

SAKET GYANPEETH
SAKET COLLEGE OF ARTS, SCIENCE AND COMMERCE KALYAN EAST
DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTCOMES (COs)
F.Y.B.SC (C.S.) SEM-I

1. DIGITAL SYSTEM AND ARCHITECTURE (02)	
1	Learn how number system and codes are useful in computer system design.
2	Learn how Flip Flops are useful in memory design and data communication through CPU and Memory and I/O devices.
3	Learn about basics of instruction sets and its types.
4	Learn about Processor Internal Architecture and Design
2. FUNDAMENTALS OF DATABASE SYSTEMS (02)	
1	To appreciate the importance of database design.
2	Analyze database requirements and determine the entities involved in the system and their relationship to one another.
3	Write simple queries to MySQL related to String, Maths and Date Functions.
4	Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands.
5	Handle data permissions.
6	Create indexes and understands the role of Indexes in optimization search.
3. COMPUTER SCIENCE PRACTICAL 1 (02)	
1	Verify truth tables of various logic gates
2	Simplify given Boolean expressions and implement them using Logisim
3	Design and validate the operation of various combinational circuits using Logisim.
4	Design and implement expressions using multiplexers/demultiplexers in Logisim
5	Create and maintain relational databases, applying normalization principles.
6	Write simple queries to MySQL related to String, Maths and Date Functions.
7	Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands.
8	Handle data permissions.
4. INTRODUCTION TO PROGRAMMING WITH PYTHON (02)	
1	Apply Python features for diverse programming tasks confidently.
2	Implement control flow statements for precise program execution
3	Manipulate arrays, strings, and data structures with precision and ease.
4	Create modular, efficient code using functions, modules, and strings.
5	Skillfully manage files, utilize regular expressions, and work with date and time for program efficiency.
5. LINUX OPERATING SYSTEM (02)	
1	Work with Linux file system structure, Linux Environment.
2	Handle shell commands for scripting, with features of regular expressions, redirections.
3	Implement file security permissions.
4	Work with vi, sed and awk editors for shell scripting using various control structures.

5	Install software like compilers and develop programs in C and Python programming languages on Linux Platform.
6. INTRODUCTION TO COMMUNICATION SKILLS IN ENGLISH I (02)	
1	Demonstrate an understanding of essential aspects of communication skills.
2	Exhibit the ability to Read a variety of written text using subskills such as skimming and scanning.
3	Identify and rectify common grammatical errors in English.
4	Show competence in delivering compelling presentations and engage in articulate and effective conversations in English across different contexts.
5	Display advanced formal writing skills in crafting job application letters, CVs, and Statements of Purpose.
7. LAW RELATED TO INTELLECTUAL PROPERTY RIGHTS (02)	
1	Learners will be able to study development and reform of intellectual property right institutions and their impact on creativity and innovation.
2	Learners will be able to critically analyze the principles of Tortious liability, develop familiarization of process of Intellectual Property Management (IPM) and various approaches for IPM and conducting IP and IPM auditing and explain how IP can be managed as a strategic resource and suggest IPM strategy
3	Learners will be well equipped with the expensive characteristics of judicial trend related to IPR and the remedies provided under the mechanism set up by the Government Convention of IPR
8. INDIAN KNOWLEDGE SYSTEM (02)	
1	Learner will understand and appreciate the rich Indian Knowledge Tradition
2	Lerner will understand the contribution of Indians in various fields
3	Lerner will experience increase subject-awareness and self-esteem
4	Lerner will develop a comprehensive understanding of how all knowledge is ultimately intertwined
9. INTRODUCTION TO CULTURAL ACTIVITIES (02)	
1	Understand the significance of cultural activities
2	Sensitize students towards Indian culture and its preservation
3	Apply the knowledge and skills of the cultural activities in their practical life
4	Participate in the various cultural activities
10. INTRODUCTION TO COMMERCE (2)	
1	Develop understanding about Commerce and Business
2	Help understand the different forms of Business Organisations
3	Help understand the Business Environment
4	Understand the recent trends in Commerce
11. BASICS OF FINTECH (2)	
1	Student will demonstrate a comprehensive understanding of the FinTech ecosystem, including fintech infrastructure and fintech evolution.

2	Student will evaluate the impact of FinTech innovations on traditional financial services, identifying opportunities and challenges of the industry.
3	Student will apply FinTech concepts and technologies to address real-world financial challenges and opportunities.

DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTCOMES (COs)
S.Y.B.SC (C.S.) SEM-III

1. PRINCIPLES OF OPERATING SYSTEMS (02)	
1	Work with any type of operating system
2	Handle threads, processes, process synchronization.
3	Implement CPU scheduling algorithms
4	Understand the background role of memory management
5	Design file system
2. THEORY OF COMPUTATION (02)	
1	Describe the fundamental concepts and significance of Theory of Computation in Computer Science.
2	Design deterministic and non-deterministic finite automata for regular languages and prove their equivalence
3	Construct context-free grammars and analyse their ambiguity, simplification, and normal forms.
4	Differentiate between complexity classes such as P, NP, NP-Complete, and NP-Hard problems.
5	Identify and analyze undecidable problems.
3. DATA STRUCTURES (02)	
1	Define and implement various data structures using Abstract Data Types (ADTs) and understand their classifications and use cases.
2	Apply operations on linked lists, including traversal, insertion, deletion, and use them in practical applications like polynomial manipulations
3	Implement stack and queue operations with array and linked representations, and apply them in real-world scenarios like delimiter checking and scheduling.
4	Design and traverse tree structures including binary trees, BSTs, AVL trees, and understand their applications in encoding and searching.
5	Implement graph structures, perform traversals using BFS and DFS, and solve shortest path and connectivity problems.
6	Use heaps and hashing techniques effectively for priority management, efficient searching, and collision handling in various applications.
4. COMPUTER SCIENCE PRACTICAL 3 (02)	
1	Design and implement solutions using inter-process communication techniques such as shared memory and message passing.
2	Apply multithreading, synchronization mechanisms, and scheduling algorithms to solve operating system-related problems.
3	Construct and manipulate linear and non-linear data structures using custom implementations.
4	Demonstrate effective use of stack, queue, trees, graphs, and hash tables in algorithm development
5	Analyze and evaluate the performance of memory and disk management techniques and abstract data operations

6	Apply practical programming knowledge to develop efficient, real-time, and scalable system-level applications.
5. JAVA PROGRAMMING (02)	
1	Apply object-oriented programming concepts to develop efficient and maintainable Java applications.
2	Implement exception handling and multithreading to build robust and concurrent programs.
3	Use Java Collection Framework to store, manipulate, and retrieve data effectively.
4	Connect Java applications with databases using JDBC and perform CRUD operations.
5	Develop dynamic, session-managed web applications using Servlets and JSP.
6. OPERATION RESEARCH-I (02)	
1	Optimize the cost, time profit or loss through Linear Programming Problem
2	Make best transportation schedule with minimum cost and to maximize profit
3	Optimal allocation or assignment of Jobs to machines
7. PRACTICAL'S BASED ON OPERATIONS RESEARCH –I (02)	
1	Optimize the cost, time profit or loss through Linear Programming Problem
2	Make best transportation schedule with minimum cost and to maximize profit
3	Optimal allocation or assignment of Jobs to machines
8. FINANCIAL LITERACY (02)	
1	Learners will develop proficiency for personal and family financial planning.
2	Learners will develop the ability to analyse banking and insurance products.
3	Learners will Apply the concept of investment planning.
9. हिंदी भाषा व्यवहारिक प्रयोग (02)	
1	विद्यार्थियों को राजभाषा हिंदी का ज्ञान प्राप्त होगा, एवं दक्षता प्राप्त होगी।
2	विद्यार्थियों को राजभाषा हिंदी के व्याकरणिक प्रयोग की जानकारी प्राप्त होगी।
3	विद्यार्थियों को हिंदी-संज्ञा आदि का ज्ञान प्राप्त होने के साथ भाषा के शुद्ध, व्यावहारिक रूप का ज्ञान होगा।
4	विद्यार्थियों को कारकों, वाक्य रचना एवं भाषिक चिह्नों आदि का ज्ञान प्राप्त होगा।
10. INDIAN THEATRE: CLASSICAL ROOTS AND CONTEMPORARY EXPRESSIONS (02)	
1	Describe the historical and cultural development of Indian theatre across different time periods.
2	Interpret and apply the aesthetic principles from Natyashastra (such as Rasa and Abhinaya) in the analysis of theatrical performances
3	Critically evaluate classical Indian plays for their structure, themes, character development, and historical significance
4	Demonstrate understanding of street theatre and one-act plays by creating outlines or performing excerpts reflecting real-world issues.
5	Reflect on the role of performing arts in cultural preservation, education, and community engagement.
11. FIELD PROJECT (02)	

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DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTCOMES (COs)
T.Y.B.SC (C.S.) SEM V

1. ARTIFICIAL INTELLIGENCE (02)	
1	Demonstrate knowledge of the foundations and key concepts in the field of AI.
2	Analyze and design intelligent agents for specific environments.
3	Apply problem-solving techniques and algorithms to find solutions to different types of problems.
4	Construct knowledge representation models and use reasoning techniques to derive new knowledge.
5	Implement machine-learning algorithms and evaluate their performance for classification and regression tasks.
2. INFORMATION & NETWORK SECURITY (02)	
1	Analyze and evaluate security trends, attacks, and mechanisms, and propose effective security solutions based on the OSI security architecture.
2	Apply classical encryption techniques, such as substitution and transposition ciphers, to encrypt and decrypt messages and analyze their security implications.
3	Implement public-key cryptography algorithms, including RSA, and demonstrate the ability to securely exchange keys and establish secure communication channels.
4	Design and implement secure authentication mechanisms, including message authentication codes and digital signatures, to ensure data integrity and non-repudiation.
5	Evaluate and implement various security measures, such as IP security, web security protocols (e.g., SSL/TLS), intrusion detection systems, and firewall configurations, to protect networks and systems from unauthorized access and attacks.
3. SOFTWARE TESTING & QUALITY ASSURANCE (02)	
1	Explain the importance of software testing and its impact on software quality.
2	Apply appropriate software testing techniques to identify and mitigate software defects.
3	Design and execute test cases to verify the functionality and performance of software systems.
4	Understand the principles of verification and validation and their application in software testing.
5	Utilize software testing tools and frameworks to automate testing processes and improve efficiency.
4. CYBER FORENSICS (02)	
1	Demonstrate a solid understanding of the principles and techniques used in computer forensics investigations.
2	Apply systematic approaches to acquire, preserve, and analyze digital evidence from various sources.
3	Utilize specialized tools and software for conducting effective computer forensics analysis.
4	Develop strong skills in investigating network-related incidents, including live acquisitions and network forensics.

5	Generate comprehensive and well-written reports that accurately document the findings of computer forensic investigations.
5. PROJECT MANAGAMENT (02)	
1	Apply project management principles, processes, and best practices to plan, execute, and control projects effectively.
2	Develop project charters, define project scopes, and create work breakdown structures (WBS) to establish project objectives and deliverables.
3	Create project schedules, estimate resource requirements, and monitor project progress using appropriate project management techniques.
4	Employ quality assurance and control measures to ensure project deliverables meet stakeholder expectations and industry standards.
5	Demonstrate effective leadership and teamwork skills, as well as the ability to manage stakeholders, resolve conflicts, and make ethical decisions in project management settings.

DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTCOMES (COs)
F.Y.BSC (CS) SEM-II

1. DESIGN AND ANALYSIS OF ALGORITHMS MAJOR(2)	
1	Students should be able to understand and evaluate efficiency of the programs that they write based on performance of the algorithms used. need
2	Students should be able to appreciate the use of various data structures as per
3	To select, decide and apply appropriate design principle by understanding the requirements of any real life problems.
2. INTRODUCTION TO OOP USING C++ MAJOR(2)	
1	The learner will be able to understand, remember, demonstrate, explain and describe concept of OOP
2	The learner will be able to design UML based diagrams
3	The learner will be able to illustrate the different types of control statements in C++
4	The learner will be able to analyze and implement concept of OOP
5	The learner will be able to write and create programs relating to OOP concepts
3. Computer Science Practical 2 (MAJOR-2)	
1	Design and implement algorithms for various problem domains.
2	Evaluate and compare the time and space complexities of algorithms
3	Apply divide and conquer strategies to solve computational problems
4	Utilize dynamic programming techniques for optimization problems
5	Implement and analyze algorithms based on greedy strategies
6	Design and implement classes and objects in C++.
7	Apply inheritance and polymorphism concepts in program development
8	Implement operator overloading for enhanced class functionality.
9	Utilize advanced features like friend functions, inline functions, and this pointer.
10	Understand the impact of scope specifiers on class members.
4. Web Technologies (VSE-2)	
1	Design valid, well-formed, scalable, and meaningful pages using emerging technologies.
2	Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites
3	Develop and implement Database Driven Websites.
4	Develop and implement client-side and server-side scripting language programs.
5	Design and apply XML to create a markup language for data and document centric applications

5. STATISTICAL METHOD-II (MAJOR-2)	
1	Explain the continuous probability distributions such as Uniform, Exponential, Normal distributions and apply to real life applications
2	Compute mean, variance and standard deviations for continuous probability distributions.
3	Apply testing of hypothesis technique to solve statistical problems
6. ADVANCED PYTHON PROGRAMMING(SE-2)	
1	Demonstrate comprehensive OOPs proficiency, apply principles effectively.
2	Develop efficient, reusable classes, successfully transfer members
3	Ability to implement inheritance and apply advanced polymorphism
4	Ability to implement abstract classes, demonstrate flexibility through interfaces.
5	Ability to thread creation, synchronization, and effective deadlock resolution.
7. INTRODUCTION TO INSURANCE	
1	Learn the terminologies related to insurance.
2	Learn various insurance products in the market.
3	Learners identify personal need and learn insurance planning.
8. ENVIRONMENTAL MANAGEMENT & SUSTAINABLE DEVELOPMENT -I(02)	
1	Use principles of Environmental Science for explaining sustainable development and its related ethical concerns
2	Display scientific perspective for issues confronting our present-day environment.
3	Analyze the national and global environmental issues relating air, water, soil, and land use, biodiversity, and pollution.
4	Explain the Role of an individual in relation to human population and environmental pollution.
9. हिन्दी भाषा : कौशल के आधार	
1	विद्यार्थियों को लेखन एवं वाचन कौशल का ज्ञान प्राप्त होगा तथा उनकी मौलिक अभिव्यक्ति में सुधार आएगा।
2	विद्यार्थियों का मानसिक विकास होगा तथा पठन-शक्ति एवं लेखन शैली का विकास होगा।
3	विद्यार्थियों में लेखन एवं भाषण कौशल के माध्यम से भाषाई दक्षता एवं शैलीगत समझ विकसित होगी तथा विशेषज्ञता आएगी।
4	विद्यार्थियों को लेखन, वाचन, श्रवण एवं भाषण कौशल की विशेषताओं एवं उपयोगिता का ज्ञान प्राप्त होगा।
10. FOUNDATION AND EXPLORATION OF PERFORMING FINE ARTS	
1	Identify and trace the historical evolution of Indian performing and fine arts.
2	Analyze the transition from traditional to modern art forms in performing arts.
3	Identify and describe a range of career paths in the fine and performing arts.

11. PRINCIPAL AND PRACTICES OF MANAGEMENT	
1	The learner will understand concept of management
2	The learner will Management functions

DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTCOMES (COs) AND LEARNING OUTCOME (LOs)
S.Y.BSC (CS) SEM-IV

1. COMPUTER NETWORKS (MAJOR-2)	
1	Describe network architectures, types, models, and the layered approach in data communication
2	Analyze the working of physical and data link layers including signal transmission, media, error detection and MAC protocols
3	Explain the role of switching techniques and multiplexing in efficient communication.
4	Configure and evaluate IPv4/IPv6 addressing schemes and understand packet forwarding and routing algorithms.
5	Compare and contrast TCP, UDP, and SCTP protocols and apply them to real-time applications.
6	Use knowledge of application layer protocols (HTTP, FTP, Email, DNS,etc.) to understand client-server interactions.
7	Assess Quality of Service (QoS) requirements and identify modern network challenges and solutions like 5G, satellite, and secure communication.
2. SOFTWARE ENGINEERING (MAJOR-2)	
1	Explain software process models and apply suitable models to project scenarios.
2	Analyze software requirements and create UML-based system models.
3	Apply design principles and estimation techniques for software development.
4	Plan, schedule, and manage software projects effectively using industry practices.
5	Demonstrate understanding of quality assurance and perform software testing using appropriate methods.
3. IOT TECHNOLOGIES (MAJOR-2)	
1	Understand the core concepts, design, and architecture of IoT systems.
2	Identify and use various sensors, actuators, and IoT development boards like Raspberry Pi, Arduino, and NodeMCU
3	Apply appropriate protocols for communication and ensure secure data exchange
4	Design simple IoT applications involving data collection, processing, and visualization.
5	Analyze IoT use cases and appreciate the role of Edge, Fog, and Cloud in modern applications.

4. Computer Science Practical 4 (MAJOR-2)	
1	Use network diagnostic and configuration commands effectively on Windows and Linux systems.
2	Design and simulate wired and wireless networks using Cisco Packet Tracer with IP configurations and routing protocols.
3	Analyze network traffic using Wireshark and identify protocol layers and data flow.
4	Configure and test IoT hardware platforms for device communication and data acquisition.
5	Implement real-time IoT applications using sensors, actuators, and cloud communication
6	Develop integrated solutions using web technologies, IoT protocols, and dashboarding tools.
5. Mobile Application Development (SEC-2)	
1	Set up Android Studio and develop basic Kotlin applications with UI interaction
2	Apply object-oriented programming concepts using Kotlin for mobile application logic.
3	Use core Android components to develop modular and multi-screen applications.
4	Create dynamic UIs using layouts, fragments, menus, and handle user interactions efficiently
5	Store and retrieve data using local databases and cloud services like Firebase.
6	Integrate media, camera, GPS, and background services into functional applications.
7	Package, sign, and deploy Android applications to the Google Play Store.
6. OPERATION RESEARCH - II (MINOR-2)	
1	Ability to Create Network Diagrams, Identification of Critical Path, and Project Scheduling Skills
2	Ability to Formulate Game Theory Problems, Strategic Decision Making and Optimal Strategy Identification
3	Analytical Decision-Making Skills, Optimal Decision Identification and Risk and Uncertainty Management
7. PRACTICAL BASED ON OPERATION RESEARCH - II (MINOR-2)	
1	Solve Network Diagrams, Identification of Critical Path, and Project Scheduling Skills
2	Formulate and solve Game Theory Problems, Strategic Decision Making and Optimal Strategy Identification
3	Understand Analytical Decision-Making Skills, Optimal Decision Identification and Risk and Uncertainty Management.
8. ENVIRONMENTAL MANAGEMENT & SUSTAINABLE DEVELOPMENT -I(02)	
1	Use principles of Environmental Science for explaining sustainable development and its related ethical concerns
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DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTCOMES (COs) AND LEARNING OUTCOME (LOs)
T.Y.BSC (CS) SEM-VI

1. Data Science	
1	Understand the foundations and scope of Data Science, including its applications and comparison to related fields like Business Intelligence and Artificial Intelligence.
2	Develop skills in data preprocessing, including cleaning, transforming, selecting, and merging data, to ensure data quality and suitability for analysis.
3	Gain knowledge of machine learning algorithms and techniques, such as regression, classification, clustering, and ensemble learning, to build predictive models and make data-driven decisions
4	Learn how to evaluate and select models using appropriate evaluation metrics and crossvalidation techniques to ensure reliable and robust model performance.
5	Develop proficiency in data visualization techniques and tools to effectively communicate insights and tell compelling stories using data.
2. Cloud Computing and Web Services	
1	Understand the basics of cloud computing, including types of clouds, deployment models, and essential characteristics of cloud platforms.
2	Explore web services technologies such as SOAP and REST and understand their role in distributed computing and parallel computing.
3	Gain proficiency in utilizing virtualization technologies, including creating virtual machines and managing virtualized environments using tools like KVM and oVirt.
4	Explore and utilize popular cloud computing platforms such as OpenStack and AWS to architect, deploy, and manage cloud-based applications and services.
5	Learn about cloud security fundamentals, including confidentiality, integrity, availability, and secure development practices.
3. Information Retrieval	
1	To understand the fundamental principles and components of information retrieval systems
2	To explore various techniques for document indexing, storage, and retrieval.
3	To analyze and compare different retrieval models and understand their strengths and limitations.
4	To gain practical experience in implementing and evaluating information retrieval systems.
5	To explore advanced topics in information retrieval, such as web information retrieval and machine learning techniques
4. Ethical Hacking	
1	Understand the terminology and concepts related to ethical hacking and penetration testing.
2	Explore various hacking technologies and the skills required to become an ethical hacker.
3	Learn the different phases involved in ethical hacking and the methodologies used in penetration testing.
4	Gain knowledge of common hacking techniques, such as footprinting, scanning, enumeration, and session hijacking
5	Develop proficiency in identifying and exploiting vulnerabilities in web servers, web applications, and wireless networks.
5. Cyber Law and IPR	
1	Understand fundamental concepts of cyber laws and their relevance in the digital age
2	Examine legal frameworks and regulations in cyber laws, including the Information Technology Act 2000 in India.
3	Explore key issues in cyber laws such as e-commerce, e-governance, and electronic records and contracts.

4	Gain knowledge of cybercrimes, enforcement mechanisms, and the role of the Cyber Appellate Tribunal.
5	Analyze emerging issues in cyber laws, including liability of ISPs, privacy concerns, and jurisdictional aspects.
6	Understand intellectual property rights and online regulations, including copyrights, patents, and domain name disputes.