



ProgrammeStructure

**SchoolofComputerApplications
BCA(Hons)withspecialization
DataScience/CloudComputing**

ProgrammeCode:CA0

201

Batch: 2023-2027

BCA(Hons)withspecializationDataScience/Cloud Computing

**TITLE:FourYearProgrammeStructureforBCA(Hons)withspecializationData
Science/ Cloud Computing**

DURATIONOFTHECOURSE:4Years

TotalCredits-160

Totalcreditofthe04yearUG Programme for year wise	01stYear	41
	02ndYear	41
	03rdYear	41
	04thYear	39

Vision of the University

To be recognized as an Institution of excellence, facilitating learning, fostering creativity, knowledge creation, innovations, consultancy and leadership in multiple areas to build a conscious community that will positively impact living beings for a sustainable future.

Mission of the University

1. To Create conducive environment for an interactive and application oriented experiential learning making the Institute a preferred destination for work and study.
2. To Foster creativity, research and innovation orientation in students and faculty in basic and applied areas in all of its disciplines, provide cost effective solutions and nurture entrepreneurial capabilities to accelerate growth.
3. To act as a catalyst in social change by developing academic, social, political, technological, scientific, industrial and business leadership in the spirit "Think Globally and Act Locally"; by providing ample opportunities to develop team spirit, sportsmanship and love for culture and national heritage.

Core Values

1. Integrity
2. Honesty
3. Transparency
4. Empathy

School of Computer Applications

Vision of School

To be a premier institution in computing sciences, recognized for pioneering research, transformative education, and impactful contributions to society, shaping the future of technology and driving positive.

Mission of School

To empower students with cutting-edge knowledge and skills in computing sciences, foster a culture of innovation, and prepare them to address the challenges of a rapidly evolving digital world through rigorous academics, experiential learning, and interdisciplinary collaboration.

Core Values

1. Excellence
2. Innovation
3. Sustainability
4. Global Perspective

Programme Educational Objectives (PEO's)

BCA(Hons)withspecializationDataScience/CloudComputing

PEO-1The graduates will establish themselves as professionals by solving real-life problems using exploratory and analytical skills acquired in the field of Computer Science and Engineering.

PEO-2The graduates will provide sustainable solutions to ever changing interdisciplinary global problems through their Research & Innovation capabilities.

PEO-3The graduates will become employable, successful entrepreneur as an outcome of Industry- Academia collaboration.

PEO-4The graduates will embrace professional code of ethics while providing solution to multidisciplinary social problems in industrial, entrepreneurial and research environment to demonstrate leadership qualities.

Programme Outcomes (PO's):

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge

eto assess societal, health, safety, legal and cultural issues
and the consequent responsibilities relevant to the professional engineering practice.

PO7:Environment and sustainability:Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8:Ethics:Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9:Individualandteamwork:Functioneffectivelyasanindividual,andasamember orleader in diverse teams, and in multidisciplinary settings.

PO10:Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11:Project management and finance:Demonstrate knowledge and understanding of the engineeringandmanagementprinciplesandapplythesetoone'sown work,asa memberandleader in a team, to manage projects and in multidisciplinary environments.

PO12:Life-longlearning:

Recognizetheneedfor,andhavethepreparationandabilitytoengage in independent and life-long learning in the broadest context of technological change.

ProgrammeSpecificOutcomes(PSO):

PSO1: Experiment and prepare programming concepts and provide new ideas and innovations towards research and societal issues.

PSO2: Analyse and develop computer programs in the areas related to algorithms, system software, cloud computing, artificial intelligence & machine learning, bioinformatics, big data analytics,blockchain,cybersecurityandnetworkingforefficientdesignofcomputer-basedsystems of varying complexity.

PSO3: Apply standard Software Engineering practices and strategies in software project developmentusingopen-sourceprogrammingenvironmenttodeliverqualityproductforbusiness success.

Semester-wise Teaching Scheme UG Program

BCA(Hons)withspecializationDataScience/Cloud Computing



SDGI GLOBAL UNIVERSITY, GHAZIABAD (SGU)

Semester–Wise Teaching Scheme UG Program

Programme: BCA (Hons)

Semester:I

Batch – 2023 – 27

Academic year: 2023 - 24

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	External	Internal	Total	Pass Marks
				L	T	P						
1	CC-1	SCA – 23101	Computer Concepts & Programming in C	4	0	0	4	4	50	50	100	45
2	CC-2	SCA – 23102	Foundation of Mathematics	4	0	0	4	4	50	50	100	45
3	CC – 3	SCA – 23103	Web designing using DHTML	3	0	0	3	3	50	50	100	45
4	SEC-1	SCA – 23104	Professional Communication	3	0	0	3	3	50	50	100	45
5	AEC-1	SCA – 23105	Principles and Practices of Management	3	0	0	3	3	50	50	100	45
6	VAC-1	SCA – 23106	Environmental Education	2	0	0	2	2	50	50	100	45
7	CC – 4	SCA – 23107	Programming in 'C' lab	0	0	4	4	2	60	40	100	45
8	CC – 5	SCA – 23108	Web designing using DHTML Lab	0	0	2	2	1	60	40	100	45
9	SEC-2	SCA – 23109	MS Office & Excel Lab	0	0	1	2	2	60	40	100	45
			Total	19	0	7	27	22	480	420	900	405

CC - Core Course

OE - Open Elective/ Multidisciplinary

AE - Ability Enhancement Compulsory Course

VAC - Value Added Course

SE - Skill Enhancement



SDGI GLOBAL UNIVERSITY, GHAZIABAD (SGU)

Semester–Wise Teaching Scheme UG Program

Programme: BCA (Hons) with Specialization Data Science/ Cloud Computing

Semester:II

Batch – 2023 – 27

Academic year: 2023 - 24

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	External	Internal	Total	Pass Marks
				L	T	P						
1	CC – 6	SCA – 23201	Data Structures Using C	3	0	0	3	3	50	50	100	40
2	CC – 7	SCA – 23202	Object-Oriented Programming Using Python	3	0	0	3	3	50	50	100	40
3	CC -8	SCA – 23203	Probability & Statistics	4	1	0	5	4	50	50	100	40
4	SEC– 3	SCA–DS–23204/ SCA–CC–23204	Computer fundamentals for Data Science (<i>Data Science Branch</i>)/ Computer Fundamentals of Cloud Computing (<i>Cloud Computing Branch</i>)	3	0	0	3	3	50	50	100	40
5	AEC– 2	SCA – 23205	Organizational Behavior	3	1	0	4	3	50	50	100	40
6	VAC– 2	SCA – 23206	First Aid & Health	1	0	0	1	1	60	40	100	40
3	CC – 9	SCA – 23207	Data Structure Using C Lab	0	0	4	4	2	60	40	100	40
4	CC– 10	SCA – 23208	OOPS Lab using Python	0	0	4	4	2	60	40	100	40
6	CC– 11	SCA–DDL–23209/ SCA–CCL–23209	Computer fundamentals for Data Science Lab (<i>Data Science Branch</i>)/ Computer Fundamentals of Cloud Computing (<i>Cloud Computing Branch</i>) Lab	0	0	2	2	1	60	40	100	40
Total				17	2	10	29	22	490	410	900	360



SDGI GLOBAL UNIVERSITY, GHAZIABAD (SGU)

Semester–Wise Teaching Scheme UG Program

Programme: BCA (Hons) with Specialization Data Science/ Cloud Computing

Semester:III

Batch – 2023 – 27

Academic year: 2024 - 25

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	CC-5	B021223301	Operating System	4	0	0	4	4	50	50	100	40
2	CC-6	B021223302	Artificial Intelligence	4	0	0	4	4	50	50	100	40
3	CC Lab	B021223351	Operating System Lab using Linux	0	0	2	2	1	60	40	100	40
4	CC-7	B021223304	Linear Algebra	4	0	0	4	4	50	50	100	40
5	DSC-3 (Minor)	B020223304/ B020123304	Analyzing and Applying data Science with python (<i>Data Science Branch</i>)/ Introduction to Virtualization (<i>Cloud Computing Branch</i>)(Minor)	3	0	0	3	3	50	50	100	40
6	DSC Lab	B020223354/ B020123354	Analyzing and Applying data Science with python lab(<i>Data Science Branch</i>)/ Introduction to Virtualization lab (<i>Cloud Computing Branch</i>)	0	0	2	2	1	60	40	100	40
7	AEC-3	BSGUAE2407	Creative Writing Skill	2	0	0	2	2	50	50	100	40
8	SEC-3	BSGUSE2416	Cyber Security	2	0	0	2	2	25	25	50	20
9.		BSGUSE2466	Cyber Security Lab	0	0	2	2	1	30	20	50	20
			Total	19	0	6	25	22	425	375	800	320

CC - Core Course

OE - Open Elective/ Multidisciplinary

AE - Ability Enhancement Compulsory Course

VAC - Value Added Course

SE - Skill Enhancement

DSC-Discipline specific course



SDGI GLOBAL UNIVERSITY, GHAZIABAD (SGU)

Semester–Wise Teaching Scheme UG Program

Programme: BCA (Hons) with Specialization Data Science/ Cloud Computing

Semester:IV

Batch – 2023 – 27

Academic year: 2024 - 25

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	CC-8	B021223401	Machine Learning using Python	4	0	0	4	4	50	50	100	40
2	CC-9	B021223402	Digital Marketing & Trend Analysis	3	0	0	3	3	50	50	100	40
3	CC-10	B021223403	Database Management System	3	0	0	3	3	50	50	100	40
4	CC-11	B021223404	Introduction to Computer Networks	3	0	0	3	3	50	50	100	40
5	CC Lab	B021223451	Machine Learning using Python Lab	0	0	2	2	1	60	40	100	40
6	CC Lab	B021223452	Database Management System Lab	0	0	2	2	1	60	40	100	40
7	DSC Lab	B020223455/ B020123455	Tableau(Data Science Branch) / Amazon Web Services(Cloud Computing Branch)	0	0	4	4	2	60	40	100	40
8	AEC-4	BSGUAE2405	Research Writing Skill	2	0	0	2	2	50	50	100	40
			Total	15	0	8	23	19	430	370	800	320

CC - Core Course

OE - Open Elective/ Multidisciplinary

AE - Ability Enhancement Compulsory Course

VAC - Value Added Course

SE - Skill Enhancement

DSC-Discipline specific course



SDGI GLOBAL UNIVERSITY, GHAZIABAD (SGU)

Semester-Wise Teaching Scheme UG Program

Programme: BCA (Hons) with specialization Data Science / Cloud Computing

Semester: V

Batch – 2023 - 27

Academic year: 2025 - 26

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	CC-12	B021223501	Design & Analysis of Algorithm	3	0	0	3	3	50	50	100	40
2	CC-13	B021223502	Software Engineering	3	0	0	3	3	50	50	100	40
3	CC-14	B021223503	Elective-1	4	0	0	4	4	50	50	100	40
4	CC-15	B021223504	Elective-2	4	0	0	4	4	50	50	100	40
5	CC Lab	B021223551	Design & Analysis of Algorithm Lab	0	0	2	2	1	60	40	100	40
6	CC Lab	B021223552	Software Engineering Lab	0	0	2	2	1	60	40	100	40
7	DSC-4 (Minor)	B020223505/ B020123505	Data Analysis using R / Cloud Architecture	3	0	0	3	3	50	50	100	40
8	DSC Lab	B020223555/ B020123555	Data Analysis using R Lab / Cloud Architecture Lab	0	0	2	2	1	60	40	100	40
Total				17	0	6	23	20	430	370	800	320

Elective - 1 Paper Code	Elective - 1 Subjects	Elective – 2 Paper code	Elective -2 Subjects
B021223503A	Business Analytics	B021223504A	Natural Language Processing
B021223503B	Soft Computing Techniques	B021223504B	MOOC
B021223503C	E-Commerce	B021223504C	Bioinformatics

CC - Core Course

OE - Open Elective/ Multidisciplinary

AE - Ability Enhancement Compulsory Course

VAC - Value Added Course

SE - Skill Enhancement

DSC-Discipline specific course

DETAILED SYLLABUS

Programme: BCA (Hons) with specialization Data Science/Cloud Computing
Year: Ist Semester: I Session: 2023-2024

Computer Concepts & Programming in C
 (Course Code: SCA-23101)

Year: Ist

L T PC

Semester: Ist 4004

COURSE OBJECTIVES
To acquire the fundamental principles, concepts and constructs of computer programming
To develop competency for the design, coding and debugging
To build the programming skills using 'C' to solve real world problems

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	To Focus Fundamentals of Computers and Peripherals.	K ₃
CO2	To Introduce programming language and aware the students about programming paradigm	K ₃ , K ₄
CO3	To Focus Concept and Methodology of Programming.	K ₂ , K ₃
CO4	To give clear idea of different strategy of basic programming with Like Looping, Decision Making, Array, Structure	K ₂ , K ₄
CO5	Function, Pointer, etc. to solve real life problems.	K ₃ , K ₆

Unit-1

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker. Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Unit-2

Operators :Types of operators, Precedence and Associativity, Expression, Statement and types of statements Build in Operators and function Console based I/O and related built in I/O function: printf(), scanf(), getch(), getchar(), putchar(); Concept of header files, Preprocessor directives: #include, #define Control structures Decision making structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, Do-while, for, Nested for loop; other statements: break, **continue**, **goto**, **exit**.

Unit-3

Array & String: Concept of array, One and Two dimensional arrays, declaration and initialization of arrays, String, String storage, Built-in string functions.

Functions: Concept of user defined functions, prototype, definition of function, parameters, parameter passing, calling a function, Macros, Preprocessing.

Recursion: Definitions, recursive function, Examples, Applications.

Unit-4

Introduction to problem solving Concept: problem solving, Problem solving techniques (Trail & Error, Brain Storming, Divide & Conquer) Steps in problem solving (Define Problem, Analyze Problem, Explore Solution) Algorithms and Flowcharts (Definitions, Symbols), Characteristics of an algorithm Conditionals in pseudo-code, Loops in pseudo code Time complexity: Big-Oh notation, efficiency Simple

Unit-5

Simple Arithmetic Problems: Addition/Multiplication of integers, Determining if a number is +ve/-ve/even/odd, Maximum of 2 numbers, 3 numbers, Sum of first n numbers, given n numbers, Integer division, Digit reversing, Table generation for n, ab, Factorial, sine series, cosine series, nCr , Pascal Triangle, Prime number, Factors of a number, Other problems such as Perfect number, GCD numbers etc (Write algorithms and draw flowchart), Swapping.

TEXTBOOKS:

- Programming in ANSI C, Forth Edition, E. Balagurusamy, TMH
- Reference Books: Let us C, Yashwant Kanitkar
- C: The Complete Reference, Herbert Schildt, McGraw Hill
- Computer fundamentals and Programming in C, Pradipdey and Manas Ghosh, Oxford

Foundation of Mathematics

(Course Code: SCA-23102)

Year: Ist
Semester: Ist

LTPC
4004

COURSE OBJECTIVES

1. To acquire the fundamentals of Matrix theory and its use to find the nature of solution of system of equations.
2. To build the skills in Limit, continuity and Differentiability and its applications.
3. To develop the idea of vector calculus and multiple integration.

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	Students will know the solution of system of equations, rank, eigen value, eigenvector and characteristic polynomial.	K ₃
CO2	Student will be able to understand the concept of limit, continuity also its applications.	K ₃ , K ₄
CO3	After the completion of unit students know the concept of differentiability and its application.	K ₂ , K ₃
CO4	After the completion of vector, students know what is vector and what are its uses such as gradient, divergence, and curl.	K ₂ , K ₄
CO5	Apply integration to compute multiple integrals, area volume, integral in polar coordinate in addition to change of order.	K ₃ , K ₆

Unit 1 Linear Algebra

Linear Algebra-Matrices: Rank of a matrix, Consistency of a system of linear equations, Linear dependence and independence of vectors, Eigen-values and Eigen vectors of a matrix, Cayley- Hamilton theorem, Determinants

Unit 2 Limits and Continuity

Definition of Limits, Left hand and right hand limit, useful formulae in finding the limits of certain Functions, Definition of continuity, Properties of continuous functions, Types of Discontinuity, Removable discontinuity, Discontinuity of first kind and second kind

Unit 3 Differentiation

Differentiability of a function, Rolle's theorem, Lagrange's mean Value theorem, Taylor's theorem, Maclaurin's theorem, Indeterminate Forms, L' Hospital's Rule, Maxima and Minima, curve tracing

Unit 4 Vector Algebra

Introduction, Representation of vector Addition and subtraction of vectors, Double and Triple Scalar and Vector Product and its Properties, System of reciprocal of Vectors, Gradient, Divergence and curl of a vector

Unit 5 Multiple Integration

Double and triple integrals, Change of variables, Change of order of integration, Applications to area and volume.

Reference Books

1. Grewal B.S., Higher Engineering Mathematics, Delhi Khanna Publishers.
2. Differential Calculus by Shanti Narayan, Publishers S. Chand & Co.
3. HKDAS "Advanced Engineering Mathematics" s. Chand and company

WebdesigningusingDHTML (CourseCode:SCA-23103)

Year:Ist
Semester:Ist

L T P C
3 0 0 3

COURSEOBJECTIVES

- 1.ToacquirethefundamentalsofWebpagedesignandabouttypesofwebsites.
- 2.TobuildtheskillsinHTML,CSSandJavaScript.
- 3.ToUnderstand the basicconceptofSEO.

CourseOutcome (CO)	Bloom’sKnowledgeLevel (KL)
Attheendofcourse,thestudentwill beableto understand	
CO1	UnderstandprincipleofWebpagedesignandabouttypesofwebsites
CO2	VisualizeandRecognizethebasicconceptofHTMLandapplicationinwebdesigning.
CO3	RecognizeandapplytheelementsofCreatingStyleSheet(CSS).
CO4	UnderstandthebasicconceptofJavaScriptanditsapplication.
CO5	IntroducebasicsconceptofWebHostingandapplytheconceptofSEO.

Unit1Introduction

Introduction:InternetandWorldWideWeb(WWW);EvolutionandHistoryofWorldWide Web,Web Pages and Contents, Web Clients, Web Servers, Web Browsers; Protocols Governing Web, URLs; Introduction to client-server computing; Introduction to Mark up Languages (HTML and DHTML).

Unit2WebDevelopment

HTMLDocumentFeatures,FundamentalsHTMLElements,CreatingLinks;Headers;Text styles;Text Structuring; Text colour and Background; Formatting text; Page layouts, Images; Ordered and Unorderedlists; InsertingGraphics;TableCreationand Layouts;FrameCreationand Layouts;Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes. Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML.

Unit3Introduction to CSS

Features,CoreSyntax,Types,StyleSheets,StyleRuleCascadingandInheritance,TextProp erties,CSS Box Model, Normal Flow Box Layout, Positioning and other useful Style Properties.

Unit 4Introduction toJava Script

Objects, Methods, Events and Functions, Tags, Operators, Data Types, Literals and Type Casting in JavaScript, Programming Construct, Array and Dialog Boxes, Relating JavaScript to DHTML, Dynamically Changing Text, Style, Content.

Unit5CoreJava

Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming. Java Server Pages (JSP): Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives,

ReferenceBooks

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, "Web Technology and Design", New Age International
3. Ivan Bayross, "HTML, DHTML, JavaScript, Perl & CGI", BPB Publication
4. Bhave, "Programming with Java", Pearson Education
5. Herbert Schildt, "The Complete Reference: Java", TMH.
6. Margaret Levine Young, "The Complete Reference Internet", TMH
7. Naughton, Schildt, "The Complete Reference JAVA 2", TMH
8. Balagurusamy E, "Programming in JAVA", TMH

Professional Communication
(Course Code: SCA-23104)

Year: Ist
Semester: Ist

LTPC
3003

COURSE OBJECTIVES

1. To acquire the fundamentals of effective Communication.
2. To build the skills in Business Correspondence.
3. To Understand the basic concept of Oral Presentation and report writing.

Course Outcome(CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	Understand principle of Communication.	K ₁
CO2	Recognize the basic concept of Letter Writing, presentation, inviting quotations, sending quotations, placing orders.	K ₂ , K ₃
CO3	Apply the concepts for report writing.	K ₂ , K ₄
CO4	Understand the need to enhance the vocabulary.	K ₂ , K ₃
CO5	Introduce basic concept of oral representation.	K ₃ , K ₂

Unit 1 Communication

Introduction: Nature of Communication, Process of Communication, Types of Communication (verbal & Non Verbal), Importance of Communication, Different forms of Communication, Effective principles of Communication, 7 C's. Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers.

Unit 2 Business Correspondence

Letter Writing, presentation, inviting quotations, sending quotations, placing orders, inviting tenders, Sales letters, claim & adjustment letters and social correspondence, Memorandum, Inter-office Memo, Notices, Agenda, Minutes of meeting, Job application letter, preparing the Resume.

Unit 3 Report Writing

Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, and check lists for reports.

Unit 4 Vocabulary

Words often confused Words often misspelt, common errors in English.

Unit 5 Oral Presentation

Oral Presentation: Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids. Corporate Communication Formal and Informal Communication Networks; Grapevine; Miscommunication (Barriers); Improving Communication. Business Etiquettes

Reference Books

1. Bovee, and Thill, Business Communication Essentials, Pearson Education
2. Shirley Taylor, Communication for Business, Pearson Education
3. Locker and Kaczmarek, Business Communication: Building Critical Skills, McGraw Hill Education
4. Herta A. Murphy, Herbert W. Hildebrandt, Jane P. Thomas, Effective Business Communication (SIE), McGraw Hill Education
5. Dona Young, Foundations of Business Communication: An Integrative Approach, McGraw Hill Education
6. Raymond V. Lesikar, Marie E. Flatley, Kathryn Rentz, Paula Lentz, and Neerja Pande, Business Communication: Connecting in a Digital World (SIE), McGraw Hill Education.

Principles and Practices of Management
(Course Code: SCA-23105)

Year: Ist

LTPC

Semester: Ist

3003

COURSE OBJECTIVES

1. To acquire the fundamentals of professional management.
2. To understand the Business Ethics & Social Responsibility.
3. To understand the models for change & Strategic Management .

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	Understand the concepts of management such as administration, organization and management etc skills .	K ₂
CO2	Recognize the basic concept of evolution of management thought.	K ₂ , K ₃
CO3	Apply the concepts of planning, identify barriers to effective planning, levels, advantages & limitations.	K ₂ , K ₄
CO4	Understand the basics of motivation, controlling and coordination among team.	K ₂ , K ₃
CO5	The basic concept of Strategic management.	K ₃ , K ₂

Unit 1 Introduction

Nature of Management: Meaning, Definition, nature & purpose, importance & Functions, Management as Art, Science & Profession-Management as social System Concepts of management-Administration-Organization, Management Skills, Levels of Management.

Unit-2 Evolution of Management

Evolution of Management Thought: Contribution of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Business Ethics & Social Responsibility: Concept, Shift to Ethics, Tools of Ethics.

Unit-3 Functions of Management: Part-I

Planning Meaning- Need & Importance, types, Process of Planning, Barriers to Effective Planning, levels, advantages & limitations. Forecasting- Need & Techniques, Decision making Types-Process of rational decision making & techniques of decision making, Organizing – Elements of organizing & processes: Types of organizations, Delegation of authority – Need, difficulties , Delegation – Decentralization. Staffing – Meaning & Importance Direction – Nature, Principles Communication – Types & Importance

Unit-4 Functions of Management: Part-II

Motivation – Importance – theories, Leadership – Meaning – styles, qualities & function of leader, Controlling - Need, Nature, importance, Process & Techniques, Total Quality Management, Coordination – Need – Importance

Unit-5 Management of Change

Models for Change, Force for Change, Need for Change, Alternative Change, Techniques, New Trends in Organization Change. Strategic Management: Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India

Reference Books

1. Drucker, F. Peter - Management - Tasks, Responsibilities & Practices.
2. Koontz "O" Donnell Wehrich - Elements of Management.
3. Koontz H, "O" Donnell C - Management - A Book of Reading.
4. Drucker, F. Peter - The Practice of Management.
5. Terry and Franklin - Principles of Management
6. Stoner - Principles of Management
7. William H. Newman and - The Process of Management. E. Kirby Wassen

Environmental Studies
(Course Code: SCA-23106)

Year: Ist

Semester: Ist

L T P C
2002

COURSE OBJECTIVES

1. To acquire the fundamentals of professional management.
2. To understand the Business Ethics & Social Responsibility.
3. To Understand the models for change & Strategic Management.

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	to critically examine all sides of environmental issues and apply understanding from different disciplines to create informed opinions about how to interact with the environment on both a personal and a social level.	K ₂
CO2	Recognize the basic concept of renewable and non-renewable resources.	K ₂ , K ₃
CO3	Understand the concepts of Structure and function of an ecosystem.	K ₂ , K ₄
CO4	Understand the biodiversity at global, national and local levels.	K ₂ , K ₃
CO5	Recognize the impact of human population on the Environment.	K ₃ , K ₂

Unit 1 The Multidisciplinary Nature of Environmental Studies

Definition, Scope and Importance, Need for Public Awareness.

Unit-2 Natural Resources

Renewable and Non-renewable Resources: Natural resources and associated problems, Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources Land Resources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit-3 Concept of an ecosystem

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem; Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit-4 Biodiversity And Its Conservation

Introduction –Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, and aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation, Hot-spots 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.

Unit-5 Human Population And The Environment

Population growth, variation among nations, Population explosion: Family Welfare Programme, Environment and human health, Human Rights, Value Education, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Reference Books

1. Agarwal, K.C. (2001) Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach (2003), The Biodiversity of India of India, Mapin Publishing Pvt. Ltd., Ahmedabad- 380013, India, Email: mapin@ivenet.net (R)
3. Gadgil, Madhav (2001) Ecological Journeys, The Science and Politics of conservation in India. Permanent Black.
4. Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T. (2001). Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
5. Dcc A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Down to Earth, Centre for Science and Environment (R)
7. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
8. Environmental Geography- Savindra Singh, New Delhi.
9. Environmental Geography- Saxena H.M., Rawar Publications, Jaipur
10. Environmental Geography- Sinha S.P., New Delhi Gleeson, B. and Low, N. (eds) 1999. Global Ethics and Environment, London, Rputledge.
11. World Commission on environment and development. 1987. Our Common Future, Oxford University Press.
12. Odum, E.P., Odum, h.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.

Programming in 'C' lab
(Course Code: SCA-23107)

Year: Ist
Semester: Ist

L	T	P	C
0	0	4	2

List of Experiments (Indicative & not limited to)

1. Basic Introduction to C program and turbo C setup (Compile/Run program).
2. Simple program using scanf/printf.
3. Program using if/else.
4. Program using operators(++,-,%,&,|,etc).
5. Switch case programs.
6. Programs of loops (while loop) Programs of loops (do...while loop).
7. Simple program of one-Dimensional/2-Dimensional array.
8. String Programs (using all string functions).
9. Program to implement union and structures.
10. Program to demonstrate working of pointers.
11. Program to read data from file and write into a file.

WebdesigningusingDHTMLLab
(CourseCode:SCA-23108)

Year:Ist	L	T	P	C
Semester:Ist	0	0	2	1

ListofExperiments(Indicative¬limitedto)

BWrite HTML/Java scripts to display your CV in navigator, your Institute website, DepartmentWebsite and Tutorial website for specific subject.

CWriteanHTMLprogramtodesignanentryformofstudentdetails

DWritingprograminCSStodisplayhovereffect.

EWriting program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document.

FWriteprogramsusingJavascriptforWebPagetodisplayallpopbox.

GWriteaprogramusingjavascripttodisplayapplicationProgramcalculator.

HWriteaprogramtoshowtheuseexceptionhandlingusingjava

IAssume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2,pwd3andpwd4respectively. Writeajspfordoingthefollowing .Createa

Cookieandaddthesefouruserid'sandpasswordstothisCookie.2.Readtheuser id and passwords entered in the Loginform and authenticate with the values available in the cookies.

JWriteaJSPwhichinsertthedetailsofthe3or4userswhoregisterwiththe web site by usingregistration form. Authenticate the user when he submits the login form using the user name and password without using cookies.

KDesignsimplewebsitefore-commerceusingsessiontracking.

DATA STRUCTURES USING C

(Course Code: SCA-23201)

Year: 1st

LTP

Semester: II

416

Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand	
CO 1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.
CO 2	Discuss the computational efficiency of the sorting and searching algorithms.
CO 3	Implementation of Trees and Graphs and perform various operations on these data structures.
CO 4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.
CO 5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.

Unit	Topic	Proposed Lecture
1	Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D, 2-D, 3-D and n-D Array Application of arrays, Sparse Matrices and their representations. Linked Lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplication of Single variable & Two variables Polynomial.	8
2	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	8

3	Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort.	8
4	Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning	8
5	Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree. A Extended Binary Trees, Tree Traversal	8

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
2. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd. Thareja, "Data Structure Using C" Oxford Higher Education.
3. AK Sharma, "Data Structure Using C", Pearson Education India.
4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
5. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India. 8. P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.
6. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education

OBJECTORIENTEDPROGRAMMINGUSINGPYTHON

(CourseCode:SCA-23202)

Year: 1st LTP

Semester:II314

CourseOutcome(CO)		Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwillbeableto understand		
CO1	ToreadandwritesimplePythonprograms.	K1, K2
CO2	TodevelopPythonprogramswithconditionalsandloops.	K2, K4
CO3	TodefinePythonfunctionsandtousePythondatastructures—lists,tuples, dictionaries	K3
CO4	Todoinput/outputwithfilesin Python	K2
CO5	TodoObjectOrientedprograms	K2, K4

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
1	Introduction:TheProgrammingCycleforPython,PythonIDE,Interacting with Python Programs, Elements of Python, Type Conversion. Basics:Expressions,AssignmentStatement,ArithmeticOperators,Operator Precedence, Boolean Expression	8
2	Conditionals:ConditionalstatementinPython(if-elsestatement,itsworking andexecution),Nested-ifstatementandElifstatementinPython,Expression Evaluation & Float Representation. Loops:Purposeandworkingofloops,Whileloopincludingitsworking,For Loop , Nested Loops , Break and Continue.	8
3	Function:PartsofAFunction,ExecutionofAFunction,KeywordandDefault Arguments, Scope Rules. Strings:LengthofthestringandperformConcatenationandRepeatoperations in it. Indexing and Slicing of Strings.	8
4	AbstractDataTypes:AbstractdatatypesandADTinterfaceinPython Programming. Classes:Classdefinitionandotheroperationsintheclasses,SpecialMethods (suchas_init_,_str_,comparisonmethodsandArithmeticmethodsetc.),Class Example, Inheritance, Inheritance and OOP.	8
5	Python Data Structure:Tuples, UnpackingSequences,Lists, Mutable Sequences, List Comprehension, Sets, Dictionaries Higher Order Functions:Treatfunctionsasfirst-classObjects,LambdaExpressions	
	Modules:Introduction,ImportingModules	8

Textbooks:

1. Guido van Rossum and Fred L. Drake Jr.,—An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
2. John V Guttag, —Introduction to Computation and Programming Using Python ‘‘, Revised and expanded Edition, MIT Press , 2013

Reference Book:

3. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter- disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, —Exploring Python, McGraw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
6. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.

Probability and Statistics
(Course Code: SCA-23203)

Year: 1st

Semester: II

L T P

	Course Outcome (CO) At the end of course, the student will be able to		Bloom's Knowledge Level (KL)
	CO 1	Understand and apply basic statistical concepts for analyzing and interpreting data using descriptive statistical techniques, such as measures of central tendency and dispersion.	K2, K3
	CO 2	Apply the concept of Regression analysis in real world problems	K3, K4
	CO 3	Understand the applications of probability theory and statistics in emerging sciences and technologies such as Machine learning, data science etc.	K2, K5
	CO 4	Apply these concepts to solve practical problems and analyze real-world situations involving uncertainty.	K3, 4, 5
	CO 5	Apply inferential statistical techniques, such as hypothesis testing, confidence interval etc. to make decisions based on data.	K6
DETAILED SYLLABUS			
Unit		Topic	Proposed Lecture
I	Descriptive Statistics	Introduction of Statistics and types, Measures of Central Tendency: Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean Measures of Dispersion : Variance, Standard Deviation, Skewness and Kurtosis	10
II	Regression Analysis	Concept, Linear Regression, Multiple Regression, Non Linear Regression, Random Forests	10
III	Probability and Probability Distributions	Basic Concepts of Probability, Conditional Probability and Bayes' Theorem, Random Variables and Probability Distributions: Binomial, Poisson & Normal, Definition of a random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function.	10
IV	Sampling Theory and Estimation	Sampling Techniques, Estimation of Population Parameters: Point Estimation and Interval Estimation, Sampling Distribution of the Sample Mean and Proportion, Central Limit Theorem, Point of Estimation: Characteristics of Good Estimator and problems	8

V	Testing of Hypothesis	Hypothesis Testing: Null and Alternative Hypotheses, Type I and Type II Errors, p-values and Significance Level, One-Sample and Two-Sample Tests for Means and Proportions, Chi Square test, Anova test	8
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Text Books:

1. S.C.Gupta-Fundamentals of statistics -Sultan Chand & sons, Delhi.
2. D.N.Elhance-Fundamentals of statistics-Kitab Mahal, Allahabad.

Reference Book:

3. Montgomery D.C.-Statistical Quality Control-John Welly and Sons
4. Goon, Gupta and Dasgupta-Fundamentals of statistics-The world press private ltd., Kolkata
6. Gupta S.P.-Statistical Methods, Pub-

Sultan Chand and sons New Delhi Suggested Books:

1. Statistical Methods, "Dr.S.P.Gupta, Sultan Chand & Sons".
2. Quantitative Techniques by "C.Sathyadevi, S.Chand".
3. Fundamentals of Mathematical Statistics, "S.C.Gupta & V.K.Kapoor, Sultan Chand"
4. Statistical Methods, "Snedecor G.W. & Cochran W.G. Oxford & +

5.Ho

ORGANISATION BEHAVIOUR

(Course Code: SCA-23205)

Year: 1st

Semester: II

LTP

3 --

COURSE OUTCOME

Course Outcomes	Bloom's taxonomy
CO1: Developing understanding of managerial practices and their perspectives.	K2, K1
CO2: Understanding and Applying the concepts of organizational behaviour	K2, K4
CO3: Applying the concepts of management and analyze organizational behaviours in real world situations	K4, K5
CO4: Comprehend and practice contemporary issues in management.	K3
CO5: Applying managerial and leadership skills among students	K4

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
1	Introduction, nature and scope of OB, Challenges and opportunities for OB, Organization Goals, Models of OB, Impact of Global and Cultural diversity on OB	8
2	Individual behaviour: Personality, Perception and its role in individual decision making, Learning, Motivation, Hierarchy of need theory, Theory X and Y, Motivation- Hygiene theory, Vrooms Expectancy theory.	8
3	Behaviour Dynamics: Interpersonal behaviour, Attitude and Values, Job anxiety and stress, The Johari Window, Leadership, Its Theories and Prevailing Leadership styles in Indian Organizations	8
4	Group Behaviour: Definition and classification of Groups, Types of Group Structures, Group decision making, Teams Vs Groups, Intergroup problems in organizational group dynamics, Management of conflict.	8
5	Management of Change: Change and Organizational development, Resistanceto change, Approaches to managing organizational change, Organizational effectiveness, Organizational culture, Recent advances in OB.	8

Text Book:

1. Robbins, S.P., Organizational behaviour., Prentice Hall of India.
2. Pareek, U., Organizational Processes, Oxford and IBH, New Delhi.

Reference Book

3. Koontz, H. and Wehrich, H., Management-A Global Perspective.
4. Sharma, R.A.; Organizational Theory and behaviour.
5. L.M Prasad; Organizational behaviour.

Fundamentals of Cloud Computing

(Course Code: SCA-23204(CC))

Year: 1st

Semester: II

LTP

4 --

Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course, the student will be able to understand		
CO1	Understand the concepts of Cloud Computing, key technologies, strengths and limitations of cloud computing.	K1, K2
CO2	Develop the ability to understand and use the architecture to compute and storage cloud, service and models.	K1, K3
CO3	Understand the application in cloud computing.	K4, K5
CO4	Learn the key and enabling technologies that help in the development of cloud.	K3, K4
CO5	Explain the core issues of cloud computing such as resource management and security.	K2, K6

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction - cloud-definition, benefits, history of cloud computing, applications in cloud computing, characteristics of cloud computing, grid computing, cluster computing, distributed computing, utility computing, cloud service providers, properties, characteristics & disadvantages, pros and cons of cloud computing, issues in cloud.	8
II	Cloud computing architecture, comparison with traditional computing architecture (client/server), how cloud computing works, types of cloud: public cloud, private cloud, hybrid cloud, community cloud. Cloud services; software as a service (saas)-platform as a service (paas)-infrastructure as a service (iaas), everything/anything as a service (xaas)	8
III	Cloud service providers: google, amazon, microsoft azure, security in cloud computing, - eucalyptus – nimbus, cloud service management, collaborating using cloud services, email communication over the cloud - crm management - project management - event management - task management – calendar - schedules - word processing – presentation – spreadsheet - databases – desktop - social networks and groupware.	8

IV	Cloud security; infrastructure as a service security, network level security, host level security, application-level security, data security and storage, data privacy and security issues, identity & access management, access control, risk authentication in cloud computing, client access in cloud	8
V	Virtualization for cloud need for virtualization – pros and cons of virtualization – types of virtualization – system vm, process vm, virtual machine monitor – virtual machine properties.	8

TEXT BOOKS:

- 1. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.**
- 2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Reference Book:**
- 4. Work and Collaborate Que Publishing, August 2008.**
- 5. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.**

Computer Fundamentals of Data Science

(Course Code: SCA-23204)

Year: 1st

Semester: II

LTP

4 -2

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO 1	Describe the significance of data science and understand the Data Science process.	K2, K1
CO 2	Explain how data is collected, managed and stored for data science.	K2, K4
CO 3	Build, and prepare data for use with a variety of statistical methods and models	K4, K5
CO 4	Analyse Data using various Visualization techniques.	K3
CO 5	Choose contemporary models, such as machine learning, AI, techniques to solve practical problems	K4
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Benefits and uses – facets of data – Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation – Exploratory Data analysis – build the model – presenting findings and building applications – Data Mining – Data Warehousing – Basic Statistical descriptions of Data	8
II	Types of Data – Types of Variables – Describing Data with Tables and Graphs – Describing Data with Averages – Describing Variability – Normal Distributions and Standard (z) Scores	8
III	Correlation – Scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – Regression – regression line – least squares regression line – Standard error of estimate – interpretation of r^2 – multiple regression equations – regression toward the mean	8
IV	Mathematical Preliminaries: Probability, Descriptive Statistics, Correlation Analysis. Data Munging: Properties of Data, Languages for Data Science, Collecting Data, Cleaning Data, Crowdsourcing	8

V	Supervised Learning: Linear Regression, Better Regression Models, Regression as Parameter Fitting, Simplifying Models through Regularization Classification and Logistic Regression, Issues in Logistic Classification, Naive Bayes, Decision Trees Classifiers	8
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TEXT BOOKS:

1. Joel Grus, "Data Science from Scratch" First Edition, April 2015
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning - with Applications in R", 2013

Reference Book:

1. Jure Leskovec, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2 edition (30 September 2014)
2. R Programming for Data Science, Roger D. Peng, Lean Pub, 2015

Data Structure using C Lab

Course Code: SCA-23207

Credit: 02

P: 02

List of Experiments/Practical

S.No	Name of Experiment	Specification of Hardware	Specification of Software (Only for the Programming)
1.	1) Write a program to input and display array elements. 2) Write a program to insert an element in an array.		
2.	1) Write a program to delete an element in an array. 2) Write a program to find maximum element in an array.		
3.	1) Write a program to find minimum element in an array. 2) Write a program to input array elements and find the sum of even and odd numbers.		
4.	1) Write a program to perform addition of two matrices. 2) Write a program to transpose of a matrix.		
5.	1) Write a program to find sum of lower triangular matrix element. 2) Write a program to find sum of upper triangular matrix element.		
6.	1) Write a program to perform binary search. 2) Write a program to find factorial of a number using recursion.		
7.	1) Write a program to sort an array using selection sort. 2) Write a program to sort an array using insertion sort.		
8.	1) Write a program to perform reverse a string using stack. 2) Write a program to perform push and pop in stack.		
9.	1) Write a program to create and display singly linked list. 2) Write a program to create singly linked list and count total number of nodes in a list.		
10	1) Write a program to search an element in singly linked list. 2) Write a program to insert at last in singly linked list.		
11	1) Write a program to perform deletion at last in singly linked list. 2) Write a program to perform deletion at beginning in singly linked list.		

Course Title: Object Oriented Programming Using Python Lab

Course C

Code: SCA-23208 Credit: 02

P: 02

List of Experiments/Practical

S.No	Name of Experiment	Specification of Hardware	Specification of Software (Only for the Programming)
1.	1. Program to print Resume. 2. Program to add two numbers.		
2.	3. Program to swap the variables. 4. Program to calculate the simple interest.		
3.	5. Program to find the area of triangle. 6. Program to find the square root of a number.		
4.	7. Program to find an odd even number. 8. Program to check if a number is positive or negative.		
5.	9. Program to check if a number is an Armstrong number. 10. Program to print the sum of a series.		
6.	11. Program to print pyramid patterns. 12. Program to reverse a number.		
7.	13. Program to print Fibonacci series. 14. Program to find the largest number among three numbers.		
8.	15. Program to find the factorial of a number using recursion. 16. Program to make a simple calculator.		
9.	17. Program to find HCF & LCM of a number. 18. Program to find ASCII value of a character.		
10	19. Program to convert decimal to binary, octal and hexadecimal. 20. Program to access index of a list using for loop.		
11	21. Program to print numbers and multiplication table. 22. Program to flatten a nested list.		
12	23. Program to slice lists. 24. Program to sort dictionary & merge two dictionaries.		
13	25. Program to find the list and add the elements of the list. 26. Program to convert string to date and time to get a substring.		
14	27. Program to append to a file. 28. Python class and object using <code>__init__</code> functions.		
15	29. Program to generate random numbers using <code>random()</code> functions.		

Course Title: Fundamentals of Data Science Lab

CourseCode:S

CA-23209(DSL) Credit: 2

P: 02

List of Experiments/Practical

S.No	Name of Experiment	Specification of Hardware	Specification of Software (Only for the Programming)
1.	Working with Numpy arrays		
2.	Working with Pandas dataframes		
3.	Basic plots using Matplotlib		
4.	Frequency distributions		
5.	Averages		
6.	Variability		
7.	Normal curves		
8.	Correlation and scatter plots		
9.	Correlation coefficient		
10	Regression		

Course Title: Fundamentals of Cloud Computing Lab

Course Code: S

CA-23209(CCL) Credit: 03

P:

02

List of Experiments/Practical

S.No	Name of Experiment	Specification of Hardware	Specification of Software (Only for the Programming)
1.	Install Virtualbox /VMware Workstation with different flavours of linux or windows OS on top of windows 7 or 8.		
2.	Install a C compiler in the virtual machine created using virtualbox and execute simple programs.		
3.	Install Google App Engine. Create hello world app and other simple web applications using python/java.		
4.	Use GAE launcher to launch the web applications.		
5.	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.		
6.	Find a procedure to transfer the files from one virtual machine to another virtual machine.		
7.	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)		
8.	Install Hadoop single node cluster and run simple applications like word count		

Operating Systems
(CourseCode: **B021223301**)

Year:2nd
Semester:IIIrd

L T P C
300 3

COURSE OBJECTIVES		
1. To understand the basic concepts of Operating Systems .		
2. To understand the concept and functions Operating System.		
3. To recognize I/O management and File systems.		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course, the student will be able to understand		
CO1	Understand the structure and functions of OS.	K ₁ , K ₂
CO2	Learn about Processes, Threads and Scheduling algorithms.	K ₁ , K ₂
CO3	Understand the principles of concurrency and Deadlocks.	K ₂
CO4	Learn various memory management scheme.	K ₂
CO5	Study I/O management and File systems.	K ₄ , K ₂

Uni

Unit 1 Introduction (Hrs-10)

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit 2 Concurrent Processes(Hrs-10)

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit 3 CPU Scheduling (Hrs-10)

: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit 4 Memory Management (Hrs-10)

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit 5 I/O Management and Disk Scheduling(Hrs-10)

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

Text Books:

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
 2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
 3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
- Reference Book:** 1. D M Dhamdhare, “Operating Systems : A Concept based Approach”, 2nd Edition,
2. TMH 5. William Stallings, “Operating Systems: Internals and Design Principles ”, 6th Edition, Pearson Education

Artificial Intelligence

(CourseCode: B021223302)

Year: 2nd
Semester: IIIrd

L T P C
40 0 4

COURSE OBJECTIVES
1. To understand the basic concepts of Intelligent Agents .
2. To understand the concept and working of Predicate Logic .
3. To recognize various AI applications .

Course Outcome(CO)	Bloom's Knowledge Level(KL)
At the end of course, the student will be able to understand	
CO1	Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents. K₁, K₂
CO2	Understand search techniques and gaming theory. K₂, K₃
CO3	The student will learn to apply knowledge representation techniques and problem-solving strategies to common AI applications. K₄, K₃
CO4	Student should be aware of techniques used for classification and clustering. K₂, K₃
CO5	Student should be aware of basics of pattern recognition and steps required for it. K₄, K₂

Unit 1 Introduction

Introduction – Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

Unit 2 Problem Solving Methods

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

Unit 3 Knowledge Representation

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

Unit 4 Software Agents

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

Unit 5 AI Applications

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

Text Books: 1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, Third Edition, 2009. 2. I. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011. 3. M. Tim Jones, —Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008

Reference Book: 1. Nils J. Nilsson, —The Quest for Artificial Intelligence, Cambridge University Press,

Analyzing and Applying data Science with python (CourseCode:B020223304)

Year:2nd
Semester:IIIrd

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3003

COURSEOBJECTIVES
1. To understand the basic concepts of data analytics.
2. To understand the concept and working of data streams.
3. To recognize various data visualization tools.

CourseOutcome(CO)	Bloom's Knowledge Level(KL)
At the end of course, the student will be able to understand	
CO1	Discuss various concepts of data analytics pipeline K ₁ , K ₂
CO2	Apply classification and regression techniques K ₃
CO3	Explain and apply mining techniques on streaming data K ₂ , K ₃
CO4	Compare different clustering and frequent pattern mining algorithms. K ₄
CO5	Describe the concept of R programming and implement analytics on Big data using R. K ₃ , K ₂

Unit 1 Introduction to Data Analytics

Introduction, Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. Data Analytics Lifecycle: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization.

Unit2 Data Analysis

Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.

Unit3 Data Streams

Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, stock market predictions.

Unit 4 Frequent Itemsets and Clustering

Frequent Itemsets and Clustering: Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in noneuclidean space, clustering for streams and parallelism.

Unit 5 Frame Works and Visualization

MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. Introduction to R - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.

ReferenceBooks

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press.
3. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.

Reference Book: 1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley.

2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics", EMC Education Series, John Wiley

Introduction to Virtualization (CourseCode: B020123304)

Year: 2nd
Semester: IIIrd

L T P C
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COURSE OBJECTIVES
1. To get an insight into the basics of cloud computing along with virtualization.
2. To understand the concept and working of data streams.
3. To understand about cloud and virtualization along with it how one can migrate over it.

Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand	
CO1	various concepts of virtualization in cloud computing. K ₁ , K ₂
CO2	Hypervisors and Virtual machines. K ₃
CO3	Explain and apply Virtualization Solutions. K ₂ , K ₃
CO4	Compare challenges while migrating to cloud. K ₄
CO5	Describe the concept of R programming and implement analytics on Big data using R. K ₃ , K ₂

Unit 1 Introduction to Virtualization

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization.

Unit 2 Hypervisors and Virtual machines

Server Virtualization: Understanding Server Virtualization, types of server virtualization, Virtual machine basics, types of virtual machines, hypervisor concepts and types

Unit 3 Virtualization Solutions

Understanding Microsoft's Virtualization solutions: Microsoft's Infrastructure Optimization Model, Virtualization and the Infrastructure Optimization Model, Benefits of Virtualization, Achieving the Benefits of Datacenter Virtualization, Achieving the Benefits of Client Virtualization, Achieving the Benefits of Cloud Virtualization.

Unit 4 Migrating into a Cloud

Introduction, Challenges while migrating to Cloud, Broad approaches to migrating into the cloud why migrate - deciding on cloud migration, the Seven-step model of migration into a cloud, Migration Risks and Mitigation, Enterprise cloud computing paradigm, relevant Deployment Models for Enterprise Cloud Computing, Adoption and Consumption Strategies, issues for enterprise applications on the cloud

Unit 5 Introduction to Python

Python basics, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.

Text Books: David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
3. Publications, 2006. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James

Broberg, AndrzejGoscinski, John Wiley & Sons, Inc. 2011

Reference Book: 1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert
Elsenpeter,TATA McGraw- Hill , New Delhi – 2010

Linear Algebra

CourseCode:B021223304)

Year:2nd
Semester:3rd

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COURSEOBJECTIVES		
1.Gain a thorough understanding of fundamental linear algebra concepts, including vector spaces, matrices, determinants, eigenvalues, and eigenvectors.		
2.Enhance analytical skills by solving systems of linear equations and applying matrix operations, transformations, and vector space theory.		
3, Utilize linear algebra techniques to model and solve practical problems in various fields such as computer science, engineering, and data science. .		
CourseOutcome(CO)	Bloom'sKnowledgeLevel(KL)	
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Applyknowledgeofdatabaseforreallifeapplications.	K ₃
CO2	Applyqueryprocessingtechniquetoautomatetherealtimeproblemsofdatabase s.	K ₃ ,K ₄
CO3	Identifyandsolvetheredundancyproblemindatabasetablesusingnormalization .	K ₂ ,K ₃
CO4	Understandtheconcepts oftransactions,theirprocessingsotheywillfamiliar withbroad range ofdatabasemanagementissuesincludingdataintegrity,securityandrecovery.	K ₂ ,K ₄
CO5	Design,developandimplementasmalldatabaseprojectusingdatabasetools.	K ₃ ,K ₆
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Fields, Vector-spaces, sub-spaces, linear-combination, linear-dependence and independence. Basis, dimensions and coordinates (each and every fact to be illustrated by suitable examples).	
II	Linear-transformation, definition and examples, matrix representation, similarity, range and kernel,rank-nullitytheorem and its consequences.	
III	Singular and non singular linear transformations, sum and product of linear transformations, vectorspaceoflineartransformations,nilpotentlinear transformations.	
IV	Inner product spaces, definition and examples, orthogonality, Cauchy-Schwartz Inequality, MinkowskiInequality,polarizationIdentity,completeorthonormalset,Bessel'sInequality, Gram-Schmidt'sorthogonalizationprocess.	
V	Linearfunctional,definitionandexamples,vectorspaceoflinearfunctional,dualvectorspaces, adjoint, self adjoint, unitary and normal operators, examples and properties, eigen values and eigen vectors, diagonalisation of linear operators, quadratic forms, principle axis theorem(without proof), some applications to engineering problems.	

Textbooks:

1. Dym, H. Linear Algebra in action, University Press.2012
 2. Halmos, P.R.: Finite Dimensional Vector Spaces (1990) Narosa.
 3. Hoffman, K. and Kunze, R.: Linear Algebra PHI (2012)
 4. Kolman, B. And Hill, D.R.: Introductory linear algebra with applications(2008) Pearson
- Reference Book: 1. Lipschutz, S. and Lipson M.: Linear Algebra (2005) Schaum's Series.
2, Noble, B. And Daniel, J.W.: Applied linear algebra. (1988) PHI

Cyber Security

(CourseCode:BSGUSE2416)

Year:2nd

Semester:3rd

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COURSEOBJECTIVES		
1,Learn key concepts like confidentiality, integrity, availability, and the technologies to protect information systems.		
2.Study various cybersecurity threats and the tools and methods for prevention, detection, and response.		
3.Understand legal and ethical issues, including data protection laws, regulations, and responsibilities in cybersecurity.		
CourseOutcome(CO)	Bloom'sKnowledgeLevel(KL)	
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Learn, structure, mechanics and evolution of various crime threats	K1
CO2	Learn to protect information systems from external attacks by developing skills in enterprise security, wireless security and computer forensics.	K2
CO3	Analyse the risks involved while sharing their information in cyber space and numerous related solutions like sending protected and digitally signed documents	K2-K3
CO4	Insights of ethical hacking and usage of password cracking tools	K3
CO5	Get an overview of different ciphers used for encryption and decryption	K4
DETAILED SYLLABUS		
Unit	Topic	
1	Definitions :Protection, Security, risk, threat, vulnerability, exploit, attack, confidentiality, integrity, availability, non-repudiation, authentication , authorization, codes, plain text, encryption, decryption, cipher text, key, ciphers, Symmetric and asymmetric 19 cryptography, Public key , private key ,Crypt analysis,, Cyber forensics. Substitution cipher (Caesar), Transposition cipher (Rail-Fence),	
2	Risk analysis, process, key principles of conventional computer security, security policies, data protection, access control, internal vs external threat, security assurance, passwords, access control, computer forensics and incident response	
3	CYBER ATTACKS (definitions and examples): Denial-of-service attacks, Man-in-themiddle attack, Phishing, spoofing and spam attacks, Drive-by attack, Password attack, SQL injection attack, Cross-site scripting attack, Eavesdropping attack, Birthday attack, Malware attacks, Social Engineering attacks	
4	Brief Introduction of handling the attacks described in UNIT 3. Firewalls, logging and intrusion detection systems, e-mail security, security issues in operating systems, ethics of hacking and cracking	
5	Definitions: Digital Signature and Electronic Signature, Digital Certificate i.[Section 43] Penalty and compensation for damage to computer etc. ii.[Section 65] Tampering with computer source documents iii.[Section 66A] Punishment for sending offensive messages	

	<p>through communication service etc. iv.[Section 66B] Punishment for dishonestly receiving stolen computer resource or communication device v.[Section 66C] Punishment for identity theft vi.[Section 66D] Punishment for cheating by impersonation by using computer resource vii.[Section 66E] Punishment for violation of privacy viii.[Section 66F] Punishment for cyber terrorism ix.[Section 67] Punishment for publishing or transmitting obscene material in electronic form x.[Section 67A] Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form xi.[Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form xii.[Section 72] Breach of confidentiality and privacy</p>
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Text Book: 1. "Principles of Information Security" by Michael E. Whitman and Herbert J. Mattord.

2. "Computer Security: Principles and Practice" by William Stallings and Lawrie Brown.

3. "Cyberlaw: The Law of the Internet and Information Technology" by Brian Craig

Reference Book: 1. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto.

2. "Information Technology Law: The Law and Society" by Andrew Murray

SDGI GLOBAL UNIVERSITY, GHAZIABAD (SGU)

Session:2024-2025

Cyber Security Lab

(CourseCode: BSGUSE2466)

Year:

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Semester:

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COURSEOBJECTIVES
To provide hands-on experience with cybersecurity tools and techniques.
To understand the practical aspects of securing computer networks, systems, and data.
To simulate and analyze security threats and vulnerabilities in real-world scenarios.

CourseOutcome(CO)	Bloom'sKnowledge Level(KL)
Attheendof course,thestudentwill be ableto understand	
CO1	Understand and apply various cybersecurity tools for system and network security. K1
CO2	Analyze and simulate common security threats and vulnerabilities. K2
CO3	Implement basic security measures such as firewalls, encryption, and intrusion detection systems. K3
CO4	Perform vulnerability assessments and penetration testing on computer systems. K4
CO5	Respond to security incidents and perform digital forensics to investigate breaches. K5

List of Experiments:

1. Introduction to Virtual Machines for Cybersecurity.
2. Installation and configuration of cybersecurity tools (e.g., Wireshark, Nmap).
3. Basic command-line tools for system security (e.g., netstat, iptables).
4. Configuring and analyzing firewall rules.
5. Packet sniffing and network traffic analysis using Wireshark.
6. Implementing and testing secure network configurations.
7. Vulnerability scanning using tools like Nessus or OpenVAS.
8. Exploiting vulnerabilities in controlled environments using Metasploit.
9. Reporting and mitigating discovered vulnerabilities.
10. Implementing symmetric and asymmetric encryption using tools like OpenSSL.
11. Securing communications using SSL/TLS.
12. Encrypting files and disk partitions for data protection.
13. Simulating security breaches and analyzing logs.
14. Conducting digital forensics on compromised systems.
15. Incident response planning and execution.

Text and Reference Books:

1. "The Web Application Hacker's Handbook" by Dafydd Stuttard and Marcus Pinto - Wiley.
2. "Hacking: The Art of Exploitation" by Jon Erickson - No Starch Press.
3. "Network Security Essentials: Applications and Standards" by William Stallings - Pearson.
4. "Penetration Testing: A Hands-On Introduction to Hacking" by Georgia Weidman - No Starch Press.
5. "Digital Forensics and Incident Response" by Gerard Johansen - Packt Publishing.

Analyzing and Applying data Science with python lab
(CourseCode:B020223354)

Year:2nd

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COURSEOBJECTIVES
1.Provide an overview of data science principles and techniques.
2.Develop skills in Python and essential libraries for data analysis.
3.each data preprocessing methods for cleaning and transforming data.

Semester:IIIrd

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CourseOutcome(CO)	Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand	
CO1	Understand key concepts and applications of data science.
CO2	nd libraries like NumPy, pandas, and Matplotlib for data analysis.
CO3	Apply techniques to clean and prepare data for analysis.
CO4	Implement and apply basic machine learning algorithms.
CO5	Perform exploratory data analysis and visualize data.

List of Experiments/Practical

- 1.To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using in Python.**
- 2. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames in Python.**
- 3. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept in Python.**
- 4. To perform statistical operations (Mean, Median, Mode and Standard deviation) using Python.**
- 5. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization**
- 6. To perform dimensionality reduction operation using PCA for Houses Data Set**
- 7. To perform Simple Linear Regression with Python.**
- 8. To perform K-Means clustering operation and visualize for iris data set**
- 9. Write R script to diagnose any disease using KNN classification and plot the results.**
- 10. To perform market basket analysis using Association Rules (Apriori)**

Introduction to Virtualization lab (CourseCode:B020123354)

Year:2nd
Semester:IIIrd

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COURSEOBJECTIVES		
1.Introduce the basic concepts and principles of virtualization		
2.Teach how to install, configure, and manage virtual machines		
3.Explore different types of hypervisors and their applications		
CourseOutcome(CO)		Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Understand the fundamental principles and benefits of virtualization.	K1
CO2	Install, configure, and manage virtual machines effectively.	K2
CO3	Differentiate between various hypervisors and understand their use cases.	K3
CO4	Efficiently allocate and manage resources in a virtualized environment	K4
CO5	Configure and manage virtual network	K5

List of Experiments/Practical

- 1.Install Virtual box with different flavors of OS.
- 2.Attach Virtual block to the virtual machine and check whether it holds the data even after the release of the virtual Machine.
3. install a C compiler in the virtual Machine.
4. Show the virtual machine migration based on the certain condition from one node to the other.
- 5.Find the procedure to transfer the file from one virtual machine to another virtual machine.
6. Find the procedure to launch virtual machine using trystack (online open stack Demo version)

"Creative Writing" (AEC) - 2 Credits

Course Code: BSGUAE2407

Year:2nd

L T P C

Semester:IVth

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Course Outcomes (COs):

- **CO1:** Demonstrate the ability to produce original creative writing in various genres such as poetry, fiction, and creative nonfiction.

- **CO2:** Apply different writing techniques to create engaging and imaginative content.

- **CO3:** Critically evaluate and revise their own and peers' creative works to improve clarity, style, and effectiveness.

- **CO4:** Explore and experiment with different literary forms and structures to enhance their writing skills.

- **CO5:** Develop a personal writing style and voice through regular practice and feedback.

Unit I: Introduction to Creative Writing

- Definition and scope of creative writing, Exploring different forms: Poetry, Fiction, and Non-fiction, The writing process: Idea generation, drafting, and revising.

Unit II: Poetry Writing

- Elements of poetry: Imagery, metaphor, meter, rhyme, Different types of poetry: Haiku, sonnet, free verse, Writing and analyzing poems.

Unit III: Fiction Writing

- Elements of fiction: Character, plot, setting, dialogue, Short stories vs. novels, Writing and developing short fiction pieces.

Unit IV: Creative Non-fiction

- Exploring memoir, personal essays, and narrative journalism, Techniques for creative non-fiction: Voice, tone, and perspective, Writing and analyzing creative non-fiction.

Unit V: Revision and Peer Review

- Techniques for revising creative work, Peer review and constructive criticism, Final project: Creating a portfolio of revised work.

Reference Books:

1. "Creative Writing: A Beginner's Manual" by AnjanaNeiraDev and Others.
2. "Writing Down the Bones: Freeing the Writer Within" by Natalie Goldberg.
3. "The Elements of Style" by William Strunk Jr. and E.B. White.
4. "Bird by Bird: Some Instructions on Writing and Life" by Anne Lamott.
5. "On Writing: A Memoir of the Craft" by Stephen King.

Operating System Lab using Linux

(CourseCode: B021223351)

Year: 2nd

Semester: IIIrd

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COURSE OBJECTIVES
1. Introduce basic concepts and functions of operating systems
2. Develop skills in using Linux commands and utilities.
3. Learn to navigate, manage, and secure Linux file systems.

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	Grasp the key concepts and architecture of operating systems.	K1
CO2	Proficiently use Linux commands and shell scripting.	K2
CO3	Perform basic Linux system administration tasks like user management and system monitoring.	K3
CO4	Manage and monitor processes and services in Linux.	K3-K4
CO5	Navigate and manage Linux file systems, including permissions and security	K5

List of Experiments (Indicative & not limited to)

1. Study of hardware and software requirements of different operating systems (UNIX, LINUX, WINDOWS XP, WINDOWS 7/8).
2. Execute various UNIX system calls for :i. Process managementii. File management,
 iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:i. SJF, ii. Priority, iii. FCFS, iv. Multi-level queue
4. Implement file storage allocation technique:i. Contiguous(using array), ii. Linked –list(using linked-list)
 iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques: i. Worst-Fit, ii. Best- Fit iii. First- Fit
6. Calculation of external and internal fragmentation
 i. Free space list of blocks from system
 ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data.
8. Implementation of resource allocation graph RAG.
9. Implementation of Banker's algorithm.
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer) problem using inter process communication techniques-Semaphores.

12. Implement the solutions for Readers-Writers problem using inter process communication technique - Semaphore.

Machine Learning using Python

(CourseCode:B021223401)

Year:2nd
Semester:IVth

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CourseOutcome(CO)		Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Understandmodernprogramminglanguagefeaturesandconstructs.	K ₃
CO2	Identifythedifferentoptimizationtechniquethatarepossibleforanyspecificblockofcode.	K ₃ ,K ₄
CO3	Designprogramspecificandgenericoptimizationtechniques.	K ₂ ,K ₃
CO4	Manageproceduresstoreduceexecutionandresourceoverheads.	K ₂ ,K ₄
CO5	Learntoworkandapplyperformanceenhancementonanylargersoftwareproject.	K ₃ ,K ₄
DETAILED SYLLABUS		
Unit	Topic	
I	INTRODUCTION Machine Learning–Types of Machine Learning : Supervised Learning, Unsupervised Learning – Machine Learning process- Testing machine learning algorithms - Parametric Vs non-parametric models - Mathematical Basics for Machine Learning : Probability and Statistics for Machine Learning – Probability Distributions – Decision Theory – Information theory – Bias Variance tradeoff.	
II	SUPERVISED LEARNING METHODS Regression: Introduction - Linear Regression - Least Squares - Under fitting and Overfitting - Cross- Validation - Lasso Regression - Logistic Regression; Classification: Linear and Non-linear models - - Support Vector Machines - Kernel Methods; K-Nearest Neighbours; Learning with Trees: constructing Decision Tree using ID3 - Classification and regression trees (CART); Decision by Committee : Ensemble Methods -- Bagging -- Boosting -- Random Forest; Evaluation of Classification Algorithms.	
III	UNSUPERVISED AND REINFORCEMENT LEARNING Clustering- K-means – Mixtures of Gaussians – Vector Quantization – The Self Organizing Feature Map- Dimensionality Reduction, Linear Discriminant Analysis, Principal Components Analysis, Independent Components Analysis - Reinforcement Learning : Q learning, Deterministic and Non- deterministic Rewards and Actions Temporal Difference Learning - Markov Decision Process.	

IV	<p>PROBABILISTIC GRAPHICAL MODELS AND EVOLUTIONARY LEARNING</p> <p>Graphical Models – Undirected Graphical Models : Markov Random Fields – Directed Graphical Models : Bayesian Networks – Conditional Independence properties – Markov Random Fields, Hidden Markov Models – Conditional Random Fields(CRFs) - Evolutionary Learning : The Genetic Algorithm , Generating offspring - Map Colouring, Punctuated Equilibrium - Knapsack problem - Limitations of the GA.</p>
V	<p>NEURAL NETWORKS AND DEEP LEARNING</p> <p>Neural Networks: The Brain and the Neuron - Perceptron learning algorithm; Multi-Layer Perceptron: Back propagation algorithm - Multi-layer perceptron in Practice, Deep Learning: Introduction - Convolution Neural Networks - Recurrent Neural Networks – Stochastic Neurons : the Boltzmann Machine – Deep Belief Networks.</p>
<p>REFERENCES</p> <ol style="list-style-type: none"> 1. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Chapman and Hall, CRC Press, Second Edition, 2014. 2. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007. 3. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012. 4. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014. 5. Tom Mitchell, “Machine Learning”, McGraw-Hill, 1997. 	

Digital Marketing & Trend Analysis
(CourseCode:B021223402)

Year:2nd
Semester:4th

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COURSEOBJECTIVES
1. To help Student understand the concept of Digital Marketing & E-commerce in today's scenario
2. To enable student in creating and maintaining a good website and blog posts.
3. To make student understand the importance of SEO and Email Marketing in today's modern world.

CourseOutcome(CO)	Bloom'sKnowledge Level(KL)
Attheendof course,thestudentwill be ableto understand	
CO1	Understand the Digital Marketing Process . K ₁ , K ₂
CO2	Learn SEO& Email-Marketing . K ₁ , K ₂
CO3	Understand the principles of SEM& Social Media Marketing . K ₂
CO4	To understand the functioning and importance of Social Media Marketing via various platforms. K ₂ , K ₃
CO5	To understand various Analytics tools of online marketing. K ₃ , K ₂

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Introduction to Digital Marketing:Introduction to Digital Marketing and its Significance; Traditional Marketing Vs Digital Marketing, Digital Marketing Process; The contemporary digital revolution, digital transformation framework. Types of websites, Keywords, Understanding Domain and Webhosting, Building Website/Blog using CMS WordPress, Using WordPress Plugins; Blog Creation: Including Headlines, Links, Posts ; Using various plug-ins like Elimentor.

Unit2

SEO&Email-Marketing:Introduction to SEO; SEO Keyword Planner Tools; On Page SEO Techniques: Indexing and Key Word Placement, Content Planning & Optimization, Display Advertising, Various SEO Plug-in, Off –Page SEO Techniques; Email Marketing- Introduction and Significance, campaigns using Mail Chimp; Email Marketing Strategy and Monitoring.

Unit3

SEM & Social Media Marketing: Introduction to SEM, Mobile Marketing, Video Marketing on YouTube. Introduction to Social Media Marketing: Facebook, Instagram, Linked-in, Twitter, Google G Suit and online marketing campaigns on theses Social Media platforms. Content Marketing, Content creation process, Influencer marketing.

Unit 4

Marketing Strategies & Analytics Tools:Using Marketing Strategies & Analytics Tools, Understanding

Digital marketing Strategies, Using Marketing analytics tools to segment, target, position; Online PR and reputation management, Digital Marketing Strategies and its ROI. Using Google Analytics and other social media analytics tools. Using Apps and Gamification.

Unit 5

E-Commerce: Applications of E-Commerce: Introduction, History of Electronic Commerce, Advantages and Disadvantage of E-commerce, Roadmap of e-commerce in India, E-business Models Based on the Relationship of Transaction Parties, e-commerce Sales Life Cycle (ESLC) Model, Electronic Payment Systems, Electronic Cash, Smart Cards and Electronic Payment Systems, Credit Card Based Electronic Payment Systems, Risks and Electronic Payment Systems, Electronic Data Interchange (EDI)

TextBooks

1. Vandana, Ahuja; Digital Marketing, Oxford University Press India November, 2015).
2. Seema Gupta; Digital Marketing, McGraw Hill Education; First edition (November 2017)
3. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital
ion; Kogan Page (3rd Edition, 2014).
4. Ravi Kalakota : Frontiers of E Commerce (Pearson).

DataBase Management Systems

(CourseCode:B021223403)

Year:2nd

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COURSEOBJECTIVES
Understand core concepts of database systems, including design and architecture.
Develop skills to design, implement, and manage databases using SQL.
Ensure data integrity, security, and explore advanced topics like NoSQL and distributed databases.

CourseOutcome(CO)		Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Applyknowledgeofdatabaseforreallifeapplications.	K ₃
CO2	Applyqueryprocessingtechniques to automatetherealtimeproblems ofdatabases.	K ₃ ,K ₄
CO3	Identifyandsolvetheredundancyproblemindatabasetablesusingnormalization.	K ₂ ,K ₃
CO4	Understandtheconcepts oftransactions,theirprocessingsotheywillfamiliar withbroad range ofdatabasemanagementissuesincludingdataintegrity,securityandrecovery.	K ₂ ,K ₄
CO5	Design,developandimplementasmalldatabaseprojectusingdatabasetools.	K ₃ ,K ₆
DETAILED SYLLABUS		
Unit	Topic	
I	Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces,DataDefinitionsLanguage,DML,OverallDatabaseStructure.DataModelingUsingthe Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints,	

	Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagram to Tables, Extended ER Model, Relationship of Higher Degree.
II	Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PLSQL
III	Data Base Design & Normalization: Functional dependencies, normal forms, first, second, & third normal forms, BCNF, inclusion dependence, lossless join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.
IV	Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed, Data Storage, Concurrency Control, Directory System.
V	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple, Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.
Textbooks: B Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill C Date CJ, "An Introduction to Database Systems", Addison Wesley D Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley E O'Neil, Databases, Elsevier Pub. F RAMAKRISHNAN "Database Management Systems", McGraw Hill G Leon & Leon, "Database Management Systems", Vikas Publishing House H Bipin C. Desai, "An Introduction to Database Systems", Gargotia Publications I Majumdar & Bhattacharya, "Database Management System", TMH	

Introduction to Computer Network

(CourseCode:B021223404)

Year:2nd
Semester:IVth

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30 0 3

COURSE OBJECTIVES		
Understand the fundamental concepts of computer networks and networking models.		
Learn about key networking protocols, including TCP/IP, routing, and switching.		
Explore network security, performance, and troubleshooting techniques.		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course, the student will be able to		
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, network devices and transmission media, Analog and digital data transmission	K ₁ , K ₂
CO2	Apply channel allocation, framing, error and flow control techniques.	K ₃
CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.	K ₂ , K ₃
CO4	Explain the different Transport Layer functions i.e. Port addressing, Connection Management, Error control and Flow control mechanism.	K ₂ , K ₃
CO5	Explain the functions offered by session and presentation layer and their Implementation.	K ₂ , K ₃
DETAILED SYLLABUS		
Unit	Topic	
I	Introductory Concepts: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. Physical Layer: Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	
II	Link layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	
III	Network Layer: Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing,	

	Routing algorithms and protocols, Congestion control algorithms, IPv6.
IV	Transport Layer: Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.
V	Application Layer: Domain Name System, World Wide Web and HyperText Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts.
<p>Textbooks and References:</p> <ol style="list-style-type: none"> 1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill 2. Andrew Tanenbaum "Computer Networks", Prentice Hall. 3. William Stallings, "Data and Computer Communication", Pearson. 4. Kurose and Ross, "Computer Networking - A Top-Down Approach", Pearson. 5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann 6. W.A. Shay, "Understanding Communications and Networks", Cengage Learning. 7. D. Comer, "Computer Networks and Internets", Pearson. 8. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill. 	

Tableau

(CourseCode:B020223455)

Year:2nd
Semester:IVth

L T P C
00 42

COURSEOBJECTIVES
Visualize Data: Create interactive, compelling dashboards.
Analyze Data: Perform quick, insightful data analysis.
Integrate Data: Combine data from multiple sources.

CourseOutcome(CO)		Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Application of Tableau skills to solve real-world data analysis problems and business challenges.	K ₃
CO2	how to analyze data trends, patterns, and outliers using Tableau's visual analytics capabilities.	K ₃ ,K ₄
CO3	Principles of effective data visualization design, including choosing appropriate chart types, color usage, and layout..	K ₂ ,K ₃
CO4	How to connect to various data sources (Excel, CSV, databases) and import data into Tableau.	K ₂ ,K ₄
CO5	Variety of visualizations such as bar charts, line charts, scatter plots, maps, and advanced charts like treemaps and box plots.	K ₃ ,K ₄

DETAILED SYLLABUS

Unit	Topic
I	Introduction to Tableau Overview of Tableau software and its features, Understanding the Tableau interface and navigation, Connecting to Data, Connecting to various data sources (Excel, CSV, databases, etc.), Data preparation and cleaning within Tableau.
II	Visualization Techniques Creating basic charts (bar charts, line charts, scatter plots, etc.), Using filters, sorting, and grouping data, Advanced Visualization Techniques; Geographic mapping and spatial analysis ,Advanced chart types (tree maps, heat maps, box plots, etc.)
III	Dashboard and Story Creation Using calculated fields for complex calculations, Creating parameters for dynamic user inputs,Designing interactive dashboards, Creating stories to present insights effectively.

IV	<p>Data Blending and Joins Integrating multiple data sources using joins and blending, Handling data relationships and data blending challenges, Advanced Features; Working with sets, groups, and bins, Using Tableau functions (Table Calculations, LOD expressions)</p>
V	<p>Sharing and Publishing Publishing dashboards to Tableau Server or Tableau Public, Setting permissions and managing access to visualizations, Case Studies and Practical Projects; Applying Tableau to real-world datasets, Solving business problems through data visualization, Integration with Other Tools; Connecting Tableau with R, Python, or other analytics tools, Embedding Tableau visualizations in web applications.</p>
<p>REFERENCES</p> <ol style="list-style-type: none"> 1. "Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software" by Daniel G. 2. "Tableau Cookbook: Recipes for Data Visualization" by ShwetaSankhe . 3. "Learning Tableau 2020: A Beginner’s Guide to Mastering Tableau Quickly and Easily" by Joshua N. Milligan 4. "Communicating Data with Tableau: Designing, Developing, and Delivering Data Visualizations" by Ben Jones. 5. "Tableau Desktop: A Practical Guide for Business Users" by Jane Crofts. 6. "Mastering Tableau 2020.2: A comprehensive guide for effective data visualization and business intelligence with Tableau 2020.2" by Marleen Meier and David Baldwin. 7. "Tableau Data Visualization Cookbook" by AshutoshNandeshwar. 	

Amazon Web Services

(CourseCode:B020123455)

Year:2nd
Semester:IVth

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00 4 4

COURSEOBJECTIVES
Cloud Infrastructure: Build scalable and secure cloud environments.
Cost Optimization: Efficiently manage cloud resources and reduce costs
Service Integration: Leverage AWS services for seamless application deployment.

	CourseOutcome(CO)	Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Understand and e4xplain AWS services and cloud models.	K ₁ ,K ₂
CO2	Apply AWS services (EC2, S3, IAM) for cloud setup and management.	K ₂
CO3	Analyze security features like IAM roles and CloudWatch for cloud security.	K ₃ ,K ₄
CO4	Evaluate AWS pricing models to manage costs effectively.	K ₄ ,K ₅
CO5	Create and deploy applications using AWS Elastic Beanstalk and CloudFormation.	K ₅

DETAILED SYLLABUS		
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Unit	Topic	
I	<p>Introduction to Cloud Computing and AWS</p> <p>Cloud Computing Overview: Definition, Characteristics, and benefits of Cloud Computing, Service Models: IaaS, PaaS, SaaS, Deployment Models: Public, Private, and Hybrid Clouds</p> <p>Introduction to AWS: History and evolution of AWS, Global AWS Infrastructure: Regions and Availability Zones, Core AWS Services Overview (Compute, Storage, Database, Networking)</p> <p>Practical:</p> <ol style="list-style-type: none"> 1. Create an AWS Free Tier Account and explore the AWS Management Console. 2. Launch an EC2 Instance: <ul style="list-style-type: none"> • Create and configure an EC2 instance using Amazon Linux or Ubuntu. • Connect to the EC2 instance via SSH (Linux) or RDP (Windows). 3. Explore Core AWS Services: <ul style="list-style-type: none"> • Navigate and explore EC2, S3, and IAM services in the AWS Console. 	

<p>II</p>	<p>AWS Core Service Compute Services: Amazon EC2 (Elastic Compute Cloud), EC2 Instance Types, Introduction to Amazon Lambda (Serverless Computing), Amazon Elastic Container Service (ECS), Storage Services: 11 Amazon S3 (Simple Storage Service): Features, Buckets, and Objects, Amazon EBS (Elastic Block Store), Amazon Glacier for Archiving Data, Networking Services: Amazon VPC (Virtual Private Cloud): Subnets, Route Tables, and Security Groups, Amazon Route 53 (DNS Service) Practical:</p> <ol style="list-style-type: none"> 1. Launch an EC2 Instance with different instance types and connect it to a web application. 2. Create and Manage S3 Buckets. <ul style="list-style-type: none"> • Upload files and set up basic permissions. 3. Set Up a VPC: <ul style="list-style-type: none"> • Create a VPC with public and private subnets. • Launch an EC2 instance in the private subnet and set up security groups.
<p>III</p>	<p>AWS Security and Identity Services AWS IAM (Identity and Access Management):Users, Groups, Roles, and Policies, Implementing Security Best Practices with IAM, AWS KMS (Key Management Service): Encrypting Data using KMS, AWS Shield & WAF:DDoS Protection and Web Application Firewall Practical:</p> <ol style="list-style-type: none"> 1. Set Up IAM Users and Roles: <ul style="list-style-type: none"> • Create IAM users and assign roles with specific permissions. 2. Enable MFA (Multi-Factor Authentication) for IAM users. 3. Encrypt Data Using KMS: <ul style="list-style-type: none"> • Create an encryption key and use it to encrypt a file in S3. 4. Set Up AWS WAF: <ul style="list-style-type: none"> • Configure a basic Web Application Firewall for an application running on EC2.
<p>IV</p>	<p>Deployment, Monitoring, and Management Services AWS Elastic Beanstalk: Deployment of Applications using Elastic Beanstalk (Web Apps), Elastic Beanstalk Environment Types (Web Server, Worker) Monitoring and Management: Amazon CloudWatch: Metrics, Alarms, and Logs, AWS CloudTrail: Logging API Calls and Tracking Activity, AWS CloudFormation: Infrastructure as Code (IaC) Practical:</p> <ol style="list-style-type: none"> 1. Deploy an Application Using Elastic Beanstalk: <ul style="list-style-type: none"> • Deploy a simple application (e.g., Node.js, PHP) using Elastic Beanstalk. 2. Set Up CloudWatch Monitoring: <ul style="list-style-type: none"> • Create custom CloudWatch metrics and set up alarms for EC2 instances. 3. Work with CloudTrail: <ul style="list-style-type: none"> • Enable CloudTrail and review logs for API activities. 4. Create a Simple CloudFormation Template: <ul style="list-style-type: none"> • Write a CloudFormation template to launch an EC2 instance.

- V AWS Pricing, Billing, and Advanced Services**
- AWS Pricing and Billing:** AWS Free Tier, Cost Management, and Pricing Calculator, Understanding AWS Pricing Models (On-Demand, Reserved, Spot Instances), **AWS Advanced Services Overview:** Introduction to AWS Lambda (Serverless), Amazon SQS (Simple Queue Service) and SNS (Simple Notification Service), AWS Auto Scaling and Elastic Load Balancing
- Practical:**
- 1. Estimate AWS Costs Using the AWS Pricing Calculator.**
 - 2. Configure Auto Scaling:**
 - Set up Auto Scaling for EC2 instances based on traffic.
 - 3. Work with Amazon SQS and SNS:**
 - Create an SQS queue and send notifications using SNS.

Text Book:

1. "AWS Certified Solutions Architect Study Guide: Associate SAA-C02 Exam" by Ben Piper, David Clinton
2. "AWS Certified Developer - Associate Guide: Your one-stop solution to passing the AWS developer's certification" by VipulTankariya, BhavinParmar
3. "AWS Certified SysOps Administrator Study Guide: Associate SOA-C01 Exam" by Stephen Cole, Gareth Digby

**Database Management System Lab
(CourseCode:B021223452)**

Year:2nd

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Semester:IVth

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COURSEOBJECTIVES
Understand Database Concepts: Learn the fundamental principles of database design and management.
Practice SQL Queries: Gain proficiency in writing and executing SQL queries for data manipulation and retrieval.
Database Normalization: Apply normalization techniques to optimize database structures.
Practice SQL Queries: Gain proficiency in writing and executing SQL queries for data manipulation and retrieval.
Database Normalization: Apply normalization techniques to optimize database structures.

	CourseOutcome(CO)	Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Apply SQL for data definition and manipulation in real-world scenarios. Design normalized databases to reduce redundancy and improve efficiency.	K3
CO2	Demonstrate the use of DBMS tools for database design and query execution	K6
CO3	Implement and manage database transactions with proper concurrency control	K3
CO4	Implement and manage database transactions with proper concurrency control	K3
CO5	Understand database security and apply mechanisms to safeguard data integrity	K2.K3

1. Installing oracle/MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE/MYSQL:
 - a) Writing basic SQL SELECT statements.
 - b) Restricting and sorting data.
 - c) Displaying data from multiple tables.
 - d) Aggregating data using group function.
 - e) Manipulating data.
 - e) Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files
12. Mini project (Design & Development of Data and Application) for following:
 - a) Inventory Control System.
 - b) Material Requirement Processing.
 - c) Hospital Management System.
 - d) Railway Reservation System.
 - e) Personal Information System.
 - f) Web Based User Identification System.
 - g) Timetable Management System.
 - h) Hotel Management System



SDGI GLOBAL UNIVERSITY (SGU)

Syllabus- Research Writing Skills (Subject Code: SGUAE2405)

Unit-1: Introduction to Research Writing:

- The importance and Purpose of Research Writing
- Types of Research Papers
- Understanding the Research Process
- Identifying Research Problems and Formulating Research Questions
- Developing Testable Hypotheses

Unit-2: Literature Review and Research Methodologies:

- Techniques for Conducting Literature Searches
- Evaluating Sources for Credibility
- Qualitative, Quantitative and Rhetorical Research Methods
- Experimental and Non-Experimental Research Designs
- Data Collection and Data-Analysis Techniques
- Thesis, Synopsis Writing-Structure and Importance

Unit-3: Structuring and Writing Research Papers:

- Components of Research Paper: Title Page, Abstract, Introduction, Literature Review, Methodology, Results, Discussion, Conclusion, Citing Sources etc.
- Writing the Methodology Section: Detailing Research Methods and Procedures
- Presenting Results: Using tables, Figures and Descriptive Statistics
- Writing the Discussion: Interpreting Findings and Discussing Implications

Unit-4: Ethical Considerations and Citations:

- Avoiding Plagiarism and Academic Dishonesty
- Ethical Issues in Research and Publications
- Various Citation Styles: APA, MLA, Chicago etc.
- Proper Formatting and Referencing

Unit-5: Effective Research Presentations:

- Introduction, Purpose, Personal Skills, Language Skills, Content Development, Gathering Supporting Evidence
- Techniques for Effective Revision and Editing
- Incorporating Feedback and Final Proofreading
- Preparing and Delivering a Research Paper Presentation

Machine Learning using Python Lab

(CourseCode:B021223451)

Year:2nd

Semester:IVth

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COURSEOBJECTIVES
Grasp the core principles and techniques of machine learning.
Use Python to implement and experiment with various machine learning algorithms.
Learn to preprocess, clean, and manipulate data for effective model building.

CourseOutcome(CO)		Bloom'sKnowledgeLevel(KL)
Attheendofcourse,thestudentwill beabletounderstand		
CO1	Apply Python for data preprocessing and manipulation to prepare datasets for machine learning models.	K ₃
CO2	Implement machine learning algorithms, including supervised and unsupervised learning techniques.	K ₃ ,K ₄
CO3	Evaluate machine learning models using appropriate performance metrics and validation techniques.	K ₂ ,K ₃
CO4	Demonstrate the ability to use Python libraries such as Scikit-learn, Pandas, and NumPy for model building and data handling.	K ₂ ,K ₄
CO5	Apply machine learning algorithms to solve real-world problems and derive meaningful insights from data.	K ₃ ,K ₄

List of Experiments (Indicative & not limited to)

1. ProblemsolvingusingRegressionmodels:Linearregression,Logistic regressionand to evaluate the performance.
2. Problem solving using Classification: SVM, K-nearest Neighbour, and Decision Trees and evaluate the performance.
3. SolvingproblemsbasedonDecisionbycommitteeapproach:BaggingandBoosting application
4. Problemsolvingusingunsupervisedlearningmodels:Clusteringalgorithmsandtoevaluate the performance.
5. Applicationofdimensionalityreductiontechniquesfornumericandtextandimagedata.
6. Gamedevelopmentandroboticapplicationdevelopmentusingreinforcementlearning model.
7. ImplementBayesianInferenceinGeneExpressionAnalysis
8. ImplementSequentialLearningusingHiddenMarkovModel
9. ApplicationofCRFs inNaturalLanguageProcessing
10. BuildingandtrainingNueralnetworksusingbackpropagationalgorithmwithgradient descent.
11. ImageClassificationusingConvolutionalNeuralNetworkswithcrossvalidation.

School Name- School of Computer Applications			
Program- BCA (Hons) with specialization Data Science / Cloud Computing			Semester-Vth
Course Name- Design and Analysis of Algorithms			
A.Y 2025-26	Course Code- B021223501	Batch-2023-27	CIE Marks- 50 (MM)
Total Teaching Hours :40	Total Credits-03		ESE Marks- 50 (MM)
Type of Course- Theory			Total Marks- 100 (MM)
Course Objectives/Course Description			
<input type="checkbox"/> Understand fundamental concepts of algorithm design and analysis. <input type="checkbox"/> Analyze the time and space complexity of algorithms using asymptotic notations (Big O, Omega, Theta). <input type="checkbox"/> Identify limitations of algorithmic solutions and explore approximation or heuristic-based approaches. <input type="checkbox"/> Improve problem-solving skills through algorithm design and rigorous performance evaluation <input type="checkbox"/> Gain exposure to real-world problems and formulate efficient algorithmic solutions.			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
1	Introduction: Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics-Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.		08
2	Advanced Data Structures: Red-Black Trees, B-Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List		08
3	Divide and Conquer with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. Greedy Methods with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees-Prim's and Kruskal's Algorithms, Single Source Shortest Paths- Dijkstra's and Bellman Ford Algorithms.		08
4	Dynamic Programming with Examples such as Knapsack. All Pair Shortest Paths Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.		08
5	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms		08

Course Outcomes

CO1 Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.

CO2 Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).

CO3 Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.

CO4 Apply classical sorting, searching, optimization and graph algorithms.

CO5 Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.

Textbooks:

1. Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Prentice Hall of India.
2. E. Horowitz & S. Sahni, "Fundamentals of Computer Algorithms",

Reference books:

1. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
2. LEE "Design & Analysis of Algorithms (POD)", McGraw Hill
3. Richard E. Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
4. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.

Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997

Assessment method: (Continuous Internal Assessment = 50%, Final Examination = 50 %)

Program- BCA (Hons) with specialization Data Science / Cloud Computing		Semester-Vth	
Course Name- Design & Analysis of Algorithms Lab			
A.Y 2025-26	Course Code- B021223551	Batch-2023-27	CIE Marks- 60 (MM)
Total Teaching Hours 15	Total Credits- 01		ESE Marks- 40 (MM)
Type of Course- Practical			Total Marks- 100 (MM)
Course Objectives/Course Description			
<input type="checkbox"/> Implement fundamental algorithms and evaluate their performance through empirical analysis. <input type="checkbox"/> Gain proficiency in applying algorithmic strategies to solve real-world computational problems. <input type="checkbox"/> Translate algorithmic concepts like sorting, searching, and recursion into working code.			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
1	List of Experiments (Indicative & not limited to) <ol style="list-style-type: none"> 1. Write a program for Recursive Binary & Linear Search and compute its time complexity. 2. Write a program for Heap Sort and compute its time complexity. 3. Write a program for Merge Sort and compute its time complexity. 4. Write a program for Selection Sort and compute its time complexity. 5. Write a program for Insertion Sort and compute its time complexity. 6. Write a program for Quick Sort and compute its time complexity. 7. Write a program for Huffman Coding using Greedy approach. 8. Write a program for Knapsack Problem using Greedy approach. 9. Write a program to perform Travelling Salesman Problem. 10. Write a program to find Minimum Spanning Tree using Kruskal's Algorithm. 11. Write a program to implement N Queen Problem using 		

Backtracking.

12. Write a program to show how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
13. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
14. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.
15. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
16. Write programs to implement All-Pairs Shortest Paths problem using Floyd's algorithm.

Course Outcomes

CO1 Develop programs for sorting a given set of elements and analyze its time complexity

CO2 Solve and analyze the problems using greedy methods.

CO3 Solve and analyze the problems using dynamic programming.

CO4 Apply backtracking method to solve various problems.

CO5 Apply branch and bound method to solve 0/1 knapsack problem.

Assessment method: (Continuous Internal Assessment = 60%, Final Examination = 40%)

School Name- School of Computer Applications

Program- BCA (Hons) with specialization Data Science / Cloud Computing			Semester-Vth
Course Name- Software Engineering			
A.Y 2025-26	Course Code- B021223502	Batch-2023-27	CIE Marks- 50 (MM)
Total Teaching Hours 45	Total Credits- 03		ESE Marks- 50 (MM)
Type of Course- Theory			Total Marks- 100 (MM)
Course Objectives/Course Description			
<input type="checkbox"/> Understand and apply software engineering principles , methods, and practices. <input type="checkbox"/> Analyze and model software requirements using appropriate requirement engineering techniques . <input type="checkbox"/> Design robust software systems using structured and object-oriented design principles <input type="checkbox"/> Evaluate and apply software process models such as Waterfall, Agile, Spiral, and Incremental models. <input type="checkbox"/> Understand the concepts of software architecture , design patterns, and component-based development.			
UNI T-1	Topics		No. of Teaching hours/ (Lecture)
1	Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.		09
2	Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.		09
3	Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.		09

4	Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, TopDown and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards	09
5	Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	09

Course Outcomes

- CO1 Explain various software characteristics and analyzed different software Development Models
- CO2 Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.
- CO3 Compare and contrast various methods for software design.
- CO4 Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.
- CO5 Manage software development process independently as well as in teams and make use of Various software management tools for development, maintenance and analysis.

Textbooks:

1. RSPressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

Reference Books:

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, "Software Engineering", Cengage Learning.

Pfleeger, Software Engineering, Macmillan Publication

Assessment method: (Continuous Internal Assessment = 50%, Final Examination = 50%)

School Name- School of Computer Applications

Program- BCA (Hons) with specialization Data Science / Cloud Computing

Semester-Vth

Course Name- Software Engineering Lab			
A.Y 2025-26	Course Code- B021223552	Batch-2023-27	CIE Marks- 60 (MM)
Total Teaching Hours 15	Total Credits- 01		ESE Marks- 40 (MM)
Type of Course- Practical			Total Marks- 100 (MM)
Course Objectives/Course Description <input type="checkbox"/> Apply software engineering practices to plan and execute a software project from start to finish. <input type="checkbox"/> Use UML tools to create use case diagrams, class diagrams, activity diagrams, and sequence diagrams for modelling software systems. <input type="checkbox"/> Conduct requirement gathering and analysis for software applications using appropriate documentation techniques like SRS (Software Requirement Specification). <input type="checkbox"/> Perform structured and object-oriented design using modeling tools and design principles.			
UNIT-	Topics		No. of Teaching hours/ (Lecture)
1	List of Experiments (Indicative & not limited to) For any given case/ problem statement do the following; <ol style="list-style-type: none"> 1. Prepare a SRS document in line with the IEEE recommended standards. 2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, postcondition and function of each use case. 3. Draw the activity diagram. 4. Identify the classes. Classify them as weak and strong classes and draw the Class diagram. 5. Draw the sequence diagram for any two scenarios. 6. Draw the collaboration diagram. 7. Draw the state chart diagram. 8. Draw the component diagram. 9. Perform forward engineering in java. (Model to code conversion) 10. Perform reverse engineering in java. (Code to Model conversion) 		

	11. Draw the deployment diagram.	
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Course Outcomes

CO1 Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement.

CO2 Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship.

CO3 Draw a class diagram after identifying classes and association among them

CO4 Graphically represent various UML diagrams and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially.

CO5 Able to use modern engineering tools for specification, design, implementation and testing.

Assessment method: (Continuous Internal Assessment = 60%, Final Examination = 40%)

School Name- School of Computer Applications			
Program- BCA (Hons)			Semester-5th
Course Name- E-commerce			
A.Y 2025-26	Course Code- B021223503C	Batch- 2023-27	CIE Marks- 50 (MM)
Total Teaching Hours 50	Total Credits- 4		ESE Marks- 50 (MM)
Type of Course- Theory			Total Marks 100 (MM)
Course Objectives/Course Description			
<ul style="list-style-type: none"> • Understand the core concepts, types, and distinguishing features of E-Commerce compared to traditional commerce. • Acquire knowledge of the technical infrastructure, security challenges, and electronic payment systems essential for building and maintaining secure E-Commerce platforms. • Explore the applications of E-Commerce across various sectors such as retail, education, and banking, along with relevant legal, ethical, and taxation considerations. • Develop practical skills to design, plan, and implement a basic E-Commerce system, integrating knowledge of security, infrastructure, and payment gateways. 			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
1	Introduction to E-Commerce & Infrastructure <ul style="list-style-type: none"> • Definition and concept of E-Commerce • Types of E-Commerce (B2B, B2C, C2C, C2B, B2G) • E-Commerce vs Traditional Commerce • Advantages and limitations of E-Commerce • Components of E-Commerce • Hardware and software requirements • Network Infrastructure (Internet, Intranet, Extranet) • E-Commerce and Mobile Commerce • Web servers and platforms (Magento, Shopify, WooCommerce) 		10
2	Security and Legal Issues in E-Commerce <ul style="list-style-type: none"> • E-Commerce security environment • Types of threats (hacking, phishing, cybercrime) • Security solutions (encryption, firewalls, digital certificates) • Secure Electronic Transactions (SET) • Secure Sockets Layer (SSL) • Legal issues (IT Act 2000, cyber laws) • Ethical and social issues • Online consumer protection 		10

3	<p style="text-align: center;">Electronic Payment Systems and Fraud Management</p> <ul style="list-style-type: none"> • Overview of E-Payment systems • Credit and Debit Cards, E-wallets, UPI, and Net Banking • Digital cash and micropayments • Payment Gateways and Payment Processors • Risk and fraud in online transactions • Taxation issues in E-Commerce 	10
4	<p style="text-align: center;">E-Commerce Applications and Strategies</p> <ul style="list-style-type: none"> • Applications in retail, wholesale, banking, insurance, and education • Online marketing (SEO, SEM, Email marketing, Social Media) • Customer Relationship Management (CRM) • Supply Chain Management (SCM) • E-Commerce business models • E-Commerce strategy and business setup 	10
5	<p style="text-align: center;">E-Commerce Implementation & Project Management</p> <ul style="list-style-type: none"> • Steps for setting up an E-Commerce business • E-Commerce website development life cycle • Planning and managing E-Commerce projects • Tools and techniques for project development • Case studies of successful E-Commerce platforms 	10

Course Outcomes

CO1: Understand fundamental concepts, types, and components of E-Commerce, and distinguish it from traditional commerce.

CO2: Identify and evaluate the technical infrastructure and platforms necessary for implementing E-Commerce and Mobile Commerce solutions.

CO3: Analyze security threats and legal/ethical issues related to E-Commerce and apply appropriate solutions to ensure secure transactions.

CO4: Demonstrate knowledge of electronic payment systems, digital transactions, fraud risks, and taxation in online commerce.

CO5: Apply E-Commerce strategies, models, and tools to real-world scenarios and manage the development and deployment of E-Commerce platforms.

Text books:

1. **E-Commerce: Fundamentals and Applications** – Henry Chan
2. **E-Commerce: Strategy, Technologies and Applications** – David Whiteley

Reference books:

- 1- **Electronic Commerce** – Gary Schneider
- 2- **E-Business and E-Commerce Management** – Dave Chaffey

Assessment method: (Continuous Internal Assessment = 50th%, Final Examination = 50th%)

School Name- School of Computer Applications			
Program- BCA (Hons) with specialization Data Science / Cloud Computing			Semester-Vth
Course Name- Natural language processing			
A.Y 2025-26	Course Code- B021223504A	Batch-2023-27	CIE Marks- 50 (MM)
Total Teaching Hours 50	Total Credits-04		ESE Marks- 50 (MM)
Type of Course- Theory			Total Marks- 100 (MM)
Course Objectives/Course Description <input type="checkbox"/> Understand the fundamental concepts and challenges of processing natural language. <input type="checkbox"/> Perform basic text preprocessing tasks such as tokenization, stemming, lemmatization, POS tagging, and stop-word removal. <input type="checkbox"/> Apply language models , such as n-grams and neural language models, to predict and generate text. <input type="checkbox"/> Analyze the structure of language through syntax and parsing techniques (e.g., constituency and dependency parsing).			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
1	INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.		10
2	SYNTACTIC ANALYSIS: Context Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.		10
3	SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods –		10

	Word Similarity using Thesaurus and Distributional methods.	
4	BASIC CONCEPTS of Speech Processing :Speech Fundamentals: Articulatory Phonetics –Production And Classification Of Speech Sounds; Acoustic Phonetics – Acoustics Of Speech Production; Review Of Digital Signal Processing Concepts; Short-Time Fourier Transform, Filter-Bank And LPC Methods.	10
5	SPEECH-ANALYSIS : Features, Feature Extraction And Pattern Comparison Techniques: Speech Distortion Measures – Mathematical And Perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances And Filtering, Likelihood Distortions, Spectral Distortion Using A Warped Frequency Scale, LPC, PLP And MFCC Coefficients, Time Alignment And Normalization – Dynamic Time Warping, Multiple Time–Alignment Paths. SPEECH MODELING : Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-Estimation, Implementation Issues.	10

Course Outcomes

CO1 To learn the fundamentals of natural language processing.

CO2 To understand the use of CFG and PCFG in NLP.

CO3 To understand the role of semantics of sentences and pragmatic.

CO4 To introduce speech production and related parameters of speech.

CO5 To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech.

Textbooks:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper,—Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.
3. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
4. Daniel Jurafsky and James H. Martin, “Speech and Language Processing—An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education, 2002.
5. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press, 1997.
6. 1. Breck Baldwin,—Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
7. Richard M. Reese,—Natural Language Processing with Java, O'Reilly Media, 2015.
8. Nitin Indurkha and Fred J. Damerau,—Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

Assessment method: (Continuous Internal Assessment = 50%, Final Examination = 50%)

School Name- School of Computer Applications			
Program- BCA (Hons)			Semester-5th
Course Name- Data Analysis Using R			
A.Y 2025-26	Course Code- B020223505	Batch- 2023-27	CIE Marks- 50 (MM)
Total Teaching Hours 45	Total Credits- 3		ESE Marks- 50 (MM)
Type of Course- Theory			Total Marks 100 (MM)
Course Objectives/Course Description			
<ul style="list-style-type: none"> • To introduce students to data analysis techniques using the R programming language. • To enable students to clean, manipulate, visualize, and interpret data using R. • To develop basic statistical modeling and machine learning skills with R. • To apply R for solving real-world problems involving data 			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
1	Introduction to R and Data Structures <ul style="list-style-type: none"> • Introduction to R and RStudio • Installing and using packages • Basic R syntax: variables, data types, operators • Control structures: if, else, loops • Functions and user-defined functions • Data structures: Vectors, Lists, Matrices, Arrays, Data Frames, Factors • Indexing and subsetting 		09
2	Data Handling and Importing <ul style="list-style-type: none"> • Reading and writing data: CSV, Excel, JSON, etc. • Importing datasets from external sources (APIs, databases) • Handling missing values and outliers • Introduction to basic data cleaning techniques 		09
3	Data Manipulation with dplyr and tidyr <ul style="list-style-type: none"> • Data wrangling with <code>dplyr</code>: <code>select</code>, <code>filter</code>, <code>arrange</code>, <code>mutate</code>, <code>summarize</code>, <code>group_by</code> • Data reshaping and tidying with <code>tidyr</code>: <code>gather</code>, <code>spread</code>, <code>separate</code>, <code>unite</code> • Joining datasets (inner, left, right, full joins) 		09
4	Data Visualization with ggplot2 and Shiny <ul style="list-style-type: none"> • Grammar of graphics and <code>ggplot2</code> fundamentals • Creating various plots: bar, histogram, scatter, line, boxplot 		09

	<ul style="list-style-type: none"> • Customizing plots: colors, labels, titles, themes • Basic introduction to interactive dashboards using <code>shiny</code> 	
5	<p style="text-align: center;">Basic Statistics and Introduction to Machine Learning</p> <ul style="list-style-type: none"> • Descriptive statistics: mean, median, mode, variance, standard deviation • Probability distributions • Hypothesis testing: t-test, chi-square test • Correlation and regression analysis • Overview of machine learning in R • Building basic models: Linear regression, k-NN, Decision Trees • Model evaluation: confusion matrix, accuracy, precision, recall 	09

Course Outcomes

CO1: Understand and apply the fundamentals of R programming, including syntax, control structures, and data types.

CO2: Work with various data structures and perform data importing, cleaning, and preprocessing tasks using R.

CO3: Perform data manipulation and transformation using powerful R packages like `dplyr` and `tidyr`.

CO4: Create and customize a variety of data visualizations using `ggplot2` and gain a basic understanding of interactive dashboard creation with `shiny`.

CO5: Apply basic statistical techniques and build simple machine learning models in R for data analysis and decision-making.

Text books:

1. **R for Data Science** – Hadley Wickham & Garrett Golemund (free online)
2. **The Art of R Programming** – Norman Matloff

Reference books:

1. **Hands-On Programming with R** – Garrett Golemund

Assessment method: (Continuous Internal Assessment = 50th%, Final Examination = 50th%)

School Name- School of Computer Applications			
Program- BCA (Hons)			Semester-5th
Course Name- Data Analysis Using R Lab			
A.Y 2025-26	Course Code- B020223555	Batch- 2023-27	CIE Marks- 60 (MM)
Total Teaching Hours 15	Total Credits- 1		ESE Marks- 40 (MM)
Type of Course- Practical			Total Marks 100 (MM)
Course Objectives/Course Description			
<ul style="list-style-type: none"> • Understand and apply the fundamental syntax, data types, control structures, and functions of R programming. • Work with various data structures in R and perform efficient data import/export and preprocessing tasks. • Perform data manipulation, cleaning, and transformation using dplyr and tidyr, and visualize data using ggplot2 with customizations. • Apply basic statistical methods and machine learning techniques in R to analyze real-world datasets and evaluate model performance. 			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
	<ol style="list-style-type: none"> 1. Write basic R scripts to perform arithmetic operations, control structures (if, else, loops), and function creation. 2. Practice with variables and data types: numeric, character, logical, etc. 3. Create and manipulate vectors, lists, matrices, arrays, and data frames. 4. Read/write data from various sources: CSV, Excel, and text files using <code>read.csv()</code>, <code>readxl</code>, and <code>write.csv()</code>. 5. Use dplyr functions to filter, select, arrange, mutate, group and summarize data. 6. Clean and reshape data using tidyr: <code>gather()</code>, <code>spread()</code>, <code>separate()</code>, <code>unite()</code>. 7. Handle missing values and detect outliers in datasets 8. Create different types of plots: Bar chart, line chart, histogram, scatter plot, box plot 9. Customize visualizations with titles, themes, axis labels, colors, and facets. 10. Calculate descriptive statistics: mean, median, mode, SD, variance using both base R and <code>summary()</code>. 11. Perform hypothesis testing: t-test, chi-square test using <code>t.test()</code> and <code>chisq.test()</code>. 12. Build a linear regression model using <code>lm()</code> and interpret the 		

summary.

13. **Create a classification model** (e.g., k-NN or decision tree) using packages like `class`, `rpart`, or `caret`.

14. **Evaluate model accuracy** using a confusion matrix

Course Outcomes

CO1: Write and execute R scripts using basic syntax, control structures, and user-defined functions with appropriate data types.

CO2: Create, manipulate, and manage key data structures in R and handle data input/output from various file formats.

CO3: Perform data cleaning, wrangling, and reshaping using `dplyr` and `tidyr`, including handling missing values and outliers.

CO4: Create and customize a variety of visualizations using `ggplot2` and compute descriptive statistics and hypothesis testing using R.

CO5: Build, interpret, and evaluate basic statistical and machine learning models in R, including regression and classification techniques.

Assessment method: (Continuous Internal Assessment = 60th%, Final Examination = 40th%)

School Name- School of Computer Applications			
Program- BCA (Hons)			Semester-5th
Course Name- Cloud Architecture			
A.Y 2025-26	Course Code- B020123505	Batch- 2023-27	CIE Marks- 50 (MM)
Total Teaching Hours 45	Total Credits- 3		ESE Marks- 50 (MM)
Type of Course- Theory			Total Marks 100 (MM)
Course Objectives/Course Description			
<ul style="list-style-type: none"> • Understand the fundamental principles of cloud computing, including service and deployment models, and their benefits and challenges. • Learn the architecture of cloud systems, including virtualization and container technologies essential for building scalable cloud infrastructure. • Explore cloud storage options, networking components, and strategies for data backup and disaster recovery. • Analyze cloud security frameworks, compliance standards, and evaluate services provided by major cloud platforms through real-world applications and pricing models. 			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
1	Introduction to Cloud Computing & Service Models <ul style="list-style-type: none"> • Definition, history, benefits, and challenges of Cloud Computing • Characteristics: on-demand, scalability, elasticity • Cloud Computing vs Traditional Computing • Cloud Service Models: IaaS, PaaS, SaaS • Cloud Deployment Models: Public, Private, Hybrid, Community 		09
2	Cloud Architecture & Virtualization Technologies <ul style="list-style-type: none"> • Cloud computing reference architecture • Frontend and backend components • Cloud computing stack and infrastructure • Virtualization: Concepts, types (hardware, OS, server, network) • Virtual Machines vs Containers • Virtualization tools: VMware, VirtualBox, Docker, Kubernetes (basics) 		0+
3	Cloud Storage, Networking & Data Management <ul style="list-style-type: none"> • Cloud storage types: Block, File, Object • Cloud storage providers: Amazon S3, Azure Blob, Google Cloud Storage • Basics of cloud networking: VPC, VPN, Subnets • Load balancing, CDN, IP addressing 		09

	<ul style="list-style-type: none"> Data backup and disaster recovery in cloud 	
4	<p>Security and Compliance in Cloud Computing</p> <ul style="list-style-type: none"> Cloud security challenges and solutions Identity and Access Management (IAM) Data encryption: at rest and in transit Compliance standards: ISO, GDPR, HIPAA Shared responsibility model 	09
5	<p>Cloud Providers, Services, and Real-World Use Cases</p> <ul style="list-style-type: none"> Overview: AWS, Azure, GCP Service comparisons: EC2 vs Azure VMs vs GCE, S3 vs Blob Cloud pricing models: Pay-as-you-go, Reserved, Spot Case studies from e-commerce, healthcare, education, and banking 	09

Course Outcomes

CO1: Explain the core concepts of cloud computing, its characteristics, benefits, and service/deployment models.

CO2: Illustrate cloud architecture and use virtualization and container tools (e.g., Docker, VirtualBox, Kubernetes) in cloud environments.

CO3: Compare and apply different cloud storage types, set up cloud networks, and understand data recovery processes.

CO4: Analyze cloud security threats and apply IAM, encryption methods, and compliance standards for secure cloud usage.

CO5: Compare services across major cloud providers (AWS, Azure, GCP) and evaluate real-world cloud applications and pricing strategies.

Text books:

1. **Cloud Computing: Concepts, Technology & Architecture** – Thomas Erl
2. **Cloud Computing Bible** – Barrie Sosinsky

Reference books:

3. **Architecting Cloud Computing Solutions** – Kevin L. Jackson, Scott Goessling

Assessment method: (Continuous Internal Assessment = 50th%, Final Examination = 50th%)

School Name- School of Computer Applications			
Program- BCA (Hons)			Semester-5th
Course Name- Cloud Architecture Lab			
A.Y 2025-26	Course Code- B020123555	Batch- 2023-27	CIE Marks- 60 (MM)
Total Teaching Hours 15	Total Credits- 1		ESE Marks- 40 (MM)
Type of Course- Practical			Total Marks 100 (MM)
Course Objectives/Course Description			
<ul style="list-style-type: none"> • Deploy and manage virtual machines in the cloud. • Configure cloud storage and networking components. • Use container technologies like Docker. • Apply IAM roles and basic cloud security features. • Understand billing, monitoring, and scaling in cloud environments. 			
UNIT-1	Topics		No. of Teaching hours/ (Lecture)
	<ol style="list-style-type: none"> 1. Create and explore a free cloud account (AWS, Azure, or GCP). <ul style="list-style-type: none"> • Navigate the dashboard • Understand services and documentation 2. Deploy a Virtual Machine (VM): <ul style="list-style-type: none"> • Launch an EC2 instance (AWS) or Azure Virtual Machine • Install a web server (Apache/NGINX) • Access it via public IP 3. Configure cloud storage: <ul style="list-style-type: none"> • Create an S3 bucket (AWS) or Azure Blob Storage • Upload and download files • Set public/private permissions 4. Static Website Hosting using S3:Host a basic HTML page on Amazon S3 5. VPC and Subnet Configuration: <ul style="list-style-type: none"> • Create a custom VPC and subnets in AWS or Azure • Launch VMs inside the subnet 6. Create and test a Load Balancer: <ul style="list-style-type: none"> • Setup AWS ELB (Elastic Load Balancer) • Add multiple EC2 instances behind the load balancer 7. Install and configure VirtualBox or VMware: <ul style="list-style-type: none"> • Create a virtual machine on your local system 8. Introduction to Docker: <ul style="list-style-type: none"> • Install Docker on a VM or locally • Pull a Docker image (e.g., nginx, httpd) 		

- Run a Docker container and expose a port
9. **Docker Compose (Optional Advanced):**
- Define a multi-container setup using `docker-compose.yml`
10. **Identity and Access Management:**
- Create IAM users and roles (AWS)
 - Assign policies and test access control
11. **Encryption and Security Groups:**
- Configure a security group to restrict access
 - Use HTTPS (self-signed certificate or AWS Certificate Manager)
12. **Monitor resource usage:**
- Use AWS CloudWatch or Azure Monitor
 - Set up basic alarms for CPU, memory usage
13. **Billing and Cost Estimation:**
- Use AWS or Azure pricing calculator
 - View usage reports and budgeting tools

Course Outcomes

CO1: Create and navigate cloud provider accounts (AWS, Azure, GCP), deploy virtual machines, install web servers, and configure cloud storage with appropriate permissions.

CO2: Design and configure cloud networking components such as VPCs, subnets, security groups, and load balancers for secure and efficient resource management.

CO3: Utilize virtualization and containerization technologies (VirtualBox, VMware, Docker) to build and manage cloud-like environments.

CO4: Implement Identity and Access Management (IAM), encryption, and security protocols to safeguard cloud infrastructure.

CO5: Monitor cloud resources using native tools, manage billing and cost estimation, and apply budgeting strategies for effective cloud usage.

Assessment method: (Continuous Internal Assessment = 60th%, Final Examination = 40th%)

Fundamentals of Mathematics (Bridge)

(Course Code: BSGUBR2401)

Duration: 30 Hrs

Course Objective: *To provide a solid foundation in number systems and basic arithmetic operations, enabling students to handle numerical computations and real-life mathematical problems effectively.*

Unit 1

Number Systems and Basic Arithmetic: Types of number systems: natural, whole, integers, rational, real, and complex numbers, Prime numbers, factorization, and divisibility rules, Basic arithmetic operations (addition, subtraction, multiplication, division), Fractions, decimals, and percentages, HCF, LCM, and simple, problem-solving using these concepts.

Unit 2

Algebraic Expressions and Equations: Algebraic expressions: terms, factors, and coefficients, Simplification of expressions, Laws of exponents and radicals, Solving linear equations (one and two variables), Quadratic equations: solving methods (factorization, quadratic formula), Introduction to inequalities and their graphical representation.

Unit 3

Geometry and Mensuration: Basic geometric figures: points, lines, planes, and angles, Properties of triangles, quadrilaterals, and circles, Theorems related to triangles (Pythagoras theorem), parallel lines, and circles, Perimeter and area of 2D shapes, Surface area and volume of 3D shapes (cylinders, cones, spheres, prisms), Introduction to coordinate geometry: distance formula and equation of a line.

Unit 4

Trigonometry Basics: Introduction to angles (degrees and radians), Trigonometric ratios: sine, cosine, tangent, and their reciprocal functions, Trigonometric identities and basic equations, Applications of trigonometry in right-angled triangles, Graphs of sine, cosine, and tangent, functions, Introduction to inverse trigonometric functions

Unit 5

Probability and Statistics: Basic concepts of probability: experiments, events, outcomes, Rules of probability (addition and multiplication rules), Introduction to statistics: data , collection, representation (bar charts, histograms, pie charts), Measures of central tendency: mean, median, mode, Measures of dispersion: range, variance, standard deviation, Basic concepts of probability distributions