

ETERNAL UNIVERSITY

(ESTABLISHED UNDER HIMACHAL PRADESH GOVERNMENT ACT NO.3 OF 2009)

BARU SAHIB HIMACHAL PRADESH



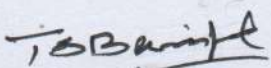
WORLD PEACE THROUGH VALUE BASED EDUCATION

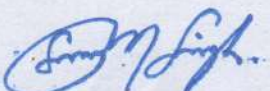
AKAL COLLEGE OF ENGINEERING & TECHNOLOGY

B.C.A. (HONS. WITH RESEARCH) (BATCH
2025 -29) CURRICULUM (SEMESTER I & II)

APPROVED VIDE ANNEXURE 4.5.5 OF 87TH
ACADEMIC COUNCIL MEETING HELD ON
25TH JULY, 2025

TO BE IMPLEMENTED FROM THE ACADEMIC
SESSION 2025-26


Dean
Academic Affairs
Eternal University
Baru Sahib (H.P.) 173101


Registrar (Officiating)
Eternal University
Baru Sahib (H.P.) 173101

ETERNAL UNIVERSITY

(Established Under Himachal Pradesh State Act No.3 of 2009)

STUDY SCHEME AND SYLLABUS

FOR

4 Year – B.C.A. (Hons. with Research)

2025-2029



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

AKAL COLLEGE OF ENGINEERING & TECHNOLOGY

ETERNAL UNIVERSITY

BARU SAHIB, SIRMAUR, H.P.

To be implemented from Academic Session 2025-2026

ABOUT THE BCA

Computer Application has been evolving as an important branch of science and technology in the last few years and it has carved out a space for itself like computer science and engineering. Computer application spans theory and more application and it requires thinking both in abstract terms and in concrete terms. Computer science has a wide range of specialties. These include computer architecture, software systems, Graphics, Artificial Intelligence, Mathematical and Statistical Analysis, Data science, Computational Science and Software Engineering.

SALIENT FEATURES OF THE DEPARTMENT

- Research oriented curriculum designed to enable students to acquire all the skills needed to collect and analyze the data.
- The Institute draws upon its strength of highly qualified well-trained faculty, state of art infrastructure and innovative teaching methodology.
- Elective courses that bridge the gap between industry requirements and academia.
- Hands-on experience in most of the courses of computer applications so as to impart practical knowledge in the relevant field.
- To keep the students at par with the emerging technologies prevailing in the market, the institute is furnished with various specialized research labs and software labs.

BCA (BACHELOR OF COMPUTER APPLICATION)

The Program outcomes in BCA are aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in BCA courses, in the outcome-based curriculum framework, help students learn how to solve problems, accomplish IT tasks, and express creativity, both individually and collaboratively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages. After graduating with a 4 years degree, the students are eligible for 1 year MCA (Master in Computer Application) Programme.

VISION

To prepare technically proficient and skillful computer professionals thereby contributing towards building a strong and developed nation.

MISSION

To provide innovative and quality knowledge to students for global competence and excellence. Also, to prepare high quality Professionals for catering the needs of industry.

ELIGIBILITY CRITERIA

10+2 or its equivalent examination in any stream conducted by a recognized Board/ University/Council

DURATION

4 Years

PROGRAM OUTCOMES

PO1: Core Computing Competency and Analytical Skills: Graduates will build a strong foundation in computer science and programming, enabling them to analyze complex problems, determine computational requirements, and design reliable software solutions.

PO2: Applied Project Development Skills: Graduates will gain hands-on experience to design, develop, and deploy innovative, scalable software systems that address real-world challenges.

PO3: Research Mindset and Technological Innovation: Graduates will demonstrate curiosity and initiative in exploring and applying emerging technologies, advancing research, and fostering creativity.

PO4: Professional Communication and Collaborative Leadership: Graduates will excel in effective communication, teamwork, and leadership in multidisciplinary project environments.

PO5: Adaptability and Continuous Learning: Graduates will embrace lifelong learning, adapting proactively to evolving technologies and methodologies for ongoing self-improvement.

PO6: Ethical, Social, and Environmental Responsibility: Graduates will act with integrity and responsibility, considering the ethical, societal, and environmental impacts of their technology decisions.

PO7: Entrepreneurial and Industry Readiness: Graduates will possess technical expertise, business acumen, and project management skills, preparing them for successful careers or entrepreneurship in the IT sector.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Gain proficiency in programming languages (C, Java, PHP), databases, software engineering, networking, and theoretical concepts, and apply them practically to develop software applications and manage projects using ICT tools.

PSO2: Build strong analytical, logical thinking, and problem-solving abilities to design efficient computer-based solutions for real-world challenges.

PSO3: Develop research skills and utilize emerging technologies to innovate, contribute new knowledge in computer science, and prepare for research publication.

PSO4: Acquire industry-relevant skills, entrepreneurial abilities, and awareness of ethical and social responsibilities to effectively pursue professional careers.

PSO5: Communicate scientific and technical information clearly, work effectively both individually and in teams, and engage in lifelong learning to stay updated in the fast-evolving IT industry.

Semester 1						
Nature of the Course	Course Code	Course Title	L	T	P	C(C= L+T+(p/2))
DSC	0610311011	Foundations of IT	3	0	2	4
DSC	0610311020	Mathematics for Computer Science	3	1	0	4
DSC	0610311031	Database Management System	3	1	2	5
DSE	0610312011	Problem Solving and Programming Fundamentals 1	3	1	2	5
AEC	0610315010	Environmental Studies for Technology	2	0	0	2
VAC	0610316011	New Age Life Skills 1	1	0	2	2
		Total	15	3	8	22

Semester 2						
Nature of the Course	Course Code	Course Title	L	T	P	C(C= L+T+(p/2))
DSC	0610321041	Problem Solving and Programming Fundamentals 2	3	1	2	5
DSC	0610321050	Agile Software Development Life Cycle	3	1	0	4
DSC	0610321061	Web Development Frontend 1-HTML-CSS	2	1	4	5
VAC	0610326021	New Age Life Skills 2	1	1	2	3
SEC	0610324010	Introduction to Generative AI	4	1	0	5
		Total	13	5	8	22

Semester 3						
Nature of the Course	Course Code	Course Title	L	T	P	C(C= L+T+(p/2))
DSE	0610332021	Web Development Frontend 2 -JS React	2	1	4	5
DSC	0610331071	Operating System Fundamentals	2	1	2	4
DSC	0610331080	Computer Network	2	1	0	3
DSE	0610332031	Data Structures and Algorithms (Problem Solving 3)	2	1	4	5
AEC	0610335021	New Age Life Skills 3	1	0	2	2
VAC	0610334020	Introduction to ChatGPT	2	1	0	3
		Total	11	5	12	22

Semester 4						
Nature of the Course	Course Code	Course Title	L	T	P	C(C= L+T+(P/2))
DSC	0610341091	Web Development Backend 1	3	0	4	5
DSC	0610341101	Web Development Backend (Deployment, Security, and Scalability of Web Apps)	3	1	4	6
DSE	0610342040	System Design (Low level)	3	1	0	4
AEC	0610345031	New Age Life Skills 4	1	0	2	2
SEC	0610344041	Introduction to Cloud Computing	3	1	2	5
		Total	13	3	12	22

Semester 5						
Nature of the Course	Course Code	Course Title	L	T	P	$C(C= L+T+(p/2))$
DSC	0610351111	Artificial Intelligence Fundamentals (Self-Paced)	0	0	6	3
DSC	0610351121	Introduction to Competitive Programming	0	0	6	3
DSE	0610352051	Introduction to Prompt Engineering (Self-Paced)	0	0	6	3
IAPC-1	0610357011	Major Project/ Internship	0	0	26	13
		Total	0	0	44	22

Semester 6						
Nature of the Course	Course Code	Course Title	L	T	P	$C(C= L+T+(p/2))$
DSE	0610362061	Python for Data Science & AI	3	0	2	4
VAC	0610366021	NCC/NSS and Evaluation of Overall Extracurricular Activities	0	0	4	2
IAPC-2	0610367021	Major Project/internship	0	0	32	16
		Total	3	0	38	22

SEMESTER-7

S.No .	Course Type	Course Code	Course Title	Hrs./Week			Credits
				L	T	P	
1	DSC	0610371131	Advanced Machine Learning	3	0	2	4
2	DSE	0610372071/ 0610372081/ 0610372091	Advanced R/ Computer Vision/ Quantitative and Statistical Concepts	3	0	2	4
3	DSE	0610372101/ 0610372111/ 0610372121	Research Methodology/ML Ops/DevOps	3	0	2	4
4	DSE	0610372131/ 0610372141/ 0610372151	Applied Cryptography/ Introduction to Cloud Computing/ Advanced Generative AI	3	0	2	4
5	IAPC-3	0610377031	Dissertation on Major Or Dissertation on Minor Or Academic Project/Entrepreneurship	0	0	12	6
Total Credits				12	0	20	22

SEMESTER-8

S.No .	Course Type	Course Code	Course Title	Hrs./Week			Credits
				L	T	P	
1	DSC	0610381141	Time Series Analysis and Forecasting	3	0	2	4
2	DSE	0610382161/ 0610382171/ 0610382181	Pattern Recognition/Deep Learning/Network Simulation	3	0	2	4
3	DSE	0610382191/ 0610382201/ 0610382211	Entrepreneurship Practices/ Mobile Computing/Distributed Computing Systems	3	1	0	4
4	DSE	0610382221/ 0610382231/ 0610382241	Natural Language Processing/ Artificial Neural Networks/Soft Computing	3	0	2	4
5	IAPC-4	0610387041	Dissertation on Major Or Dissertation on Minor Or Academic Project/Entrepreneurship	0	0	12	6
Total Credits				12	1	18	22

OVERALL CREDIT DISTRIBUTION TABLE

SEMESTER	Hrs. / Week			Credits
	L	T	P	
SEMESTER-I	15	3	8	22
SEMESTER-II	13	5	8	22
SEMESTER-III	11	5	12	22
SEMESTER-IV	13	3	12	22
SEMESTER-V	0	0	44	22
SEMESTER-VI	3	0	38	22
SEMESTER-VII	12	0	20	22
SEMESTER-VIII	12	1	18	22

Note – L: Lecture Hour, T: Tutorial Hour, P: Practical Hour, TC: Total Credits, IAE: Internal Assessment Examination, ESE: End Semester Examination.

Definition of Credit

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hrs. Practical (P) per week	1 Credit

Semester 1						
Nature of the Course	Course Code	Course Title	L	T	P	C(C=L+T+(p/2))
DSC	0610311011	Foundations of IT	3	0	2	4
DSC	0610311020	Mathematics for Computer Science	3	1	0	4
DSC	0610311031	Database Management System	3	1	2	5
DSE	0610312011	Problem Solving and Programming Fundamentals 1	3	1	2	5
AEC	0610315010	Environmental Studies for Technology	2	0	0	2
VAC	0610316011	New Age Life Skills 1	1	0	2	2
		Total	15	3	8	22

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610311011
Course Title	Foundations of IT
Semester	I
Type of Course	DSC
Credits	3+0+1
Course Prerequisites	—
Course Objective(s)	1. Understand the basics of computer fundamentals. 2. Familiarize with the working principles of a computer 3. Familiar with the various devices and interfaces 4. Compare and contrast different computer components and their functionalities. 5. Evaluate the implications of technology choices on user experience and security.
Course Outcome (CO)	CO1: Describe key computer components and differentiate between hardware and software. CO2: Explain how data is processed within a computer and the role of the operating system. CO3: Identify common computer peripherals and input/output interfaces. CO4: Assess the importance of ergonomics and security

	considerations in technology usage protocols. CO5: Demonstrate basic troubleshooting skills and perform routine maintenance tasks to ensure optimal computer performance.
--	---

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	1	1	1	1	2	1	3	2	1	1	1
CO2	3	2	1	1	2	2	1	3	3	2	2	1
CO3	3	2	1	1	1	2	1	3	2	1	1	1
CO4	3	2	1	1	2	2	1	3	3	1	1	1
CO5	2	1	1	2	3	3	1	2	2	1	2	2
Avg.	2.8	1.6	1.0	1.2	1.8	2.2	1.0	2.8	2.4	1.2	1.4	1.2
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Introduction to Computers: Computer Definition, Purpose of Computers, Evolution of Computing Machines. Explore the History of Computers, Early Mechanical Computers, Emergence of Digital Computers, Pioneering Computer Innovations, Modern Computing Era, Discuss the Various Uses of Computers in Modern Society, Communication and Networking.	11
UNIT II	Differentiate Between Computer Hardware and Software, Hardware vs. Software, Examples of Computer Hardware, Types of Software (System and Application). Explore the Key Components of a Computer System, (CPU), Memory (RAM and ROM), (HDD, SSD), Motherboard, Input Devices (Keyboard, Mouse, Touchscreen), Output Devices (Monitor, Printer), Storage Devices (USB Drives, Optical Discs),	11
UNIT III	How computers process information: Binary Representation, Data Encoding, Character Encoding (ASCII, Unicode), Data Types and Formats. Number System, Binary Numbers, and Conversions, Number Systems Overview (Decimal, Binary, Hexadecimal), Binary Arithmetic (Addition, Subtraction), Binary to Decimal Conversion, Decimal to Binary Conversion, Hexadecimal Representation. Logic Gates, Logic Gates Overview, AND, OR, NOT Gates, NAND, NOR, XOR, XNOR Gates, Logic Gate Combinations. Culmination.	12

UNIT IV	Computer Networks and Internet: Definition of Computer Networks, Networking Purpose and Importance, Network Protocols (TCP/IP, HTTP, FTP). Discuss Web Browsers and Online Services, Web Browsers and Their Role, Online Services (Email, Social Media, Cloud), Internet Safety and Security, Browsing and Search Engines.	11
	Practical	30
	Total Theory + Practical	75
LIST OF PRACTICALS 1. Dismantling and assembling a computer. 2. Identifying motherboard, CPU, RAM, HDD, SSD. 3. Installing operating systems (e.g., Windows, Linux). 4. Creating and formatting partitions. 5. Installing and uninstalling software. 6. Configuring BIOS/UEFI settings. 7. Understanding input/output devices. 8. Basic network setup using LAN. 9. Constructing and analyzing basic logic gate circuits. 10. Binary to decimal and vice versa conversions. 11. Setting up printers and scanners. 12. Practicing safe shutdown and reboot procedures. 13. Exploring file systems and file extensions. 14. Introduction to MS-DOS and basic commands. 15. Troubleshooting common hardware issues.		

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	45
Practical	30
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	

Total Number of Contact Hours	75
-------------------------------	----

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	Yes
Quiz	
Seminars/ Presentation	Yes
Problem Based Learning (PBL)	Yes
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Fundamentals of Computers	V. Rajaraman
2	Computer Fundamentals	P.K. Sinha & Priti Sinha
3	Introduction to Information Technology	ITL Education Solutions
4	Essentials of Computer Science	E. Balagurusamy

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610311020
Course Title	Mathematics for Computer Science
Semester	I
Type of Course	DSC
Credits	3+1+0
Course Prerequisites	–
Course Objective(s)	1. Develop proficiency in fundamental mathematical concepts 2. Apply mathematical techniques to solve real-world problems. 3. Enhance critical thinking and problem-solving skills.
Course Outcome (CO)	CO1: Effectively work with algebraic expressions and equations to address real-world challenges. CO2: Demonstrate precision in long division for polynomials and numbers, simplifying complex mathematical problems. CO3: Proficiently solve linear equations and systems, applying these skills in practical scenarios. CO4: Efficiently find HCF, LCM, and work with exponents and logarithms, applying them to various mathematical applications.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	2	2	1	1	3	3	1	2	2
CO2	3	2	1	1	2	1	1	3	3	1	1	2
CO3	3	3	1	2	2	1	2	3	3	1	2	2
CO4	3	2	1	1	2	1	1	3	2	1	1	1
Avg.	3.0	2.1	1.3	1.3	2.0	1.3	1.6	3.0	2.9	1.3	1.7	1.7
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Arithmetic : Fundamentals of arithmetic, beginning with exploration of basic operations, encompassing addition, subtraction, multiplication, and division, importance of understanding order of operations, denoted by PEMDAS, applying order of operations to solve arithmetic problems, practical problem-solving in arithmetic, real-world applications, word problems, and multi-step problem-solving.	11
UNIT II	Understanding Algebra, Algebraic Expressions, Variables and Constants, Terms and Coefficients. Solving Simple Equations, Linear Equations, Solving Equations with One Variable, Equations and Solutions, Using Variables and Constants, The Role of Variables, Constants in Algebra, Expressing Relationships, Algebraic Notation, Expressions and Formulas, Mathematical Expressions, Evaluating Expressions, Algebraic Formulas, Introduction to Polynomials, Adding and Subtracting Polynomials, Multiplying and Factoring Polynomials, Quadratic Equations; Matrix operations - Addition and subtraction, Scalar multiplication, Multiplication, Transpose; Matrix properties - Square matrices, Symmetric and skew-symmetric matrices, Diagonal matrices; Identity matrix, Zero matrix, Determinant, Inverse, Linear equations; Types of matrices - Square matrices, Symmetric and skew-symmetric matrices, Diagonal matrices, Identity matrix, Zero matrix	14
UNIT III	Exponents: Understanding Exponents, Exponent Terminology, Writing Exponents, Examples of Exponent Notation. Laws of Exponents, Multiplying Exponents, Dividing Exponents, Raising Exponents to Exponents, Negative Exponents, Exponent Properties with Parentheses. Scientific Notation, Introduction to Scientific Notation, Converting to Scientific Notation, Exponent Properties with Parentheses, Exponents and powers, Intro to rational exponents, Unit-fraction exponents, Fractional exponents, Evaluating fractional exponents.	10
UNIT IV	Logarithms : Understanding Logarithms, Logarithmic Terminology, Writing Logarithms, Examples of Logarithmic Notation, Basic Logarithmic Properties, Logarithms of Different Bases, Logarithmic Rules, Equations with Logarithmic Terms, Isolating and Solving for Logarithms, Logarithmic Equations with Exponents, Logarithms in Real-World Scenarios.	10
	Tutorial	15

	Total Theory + Tutorial	60
--	-------------------------	----

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	45
Tutorial	15
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	60

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	
Quiz	
Seminars/ Presentation	
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Discrete Mathematics and Its Applications	Kenneth H. Rosen
2	Mathematics for Computer Science	Eric Lehman, F. Thomson Leighton (MIT OpenCourseWare)
3	Higher Engineering Mathematics	B.S. Grewal

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610311031
Course Title	Database Management System
Semester	I
Type of Course	DSC
Credits	3+1+1
Course Prerequisites	–
Course Objective(s)	1. Learning higher-level programming concepts 2. Applying different programming algorithms for various problem statements. 3. Write optimized, efficient, and quality code
Course Outcome (CO)	CO1: You will gain a deeper and practical real time understanding of SQL and CO2: MySQL as you create and optimize database schemas, CO3: Project provides valuable hands-on experience in designing, developing, and implementing database-driven applications.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	1	2	2	2	3	2	2	2	1
CO2	3	3	2	1	2	2	3	3	2	2	2	1
CO3	3	3	3	2	2	2	3	3	3	2	3	2
Avg.	3.0	2.7	2.3	1.3	2.0	2.0	2.7	3.0	2.3	2.0	2.3	1.3
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Introduction and Basics of DBMS: Introduction of DBMS (Database Management System) , History of DBMS, Advantages of Database Management System, Disadvantages of DBMS, Application and Need for DBMS, DBMS Architecture, 1-level, 2-Level, 3-Level, Difference between File System and DBMS, Entity Relationship Model	11

UNIT II	SQL PART 1 (Structured Query Language): Intro, RDBMS, SQL, SELECT, WHERE, AND, OR, NOT, ORDER BY, INSERT INTO, NULL Values, UPDATE, DELETE, LIMIT, MIN and MAX, COUNT, AVG, SUM, LIKE, Wildcards, IN, BETWEEN. Aliases, Joins, INNER JOIN, LEFT JOIN, RIGHT JOIN, CROSS JOIN, Self Join.	11
UNIT III	SQL PART 2 (Structured Query Language): UNION, GROUP BY, HAVING, EXISTS, ANY, ALL, INSERT SELECT, CASE, Null Functions, Database, Create DB, Drop DB, Create Table, Drop Table, Alter Table, Constraints, Not Null, Unique, Primary Key, Foreign Key, Check, Default, Create Index, Auto Increment, Dates, Views.	12
UNIT IV	Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Transaction management: ACID properties, Normalization (1NF, 2NF, 3NF, BCNF),	11
	Tutorial	15
	Practical	30
	Total Theory + Tutorial + Practical	90

LIST OF PRACTICALS

1. Create a database CollegeDB and a table Students with fields: student_id, name, age, course, marks, and city.
2. Insert at least 5 records into the Students table.
3. Update a student's marks and city using UPDATE with WHERE clause.
4. Delete a student record based on their student_id.
5. Query all students using SELECT with WHERE, AND, and OR conditions.
6. Create a Courses table with fields: course_id, course_name, and establish a foreign key relationship with the Students table.
7. Perform INNER JOIN and LEFT JOIN between Students and Courses to display student names with course names.
8. Use GROUP BY and HAVING to find average marks per course and filter groups with average > 70.
9. Write a nested subquery to list students whose marks are above the overall class average.
10. Create a view TopStudents to show students with marks above 75 from a specific city.
11. Apply PRIMARY KEY and FOREIGN KEY constraints in both tables appropriately.
12. Create new database users and assign privileges (one with read-only, one with full access).
13. Write a stored procedure InsertStudent to insert new records into the Students table.
14. Perform backup and restore of the CollegeDB database using .sql dump.

15. Use LIKE, IN, BETWEEN, and aggregate functions (AVG, COUNT, SUM) to perform data filtering and analysis.

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	45
Tutorial	15
Practical	30
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	90

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	Yes
Quiz	
Seminars/ Presentation	
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Books	Author
1	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan
2	Learning SQL	Alan Beaulieu
3	MySQL Cookbook	Paul DuBois

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610312011
Course Title	Problem Solving and Programming Fundamentals 1
Semester	I
Type of Course	DSE
Credits	3+1+1
Course Prerequisites	–
Course Objective(s)	1. Understand programming concepts. 2. Develop algorithmic thinking. 3. Cultivate problem-solving skills. 4. Learn debugging and testing techniques. 5. To apply concepts and techniques for implementation
Course Outcome (CO)	CO1: Understanding of algorithms and problem-solving with Language agnostic or block coding. CO2: Proficiency in working with variables in a block coding environment. CO3: A solid foundation in problem-solving CO4: Learn to write optimal codes with respect to time and space CO5: Implement sorting and searching algorithms and compare their runtime complexity

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	2	2	2	2	3	3	2	2	2
CO2	3	2	1	2	2	1	2	3	3	1	2	2
CO3	3	2	1	2	3	2	2	3	3	2	2	2
CO4	3	2	2	1	3	2	2	3	3	2	2	1
CO5	3	3	2	1	2	2	2	3	3	2	2	1
Avg.	3.0	2.2	1.6	1.6	2.4	1.8	2.0	3.0	3.0	1.8	2.0	1.6
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Introduction to Programming : variables and operators (+, -, *, /, %, !,), Logical Operators, and (&&), or (), Condition Operator, Looping, Flowcharts, Flowchart Definition, Symbols and Shapes in Flowcharts, How to Create a Flowchart, Use Cases of Flowcharts, Advantages of Flowcharts.	11
UNIT II	Programming with block coding : Methods and functions, Writing Pseudocode for Algorithms, Pseudocode Conventions and Syntax, Transition from Pseudocode to Code, Block Coding, Block Coding Overview, Visual Programming with Blocks, Number System and Practice Session,	12
UNIT III	Algorithms, Definition, Importance of Algorithms, Designing and Implementing Algorithms, Algorithm Efficiency and Analysis, Real-World Applications of Algorithms, Pseudocode, Pseudocode Definition, Purpose of Pseudocode.	11
UNIT IV	Implement Data Structure Library - Function - What are functions? Parameters, Return Values and type, call by value, call by reference, and Arrays. What is 1d Array, 2d Array? Memory Management of Array. Introduction to String - Usages, Memory Management of Strings, Operations on String.	11
	Tutorial	15
	Practical	30
	Total Theory + Tutorial+Practical	90

LIST OF PRACTICALS

1. Design a flowchart to perform basic arithmetic operations (addition, subtraction, multiplication, division) between two numbers.
2. Write pseudocode for a calculator that performs arithmetic operations based on user input.
3. Implement a command-line calculator that takes two numbers and an operator as input and prints the result.
4. Create a BMI calculator that accepts height and weight as input and displays BMI and health category.
5. Develop a number guessing game where the program randomly picks a number and the user tries to guess it using hints.
6. Write a program to generate a multiplication table for a number entered by the user.
7. Create a program to find the maximum and minimum value from a list of user-entered numbers.
8. Implement linear search to find whether a given number exists in a list or not.

9. Write a bubble sort program to sort numbers in ascending order and count the number of comparisons made.
10. Demonstrate use of 1D and 2D arrays through sample programs like matrix addition or student score lists.
11. Create a simple login simulation that accepts a username and password and checks for correctness using conditionals.
12. Write and use custom functions for tasks like checking if a number is prime or calculating factorial.
13. Perform string manipulations such as reversing a string, checking for a palindrome, and counting vowels.
14. Translate a basic pseudocode algorithm into block coding using tools like Scratch or Blockly.
15. Write a program to convert a decimal number into binary using loops or recursion.

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	45
Tutorial	15
Practical	30
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	90

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	Yes
Quiz	
Seminars/ Presentation	
Problem Based Learning (PBL)	

Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
-------------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Python Programming for the Absolute Beginner	Michael Dawson
2	Think Like a Programmer	V. Anton Spraul
3	Coding for Beginners in Easy Steps	Mike McGrat

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610315010
Course Title	Environmental Studies for Technology
Semester	I
Type of Course	AEC
Credits	2+0+0
Course Prerequisites	–
Course Objective(s)	1. Implement sustainable computing practices for reduced environmental impact. 2. Utilize data-driven approaches to support biodiversity conservation and ecosystem management. 3. Promote clean energy solutions and recycling practices for sustainable resource management. 4. Harness technology to address environmental challenges and promote awareness. 5. Foster interdisciplinary collaboration to integrate environmental considerations into various fields and promote responsible decision-making.
Course Outcome (CO)	CO1: Understanding Environmental Impacts of Technology CO2: Sustainable Technology Design CO3: Policy and Regulation Knowledge CO4: Resource Management and Conservation CO5: Environmental Ethics and Social Responsibility

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	3	1	2	3	2	2	2	3	2	2
CO2	2	2	3	1	2	3	3	2	2	3	3	2
CO3	1	1	2	1	2	3	3	1	1	3	3	1
CO4	2	1	2	1	2	3	2	1	1	2	2	1
CO5	1	1	2	2	2	3	2	1	1	2	3	2
Avg.	1.6	1.4	2.4	1.2	2.0	3.0	2.4	1.4	1.4	2.6	2.6	1.6

1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Green Computing: Energy-efficient coding practices, Sustainable data centers, Green software development tools, Cloud computing for sustainability, Virtualization techniques for energy savings, Optimization of server cooling systems, Power management software for devices, Renewable energy integration in computing facilities.	7
UNIT II	Data for Nature: Environmental sensor networks, Geospatial analysis software, AI and machine learning in environmental monitoring, Open data initiatives, Remote sensing technologies, Wildlife tracking and conservation databases, Climate modeling and prediction algorithms, Community science platforms for data collection.	7
UNIT III	Clean Energy and Recycling: Software solutions for renewable energy management, Electronic waste tracking systems, Circular economy platforms, Energy-efficient algorithms, Smart grid technologies for energy distribution, Waste-to-energy conversion software, Eco-friendly product design tools, Life Cycle assessment software for products and materials.	8
UNIT IV	Tech for a Greener Future: Blockchain for sustainable supply chains, Virtual reality for environmental education, Cybersecurity for environmental protection, Sustainable software startups, Smart home automation for energy efficiency, Environmental impact assessment tools, Sustainable transportation planning software, Eco-friendly packaging design software.	8
	Total Theory	30

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	30
Practical	
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	

Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	30

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	
Quiz	
Seminars/ Presentation	
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Environmental Studies	Benny Joseph
2	Textbook of Environmental Studies for Undergraduate Courses	Erach Bharucha
3	Green Computing Tools and Techniques	Bud E. Smith

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610316011
Course Title	New Age Life Skills 1
Semester	I
Type of Course	VAC
Credits	1+0+1
Course Prerequisites	–
Course Objective(s)	1. Identify common communication problems that may be holding learners back 2. Perceive what the non-verbal messages are communicating to others 3. Understand the role of communication in the teaching-learning process 4. Learn to communicate through the digital media 5. Understand the importance of empathetic listening 6. Explore communication beyond language
Course Outcome (CO)	CO1: Get a clear understanding of good communication skills. CO2: Know what they can do to improve their communication skills. CO3: Demonstrate the effectiveness of digital marketing for business and using the tools to reach a global audience. CO4: Use nonverbal communication effectively in communication as an aid.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1	1	3	2	1	2	1	1	1	1	3
CO2	1	1	1	3	3	1	2	1	2	1	1	3
CO3	1	3	2	2	2	2	3	3	2	2	3	2
CO4	1	1	1	3	2	1	1	1	1	1	1	3
Avg.	1	1.5	1.25	2.75	2.25	1.25	2	1.5	1.5	1.25	1.5	2.75
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Building Vocabulary: vowel words, words with silent alphabets, Sorting out words, identifying themes/categories, synonyms and antonyms, prefixes and suffixes, multiple-meaning words, context clues, building spellings, idioms, Foundation of Reading: Would this happen in real life, what is the picture about, analysis and inferences (identify the word for the pictures, what will happen next, what/who am I, use actions/words to describe the character), story-reading, describing the characters, beginner level comprehension reading and practice, introduction to informational text.	3
UNIT II	Grammar: Punctuation, Sentence structure, types of sentences, parts of speech: noun, pronoun, verb, adjective, and adverb, articles, prepositions, determinants, conjunctions, subject-verb agreement, contractions, editing & omitting. Listening/Watching: English songs, movies, and web series. Speaking: Greeting each other, Asking basic questions about others, Giving or asking for directions, Individual introduction (Where am I from, my family, relatives, educational background), Making requests for individual needs and necessities.	4
UNIT III	Goal setting, how to dream: Understanding the Importance of Goals, Setting SMART Goals, Creating a Goal Action Plan, Overcoming Challenges and Obstacles, Periodic Review and Adjustments, Unlocking Imagination, Visualization Techniques, Turning Dreams into Goals, Staying Motivated, Sharing Dreams and Goals. Cyber security: Introduction to Cybersecurity, Data Privacy Basics, Common Cyber Threats, Protecting Personal Devices, Online Behavior and Social Media Safety. Group discussion skills: Active Listening, Effective Communication, Respecting Diverse Perspectives, Conflict Resolution, Leadership in Group Discussions	4
UNIT IV	Office Tools: Types of OS, Files and Directories, Windows Operating Environment, Control Panel, Taskbar, Desktop Icons. Working with MS word -Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Toolbars, Ruler, Using Icons, using help, Formatting Documents - Setting Font styles, Font selection- style, size, color etc, Typeface - Bold, Italic, Underline, Case settings, Highlighting,	4

	Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering.	
	Practical	30
	Total Theory + Practical	45

LIST OF PRACTICALS

1. Play a vocabulary game where you group words and find their synonyms or antonyms.
2. Join a spelling bee that includes tricky words with silent letters and homophones.
3. Read a short story and then retell it in your own words, focusing on characters and what happened.
4. Make your own mini-dictionary with new idioms and words that have more than one meaning.
5. Do a roleplay where you practice giving and asking for directions clearly.
6. Prepare and speak about yourself in a short self-introduction activity.
7. Practice gestures and body language in a mirror activity to understand non-verbal communication.
8. Watch a short English video and discuss what it means with your classmates.
9. Take part in a mock interview with a friend and give each other feedback.
10. Write and send a formal email to a teacher or imaginary employer using correct format.
11. Open a document in Google Docs or LibreOffice Writer, type something, save it, and format the text (bold, italic, headings).
12. Insert a picture or table in your Google Doc or LibreOffice file and format it neatly.
13. Try an editing challenge: use undo/redo, find and replace, and apply different text styles.
14. Share a Google Doc with a classmate or use LibreOffice on a shared computer and work on it together.
15. Work in a group to create a flyer or newsletter in Google Docs or LibreOffice for an upcoming event or awareness campaign.

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	15
Practical	30
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	45

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	Yes
Quiz	
Seminars/ Presentation	
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
-------------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Soft Skills: Enhancing Employability	M. S. Rao
2	Personality Development and Soft Skills	Barun K. Mitra
3	The 7 Habits of Highly Effective People	Stephen R. Covey

SEMESTER-2

Course Type	Course Code	Course Title
DSC	0610321041	Problem Solving and Programming Fundamentals 2
DSC	0610321050	Agile Software Development Life Cycle
DSC	0610321061	Web Development Frontend 1- HTML-CSS
VAC	0610326021	New Age Life Skills 2
SEC	0610324010	Introduction to Generative AI

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610321041
Course Title	Problem Solving and Programming Fundamentals 2
Semester	II
Type of Course	DSC
Credits	3+1+1
Course Prerequisites	–
Course Objective(s)	1. Learning Higher level programming concepts 2. Applying different programming algorithmics for various problem statements. 3. Write optimized, efficient, and quality code
Course Outcome (CO)	CO1: Apply programming paradigms like recursion, Greedy algo CO2: Implement Data Structure Library of Map and OOPS concepts CO3: Analyze the time and space complexity of algorithms to evaluate their efficiency in solving computational problems. CO4: Design and implement advanced data structures like trees, graphs, and heaps for optimized problem-solving in real-world applications.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	1	2	1	1	3	3	2	2	2
CO2	3	3	2	1	2	1	1	3	3	2	2	2
CO3	3	2	2	1	2	1	1	3	3	2	2	2
CO4	3	3	2	2	2	1	2	3	3	2	2	2
Avg.	3	2.5	2	1.25	2	1	1.25	3	3	2	2	2
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Introduction to Dynamic Data Structure: ArrayList, Operations on ArrayList: Add: Insert an element at the end of the list, Remove: Remove an element by its index or the element itself, Access: Get the element at a specific index (position) in the list. Problem-Solving Techniques: Recursion - Definition, Base Case, Recursive Case, Examples. Backtracking - Definition, Example: Finding all paths through a maze. Applying Problem-Solving Techniques: Recursion in Arrays, Get Subsequence, Target Sum Subsets.	12
UNIT II	Basics of time and space complexity: Asymptotic notation (big O, big omega, big theta), Common algorithms and data structures (e.g., sorting, searching), Implement sorting and searching algorithms and compare their runtime complexity and algorithm analysis (e.g., time complexity, space complexity).	11
UNIT III	Method for handling data structures: LIFO (Last In, First Out) and FIFO (First In, First Out). Principle analogy of a stack, Principle analogy of a queue. Intermediate level data structures: Linked Lists and their types: Singly linked lists, Doubly linked lists, Circular linked lists; Generic Tree, Binary Tree, Binary Search Tree.	11
UNIT IV	Object-oriented programming system and Key Value Pair : Introduction to OOPS, Introduction to Map, Highest Frequency Character, Highest Frequency Character, Heap, object-oriented programming system.	11
	Tutorial	15

	Practical	30
	Total Theory +Tutorial+ Practical	90

LIST OF PRACTICALS

1. Write a program using recursion to calculate the factorial of a number and generate the Fibonacci sequence.
2. Solve a problem using backtracking, such as the subset sum or finding a path through a maze.
3. Create a program using ArrayList and Map to store and display student records or product details.
4. Implement binary search to find an element in a sorted list.
5. Compare binary search and linear search by measuring their performance on large lists.
6. Implement sorting algorithms like selection sort and quick sort to arrange numbers in ascending order.
7. Create a linked list with insert and delete operations, and display the updated list after each operation.
8. Implement a stack using arrays or a linked list and perform push, pop, and peek operations.
9. Create a queue and a circular queue, and demonstrate enqueue, dequeue, and display functions.
10. Build a binary tree and write functions for inorder, preorder, and postorder traversal.
11. Create a graph using either an adjacency list or matrix and print its connections.
12. Use a heap structure to find the k-largest or k-smallest numbers in a list.
13. Implement object-oriented programming concepts like class, object, and inheritance in a sample program.
14. Build a mini project that combines OOP concepts with data structures (e.g., library system, student portal).
15. Write code examples to analyze time complexity and understand Big O notation through practice.

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	45
Tutorials	15
Practical	30
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	

Revision	
Others If any:	
Total Number of Contact Hours	90

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	
Quiz	Yes
Seminars/ Presentation	Yes
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
-------------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Think Python: How to Think Like a Computer Scientist	Allen B. Downey
2	Automate the Boring Stuff with Python	Al Sweigart
3	Python Programming: An Introduction to Computer Science	John Zelle

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610321050
Course Title	Agile Software Development Life cycle
Semester	II
Type of Course	DSC
Credits	3+1+0
Course Prerequisites	–
Course Objective(s)	1. Modern Skills: Agile is the industry standard for software development, preparing students for real-world practices. 2. Teamwork Prowess: Agile emphasizes collaboration, a vital skill for successful software projects. 3. Adaptable to Change: Software requirements often evolve - Agile teaches students to be flexible and adjust. 4. Lifelong Learning: Agile promotes continuous improvement, a valuable mindset for any software engineer.
Course Outcome (CO)	CO1: Agile Methodology Fluency: Students gain a solid understanding of various Agile methodologies like Scrum and Kanban, allowing them to effectively participate in Agile projects. CO2: Project Management: They learn essential Agile project management skills, including user story estimation, backlog management, and tracking progress through tools and techniques. CO3: Collaboration and Communication: Agile practices emphasize teamwork and communication, equipping students with the ability to collaborate effectively with diverse stakeholders. CO4: Adaptability: Agile embraces change, and through this learning, students acquire the skills to adapt to evolving requirements and unexpected challenges throughout the development process.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	2	1	2	1	2	2	1	2	2	2
CO2	1	3	2	2	2	1	3	2	2	2	3	2
CO3	1	2	2	3	2	2	2	2	2	2	2	3
CO4	2	2	2	2	3	2	2	2	3	2	2	2
Avg.	1.5	2.25	2	2	2.25	1.5	2.25	2	2	2	2.25	2.25

1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Introduction to Agile and Traditional SDLC: Waterfall model, Agile Manifesto, values (individuals & interactions, working software, collaboration & response to change), principles, benefits (faster feedback, adaptability, motivation).	12
UNIT II	Agile Methodologies and Practices: Scrum, Kanban, Extreme Programming (XP), user stories, sprint planning, daily stand-ups, sprint reviews, retrospectives, Product Owner, Scrum Master, Development Team, roles, responsibilities, and interactions.	12
UNIT III	Implementing Agile in Practice: User story estimation, backlog management, velocity tracking, project management, testing, quality assurance, continuous integration (CI), continuous delivery (CD), Agile tools, project boards, communication platforms, code repositories.	12
UNIT IV	Case studies: Real-life examples of companies using Agile successfully	9
	Tutorial	15
	Total Theory + Tutorial	60

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	45
Tutorials	15
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	60

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	Yes
Quiz	
Seminars/ Presentation	Yes
Problem Based Learning (PBL)	Yes
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
-------------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Agile Software Development: Principles, Patterns, and Practices	Robert C. Martin
2	Scrum: The Art of Doing Twice the Work in Half the Time	Jeff Sutherland
3	The Agile Samurai	Jonathan Rasmusson

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610321061
Course Title	Web Development Frontend 1 - HTML CSS
Semester	II
Type of Course	DSC
Credits	2+1+2
Course Prerequisites	–
Course Objective(s)	1. Foundational Building Blocks: Introduce the fundamental building blocks of web development, including HTML for structuring content and CSS for styling the visual presentation. 2. Interactive Elements: Equip students with the ability to create interactive web pages using basic HTML elements like forms, buttons, and links. 3. Visual Design and Layout: Enable students to understand and apply CSS properties to control the layout, appearance, and responsiveness of web pages across different devices. 4. Version Control and Collaboration: Introduce the concept of version control using Git and GitHub, allowing students to effectively manage code changes, collaborate with others, and track project history.
Course Outcome (CO)	CO1: Solid understanding of web development fundamentals: Students gain a firm grasp of the core concepts of building web pages, including HTML structure and CSS styling. CO2: Ability to create basic interactive web experiences: They can build functional websites with basic user interactions, forms, and navigation elements. CO3: Effective visual design skills: Students can apply CSS to control the layout, appearance, and responsiveness of their web pages, ensuring a visually appealing user experience. CO4: Proficiency in version control and collaboration: They can effectively utilize Git and GitHub to manage code versions, collaborate with others on projects, and track code history, laying the foundation for future development endeavors.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	1	2	1	1	3	2	1	1	2
CO2	3	3	1	2	2	1	1	3	3	1	2	2
CO3	2	2	1	2	2	2	1	2	2	1	1	2
CO4	2	3	1	3	2	1	2	2	2	1	2	3
Avg.	25	2.5	1	2	2	1.25	1.25	2.5	2.25	1	1.5	2.25

1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Fundamentals of Web Development and Basic HTML: Introduction to HTML and Web Development, Understanding the Internet, Browser, and the World Wide Web, The Role of Web Developers, Web Development Tools and Environments, HTML (Hypertext Markup Language), Structure of HTML Documents, HTML Elements and Tags, Creating Links and Anchors, Working with Forms and Input Elements	7
UNIT II	Cascading Style Sheets (CSS) Basics: Introduction to CSS, CSS Selectors and Properties, Styling Text (Font properties, Text alignment, Text decoration, Text transformation), Styling Colors and Backgrounds (Color property, Background color, Background image, Background repeat, Background position), Box Model Basics (Margin, Border, Padding, Width, Height), Introduction to Layout (Block-level vs Inline elements, Display property, Floats), Positioning Basics (Static, Relative, Absolute, Fixed), Introduction to Responsive Design (Viewport meta tag, Media queries, Fluid layouts).	7
UNIT III	Advanced CSS Concepts: Flexbox Layout, Advanced Selectors and Pseudo-classes, Transitions and Animations, Responsive Images and Media Queries, Typography and Web Fonts, CSS Preprocessors (e.g., Sass, Less), Cross-Browser Compatibility and Vendor Prefixes, Performance Optimization Techniques.	8
UNIT IV	Git & Github: Git basics (repositories, commits, branches, merges, staging), GitHub features (repositories, issues, pull requests, collaboration tools), working with remote repositories, branching/merging, collaborative development on GitHub	8

	(forking, pull requests, code reviews), GitHub workflows, and best practices/tips for effective Git/GitHub usage (commit messages, branching strategies, repository organization, pitfalls).	
	Tutorial	15
	Practical	60
	Total Theory +Tutorial+ Practical	105

LIST OF PRACTICALS

1. Create your personal profile web page using HTML with sections like introduction, hobbies, and goals.
2. Build a simple landing page for a restaurant that includes the name, menu, images, and contact details.
3. Design a portfolio or resume website with sections for education, projects, and contact info.
4. Add a contact form to your site using different input types like text, email, and radio buttons.
5. Style a navigation bar using CSS, including horizontal links and hover effects.
6. Use Flexbox to create a responsive layout with a header, sidebar, and main content area.
7. Add media queries to make your webpage look good on mobile, tablet, and desktop.
8. Create a pricing table using CSS Grid with columns for Basic, Standard, and Premium plans.
9. Add smooth transitions and hover effects to buttons and images using CSS.
10. Use Google Fonts and external CSS stylesheets to improve typography and design consistency.
11. Create a styled HTML table for showing data like schedules, scores, or bookings using CSS.
12. Design a homepage for a Learning Management System (LMS) with sections like dashboard, courses, and announcements.
13. Create an image gallery with thumbnails, hover effects, and lightbox-style layout.
14. Practice version control by pushing your website code to a GitHub repository.
15. Collaborate with classmates on GitHub using branches, pull requests, and merge approvals.

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	30
Tutorial	15
Practical	60
Seminar/Journal Club	
Small group discussion (SGD)	

Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	105

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	
Quiz	
Seminars/ Presentation	
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Books	Author
1	HTML and CSS: Design and Build Websites	Jon Duckett
2	Learning Web Design	Jennifer Robbins
3	CSS: The Definitive Guide	Eric A. Meyer

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610326021
Course Title	New Age Life Skills 2
Semester	II
Type of Course	VAC
Credits	1+1+1
Course Prerequisites	–
Course Objective(s)	1. Identify common communication problems that may be holding learners back 2. Perceive what the non-verbal messages are communicating to others 3. Understand the role of communication in the teaching-learning process 4. Learn to communicate through the digital media 5. Understand the importance of empathetic listening 6. Explore communication beyond language
Course Outcome (CO)	CO1: Understand the fundamentals of effective communication, including verbal and non-verbal techniques. CO2: Identify areas for self-improvement and apply strategies to enhance communication skills such as active listening and confident speaking. CO3: Apply nonverbal communication effectively to support and enhance verbal interactions. CO4: Demonstrate the use and impact of digital marketing tools in business communication to reach a global audience.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1	1	3	2	2	1	1	1	1	1	3
CO2	1	1	2	3	3	2	2	1	2	2	2	3
CO3	1	1	2	3	2	2	2	1	2	1	2	3
CO4	2	2	2	3	3	2	3	2	2	3	3	3
Avg.	1.25	1.25	1.75	3	2.5	2	2	1.25	1.75	1.75	2	3
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	Reading Strategies: Main theme of the text/passage, Author's purpose of the text, text structure, point of view text, inferences from the text, introduction to the fictional, literary, and social text, Character sketch, intermediate/advanced comprehension passage practice. Grammar: Tenses, Direct and indirect Speech, Active and passive, editing and omitting. Listening: Audio-based assignments, and audio-passages, podcasts, talk shows with assignments, exercises. Watching: Documentaries. Writing: Developing coherent paragraphs, writing short essays on a topic, and descriptive writing. Speaking: Delivering speech and presentations, beginner/intermediate level interactions in English with an individual, Making enquiries related to a topic/need/situation, expressing opinions, agreements, and disagreements.	3
UNIT II	Critical thinking and design thinking: Critical Evaluation and Problem Solving, Creative Solutions, Analyzing information objectively, Identifying key factors and variables, Defining the problem clearly, Generating alternative solutions, Thinking outside the box, Encouraging innovation in problem-solving. Gender: Unlearning Gender Roles and Stereotypes, Understanding Choice and Agency, Consent and LGBTQIA+, Recognizing and challenging societal expectations, Promoting equality and inclusivity, Empowering individuals to make autonomous decisions, Recognizing the impact of personal choices, Respecting boundaries and consent, Creating an inclusive environment for LGBTQIA+ individuals.	4
UNIT III	Food and Nutrition: Informed and Healthier Food Choices, Positive Eating Behaviors, Overall Well-being through Nutrition, Providing information on nutritional values, Encouraging mindful eating, Promoting a balanced and varied diet, Addressing emotional eating habits, Connecting nutrition to physical and mental well-being, Creating sustainable and healthy eating habits Financial literacy: Different Components of Financial Literacy, Managing Finances, Healthy Relationship with Money, Basics of budgeting, saving, and investing, Credit and debt management, Creating a personal budget, Setting financial goals and priorities, Fostering a positive mindset towards finances, Balancing spending and saving habits	4

UNIT IV	Office Tools: Setting Page style -Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & endnotes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, PageNumbering, date & Time, Author etc., Creating Master Documents, Web page. Creating Tables- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, Drawing - Inserting ClipArts, Pictures/Files etc., Tools – Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes. Page layout & view.	4
	Tutorial	15
	Practical	30
	Total Theory + Tutorial + Practical	60

LIST OF PRACTICALS

1. Listen to a podcast or talk show and write a short summary highlighting the main points and your reflections.
2. Write a paragraph on a given topic or prompt such as your hobby, your favorite place, or a life lesson.
3. Write a short essay on a topic like your favorite movie, an inspiring person, or a current event.
4. Prepare and deliver a 2-minute presentation using visual aids like slides, posters, or charts.
5. Participate in an enquiry roleplay where you practice making and responding to polite requests.
6. Join a classroom debate and take a clear position on a topic, supporting it with reasons and examples.
7. Take part in a gender awareness activity by discussing real-life scenarios and how to respond respectfully.
8. Join a 1-hour design thinking challenge in teams to solve a creative or real-world problem.
9. Track your meals for one week in a food diary and write a reflection about your eating habits.
10. Create a monthly budget using a spreadsheet tool to track your income, expenses, and savings.
11. Participate in a mock investment challenge by selecting virtual stocks or mutual funds and tracking their progress.
12. Format a digital document by adding section breaks, headers, footers, and a table of contents.
13. Use mail merge to generate personalized certificates, letters, or event invites from a data source.

14. Create a master document by combining smaller documents or chapters into one formatted file.
15. Design a professional report or newsletter using formatting tools, visuals, and proper layout structure.

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	15
Tutorials	15
Practical	30
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	60

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	Yes
Quiz	Yes
Seminars/ Presentation	Yes
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Emotional Intelligence	Daniel Goleman
2	Critical Thinking	Richard Paul & Linda Elder
3	The Design Thinking Playbook	Michael Lewrick, Patrick Link, Larry Leifer

Name of the College	Akal College of Engineering and Technology
Name of the Program	BCA (Hons. with Research)
Course Code	0610324010
Course Title	Introduction to Generative AI
Semester	II
Type of Course	SEC
Credits	4+1+0
Course Prerequisites	–
Course Objective(s)	1. Understand the fundamentals of AI technologies and their applications in various industries. 2. Learn to identify opportunities to leverage AI solutions to solve problems within your organization. 3. Gain insights into the capabilities and limitations of current AI technologies. 4. Explore the societal impact of AI and learn strategies to navigate through technological changes. 5. Develop a sustainable AI strategy tailored to your business needs, whether you're a non-technical professional or a machine learning expert.
Course Outcome (CO)	CO1: Gain a comprehensive understanding of AI technologies and their practical applications across various industries. CO2: Identify opportunities within your organization to leverage AI solutions effectively to address challenges and optimize processes. CO3: Develop a nuanced understanding of the capabilities and limitations of contemporary AI, enabling informed decision-making. CO4: Recognize the societal implications of AI and acquire strategies to navigate through the impacts of technological advancements.

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	2	2	3	3	2	3	2	2
CO1	2	3	2	2	3	2	2	2	3	2	3	2
CO1	3	2	3	2	2	2	3	3	3	3	2	2
CO1	2	2	3	3	3	3	2	2	2	2	2	3
Avg.	2.5	2.25	2.75	2.25	2.5	2.25	2.5	2.5	2.5	2.5	2.25	2.25
1: Weak Correlation, 2: Moderate Correlation; 3: Strong Correlation												

SYLLABUS

UNIT(S)	COURSE CONTENT	LECTURES
UNIT I	What is AI: Introduction, Machine Learning, What is data, The terminology of AI, What makes an AI company?, What Machine Learning can and cannot do, Intuitive explanation of deep learning	15
UNIT II	Building AI Projects: Workflow of a Machine Learning project, Workflow of a Data Science project, Every job function needs to learn to use data, How to choose an AI project, Working with an AI team, Technical tools for AI teams.	15
UNIT III	AI in Your Company: Case study: Smart speaker, Case study: Self-driving car, Example roles of an AI team, AI Transformation Playbook, AI pitfalls to avoid, Taking your first step in AI, Survey of major AI applications, Survey of major AI techniques.	15
UNIT IV	AI and Society: A realistic view of AI, Discrimination / Bias, Adversarial attacks, Adverse uses, AI and developing nations, AI and jobs, Conclusion.	15
	Tutorial	15
	Total Theory + Tutorial	75

LEARNING STRATEGIES AND CONTACT HOURS

Learning Strategies	Contact Hours
Lecture	60
Tutorial	15
Seminar/Journal Club	
Small group discussion (SGD)	
Self-directed learning (SDL) / Tutorial	
Problem Based Learning (PBL)	
Case/Project Based Learning (CBL)	
Revision	
Others If any:	
Total Number of Contact Hours	75

ASSESSMENT METHODS

Formative	Summative
Multiple Choice Questions (MCQ)	
Viva-voce	
Quiz	Yes
Seminars/ Presentation	Yes
Problem Based Learning (PBL)	
Journal Club	
Professional Activity	
Assignment	Yes
End Term Practical Examination	University Examination
End Term Semester Examination	University Examination

FEEDBACK PROCESS

Feedback Process	Student's Feedback
-------------------------	--------------------

RECOMMENDED BOOKS

Sr. No.	Book Title	Author(s)
1	Deep Learning with Python	François Chollet
2	Artificial Intelligence: A Modern Approach	Stuart Russell & Peter Norvig (for foundational understanding)
3	AI for Everyone (Coursera companion)	Andrew Ng (Online + Notes)