications, Meerut

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA11010	COMPUTER ORGANIZATION	CO	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the fundamental concepts and techniques used in digital electronics and using K-Maps for Boolean Expression simplification	2	PO1, PO3
CO2	Model the building blocks of Combinational and Sequential circuits and explaining registers and its usage	3	PO1, PO3
CO3	Analyze the basic concepts of computer organization: structure and operation of computers and their peripherals the design of the functional units of a digital computer system.	4	PO1, PO3
CO4	Classify the working of the Central Processing Unit. Design and evaluate the performance of memory systems	4	PO1, PO3

Syllabus

Number Systems and Boolean Algebra Number Systems cover representing numbers in various radices, radix conversions, and different integer formats (unsigned, signed, sign magnitude, 1's and 2's complement). Boolean Algebra includes logic gates (OR, AND, NOR, NAND, XOR, XNOR), truth tables, De Morgan's theorem, Boolean laws, and circuit design using Karnaugh Maps for minimization techniques (SOP, POS). Combinational Building Blocks focus on adders and subtractors.

Digital Circuits and Computer Architecture Digital Circuits include multiplexers and decoders, and sequential circuits featuring various flip-flops (SR, JK, D, T). Basic Structure of Computers covers computer types and functional units. Register Transfer and Micro-Operations involve register transfer language, bus and memory transfers, and different types of micro-operations (arithmetic, logic, shift).

Basic Computer Organization and Design Basic Computer Organization and Design covers computer codes, registers, and instructions, along with timing and control methods (hardwired and microprogrammed). It includes the instruction cycle, memory-reference instructions, I/O operations, interrupts, and designing basic computers and accumulator logic. The microprogrammed control unit focuses on address sequencing and microprogram examples, with an overview of the Central Processing Unit (CPU).

Computer Architecture Components include General Register Organization, various Stack types, Instruction Formats, Addressing Modes for data transfer and manipulation, and Program Control. It also covers concepts in Reduced Instruction Set Computer (RISC). Memory Organization encompasses Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, and Virtual Memory systems, focusing on their roles in data storage and retrieval efficiency.

Reference Books

- 1 Computer Organization and Design, David A. Patterson, John L. Hennessy, 2012, Morgan Kaufmann.
- 2 Computer Organization, Carl Hamacher, 2012, Tata McGraw Hill.
- 3 Computer Architecture, John L. Hennessy, David A. Patterson, 2016, Morgan Kaufmann.
- 4 Structured Computer Organization, Andrew S. Tanenbaum, Todd Austin, 2015, Pearson.
5. Computer Organization and Embedded Systems, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, NaraigManjikian, 2010, McGraw-Hill Education.

24CA11020 - ESSENTIALS OF INFORMATION TECHNOLOGY

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA11020	ESSENTIALS OF INFORMATION TECHNOLOGY	EIT	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Illustrate the basic building blocks of computers (hardware), system software, and essential programming concepts for problem solving.	2	PO1, PO3, PO5
CO2	Understand various basic concepts of creating, formatting, and collaborating on documents in MS Word.	2	PO1, PO2, PO3
CO3	Apply the concepts of Microsoft PowerPoint for building presentations with slides, layouts, visuals, animations, and speaker notes for effective delivery.	3	PO2, PO3, PO5
CO4	Examine the basic and advanced functions in Microsoft Excel for data manipulation, analysis, and presentation.	4	PO1, PO5
CO5	Evaluate and Explore data through Word Processing, Spreadsheet applications and Presentations.	5	PO2, PO3, PO5

Syllabus

Fundamentals of Computers, block diagram of Computer, Central Processing Unit (CPU), Memory, Input/output devices. System Software types, Programming Essentials: Problem solving with algorithms, flowchart, Programming styles, Programming Fundamentals.

interface overview, Creating new documents and working with templates, Text formatting (font, size, color, alignment), Paragraph formatting (indentation, spacing, line breaks), Working with styles and themes, Inserting and editing images, tables, and charts, Checking spelling and grammar, Page layout and formatting (margins, headers, footers), Collaboration features (sharing documents, track changes), Mail Merge (Creating personalized letters and

Introduction to PowerPoint and presentation creation, designing slides with layouts, themes, and backgrounds, adding text, images, videos, and audio to slides, Working with transitions and animations, creating charts and graphs, delivering presentations with speaker notes and handouts.

Basic Functions: Basic Math & Percentages, Statistics, Conditional Logic, lookup & Reference, Text Manipulation, Logical Operations, Date & Time Advanced Functions, Pivot Tables, Financial Functions, Data Analysis, Data Manipulation

Evaluate and Explore data through Word Processing, Spreadsheet applications and Presentations - planning to do lab on word, excel, power point from basic to advanced level

Reference Books

1. Computer Systems: A Programmer's Perspective, Randal E. Bryant, David R. O'Halloran, 2105, Pearson.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson, John L. Hennessy, 2017, Morgan Kaufmann.
3. Microsoft Office 365 & Office 2019 Introductory, David W. Beskeen, Steven M. Freund, Joy L. Starks, 2019, Cengage Learning.
4. Microsoft PowerPoint 2019 Step by Step, Joan Lambert, 2019, Microsoft Press.
5. Excel 2019 Bible, Michael Alexander, Richard Kusleika, 2019, Wiley.

24CA1103O - COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1103O	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	CTSD	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand different concepts of C programming constructs for creating programs.	2	PO2, PO3
CO2	Illustrate different control structures and Arrays.	2	PO1, PO3
CO3	Experiment with functions and pointers for solving real world problems.	3	PO1, PO3
CO4	Analyze the working of structures and different file handling methods	4	PO1, PO3
CO5	Evaluate solutions for programs using basic and advanced concepts of C language.	5	PO2, PO3, PO5

Syllabus

Overview of Programming: Introduction, Program design and implementation, Flowcharts & Algorithms, Types of Programming Languages, Assemblers, Compilers, Interpreters. Fundamentals of C programming: Overview of C, Data Types, Constants & Variables, Operators & Expressions. Basic I/O-formatted and Unformatted I/O, Type modifiers, Type casting, type conversion.

Decision Making-Branching & Looping: Decision making with IF statement, switch statement, while statement, do-while statement, for statement, Jump Statements. Arrays: Concepts, Using array in C, One dimensional array, two-dimensional array, multi-dimensional array. Strings: String Concepts, C String, String Input / Output Functions, Arrays of S t r i n g s, S t r i n g M a n i p u l a t i o n F u n c t i o n s User-defined Functions: Purpose of functions, Definition, types, Structure of User-defined Functions, Return Values, Categories of User-defined Functions, Passing Arrays to Functions, argc and argv, Recursion, The Scope, Visibility and Lifetime of variables. Pointers: Introduction, Declaring Pointer Variables, Initialization of Pointer variables, accessing Variables, Pointer expression and Arithmetic, pointer to pointers, dynamic memory allocation, storage class specifiers. Enumerated, Structure, and Union: The Type Definition or Type def, Enumerated Types, Structure Introduction, defining a structure, declaring structure variables, accessing structure members, structure initialization, nested structures, array of structures, passing structures to functions, Unions. Additional features: File Handling Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files, C Preprocessor commands, Conditional compilation directives, C standard library and header files.

Reference Books

- 1 The C programming Language by Richie and Kenninghan, 2004, Brian W. Kernighan Dennis M. Ritchie, 1988, BPB.
- 2 Programming in ANSI C, Balaguruswamy, 2017, Tata McGraw Hill. .
- 3 Let us C, Yashwant Kanetkar, 2017, B P B .
- 4 Programming in C, Reema Thereja, 2016, Cengage.

24SDCA010 - WEB AND SOCIAL MEDIA TECHNOLOGIES

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24SDCA010	WEB AND SOCIAL MEDIA TECHNOLOGIES	WSM	R	1	0	0	4	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Explain the understanding of HTML and CSS by explaining their syntax, structure, and basic components.	2	PO1
CO2	Apply knowledge of HTML and CSS to construct web pages, including layouts, images, iframes, and hypertext links.	3	PO1, PO2
CO3	Apply knowledge of the evolution and types of social media to discuss its influence on individuals, businesses, and society.	3	PO3
CO4	Apply strategies for using LinkedIn to build and maintain a professional network, including account setup, connection management, and profile optimization.	3	PO2, PO3
CO5	Evaluate the use and impact of mainstream and non-mainstream social media platforms, such as blogs, wikis, and video platforms, on academic and professional domains.	5	PO5

Syllabus

HTML: Syntaxes, HTML structure, Basic Text Markup Language, HTML styles, Element Attributes, Heading, Layouts, I- frame Images, Hypertext Links, List, tables, forms, GET and POST method, Frames. HTML: Syntaxes, HTML structure, Basic Text Markup Language, HTML styles, Element Attributes, Heading, Layouts, I-frame Images, Hypertext Links, List, tables, forms, GET and POST method, Frames. CSS: Introduction to CSS, Levels, Style Specification formats, Selector forms, the box model, Conflict resolution, CSS3.

Social media: Definition of social media, Evolution of social media, types of social media, positive and negative influence of social media on individuals, businesses, and society, identifying the uses of social media platforms. LinkedIn: Opening accounts in LinkedIn, Authentication and Security issues, strategically build network on LinkedIn, searching connections and developing tracking sheet for network connection, adding recruiter and people from the company to work, review and update profile, achieving academic and professional realms strategies for LinkedIn Platform.

Facebook & Twitter: Introduction, Evolution of Facebook & Twitter, Uses of the platforms in personal, academic, and professional realms, creating accounts in each platform, Guidelines and security features for each platform, strategies for achieving academic and professional goals using Facebook and Twitter.

The Outcasts of social media: Blogs, Videos, Wikis and more: Introduction to various outcasts of social media platforms, history, and evolution of each social media outcasts - its usage- implementation, overall impact of social media outcasts on academic's, professions, society in general.

Reference Books

- 1 Social Networks and the Semantic Web, Peter Mika, 2007, Springer US.
- 2 Web Technologies, Uttam K. Roy, 2010, Oxford University Press.
- 3 An Introduction to Web Design, Programming, Paul S. Wang, Sanda S. Katila, 2003, Course Technology Inc.
- 4 Programming in world wide web, Robert W Sebesta, 2011, Pearson Education.

SEM II SYLLABUS

23MT12130 - PROBABILITY AND STATISTICS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23MT12130	PROBABILITY AND STATISTICS	PS	R	2	2	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply Central Tendency and dispersion in Data Analysis	3	PO1, PO5
CO2	Apply Correlation and Regression in Real-World Problem Solving	3	PO1, PO5
CO3	Apply probability concepts and distributions to solve real-world problems	3	PO1, PO5
CO4	Apply Hypothesis Testing in Real-World Problem Solving	3	PO1, PO5

Syllabus

Measures of Central tendency Mean, Median, Mode, Geometric Mean, Harmonic Mean, relation between mean, median and mode. Measures of dispersion Quartile Deviation, Variance and Standard Deviation, coefficient of variation

Correlation and Regression Types of Correlation, Karl Pearsons coefficient of correlation, Rank correlation tied and without tied observations. Regression coefficients regression lines Method of least squares Straight line parabola Exponential curves.

Probability and Distribution Basics of Probability, Addition theorem, Conditional probability, and Bayes Theorem. Discrete and Continuous random variables Binomial, Poisson, and Normal distribution. Statistical Inference Basic of sampling distributions,

Introduction to Hypothesis, Level of significance. Large and small sample test single and two sample case, Test for Attributes.

Reference Books

- Probability and Statistics for Engineers and Scientists, Ronald E. Walpole, Sharon L. Myers and Keying Ye, 8th, Pearson.
- Statistics for Management, Richard. I. Levin, David.S. Rubin, 7th, Pearson.
- Statistical Methods, Dr. S.P. Gupta, 46th, Sultan Chand and Sons.
- Probability and Statistics for Engineers and Scientists, Sheldon M Ross, 5th, Elsevier.

24UC21050 - COMMUNICATION SKILLS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24UC21050	COMMUNICATION SKILLS	CS	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To Understand the essential career skills, including resume writing, interview techniques	2	PO10
CO2	Apply a comprehensive understanding of essential team skills, preparing them for successful collaboration and contribution in professional team environments.	3	PO10

Syllabus

Career Skills

Advanced Communicative Listening & Speaking

Reference Books

1. "Modernize Your Resume: Get Noticed...Get Hired", Wendy Enelow, Louise Kursmark, 2nd Edition, Emerald Career Publishing.
2. Effective speech, Richard W. Clark, 1st edition, Glencoe Pub. Co.1988.
3. "Resume Magic: Trade Secrets of a Professional Resume Writer" , Susan Britton Whitcomb, 2nd Edition, JIST WORKS.
4. The Ace of Soft Skills, Mr. Gopalaswamy Ramesh et al, 1st edition, Pearson publishers, 2010 print.
5. The Wisdom of Teams: Creating the High-Performance Organization", Jon R. Katzenbach, Douglas K. Smith, 1st Edition, Harvard review Business Press.

24CA12040 - ESSENTIALS OF OPERATING SYSTEM

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA12040	ESSENTIALS OF OPERATING SYSTEM	EOS	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Discuss Operating System Functionalities, Types of Operating Systems, Computer Architecture support to Operating Systems.	2	PO1, PO2, PO3
CO2	Explain the Process and CPU scheduling.	2	PO2, PO3, PO4
CO3	Demonstrate Process Synchronization, and Deadlocks	3	PO2, PO3, PO4
CO4	Illustrate Memory management, Fragmentation and file system	3	PO1, PO3, PO4

Syllabus

What is an OS, Brief history, Functionalities of OS. Basics Computer System Architecture overview. Operating System Structures, Types of Different OS, Basic Oss: Batch, Multi-programmed batch, Timesharing, Real-Time OS (RTOS), Distributed OS.

Processes: Definition, Process States, 5 state model, Process structure: PCB and components, Interprocess Communication, Operations on Processes, Threads, CPU Scheduling: I/O burst cycle, Context Switching, Short Term, Long Term and Scheduling Criteria, Algorithms: First Come First Serve, Shortest Job First, Priority Scheduling, Round Robin.

Process Synchronization: Critical Section Problem, Mutual Exclusion, Races, Semaphores, Classic Synchronization Problems, Readers/Writers, Dining Philosophers. Deadlocks: Deadlocks and Starvation, System Model, Necessary Conditions for a deadlock, Mutual Exclusion, Hold and Wait, No Pre-emption, Circular wait, Resource Allocation Graphs, Handling Deadlocks, Prevention, Avoidance, Bankers Algorithm. I/O Device Management, I/O Device Types and Characteristics.

Memory Management: Swapping, Multiple Partition-First Fit-Best Fit-Worst Fit, RAID and Data Redundancy. Fragmentation: Internal and External Fragmentation, Paging and Demand Paging, Page Replacement, Page Replacement Algorithms, Thrashing. File-System: File-System structure, Access Methods, Directory structure, File-System Implementation, Protection.

Reference Books

- 1 Operating System Concepts, Abraham Silberschatz, Greg Gagne, and Peter Baer Galvin, 2017, Pearson Education.
- 2 Modern Operating Systems, A n d r e w S. Tanenbaum and Herbert Bos, 2014, Pearson Education.
- 3 Linux Kernel Development, Robert Love, 2010, Addison-Wesley Profession.
- 4 Windows Internals, Mark Russinovich, David A. Solomon, Alex Ionescu, 2012, Microsoft Press.

24CA12050 - DATA STRUCTURES

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA12050	DATA STRUCTURES	DS	R	3	0	2	0	4

Prerequisite

S#	Course Title	Acronym	Rule
1	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	CTSD	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the fundamental data structures, is crucial for designing efficient algorithms and solving complex problems in computer science.	2	PO1, PO2
CO2	Apply the Basic operations sorting, searching, insertion and deletion of data for arrays and linked list. Stacks and queues are essential building blocks in computer science, providing structured ways to organize data based on specific access patterns.	3	PO2, PO3, PO4
CO3	Analyze real time problems and design solutions using Trees and Graphs. Trees and graphs are fundamental data structures that excel at representing hierarchical and network relationships between elements.	4	PO1, PO2, PO3
CO4	Analyze the strengths and weaknesses of different searching and sorting techniques, you can select the most appropriate algorithm for your specific needs, leading to efficient and well-performing software solutions	4	PO1, PO2, PO4
CO5	Evaluating programs to demonstrate the functionality of different data structures, sorting algorithms, searching algorithms, etc.	5	PO1, PO2, PO4

Syllabus

Introduction to Data structures: Definition, Classification of data structures, Time and space complexity, Static and Dynamic memory management, Dynamic Memory allocation functions. Pointers, Array and its type. Linked List: Definition, Representation, Types of linked lists, creation, insertion, deletion, search and display

Stack and Queue: Stack Definition, Array Operations on stack: PUSH, POP, peek Applications of stacks Infix, prefix and postfix notations and recursion. Queue: Definition, enqueue and dequeue operation, Types of queue: Simple queue, Circular queue, double ended queue (deque), Priority queue, Application of queue

Trees and Graph: Definition, Binary tree and its terminology, Traversal of Binary Tree, Binary search tree, AVL Tree, Graphs: Definition, Graph terminology, Depth First search, Breadth First search, Application of Graphs.

Searching and Sorting: Sequential and binary search. Sort: Classification of sorting technique Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Heap sort.

Reference Books

1. Data Structures Through C-4TH Edition: Learn the Fundamentals of Data Structures Through C, Yashvanth Kanetkar, 2022, BPB Publications.
2. Data Structures, E. Balagurusamy, 2017, McGraw Hill Education
3. Data structures, Tata McGraw-Hill, 2017, McGraw Hill Education.
4. Algorithms II, Robert Sedgewick and Kevin Wayne, 2014, Pearson Education.

24CA1206O - DATABASE MANAGEMENT SYSTEMS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA1206O	DATABASE MANAGEMENT SYSTEMS	DBMS	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding Database and File System and Applying different kinds of data models with functional components of DBMS	2	PO1
CO2	Applying design, SQL, PL/SQL and correlating appropriate strategies for optimization of queries with Tuple Relational Calculus and Domain Relational Calculus	3	PO2, PO3
CO3	Analysing normal forms based on functional dependency and Apply normalization techniques to eliminate redundancy with the ACID properties	4	PO1, PO3
CO5	Analysing and apply in Identifying variety of methods for effective processing of given queries	4	PO3, PO5
CO6	Implement SQL queries and PL/SQL programs to do various operations on data.	5	PO3, PO5

Syllabus

In-depth understanding of Database Management Systems (DBMS) and their characteristics, advantages, and various types. Database environments, user roles, and DBMS architecture, emphasizing data independence and interaction through various languages, tools, and interfaces. Data modeling with a focus on the Entity-Relationship (ER) model, including notation, constraints, and relationship types. Explores advanced topics such as the Enhanced ER (EER) model, ensuring comprehensive knowledge in designing and managing databases. Practical applications and considerations in ER and EER diagrams are highlighted for real-world database design.

The Relational Model, covering core concepts, constraints, and schema design. How to convert ER models to relational schemas and gain proficiency in SQL for data definition, manipulation, and complex querying. Topics include relational algebra, creating tables, data types, constraints, and advanced SQL features like nested subqueries, joins, views, and triggers. Practical database design guidelines ensure robust, scalable, and secure databases. Enhanced learning through user-defined functions, procedures, and cursors.

Concept of normalization, including First, Second, and Third Normal Forms, BCNF, and higher normal forms with multi-value and join dependencies. It explores decomposition algorithms for effective normalization. It also explores about file and storage structures, including file storage techniques, index structures, indexing, hashing, query processing and optimization strategies for efficient data retrieval.

Focuses on transaction management, covers transaction processing issues, states, and challenges in handling multiple transactions. It examines ACID properties, system logs, and concurrency control techniques such as lock-based, timestamp-based, and multiversion techniques. Students will learn recovery techniques, including shadow paging and ARIES, to ensure data integrity and consistency in database systems.

Reference Books

Database System Concepts, Abraham Silberschatz, Yale University Henry, F. Korth Lehigh University, S. Sudarshan

- 1 Indian Institute of Technology, Bombay., 1991, Tata McGraw hill books.
Fundamentals of Database Systems, Ramez Elmasri, University of Texas at Arlington, Shamkant B. Navathe,
- 2 University of Texas at Arlington, 2011, Pearson.
- 4 Principles of Database Systems, Jeffrey D. Ullman , 2014, Galgotia Publications.
- 5 Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 2014, Tata McGraw Hill..

24SDCA020 - OBJECT ORIENTED PROGRAMMING

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24SDCA020	OBJECT ORIENTED PROGRAMMING	OOP	R	1	0	0	4	2

Prerequisite

S#	Course Title	Acronym	Rule
1	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	CTSD	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concepts of Object-Oriented Programming, Datatypes, Operators and Type Conversion.	2	PO1, PO3
CO2	Design and implement programs using standard design patterns to solve general problems.	3	PO2, PO5
CO3	Choose the best type of Inheritance, creation of packages and interfaces to implement multiple inheritance.	4	PO3, PO5
CO4	Build and Analyze Java applications using exceptions, formatted and unformatted I/O Streams.	4	PO2, PO5
CO5	Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs that solve real-world problems.	4	PO2, PO5

Syllabus

Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism
Java as a OOP, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program.

Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, different types of Constructors, Access Control, Garbage Collection, Usage of static keyword with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes.

Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, String handling functions.

Packages and Interfaces: Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing
,Applying interface.

Exception handling and Multithreading

Reference Books

- 1 The Complete Reference Java, Herbert Schildt, 1, TMH.
- 2 An Introduction to Object-Oriented Programming, Timothy A. Budd, 3, Pearson.
- 3 JAVA for Beginners, Joyce Farrell, Ankit R. Bhavsar, 1, Cengage Learning.
- 4 Core Java An Integrated Approach, R. Nageswara Rao, 1, Dream tech.
- 5 Java in a Nutshell, Benjamin, 7, O'Reilly Media.

22UC00210 SOCIAL IMMERSIVE LEARNING - 1

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
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22UC00210	SOCIAL IMMERSIVE LEARNING	SIL-1	R	0	0	0	4	1
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Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3	PO9
CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3	PO9
CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3	PO9
CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3	PO9
CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3	PO9

Syllabus

Extension Activities and Social Outreach activities (ESO)

Technology Clubs (TEC)

Liberal arts, creative arts and hobby

clubs (LCH) Innovation, Incubation &

Entrepreneurship (IIE) Health & Well

Being (HWB)

Reference Books

- 1 The Innovators Mindset Empower Learning, Unleash Talent and Lead a Culture of Creativity, George Couros, 1, georgecouros.com.
- 2 Reality+: Virtual Worlds and the Problems of Philosophy, Douglas Thomas and John Seely Brown, 2022, W. W. Norton & Company.
- 3 Immersive Education Designing for Learning, Paula MacDowell, Jennifer Lock, 2022, Springer.
- 4 A New Culture of Learning, John Seely Brown, Douglas Thomas, 2011, CreateSpace Independent Publishing.

SEM III SYLLABUS

24CA2107O - DESIGN AND ANALYSIS OF ALGORITHMS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA21070	DESIGN AND ANALYSIS OF ALGORITHMS	DAA	R	3	1	0	0	4

Prerequisite

S#	Course Title	Acronym	Rule
1	DATA STRUCTURES	DS	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of algorithmic problem-solving, including techniques such as divide and conquer, and recognize their significance in solving computational problems efficiently.	2	PO1, PO2
CO2	Apply and evaluate the applicability of the Greedy Method to different types of optimization problems, including the Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, and Optimal Merge Patterns.	3	PO1, PO2, PO3
CO3	Develop proficiency in formulating dynamic programming solutions by breaking down complex problems into smaller subproblems, solving them recursively, and storing intermediate results to avoid redundant computations.	3	PO1, PO2, PO3
CO4	Analyse the relationship between backtracking and other algorithmic paradigms, such as dynamic programming and branch and bound, understanding when each approach is most suitable for solving optimization problems.	4	PO1, PO2, PO3

Syllabus

Introduction: Fundamentals of algorithmic problem solving , Performance Analysis: Space complexity, Time complexity

,Growth of Functions: Asymptotic Notation, Big oh notation, Omega notation, Theta notation. Divide and Conquer: Divide and conquer: General method, applications search, Quick sort, Merge sort, Finding the Maximum and Minimum.

Graph Algorithms Graph representations. Traversal algorithms Depth first search and Breadth first search. Greedy method The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum cost Spanning Trees, Prims Algorithm, Kuskals Algorithms, Optimal Merge Patterns, Single Source Shortest Paths.

Sorting and Searching: Sorting algorithms: Insertion sort, Bubble sort, Searching algorithms: Linear search, Binary search. Dynamic Programming: General method, applications-, Optimal binary search trees, 0/1knapsack problem, All pairs shortest path problem, Travelling salesperson problem, Reliability design.

Backtracking: General method, applications-n-queen problem, sum of subsets problem, Graph colorings. knapsack problem. Branch and Bound: General method, applications - Travelling salesperson problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution

Reference Books

- 1 Fundamentals of Computer Algorithms, , Ellis Horowitz, SatrajSahni and Rajasekaran, , 2008, University press.

- 2 Introduction to The Design and Analysis of Algorithms, Anany Levitin, , 2017., Pearson Education.
 - 3 Introduction to Algorithms, T.H. Cormen, C.E. Lieberman, R.L. Rivest, and C. Stein, 2022, Pearson Education.
 - 4 Design and Analysis of algorithms, Aho, Ullman and Hopcroft, 1974, Pearson education...
 - 5 Algorithms, Richard Johnsonbaugh and Marcus Schaefer, 2003, Pearson Education.
- Probability and Computing: Randomized Algorithms and Probabilistic Proofs, Mitzenmacher and Upfal., 2005, Cambridge University Press.

24CA2108O - COMPUTER NETWORKS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
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24CA21080	COMPUTER NETWORKS	CN	R	3	1	0	0	4
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Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamentals of computer networks and data communication.	2	PO2
CO2	Understand and Analyze the fundamentals of Data Communication	2	PO1
CO3	Analyze the IEEE Standards, Data Link Layer and Evaluate design issues in networks.	4	PO1
CO4	Analyze Internet Transport Protocols and Evaluate different types of protocol, Evaluate various types of Network Devices and different types of Networks.	4	PO4

Syllabus

Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications, Data Communications: Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, Broad Band ISDN, ATM Network. Data Link Control, Error Detection & Correction, Sliding Window Protocols.

LANs &MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5,802.6, High Speed LANs. Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

Internet Transport Protocols: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues. Overview of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

Network Devices: Overview of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, routers, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies. Overview of Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks, Sensor Networks.

Reference Books

- 1 Computer Networks, Andrews S Tanenbaum, 5th Edition,2010, Pearson.
- 2 Computer Networks, A System Approach, Larry L Peterson and Bruce S Davie, 5th Edition,2011, Pearson.
- 3 CCNA Exploration Course Booklet: Routing Protocols and Concepts, Pearson, Version 4.0, 2004.
- 4 Understanding Communications and Networks, W.A. Shay, Thomson, 3rd Edition,2004 , Pearson.

24SDCA03R - WEB DEVELOPMENT USING PYTHON

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
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24SDCA030	WEB DEVELOPMENT USING PYTHON	WDP	R	1	0	0	4	2
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Prerequisite

S#	Course Title	Acronym	Rule
1	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN THROUGH C	CTSD	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic programming skills in core Python	2	PO1, PO2, PO3
CO2	Apply the advanced modules in Python to build Object Oriented Applications	3	PO1, PO2, PO3
CO3	Build python application to connect with the database and perform CRUD operations	3	PO1, PO3, PO5
CO4	Analyze Web forms and Application in Django	4	PO1, PO3, PO5
CO5	Create Web Applications in Python using Django Framework	5	PO1, PO3, PO5

Syllabus

Python Environment provides a comprehensive overview of the languages history and development, highlighting its evolution and widespread adoption. It covers fundamental concepts including syntax, comments, variables, and data types such as booleans, along with operators for performing operations. Students will learn about essential data structures like lists, tuples, sets, and dictionaries, and how to utilize them effectively. The course also delves into control flow mechanisms such as conditional and iterative statements, enabling learners to create structured and efficient code. Additionally, it introduces functions and lambda expressions, culminating in a solid foundation for understanding Python's capabilities and applications in various programming scenarios.

Advanced Python covers classes/objects, inheritance, scope, modules, date manipulation, mathematical operations, JSON handling, regular expressions, PIP for package management, exception handling, user input processing, string formatting, dictionaries, file operations, and key libraries like SciPy, NumPy, Scikit-learn, and matplotlib for scientific computing and data visualization.

Web Applications in Python introduces foundational web concepts, covering key terms, client-server architecture, and Python's integration with SQLite and MySQL databases. Students will learn to access and manipulate data from relational databases and perform MongoDB CRUD operations, essential for building dynamic and scalable web applications using Python.

Django web application framework explores its robust features and characteristics, focusing on installation within a virtual environment, project creation phases, app structure setup, and utilization of Django's ADMIN interface and console. To create views, map URLs, integrate the template system, work with models for database interaction, manage page redirections, set up emails, process forms, and handle static and media files. Advanced topics include pagination, page restrictions via decorators, cookies, sessions, caching, database migrations, and deployment on free web hosting domains, enabling students to build scalable and efficient web applications using Django.

Reference Books

- 1 Python Cookbook, David Beazley and Brian K. Jones., Third edition,2013, O'Reilly Media.
- 2 Fluent Python: Clear, Concise, and Effective Programming, Luciano Ramalho, Second edition,2022, O'Reilly Media.
- 3 Core Python Programming, R. Nageswara Rao, 2nd edition,2018, Wiley Publisher.
- 4 Django for Beginners: Build Websites with Python & Django, William S Vincent, Volume 1,2018, Amazon Digital Services LLC.

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24UC12030	DESIGN THINKING AND INNOVATION	DTI	R	2	0	2	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the importance of Design thinking mindset for identifying contextualized problems	2	PO2
CO2	Analyze the problem statement by empathizing with user	4	PO7
CO3	Develop ideation and test the prototypes made	3	PO3
CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity	2	PO10

Syllabus

Introduction to Design Thinking and Innovation: Introduction to design thinking and its principles, Design definitions and stories, desirability, feasibility, viability, mystery, heuristics, algorithm, requirements, patterns, connect, blind spots; Laws of Design Thinking: less is more, last 2% equals 200%, theory of prioritization; Design mind: definitions, 5 forces of growth (SEPIA), 5 frictional forces (DCAFE), 3 capacity levers (VAL), Design thinking for contextualized problem-solving, Incorporating sustainable development goals into design thinking,

Design Thinking Process: Overview of the design thinking process, Design framework (L0); Empathy research: understanding user needs and perspectives, Persona development: creating user profiles; Customer journey mapping: visualizing user experiences, Define phase: asking the right questions and problem statement formulation.

Ideation, Prototyping and Testing: Ideation techniques, brainstorming and generating creative ideas, Identifying patterns and anti-patterns in ideation, Evaluation of ideas using different criteria (10/100/1000 gm): Prototyping and testing: translating ideas into tangible prototypes.

Entrepreneurial Innovation: Introduction to innovation management, Basics of business models and their role in innovation, Financial estimation for innovation projects: Pitch decks: creating persuasive presentations for innovation, Considerations for intellectual property rights (IPR) in innovation.

Reference Books

- 1 Design Thinking in the Classroom, David Lee, Kindle, Ulysses Press.
- 2 The Art of Innovation: Lessons in Creativity from IDEO, America, Tom Kelley , Jonathan Littman , Tom Peters, 2001, Doubleday Broadway Publishing, USA.
- 3 Unmukt- Science and Art of Design Thinking, Arun Jain, 2019, School of Design Thinking.
- 4 The Design Thinking Play Book, Michael Lewrick, Patrick Link & Larry Leifer, 2018, Wiley Press.

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23UC00080	INDIAN CONSTITUTION	IC	R	2	0	0	0	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	To acquire knowledge of the historical developments that culminated in the drafting of the Indian Constitution.	2	PO3
CO2	To understand the basic features of the Indian Constitution.	2	PO3
CO3	To understand the structure of the Federal government as defined by the Indian Constitution.	2	PO3
CO4	To understand the Indian Judicial system and election commission of india	2	PO3

Syllabus

Making of the Constitution: A brief analysis of National Movement, Constitutional Development with reference to Government of India Act 1909, 1919, 1935 and Indian Independence Act 1947. The Constituent Assembly of India. Basic features of the Indian Constitution: the Preamble, Fundamental Rights,

Basic features of the Indian Constitution and the Preamble, Fundamental Rights, Directive Principles of State Policy Fundamental Duties Government of the Union:

Government of the State:

Jurisdiction and functions, judicial review, Judicial activism, Independence of Judiciary In India. Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners

Reference Books

- 1 Indian Polity, M Laxmikanth , 7 Edition, McGraw Hill.
Democracy and Good Governance Some Guidelines for Today's Parliamentarians, Subhash Kashyap, 1 June 2017,
- 2 Vitasta Publishing Pvt.Ltd.
- 3 Indian Administration, M. Sharma, 1 December 2004, Anmol Publisher.
- 4 Indian Constitutional Law , M P Jain , 4 February 2018, LexiNexis.

22UC00220 - SOCIAL IMMERSIVE LEARNING - 2

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
22UC00220	SOCIAL IMMERSIVE LEARNING	SIL-2	R	0	0	0	4	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3	PO7, PO9
CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3	PO2, PO7, PO9
CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3	PO7, PO9
CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3	PO7, PO9
CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3	PO2, PO7, PO9

Syllabus

Extension Activities and Social Outreach activities (ESO)

Technology Clubs (TEC)

Liberal arts, creative arts and hobby

clubs (LCH) Innovation, Incubation &

Entrepreneurship (IIE) Health & Well

Being (HWB)

Reference Books

- 1 The Innovators Mindset Empower Learning, Unleash Talent and Lead a Culture of Creativity, George Couros, 1, georgecouros.com.
- 2 Immersive Education Designing for Learning, Paula MacDowell, Jennifer Lock, 2022, Springer.
- 3 Reality+: Virtual Worlds and the Problems of Philosophy, Douglas Thomas and John Seely Brown, 2022, W. W. Norton & Company.
- 4 A New Culture of Learning, John Seely Brown, Douglas Thomas, 2011, CreateSpace Independent Publishing.

23UC00130 - GLOBAL LOGIC BUILDING CONTEST PRACTICAL-1

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23UC00130	GLOBAL LOGIC BUILDING CONTEST PRACTICUM	GLBCP	R	0	0	0	2	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate proficiency in identifying, analyzing, and solving problems using logical reasoning.	2	PO1, PO2, PO3
CO2	Apply logical reasoning to global issues, considering multiple perspectives and potential solutions.	3	PO1, PO2, PO3
CO3	Identify logical principles to assess ethical dilemmas and develop reasoned solutions.	3	PO1, PO2, PO3
CO4	Inspect the ability to apply learned logical skills to new and unfamiliar challenges.	4	PO1, PO2, PO3

Syllabus

Critical thinking skills necessary to identify, analyze, and solve problems effectively using logical reasoning through interactive exercises and practical applications.

Thinking Through Universal Challenges: Logical reasoning by exploring the challenges from multiple viewpoints and analyze potential solutions.

Explore principles like considering consequences, respecting rights, and upholding fairness to identify the core values in conflict. By applying these principles, Systematically analyze dilemmas, weigh options, and develop reasoned solutions that prioritize ethical conduct.

Logical reasoning skills honed can be applied beyond familiar situations, equipping you to tackle new and unexpected challenges by breaking them down, analyzing information effectively, and crafting sound solutions.

Reference Books

- 1 The art of thinking : a guide to critical and creative thought, Ruggiero, Vincent Ryan, 2012, Boston : Pearson Learning Solutions.
- 2 Thinking, Fast and Slow, Daniel Kahneman , 2015, PENGUIN UK.
- 3 Putnam and Beyond, Razvan Gelca , Titu Andreescu, 2007, Springer.
- 4 Problem Solving 101: A Simple Book for Smart People, Ken Watanabe, 2009, Portfolio.

SEM IV SYLLABUS

24CA22090 - OBJECT ORIENTED ANALYSIS & DESIGN

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA22090	OBJECT ORIENTED ANALYSIS & DESIGN	OOAD	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Illustrate the fundamentals of object modelling	2	PO1
CO2	Build static and dynamic UML diagrams.	3	PO1, PO2, PO3
CO3	Make use of design patterns for Software design	3	PO3, PO4
CO4	Analyse various Object-Oriented Methodologies.	4	PO3, PO4
CO5	Evaluate different types of UML Diagrams	5	PO3, PO4

Syllabus

Introduction to OOAD with OO Basics ,Unified Process ,UML diagrams ,Use Case ,Case study ,the Next Gen POS system, Inception ,Use case Modelling ,Relating Use cases ,include, extend and generalization ,When to use cases

Class Diagram, Elaboration , Domain Model , Finding conceptual classes and description classes , Associations , Attributes , Domain model refinement , Finding conceptual class Hierarchies , Aggregation and Composition , Relationship between sequence diagrams and use cases , When to use Class Diagrams, UML interaction diagrams , System sequence diagram , Collaboration diagram , When to use Communication Diagrams ,State machine diagram and Modelling ,When to use State Diagrams , Activity diagram ,When to use activity.

Designing objects with responsibilities , Creator ,Information expert , Low Coupling , High Cohesion , Controller Design Patterns , creational , factory method , structural ,Bridge ,Adapter ,behavioural , Strategy , observer ,Applying GoF design patterns , Mapping design to code

Object Oriented Methodologies , Software Quality Assurance , Impact of object orientation on Testing , Develop Test Cases and Test Plans

Reference Books

- 1 Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative development, A. Craig Larman, 3rd edition 2005, Pearson Education.
- 2 Object Oriented Systems Development, B. Ali Bahrami, 1999, McGraw Hill International.
- 3 Design patterns: Elements of Reusable Object oriented software, Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, 1995, Addison-Wesley.
- 4 UML Distilled: A Brief Guide to the Standard Object Modeling Language, Martin Fowler, 3rd edition 2003, Addison-Wesley.

24CA22100 - SOFTWARE ENGINEERING

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA22100	SOFTWARE ENGINEERING	SE	R	3	1	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate the requirement of software development for various applications.	2	PO1, PO2
CO2	Utilize some of the Process Models in software engineering for software development.	3	PO2, PO3, PO7
CO3	Identify stakeholders requirements, multiple viewpoints, eliciting requirements pts, Extreme Programming, SAFE Methodology	3	PO2, PO3, PO7
CO4	Examine a wide range of testing techniques used in software development to ensure comprehensive understanding and application.	4	PO3

Syllabus

To impart a deep understanding of software and software engineering, encompassing the nature of software, diverse application domains, and the distinctive characteristics of web applications.

To familiarize learners with various process models, including generic, prescriptive, specialized, and the unified process, and to enable them to apply reverse engineering techniques for understanding data, processing, and user interfaces effectively.

Understanding Requirements: Identify stakeholders, recognizing multiple viewpoints, eliciting requirements, Building requirement model, negotiating requirements, validating requirements, SRS Vs User Stories. Agile Modeling, Extreme Programming, Scrum, Kanban, SAFe Methodology.

To impart a solid understanding of Test Driven Development (TDD) basics and strategic software testing approaches, including test strategies for conventional software, Black-Box and White-Box testing methodologies, validation testing, and system testing techniques.

Reference Books

- 1 Software Engineering : A Practitioners Approach, Roger S.Pressman, 2014, Mc Graw Hill.
- 2 Software Engineering, Ian Sommerville, 2015, Pearson Education.
- 3 Agile and Iterative Development: A Managers Guide, Craig Larman, 2015, Addison-Wesley.
- 4 Applying UML and Patterns: An introduction to OOAD and design and interface deployment, Craig Larman, 2005, Pearson Education.
- 5 Software Engineering, Stephen R.Schach, 2012, Tata Mc Graw Hill.

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24SDCA040	JAVA FULL STACK DEVELOPMENT	JFSD	R	1	0	0	4	2

Prerequisite

S#	Course Title	Acronym	Rule
1	OBJECT ORIENTED PROGRAMMING	OOP	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	JDBC API - Introduction to JDBC API, Type of Drivers in JDBC, Statement, PreparedStatement, CallableStatement, ResultSetMetaData, DatabaseMetaData, Scrollable & Updatable ResultSet, Transaction Management in JDBC.	2	PO1, PO2, PO3
CO2	JUnit - Introduction to JUnit framework, JUnit Environment Setup, Features of Junit Framework, Junit Framework and its Implementation. XML - Introduction to XML, Advantages of XML, XML Tree, XML Attributes, XML DOM, DTD, XSD, XML with CSS, XSLT. Servlets - Introduction to Servlets, Lifecycle, Init and context parameters, Servlet Collaboration, Session Tracking Techniques, Servlet CRUD Operations.	4	PO1, PO2, PO3
CO3	JSP Servlets Vs JSP, JSP Architecture and Lifecycle, JSP Scripting Elements, Session Tracking Techniques, JSP Implicit Hibernate JDBC Vs Hibernate, Introduction to Hibernate Framework, Advantages, XML & Annotation based Hibernate CRUD Operations, Generator Classes in Hibernate, HQL, HCQL	4	PO1, PO2, PO3
CO4	Spring and Spring Boot Introduction to Spring, Spring Architecture, Spring Vs Spring Boot, Maven Repository, Introduction to Spring Boot, Advantages of Spring Boot over Spring, bjects, JSP Directive Elements, JSP Action Tags, JSP MVC Architecture, JSP CRUD Operations.	5	PO1, PO2, PO3
CO5	Spring Boot and RESTful API Vs REST API with JSON, Spring Boot and Hibernate CRUD Operations, Microservices with Spring monolithic vs micro-service Architecture, SOA vs Microservices, Web Application MVC using Spring Boot,	5	PO1, PO2, PO3
CO6	RESTful API Vs REST API with JSON,,Spring Boot and Hibernate CRUD Operations. Microservices with Spring monolithic vs micro-service Architecture.SOA vs Microservices.	5	

Syllabus

JDBC API - Introduction to JDBC API, Type of Drivers in JDBC, Statement, PreparedStatement, CallableStatement, ResultSetMetaData, DatabaseMetaData, Scrollable & Updatable ResultSet, Transaction Management in JDBC.

JUnit - Introduction to JUnit framework, JUnit Environment Setup, Features of Junit Framework, Junit Framework and its Implementation. XML - Introduction to XML, Advantages of XML, XML Tree, XML Attributes, XML DOM, DTD, XSD, XML with CSS, XSLT. Servlets - Introduction to Servlets, Lifecycle, Init and context parameters, Servlet Collaboration, Session Tracking Techniques, Servlet CRUD Operations.

JSP Servlets Vs JSP, JSP Architecture and Lifecycle, JSP Scripting Elements, Session Tracking Techniques, JSP Implicit Hibernate JDBC Vs Hibernate, Introduction to Hibernate Framework, Advantages, XML & Annotation based Hibernate CRUD Operations, Generator Classes in Hibernate, HQL, HCQL

Spring and Spring Boot Introduction to Spring, Spring Architecture, Spring Vs Spring Boot, Maven Repository, Introduction to Spring Boot, Advantages of Spring Boot over Spring, Objects, JSP Directive Elements, JSP Action Tags, JSP MVC Architecture, JSP CRUD Operations, Web Application MVC using Spring Boot, Spring Boot CRUD Operations with Spring MVC, Spring Boot Introduction to Spring, Spring Architecture, Spring Vs Spring Boot, Maven Repository, Introduction to Spring Boot, Advantages of Spring Boot over Spring, Objects, JSP Directive Elements, JSP Action Tags, JSP MVC Architecture, JSP CRUD Operations., Spring Boot and RESTful API Vs REST API with JSON, Spring Boot and Hibernate CRUD Operations, Micro services with Spring monolithic vs micro-service Architecture, SOA vs Micro services

Reference Books

- 1 Web Technologies: Concepts, Methodologies, Tools, and Applications, Information Science Reference, 4th edition, Arthur Tatnall . Spring and Hibernate, Tata McGraw-Hill Education, 2009, Arthur Tatnall , 4th, Tata McGraw-Hill Education.
- 2 Applications and Microservices with the Spring Framework, Santosh Kumar, 1st, Tata McGraw-Hill Education.
- 3 Java The Complete Reference, James Keogh, 11th, Tata McGraw-Hill Education.
- 4 "Java: The Complete Reference", Herbert Schildt, 12th Edition, McGraw-Hill Education.

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23UC00260	HUMAN VALUES, GENDER EQUALITY & PROFESSIONAL ETHICS	HGP	R	2	0	0	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understanding the basic concepts of value education	2	PO8, PO9
CO2	Gain basic understanding of the principles in harmony among the human beings	2	PO8, PO9
CO3	Gain knowledge in the concept of Harmony in the family and society	3	PO8, PO9
CO4	Acquire knowledge in the concepts of harmony in the nature	4	PO8, PO9

Syllabus

Introduction to Human Values Understanding Value, Self-exploration as the Process for identifying Value, Continuous Happiness and Prosperity The Basic Human Aspirations, Right Understanding, Relationship and Physical Facilities, Happiness and Prosperity Current Scenario, Method to fulfil the Basic Human Aspirations Harmony in the Human Being Understanding the Human Being as Coexistence of Self I and Body, Discriminating between the Needs of the Self and the Body, The Body as an Instrument of I, Understand Harmony in the Self I, Harmony of the Self I with the Body.

Understanding Harmony in the Family and Society The Basic Unit of Human Interaction, Values in Human to Human Relationships, Vision for the Universal Human Order Harmony in the Nature Existence Understand Harmony in the Nature, Interconnectedness, Self regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence is Coexistence at All Levels, The Holistic Perception of Harmony in Existence.

What is Gender, and Why Should We Study It? Gender Equality Milestones, The Context Today Socialisation Making Women, Making Men Preparing for Womanhood, Preparing for Manhood, Different Masculinities, Unrecognised and Unaccounted For, Wage Differentials between Women and Men, Women in the Working Environment . Being Boy A Village Boyhood, School Days, College Styles, Ek Ladki Ko Dekha Toh Sexual Harassment SAY NO! Sexual Harassment, Not EveTeasing, Consent and Relationships, Coping with Everyday Harassment Becoming Man A Dangerous Model of Masculinity, Changing Masculinities, Imprints of Masculinity, Mothers, Fathers and Family.

Implications of the Right Understanding a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of Ethical Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models Typical Case Studies, Strategies for Transition towards Valuebased Life and Profession

Reference Books

- 1 . A Foundation Course in Human Values and Professional Ethics , - R R Gaur, R Sangal and G PBagaria,, First Edition, Excel Books., Penguin press.
2. " Seeing like a Feminist", Menon, Nivedita, First Edition, Excel Books., Zubaan.
3. "The Brave Heart", Rosa Parks, 1, Indian.
- 4 How the Other Half Dies, Sussan George, First Edition, Penguin Press, Reprinted.

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
22UC00230	SOCIAL IMMERSIVE LEARNING	SIL-3	R	0	0	0	4	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community.	3	PO7, PO9
CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.	3	PO2, PO7, PO9
CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.	3	PO7, PO9
CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.	3	PO7, PO9
CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.	3	PO2, PO7, PO9

Syllabus

Extension Activities and Social Outreach activities (ESO)

Technology Clubs (TEC)

Liberal arts, creative arts and hobby

clubs (LCH) Innovation, Incubation &

Entrepreneurship (IIE) Health & Well

Being (HWB)

Reference Books

- 1 The Innovators Mindset Empower Learning, Unleash Talent and Lead a Culture of Creativity, George Couros, 1, georgecouros.com.
- 2 Immersive Education Designing for Learning, Paula MacDowell, Jennifer Lock, 2022, Springer.
- 3 Reality+: Virtual Worlds and the Problems of Philosophy, Douglas Thomas and John Seely Brown, 2022, W. W.Norton & Company.
- 4 A New Culture of Learning, John Seely Brown, Douglas Thomas, 2011, CreateSpace Independent Publishing.

23UC00140 - GLOBAL LOGIC BUILDING CONTEST PRACTICAL-2

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23UC00140	GLOBAL LOGIC BUILDING CONTEST PRACTICUM	GLBCP	R	0	0	0	2	0

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate proficiency in identifying, analyzing, and solving problems using logical reasoning.	2	PO1, PO2, PO3
CO2	Apply logical reasoning to global issues, considering multiple perspectives and potential solutions	3	PO1, PO2, PO3
CO3	Identify logical principles to assess ethical dilemmas and develop reasoned solutions	3	PO1, PO2, PO3
CO4	Inspect the ability to apply learned logical skills to new and unfamiliar challenges	4	PO1, PO2, PO3

Syllabus

Critical thinking skills necessary to identify, analyze, and solve problems effectively using logical reasoning through interactive exercises and practical applications.

Thinking Through Universal Challenges: Logical reasoning by exploring the challenges from multiple viewpoints and analyze potential solutions

Explore principles like considering consequences, respecting rights, and upholding fairness to identify the core values in conflict. By applying these principles, systematically analyze dilemmas, weigh options, and develop reasoned solutions that prioritize ethical conduct.

Logical reasoning skills honed can be applied beyond familiar situations, equipping you to tackle new and unexpected challenges by breaking them down, analyzing information effectively, and crafting sound solutions

Reference Books

- 1 The art of thinking: a guide to critical and creative thought, Ruggiero, Vincent Ryan, 2012, Boston: Pearson Learning Solutions.
- 2 Thinking, Fast and Slow, Daniel Kahneman, 2015, PENGUIN UK.
- 3 Putnam and Beyond, Razvan Gelca, Titu Andreescu, 2007, Springer.
- 4 Problem Solving 101: A Simple Book for Smart People, Ken Watanabe, 2009, Portfolio.

SEM V SYLLABUS

24CA31110 - CONTINUOUS DELIVERY AND DEPLOYMENT WITH DEVOPS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA31110	CONTINUOUS DELIVERY AND DEPLOYMENT WITH DEVOPS	CDDD	R	3	0	2	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Identify the Need of DevOps in SDLC and Cloud Infrastructure in DevOps, Apply Version Control System to track the latest version of Software	3	PO1, PO2
CO2	Analyse Continuous Integration and Continuous Deployment using Infrastructure as Code, Build in Cloud native Applications using Pipeline and Examine the Software and Automation Testing Frameworks	4	PO1, PO2
CO3	Analyze need of Containerization in SDLC and Examine the Kubernetes Pod Configuration.	4	PO2, PO3
CO4	Inspect Configuration Management using Infrastructure as Code, Analyze Continuous Monitoring and Container Orchestration process.	4	PO2, PO3
CO5	Build and Inspect the Tools associated to DevOps Life Cycle	5	PO3, PO5

Syllabus

Introduction to DevOps: Introduction to DevOps, Overview of DevOps, Relationship Between Agile and DevOps, Principles of DevOps, , Best Practices for DevOps. Version Control Systems: Role of Version Control System in DevOps Environment, GitHub, Deploy the files to Bitbucket via Git. Need of Cloud in DevOps: Popular Cloud Providers, CI/CD in AWS and Azure, CI/CD Services in AWS

Continuous Integration and Continuous Deployment: Continuous Integration and Continuous Deployment using Jenkins, Continuous DevOps Tools Integration with Jenkins, Git, and Maven, Build Applications using Pipeline on azure platform. Software and Automation Testing Frameworks: Popular Testing Tools, Test Driven Development Cycle, Behavior driven development is an extension of test driven development, Automated Testing using Cucumber.

Docker as Containerization: Virtualization, Docker on Windows Desktop, Creating an Account in Docker Hub, MySQL in Docker. Kubernetes: Components, Kubernetes Architecture, Minikube, Pod Configuration on Windows.

Configuration Management: Configuration Management Process, Role of Infrastructure as Code in DevOps Environment, Puppet. Continuous Monitoring: Role of Monitoring Systems, Types of Monitoring, Popular Monitoring Tools: Nagios.Orchestrating application deployment.

Reference Books

- 1 DevOps for Web Development, MiteshSoni, 1, PACKT Publishing.
- 2 Migrating a Two-Tier Application to Azure_ A Hands-on Walkthrough of Azure Infrastructure,

Platform, and Container Services, Peter De Tender, 1, APRESS.

3 A Complete DevOps Cookbook_ Build and manage your applications, orchestrate containers, and deploy cloud-native services, Murat Karslioglu - Kubernetes, 2, PACKT Publishing.

4 Docker for Developers_ Develop and run your application with Docker containers using DevOps tools for continuous delivery, Richard Bullington-McGuire, Andrew K. Dennis, Michael Schwartz, 1, PACKT Publishing.

5 Beginning DevOps with Docker, Joseph Muli, 2, PACKT Publishing.

24CA3112O - NETWORK AND INFRASTRUCTURE SECURITY

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA3112O	NETWORK AND INFRASTRUCTURE SECURITY	NIS	R	3	0	2	0	4

Prerequisite

S#	Course Title	Acronym	Rule
1	COMPUTER NETWORKS	CN	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Estimate the knowledge and skills required to protect your organization's network from physical security threats and understand the security considerations of copper and optical media.	2	PO1, PO3
CO2	Explain the role of routers and switches in network security, Analyze lookup and classification algorithms used in routers, Configure packet scheduling and fair queuing mechanisms.	3	PO1, PO3
CO3	Apply security best practices for wireless communication in distributed systems and implement a holistic approach to securing distributed and networked systems.	3	PO1, PO2
CO4	Analyze the types of vulnerabilities and attacks in web applications and algorithms designed against them, and implement advanced security measures for web and DNS systems.	4	PO1, PO2
CO5	Apply security concepts and analyse their performance using networking tools.	5	PO1, PO5

Syllabus

Physical network security : Physical layer security, copper and optical media, Data center and enterprise network: LAN security and Resilient network topologies.

Router mechanisms for security : Router and switch architectures, Lookup and classification algorithms, Packet scheduling and Fair queuing, Queuing and Scheduling algorithms, Network configuration security: Internet policy routing. :

Securing Distributed and networked systems: Securing distributed algorithms, Big Picture : Physical security, Wireless media, Malware, QoS and Multicast.

Current topics in network security : Web and DNS security, Wireless security, Convert channels in networks, Quantum Cryptography / Communication, Security of internet architectures, Secure multi-party communication, Anomaly detection and traffic analysis, Operational network security, Intrusion detection algorithms, Data mining for intrusion detection, Traffic anomaly detection and DHT security.

Reference Books

- 1 NETWORK SECURITY: THE COMPLETE REFERENCE, Mark Rhodes-Ousley , Roberta Brag, Keith Strassberg , 1st Edition, Tata McGraw-Hill .
- 2 Network Security Essentials: Applications, William Stallings, 6th Edition , Pearson Education.
- 3 Cryptography and Network Security, William Stallings, 5th Edition, Prentice Hall.
- 4 Introduction to Cryptography and Network Security, Behrouz A. Forouzan, Indian Edition, McGraw-Hill

24SDCA050 - ASPECTS OF MOBILE APPLICATION

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24SDCA050	ASPECTS OF MOBILE APPLICATION	AML	R	1	0	0	4	2

Prerequisite

S#	Course Title	Acronym	Rule
1	OBJECT ORIENTED PROGRAMMING	OOP	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Discuss various concepts of mobile app design programming that make it unique from programming for other platforms,	2	PO1, PO2, PO4
CO2	Apply Android concepts and user Interface components for mobile app programming	3	PO1, PO2, PO3
CO3	Apply Background tasks and Design Activities, communication between activities	3	PO1, PO2, PO4
CO4	Apply data requirements and background data storage for mobile app development	3	PO1, PO2, PO3
CO5	Evaluate a mobile application through publishing and testing.	5	PO1, PO2, PO4

Syllabus

Mobile Applications and Device Platforms - Alternatives for Building Mobile Apps -Comparing Native vs. Hybrid Applications -The Mobile Application Development Life cycle-The Mobile Application Front-End-The Mobile Application Back-End-Key Mobile Application Services-What is Android-Android version history-Obtaining the Required Tools- Launching Your First Android Application-Exploring the IDE-Debugging Your Application-Publishing Your Application

Understanding Activities-Linking Activities Using Intents-Fragments-Displaying Notifications- Understanding the Components of a Screen-Adapting to Display Orientation Managing Changes to Screen Orientation- Utilizing the Action Bar-Creating the User Interface Programmatically Listening for UI Notifications

Using Basic Views-Using Picker Views -Using List Views to Display Long Lists Understanding Specialized Fragments - Using Image Views to Display Pictures -Using Menus with Views-Using WebView- Saving and Loading User Preferences- Persisting Data to Files-Creating and Using Databases.

Sharing Data in Android-Creating Your Own Content Providers -Using the Content Provider- SMS Messaging - Sending Email-Displaying Maps- Getting Location Data- Monitoring a Location.

Consuming Web Services Using HTTP-Consuming JSON Services- Creating Your Own Services - Binding Activities to Services -Understanding Threading - Developing simple applications that uses radio button, image button, Alert dialog box, Layout managers and to display personal details using GUI components etc.

Reference Books

- 1 Android Programming: Big Nerd Ranch Guides, Bill Phillips, Chris Stewart, Kristin Marsicano, 4th Edition, The Big Nerd Ranch Guide .
- 2 Mobile Application Development Using Android Studio, John Horton Ralph F. Grove, 3rd Edition, Apress.
- 3 React Native in Action, Nader Dabit, 1st Edition, Manning Publications.
- 4 Mobile Application Development using Android , Joseph Annuzzi Jr., 3rd Edition, Addison-Wesley Professional.
- 5 Mobile Application Development Using Android OS, James F. O'Reilly David Wolber Ralph Morelli Trish Cornez, 2nd Edition, Wiley.

23FL3055O - GERMAN LANGUAGE

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23FL3055O	GERMAN LANGUAGE	GLG	R	3	0	0	0	3

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	classify their understanding of greeting wishes, alphabets and numbers learning. to understand the greetings in formal and informal way	2	PO10

CO2	Apply their knowledge of essential daily expressions, present, past and future tense. Conjugating the verbs in the Singular and Plural groups, Past participle tense and the futertense and relations with the verbs	3	PO10
CO3	Utilize their understanding with suitable prepositions, questions, and possessive pronouns, and the importance of four German cases. Prepositions in Akkusativ and Dativ	3	PO10
CO4	Develop their knowledge about how to move in public places, such as shopping centres, restaurants, tourist places, etc, and preparation of them for German A1 level examination.	3	PO10

Syllabus

Introduction to multiplication concepts (may be a bit advanced for beginners). Simple multiplication problems with pictures or manipulatives might be introduced. Learn the upper and lowercase letters of the German alphabet (A-Z, a-z). Practice pronunciation of each letter.

Sein Form: Used for statements about existence, location, and becoming (e.g., "Ich bin Student" - I am a student). Haben Form: Used for statements about possession, action, and completion (e.g., "Ich habe ein Auto" - I have a car).

Building German sentences? Cases (Nominative, Accusative, Dative, Genitive) are key! They show the role of nouns and pronouns (like "ich," "mein Buch"). Prepositions (in, auf) and questions (Wo? Wer?) require specific cases too. Understanding cases unlocks clear and flexible sentence structures!

Understand about how to move in public places such as shopping centres restaurants tourist places etc and preparation of them for German A1 level examination. A1 German for navigating public places: Learn basic greetings ("Guten Tag") and phrases ("Entschuldigung, wo ist...?" - Excuse me, where is...?). Practice ordering ("Ein Kaffee, bitte" - One coffee, please) and asking permission ("Darf ich hier sitzen?" - May I sit here?). Remember key vocabulary for shops ("Gesch?ft"), restaurants ("Restaurant") and tourist spots ("Sehensw?rdigkeit").

Reference Books

- 1 Studio D A1, Deutsch als Fremdsprache , Kursbuch und Arbeitsbuch, Cornelsen, 2000, Goyal Publishers & Distributors Pvt.Ltd. New Delhi.
- 2 Collins, easy learning German Grammar & Practice , Harpercollins Specials, 2004, Goyal Publishers & Distributors Pvt.Ltd..
- 3 Tangram aktuell 1 Kursbuch + Arbeits buch , Huebner , 2007, Goyal publishers and Distributors pvt.Ltd.
- 4 Studio d A1 Deutsch als Fremdsprache A1, Vocabulary , Cornelsen, 2004, Goyal Publishers & Distributors Pvt Ltd.

SEM VI SYLLABUS

23UC00270 - LEADERSHIP AND MANAGEMENT SKILLS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23UC0027	LEADERSHIP AND MANAGEMENT SKILLS	LAMS	R	0	0	4	0	2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
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CO1	Understand basic leadership, skills and perspectives and leadership styles	2	
CO2	Understand different managerial skills and apply them to develop high performance teams	3	
CO3	Analyse effective communicative strategies and apply them in team tasks	3	
CO4	Apply strategic planning fundamentals and decision-making techniques, through exercises and case studies	3	

Syllabus

Fundamentals of Leadership Skills Understanding Leadership and its Importance, Traits and Models/styles of Leadership, Perspectives on Leadership: Bipolarity-Unidimensionality - Bidimensionality-Hierarchical: Management within Leadership - Hierarchical: Leadership within Management, Basic Leadership Skills: Motivation, Teamwork, Negotiation & Networking, Emotional intelligence.

Managerial Skills - Basic Managerial Skills - Planning for effective management, Recruiting and Retaining Talent - Delegation of tasks - Learn to Coordinate, Organising, Building and Leading high-performance Teams

Effective Communication Strategies for Leaders and Managers - Self-Management Skills: Understanding Self-Concept - Developing Self-Awareness -Self-Examination - Self-Regulation, Active Listening and Feedback Techniques, Conflict Management & Conflict Resolution - Negotiation skills, Role-playing and Group activities

Strategic Planning and Decision-Making - Fundamentals of Strategic Planning and Decision-Making - Setting Goals & Objectives for the Organization, Strategic Tools: SWOT, PEST, FORCE FIELD, SCENARIO PLANNING and SIX THINKING HATS, etc., Simulation Exercises and Strategic Planning Case Studies

Reference Books

- 1 The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership, Caruso, D. R. and Salovey P, First edition, 2004, JohnWiley & Sons.
- 2 Training in Interpersonal Skills:Tips for Managing People at work, Stephen P. Robbins, Phillip L. Hunsaker, 6 edition, 2015, Pearson Education.
- 3 Learning to Lead: A Workbook on Becoming a Leader, Bennis, W.and Goldsmith, J, 4 edition, 2010, Reading, Mass. : Addison-Wesley.
- 4 Strategic Management: Concepts and Cases, Fred R. David and Forest R. David, 17th Edition, 2017, Pearson.
- 5 Interpersonal Skills in Organizations, Suzanne de Janasz, Karen Dowd, and Beth Schneider, 6th Edition, 2018, McGraw-Hill Education.
- 6 Human Resource Management", Gary Dessler and Biju Varkkey, 15th Edition, 2020, Pearson Education.
- 7 "Leadership: Theory and Practice", Peter G. Northouse, 8th Edition, 2021, SAGE Publications.
- 8 Case Studies in Strategic Management: A Practical Approach", Sanjay Mohapatra and R. Sridhar, 1st Edition (2012), Pearson Education.
- 9 Active Listening: Improve Your Ability to Listen and Lead, Center for Creative Leadership , 1st Edition (2012), Center for Creative Leadership.

23OEBT01O - IPR AND PATENT LAWS (OPEN

ELECTIVE - 1)

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23OEBT01O	IPR AND PATENT LAWS	IPR	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the the principles of copy rights in applying patents, trademarks, copyrights, and trade secrets	2	PO1, PO9
CO2	Apply the guidelines framed by GATT & WTO in patenting	3	
CO3	Apply the regulatory affairs in maintaining patenting rights	3	PO3
CO4	Apply the concepts of copy rights in drafting patents of various types.	3	PO5

Syllabus

Intellectual Property Rights; Patents and intellectual property rights (IPR): Definition, History of intellectual property; Types of intellectual property rights, copy rights, trade marks, geographical indication, Industrial design rights, patents. Sources of patent information, patent application procedures

Principles, Scope and Functions of GATT&WTO; GATT- Historical perspective, objectives and fundamental principles, impact on developing countries. WTO-Objectives, scope, functions, structure, status, membership and withdrawal, dispute settlement, impact on globalization, India tasks and challenges

Regulatory Affairs; Indian context-requirements and guidelines of GMP, understanding of Drugs and cosmetic act 1940 and rules 1945 with reference schedule M, U & Y. Related quality systems-objectives and guidelines of USFDA, WHO & ICH; Introduction to ISO series

Documentation and Protocols; Documentation: Types related to pharmaceuticals industry, protocols, harmonizing formulation development for global fillings, NDA, ANDA, CTD, Dealing with post approval changes-SUPAC, handling and maintenance including electronic documentation. self study topic: Case Studies on Patents and Case Studies on - Patents (Basmati rice, turmeric, Neem, and related medicinal plants and byproducts)

Reference Books

- 1 Patent Law and Policy: Cases and Materials, Robert Patrick Merges, John Fitzgerald Duffy, and Mark D. Lemley, 2021, Carolina Academic Press.
- 2 Intellectual Property Rights: Legal and Economic Challenges for Development, Carlos M. Correa, 2020, Oxford University Press .
- 3 Principles of Intellectual Property Law, Thomas G. Field Jr., 2021, New Hampshire.
- 4 Good manufacturing practices for Pharmaceuticals, Informa Healthcare, S.H. Willig, 2010, Academic Press.
- 5 IPR, Biosafety and Bioethics, Deepa Goel, Shomini Parashar, 2021, Pearson .

23OEEC110 - IMAGE PROCESSING (OPEN

ELECTIVE - 2)

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
23OEEC110	IMAGE PROCESSING	IMP	R	4	0	0	0	4

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the fundamental concepts of a digital image processing system and transformation techniques	2	PO1, PO2, PO9
CO2	Understand image enhancement techniques in spatial and frequency domains.	2	PO1, PO2, PO9
CO3	Apply image restoration and compression techniques	3	PO1, PO2, PO9
CO4	Apply image segmentation, representations, and description	3	PO1, PO2, PO10

Syllabus

INTRODUCTION Origin of Digital Image Processing, Fields that uses Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System. **DIGITAL IMAGE FUNDAMENTALS:** Elements of Visual perception, Image sampling and Quantization, Basic relationships between Pixels, Linear and Non-linear operations. **IMAGE TRANSFORMS** The Discrete Fourier Transform, The FFT, Walsh, Hadamard, Discrete Cosine Transform, The Haar Transform, and Slant Transform.

IMAGE ENHANCEMENT IN SPATIAL DOMAIN Some basic Gray transformations, histogram processing, enhancement using Arithmetic Logic operations, Smoothing Spatial Filters, Sharpening Spatial Filters. **IMAGE ENHANCEMENT IN FREQUENCY DOMAIN** Introduction on Fourier Transform and the Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters.

IMAGE RESTORATION Noise models, Restoration in the presence of Noise, only Spatial Filtering, Periodic Noise reduction by Frequency Domain Filtering, Linear, Position Invariant Degradation, Inverse Filtering, Wiener Filtering, least mean square Filtering. **IMAGE COMPRESSION** Fundamentals Image Compression models Error-Free Compression, Lossy Compression.

IMAGE SEGMENTATION Detection of discontinuities, Thresholding, Edge based Segmentation, and Region-based Segmentation. **IMAGE REPRESENTATIONS AND DESCRIPTION** Representation schemes, Boundary Descriptors, Regional Descriptors

Reference Books

- 1 Image Processing Analysis and Machine Vision, Milan Sonka, 2001, McGraw Hill.
- 2 Digital Image Processing, William J Prati, 2002, Cambridge University Press.
- 3 Image Processing Principles and Applications Principles and Applications, Tinku Acharya, 3e, 2004, PHI.
- 4 Digital Image Processing, Rafael C Gonzalez, 2008, pearson.

List of Professional Electives

24CA21C10 - CLOUD ARCHITECTURES

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
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24CA21C10	CLOUD ARCHITECTURES	CA	R	3	0	2	0	4
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Prerequisite

S#	Course Title	Acronym	Rule
1	ESSENTIALS OF OPERATING SYSTEM	EOS	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Classify cloud computing importance and services	2	PO1, PO2, PO3
CO2	Demonstrate the variopus cloud services & models .	2	PO1, PO2, PO3
CO3	Explain Virtualization approaches & Web services	2	PO2, PO3
CO4	Apply cloud services using Network security Cloud to utilize cloud resources	3	PO2, PO3
CO5	Experiment with various cloud services using web services Cloud for building and deploying applications	3	PO2, PO3

Syllabus

Overview of Cloud Computing: Brief history and Evolution of Cloud Computing, Traditional vs. Cloud Computing, Importance of Cloud Computing, Benefits and Challenges of Cloud Computing.

Cloud Computing Architecture: Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used.

Role of Web services Service Models (XaaS) Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) Deployment Models Public cloud, Private cloud, hybrid cloud, and community cloud. Infrastructure as a Service (IaaS): Introduction to virtualization, Different approaches to virtualization, Hypervisors

Machine Image, Virtual Machine (VM) Platform as a Service (PaaS): Introduction to PaaS What is PaaS, or Service-Oriented Architecture (SOA) Cloud Platform and Management Computation Storage? Software as a Service (SaaS:) Introduction to SaaS, Web services, Web 2.0, Web OS. Overview of Multi-Cloud Management Systems: Explain the concept of multi- cloud management.

Reference Books

- 1 Cloud Security, A comprehensive Guide to Secure Cloud Computing, Krutz, Ronald L.; Vines, Russell Dean, 2010, Wiley.
- 2 Cloud Computing Bible, .Barrie Sosinsky, 2011, Wiley.
- 3 Cloud Architecture Demystified, Keshri Asthana/ Ankur Mittal, 2023, BPB.
- 4 Cloud Computing: Architecting Next-Gen Transformation Paradigms, Kumar Saurabh , 2017, Wiley.

24CA22C20 - CLOUD WEB SERVICES

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA22C20	CLOUD WEB SERVICES	CWS	R	3	0	0	0	3

Prerequisite

S#	Course Title	Acronym	Rule
1	CLOUD ARCHITECTURES	CA	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Design and manage cloud-based solutions, leveraging key cloud services and adhering to best practices in cloud architecture and economics	3	PO1, PO2
CO2	Understanding network types and build various storage services , solutions in cloud environments	3	PO1, PO2, PO3
CO3	Identify and utilize key AWS core services essential for cloud computing environments	3	PO2, PO3, PO4
CO4	Analyze the benefits of AWS services such as CloudWatch for real-time monitoring and CloudTrail for auditing and compliance.	4	PO3, PO4

Syllabus

Cloud Web concepts: Search engine, Apache Hadoop, Grid Computing, Amazon Web Services, REST APIs, SOAP API, Query API, User Authentication, Connecting to the Cloud, Open SSH Keys, Tunnelling/ Port Forwarding, Image (glance), Object Storage (swift), ACL, Logging, Signed URI, Compute (nova), Cloud value proportion, Cloud economics, cloud architecture and design principles, AWS Cloud basic services

Networking & Storage: Overview, Key pairs, Network Types, LAN, Gateways and Router, IP Classes and Subnets, CIDR, Utilities, Instances Management, Image Management, direct connect, hybrid deployments, VPN, Security groups, Block Storage (cinder), Ubuntu in the Cloud, Installation, Utilities, File system, basic concepts of storage and databases, various storage services, storage solutions, database services.

Global Infrastructure and Security: Methods of deploying and operating cloud, global infrastructure, availability zone, benefits of CloudFront and Edge locations. AWS Core services, resources for technology support, methods for provisioning services, Benefits of shared responsibility model, layers of security, Multi Factor Authentication, Identity Access Management Security levels, security policies, benefits of compliance, security services.

Monitoring & Pricing: Approaches for monitoring, benefits of Cloud watch, CloudTrail, Trust Advisor, Pricing and support model, free tier, benefits of organization and consolidated billing, Budgets, Explorer, AWS pricing calculator, various AWS support plans, AWS market place.

Reference Books

- 1 Cloud Computing: Principles and Paradigms, RajkumarBuyya, James Broberg, Andrzej , 2011, Wiley .
- 2 OpenStack Essentials, Dan Radez, 2009, Wiley.
- 3 Cloud Computing: Concepts, Technology and Architecture , Erl Pearson Education , 2009, Wiley.
- 4 Resource Management in Utility and Cloud Computing , Zhao,Xiaolin Li , 2013, Springer.

24CA22C30 - CLOUD SERVERLESS COMPUTING

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA22C30	CLOUD SERVERLESS COMPUTING	CSS	R	3	0	0	0	3

Prerequisite

S#	Course Title	Acronym	Rule
1	CLOUD ARCHITECTURES	CA	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Describe Cloud computing and cloud service scheduling hierarchy.	2	PO1, PO2
CO2	Describing the Functions-as-a-service and Event-driven programming. Develop Scalable Models Using Serverless Architectures.	2	PO2, PO3
CO3	Demonstrating the application functionalities using Serverless runtimes and Serverless databases	3	PO2, PO3
CO4	Apply Serverless Programming Practices and Patterns. Architect, Build, and Operate the serverless applications	3	PO2, PO3

Syllabus

Overview of cloud computing, Resource scheduling for cloud computing, Serverless AWS. Serverless Programming Practices and Patterns, building serverless applications using Java and AWS. Lambda.

Building Serverless REST APIs with API Gateway. DynamoDB, Amazon Cognito, Web Hosting with S3, Route53, and CloudFront.

Postman, Domain name services, Serverless Amazon Athena and the AWS Glue Data CatLog, Real- Time Data Insights Using Amazon Kinesis, Messaging and Notifications with SQS and SNS.

Your first Serverless application on Azure, Google Cloud Platform, Example: Serverless Sensor Data Collector. Building Effective Serverless Applications with Kubernetes and OpenShift.

Reference Books

- 1 Learn AWS Serverless Computing: A beginner's guide to using AWS Lambda, Amazon API Gateway, and services from Amazon Web Services, Scott Patterson , 1st Edition , Packt Publishing.
- 2 Cookbook: Building Effective Serverless Applications with Kubernetes and OpenShift, BurrSutter, Kamesh and Sampath - Knative, 1st Edition, O'Reilly Media .
- 3 Building Serverless Web Applications Paperback, Diego Zanon, 1st Edition, Packt Publishing Limited
- 4 Serverless Applications with Node, Slobodan Stojanovic,Aleksandar Simovic and Mladen Macanovic, 3rd Edition, Pearson Education .

24CA31C4 - DESIGN AND DEVELOPMENT OF CLOUD APPLICATION (R)

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA31C4	DESIGN AND DEVELOPMENT OF CLOUD APPLICATION	DDCA	R	3	0	2	0	4

Prerequisite

S#	Course Title	Acronym	Rule
1	CLOUD ARCHITECTURES	CA	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the basic concept of hybrid cloud	2	PO1, PO2, PO3
CO2	Understand the management of hybrid cloud in terms of development and deployment	2	PO1, PO2, PO4
CO3	Plan the establishment of hybrid cloud	3	PO2, PO3, PO4
CO4	Apply the usage of Azure as a platform for hybrid cloud	3	PO1, PO3, PO4
CO5	Evaluate Applications using AWS cloud	5	PO1, PO2, PO3

Syllabus

Compute, Storage, Database: Compute: EC2, Lightsail, Lambda, batch, EBS, Serverless, AWS Outposts, Storage: S3, EFS, FSx, S3 Glacier, Storage gateway, AWS Backup, Database: RDS, DynamoDB, ElastiCache, Neptune, Amazon QLDB, Amazon Document DB, Keyspaces, Timestream.

Services: Migration and Transfer, Network, IAM: Migration and transfer: AWS Migration Hub, Database & Server Migration service. Network & Content Delivery: VPC, CloudFront, Route53, API Gateway, Direct Connect, Global Accelerator. Management & Governance: AWS organizations, CloudWatch, AWS Auto Scaling, CloudFormation, Config. Security, Identity & Compliance: IAM, Resource Access manager, AWS Single Sign-on, Key Management Services.

Identity access Management & S3: Identity access management, S3 Bucket, S3 pricing Tier, S3 Security and encryption, Versioning control, S3 lock policies and vault lock, S3 Performance, AWS Organizations, Sharing S3 buckets between accounts, Cross region Replication, Transfer Acceleration, Data sync overview, CloudFront, Snowball, Storage gateway.

Amazon EC2 & Network Security: EC2, Security group, Elastic Block Store (EBS), Volumes and Snapshots, AMI Types, ENI vs ENA vs ENA, Encrypted Root Device volumes & Snapshots, EC2 Hibernate, Cloud Watch, AWS Command line, IAM roles with EC2, Bootstrap Scripts, Elastic File System, FSx for Windows and FSx for Lustre, EC2 Placement Groups, HPC on AWS, AWS Web Application Firewall, VPCs, HA Architecture, Security and Serverless.

Reference Books

- 1 Cloud Computing Explained, John Rhoton, 2002, Wiley Dream Tech.
- 2 Hybrid Cloud for Dummies, Judith Hurwitz, Marcia Kaufman, 2005, John Wiley .
- 3 Windows Azure Hybrid Cloud, Danny Garber, 2007, John Wiley & Sons Inc.

- 4 Amazon Web Services for Beginners, STEVE M.BURNETT, 2013, Printed in the United States of America.
- 5 Amazon Web Services For Dummies, Bernard Golden, 2013, John Wiley & Sons, Inc

24CA31C5 - CLOUD SECURITY (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA31C5	CLOUD SECURITY	CS	R	3	0	0	0	3

Prerequisite

S#	Course Title	Acronym	Rule
1	CLOUD ARCHITECTURES	CA	1 2
2	CYBER SECURITY AND ETHICAL HACKING	CSEH	1 2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Cloud security is vital because it protects sensitive data, keeps critical applications running smoothly, ensures compliance with regulations, and builds trust with customers by safeguarding their information.	2	PO1, PO2
CO2	Cloud security goes beyond firewalls, encompassing multiple layers to protect data. This includes identity and access management (IAM) to control who sees what, encryption to scramble data, data loss prevention (DLP) to monitor for leaks,	2	PO1, PO2
CO3	Cloud environments, while convenient, introduce new security risks. Misconfigured settings, weak access controls, and insecure APIs can create openings for attackers to steal data	3	PO3, PO4
CO4	Achieving a seamless cloud security model involves creating a unified environment where security measures are integrated throughout the cloud infrastructure.	3	PO3, PO4

Syllabus

Introduction to Virtualization & Cloud: Virtualization and Cloud computing concepts, Private cloud Vs Public cloud, IAAS, PAAS & SAAS concepts, Virtualization security concerns, Hypervisor Security, Host/Platform Security, Security communications, Security between Guest instances, Security between Hosts and Guests

Cloud Controls Matrix & Top Cloud Threats: Introduction to Cloud Controls Matrix & Top Cloud Threats, Cloud Controls Matrix, Trusted Cloud Initiative architecture and reference model, requirements of Security as a Service (SecaaS) model and Top Security threats to the cloud model

Cloud Security: Cloud Security vulnerabilities and mitigating controls, Cloud Trust Protocol, Cloud Controls Matrix. Complete Certificate of Cloud Security Knowledge (CCSK).

Cloud Trust Protocol & Transparency: Introduction to Cloud Trust Protocol & Transparency, Cloud Trust Protocol and Transparency, Transparency as a Service, Concepts, Security, Privacy & Compliance aspects of cloud.

Reference Books

1. Visible Ops Private Cloud Andi Mann, Kurt Miline and Jeanne Morain, IT Process Institute., John Rhoton 2009, 2011, Visible Ops Private Cloud.
2. Cloud Computing Bible, Barrie Sosinsky, 2011, Wiley.

3. Cloud Computing Explained, John Rhoton, 2011, NA.
4. Cloud Security and Privacy, Tim Mather, Subra Kumaraswamy, and Shahed Latif, 2009, NA.
5. Cloud Security A comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz and Russel Dean Vines, 2009, NA.

24CA22D3 - APPLIED MACHINE LEARNING (R)

CourseCode	Course Title	Acronym	Mode	L	T	P	S	CR
24CA22D3	APPLIED MACHINE LEARNING	AML	R	3	0	0	0	3

Prerequisite

S#	Course Title	Acronym	Rule
1	APPLIED ARTIFICIAL INTELLIGENCE	AAI	1 2
2	DATA SCIENCE METHODOLOGIES	DSM	1 2

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Demonstrate the in-depth exploration of the various types of machine learning and the diverse ways in which models can be represented and gain comprehensive understanding of supervised, unsupervised, and reinforcement learning.	2	PO1, PO2, PO3
CO2	Apply multiple linear regression approach on complex data sets effectively and it will give an immersive knowledge on multiple linear regression	3	PO1, PO2, PO3
CO3	Interpreting a comprehensive introduction to multiple linear regression analysis, focusing on both the theoretical foundations and practical applications and will learn to build, interpret, and validate multiple linear regression models.	3	PO2, PO3, PO4
CO4	Analyzing regression coefficients within the context of various regression models and learn how to estimate, interpret, and validate regression coefficients, gaining insights into their practical implications in statistical modeling and data analysis.	4	PO2, PO3, PO4

Syllabus

Introduction to Machine Learning Algorithms Introduction to Machine learning Statistical Learning types of Machine Learning learning models geometric probabilistic and logistic models introduction to supervised, unsupervised and reinforcement learning model evaluation model implementation model accuracy indicators

Supervised Learning Simple Linear Regression Analysis Introduction to parametric machine learning method assumptions of parametric machine learning methods linear model and its assumptions simple linear regression scatter diagram Simple linear Regression parameter estimation properties of regression parameters testing the significance of regression parameters using ANOVA and t test estimation of Interval Estimation of the Mean Response R Square Adjusted R Square Normality of response variable prediction of new observations

Supervised Learning Multiple Linear Regression Analysis I Multiple linear regression model assumptions of Multiple linear regression variables multicollinearity homoscedasticity autocorrelation effects of multicollinearity effect of homoscedasticity and auto autocorrelation in parameter estimation Least Squares Estimation of the Regression Coefficients Performance metrics in regression

Classification Problem with Python Data Visualization Statistical Summary Create Training and Test Sets and Apply Scaling Build Models predicting new observations residual analysis model adequacy and validation

Reference Books

1. Introduction to Linear Regression Analysis, DOUGLAS C. MONTGOMERY, ELIZABETH A. PECK, G. GEOFFREY VINING, 2017, A JOHN WILEY & SONS, INC., PUBLICATION.
2. Introduction to Machine Learning , EthemAlpaydm, 2014, MIT Press.
3. Python Machine Learning, Sebastian Raschka, 2021, PACKT Publishing.

4. Using Multivariate Statistics, Barbara G. Tabachnick, Linda S. Fidell, 2016, Pearson Education Inc.

24CA31D5 - DATA VISUALIZATION TECHNIQUES (R)

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA31D5	DATA VISUALIZATION TECHNIQUES	DVT	R	3	0	0	0	3

Prerequisite

S#	Course Title	Acronym	Rule
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1	DATA SCIENCE METHODOLOGIES	DSM	1
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Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand the brief history of data visualization, its importance, and the challenges involved in visualizing data	2	PO1, PO2
CO2	Apply static graphical techniques such as bar graphs to represent data, including grouping bars, customizing colors, sizes, titles, and axis units	3	
CO3	Experiment with static graphical techniques such as bar graphs to represent data, including grouping bars, customizing colors, sizes, titles, and axis units	3	PO2, PO5
CO4	Examine the visualizations by adding annotations such as text, mathematical expressions, lines, arrows, shaded shapes, and error bars. Examine bar graphs, customizing color, applying bar graphs in business scenarios.	4	PO1, PO3, PO5
CO5	Students will apply data visualization techniques to real-world datasets, demonstrating the practical application of learned concepts.	5	PO1, PO3, PO5

Syllabus

Data visualization transforms complex data into visual formats like charts and graphs, making it easier to understand and use for decision-making. Effective visualizations adhere to principles of clarity, accuracy, and aesthetics, with applications in problem-solving across various fields. Key considerations include data selection and preparation, color theory, typography, layout principles, and cognitive design principles like Gestalt laws.

Bar graphs are one of the most common and versatile types of charts used in data visualization. They represent data with rectangular bars, where the length of each bar is proportional to the value it represents. Bar graphs are ideal for comparing quantities across different categories. Bar graphs are fundamental tools in data visualization, offering a straightforward way to compare data across categories. Understanding how to create and customize bar graphs allows for effective communication of information, making them invaluable in business and other fields where data-driven decision-making is crucial.

Multivariate Graphical Techniques introduce correlation matrices for analyzing relationships between variables, network graphs for visualizing complex connections, and heat maps and tree maps for displaying data patterns and hierarchies. The module also covers higher-dimensional scatter plots and adjusting axes for accurate multivariable representation. Complex data structures, while higher-dimensional scatter plots incorporate additional dimensions for more comprehensive data analysis. Adjusting axes in these plots ensures accurate representation and comparison of multiple variables.

Graphical Validation involves multivariate statistical visual representations like dendrograms for cluster analysis, Scree plots for determining the number of clusters and factors, and QQ and PP plots for assessing data distribution. It also covers customization techniques, including annotations (text, mathematical expressions, lines, arrows), error bars, and axis modifications (swapping, scaling, positioning, tick marks, labels). Additionally, it addresses circular graphs, themes, and legend customization (position, title, labels).

Reference Books

1. The Visual Display of Quantitative, Edward Tufte, 2001, Graphics Press.
2. Data Points - Visualization That Means Something, Nathan Yau, 2013, John Wiley & Sons Inc.
3. Learning Responsive Data Visualization, Erik Hanchett, Christoph Kornor, 2016, packt.
4. Visualization Analysis and Design, Munzner, 2014 year, A K Peters/CRC Pres.

5. Information Visualization: Perception for Design, Colin Ware , 2019 year, Morgan Kaufmann

24CA21S10 - CYBER SECURITY AND ETHICAL HACKING

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA21S10	CYBER SECURITY AND ETHICAL HACKING	CSEH	R	3	0	2	0	4

Prerequisite

S#	Course Title	Acronym	Rule
1	MATHEMATICS FOR COMPUTER SCIENCE	MCS	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Understand Information Systems and Cyber Security	2	PO1, PO2
CO2	Build measures for various types of security threats and electronic payment systems	3	PO2, PO3
CO3	Identify the security issues involved in developing secure information systems	3	PO2, PO3
CO4	Apply different ethical hacking methods	3	PO2, PO3
CO5	Evaluate various cryptographic algorithms	5	PO3, PO5

Syllabus

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software.

Digital Signature, public Key Cryptography. Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management.

Introduction to Ethical Hacking: Hacking Methodology, Process of Malicious Hacking, Foot printing and Scanning: Foot printing, Scanning. Enumeration: Enumeration. System Web and Network Hacking: SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security.

Reference Books

1. Analysing Computer Security , Charles P. Pfleeger, Shari Lawerance Pfleeger,, 2011, Pearson Education India. .
2. Cryptography and Information Security, V.K. Pachghare, 2015, PHI Learning Private Limited, Delhi.
- 4.3 Introduction to Information Security and Cyber Laws, Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla, 2014, Willey Dreamtech Press.
- 4 Information Assurance for the Enterprise, Schou, Shoemaker, 2006, Tata McGraw Hill.
5. Hacking Exposed 7th Edition, Stuart McClure, Joel Scambray, George Kurtz, 2012, Tata McGraw Hill.

24CA22S20 - CYBER FORENSICS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA22S20	CYBER FORENSICS	CF	R	3	0	0	0	3

Prerequisite

S#	Course Title	Acronym	Rule
1	CYBER SECURITY AND ETHICAL HACKING	CSEH	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Outline digital evidence following established procedures, analyze recovered data for traces of cybercrime, and effectively present findings for further investigation	2	PO1, PO2
CO2	Analyze complex digital evidence from various sources (Windows, Linux, networks, mobile devices) using advanced forensic techniques (packet analysis, intrusion detection, steganography)	4	PO2, PO3
CO3	Examine advanced forensic techniques such as cross-drive analysis, live analysis, deleted file recovery, stochastic forensics, password cracking methods	4	PO2, PO3, PO4
CO4	Inspect legal principles and best practices to effectively handle corporate espionage, digital evidence, and cybercrime incidents	4	PO3, PO4

Syllabus

Computer Forensics : Introduction to Computer Forensics, Forms of Cyber Crime, First Responder Procedure- Non- technical staff, Technical Staff, Forensics Expert and Computer Investigation procedure, Case Studies
Storage Devices & Data Recover Methods : Data Acquisition, Data deletion and data recovery method and techniques, volatile data analysis, Case Studies

Computer Forensics : Introduction to Computer Forensics, Forms of Cyber Crime, First Responder Procedure- Non- technical staff, Technical Staff, Forensics Expert and Computer Investigation procedure, Case Studies
Storage Devices & Data Recover Methods : Data Acquisition, Data deletion and data recovery method and techniques, volatile data analysis, Case Studies

Forensics Techniques II : Crossdrive analysis, Live analysis, deleted files, stochastic forensics, Dictionary attack, Rainbow attack, Email Tacking Header option of SMTP, POP3, IMAP, examining browsers, Case Studies

Cyber Law: Corporate espionage, digital evidence handling procedure, Chain of custody, Main features of Indian IT Act 2008 (Amendment), Case Studies, Incident specific procedures

Reference Books

- 1 Computer Forensics: Computer Crime Scene Investigation, John Vacca, 2015, Laxmi Publications.
- 2 Digital Forensic: The Fascinating World of Digital Evidences, Nilakshi Jain, 2016, Wiley.
- 3 Hacking Exposed Computer Forensics, Aaron Philipp, David Cowen, 2009, McGraw Hill.
- 4 Mastering Mobile Forensics, SoufianeTahiri, 2016, Packt Publishing.
- 5 Computer Forensics: A Beginners Guide, David Cowen, 2013, McGraw Hill.

24CA22S30 - MALWARE ANALYSIS

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA22S30	MALWARE ANALYSIS	MA	R	3	0	0	0	3

Prerequisite

S#	Course Title	Acronym	Rule
1	CYBER SECURITY AND ETHICAL HACKING	CSEH	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Illustrate the Goals of Malware Analysis and Creating fake networks	2	PO1, PO4
CO2	Demonstrate the usage of virtual machines in the context of malware analysis.	3	PO1, PO2
CO3	Apply the concept of exception handling in the context of malware analysis. How can it be used to identify and analyze malware activity	3	PO1, PO2
CO4	Develop a plan for analyzing malware persistence mechanisms	4	PO1, PO5

Syllabus

Goals of Malware Analysis, AV Scanning, Hashing, FindingStrings, Packing and Obfuscation, PE file format, Static, LinkedLibraries and Functions, Static Analysis tools, Virtual Machines and their usage in malware analysis, Sandboxing, Basicdynamic analysis, Malware execution, Process Monitoring, Viewing processes, Registry snapshots, Creating fake networks

X86 Architecture- Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, Simple Instructions, The Stack, Conditionals, Branching, Rep Instructions, Disassembly, Global and local variables, Arithmetic operations, Loops, Function Call Conventions, C Main Method and Offsets. Portable Executable File Format, The PE File Headers and Sections, IDA Pro, Function analysis, Graphing, The Structure of a Virtual Machine, Analyzing Windows programs, Anti-static analysis techniques, obfusca

Live malware analysis, dead malware analysis, analyzing traces of malware, system calls, api calls, registries, network activities. Anti-dynamic analysis techniques, VM detection techniques, Evasion techniques, , Malware Sandbox, Monitoring with ProcessMonitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching

Downloaders and Launchers, Backdoors, Credential Stealers, Persistence Mechanisms, Handles, Mutexes, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection, YARA rule based detection.

Reference Books

- 1 Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software, Michael Sikorsk and Andrew Honig, 2017, No Starch Press.
- 2 The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory, Michael Hale Ligh, Andrew Case, Jamie Levy, and Aaron Walters, 2012, Willey.
- 3 Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code, Michael Hale Ligh, Steven Adair, Blake Hartstein, and Matthew Richard, 2012, Willey.
- 4 Practical Reverse Engineering: x86, x64, ARM, Windows Kernel, Reversing Tools, and Obfuscation, Bruce Dang, Alexandre Gazet, and Elias Bachaalany, 2019, Willey.
- 5 Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz, 2011, No Starch Press.

24CA31S4 - SECURITY GOVERNANCE AND MANAGEMENT

(R)

Course Code	Course Title	Acronym	Mode	L	T	P	S	CR
24CA31S4	SECURITY GOVERNANCE AND MANAGEMENT	SGM	R	3	0	2	0	4

Prerequisite

S#	Course Title	Acronym	Rule
1	CYBER SECURITY AND ETHICAL HACKING	CSEH	1

Course Outcomes

CO#	CO Description	BTL	PO/PSO
CO1	Introduction to E-Government and E-Governance; Models of E-Governance	2	PO1, PO2
CO2	E-Government Infrastructure Development	3	PO2, PO3, PO5
CO3	Security for e-Government; Applications of Data Warehousing and Data Mining in Government	3	PO2, PO3
CO4	Case Studies	3	PO1, PO2, PO3
CO5	Implementing e-governance models and systems using suitable platform.	5	PO5

Syllabus

Security Gov. & Mgmt: Why & How? Benefits, Legal, Roles (Board, Mgmt, CISO). CIA Model. Access Mgmt (Auth, Authz, Access Control).

Strategic Metrics: Governance Objectives, Information Security Outcomes : Defining Outcomes , Security Governance Objectives: Security Architecture, CobiT ,Capability Maturity Model , ISO/IEC 27001/27002 63, Other Approaches, Risk Management Objectives: Risk Management Responsibilities, Managing Risk Appropriately ,Determining Risk Management Objectives

Security Management: Risks, Gaps, Strategies & Implementation. Covers identifying security risks, crafting effective strategies, and measuring success through action plans and metrics

Security Program Development Metrics: Information Security Program Development Metrics ,Program Development Operational Metrics ,Information Security Management Metrics: Management Metrics ,Security Management Decision Support Metrics ,CISO Decisions , Incident Management and Response Metrics: Incident Management Decision Support Metrics

Reference Books

- 1 INFORMATION SECURITY Governance: A Practical Development and Implementation Approach, KRAG BROTBYA, 4th, Wiley.
- 2 Information Systems Security: Security Management, Metrics, Frameworks And Best Practices, Nina Godbole, 3rd, ISC2 Press.
- 3 Information Security Risk Analysis, Thomas R. Peltier, 3rd, Auerbach, 2012.
- 4 The Security Risk Management Body of Knowledge (CISSP Risk and Information Security Domain), James M. Conrad, 1st, Auerbach Publications.

