



Sinhgad Institutes

Sinhgad Technical Education Society's

SINHGAD ACADEMY OF ENGINEERING

(Affiliated to University of Pune and Approved by, AICTE, New Delhi.)
S. No. 40/4 A. Near octroi Post, Kondhwa –Saswad Road, Pune – 411048.
E-mail : saeprincipal@sinhgad .edu, Website : www.sinhgad.edu

Department of Electronics & Telecommunication

Course Outcomes

SE (IT)

Name: Discrete Mathematics

Code: 214441

CO1	Formulate and apply formal proof techniques and solve the problems with logical reasoning.
CO2	Analyze and evaluate the combinatorial problems by using probability theory.
CO3	Apply the concepts of graph theory to devise mathematical models.
CO4	Analyze types of relations and functions to provide solution to computational problems.
CO5	Identify techniques of number theory and its application.
CO6	Identify fundamental algebraic structures.

Name: Logic Design & Computer Organization

Code: 214442

CO1	Perform basic binary arithmetic & simplify logic expressions.
CO2	Grasp the operations of logic ICs and Implement combinational logic functions using ICs.
CO3	Comprehend the operations of basic memory cell types and Implement sequential logic functions using ICs.
CO4	Elucidate the functions & organization of various blocks of CPU.
CO5	Understand CPU instruction characteristics, enhancement features of CPU.
CO6	Describe an assortment of memory types (with their characteristics) used in computer systems and basic principle of interfacing input, output devices.

Name: Data Structure & Algorithms

Code:214443

CO1	Perform basic analysis of algorithms with respect to time and space complexity.
CO2	Select appropriate searching and/or sorting techniques in the application development.
CO3	Implement abstract data type (ADT) and data structures for given application.
CO4	Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.
CO5	Apply implement learned algorithm design techniques and data structures to solve



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	problems.
CO6	Design different hashing functions and use files organizations.

Name: Object-Oriented Programming **Code:214444**

CO1	Differentiate various programming paradigms.
CO2	Identify classes, objects, methods, and handle object creation, initialization, and Destruction to model real-world problems.
CO3	Identify relationship among objects using inheritance and polymorphism principles.
CO4	Handle different types of exceptions and perform generic programming.
CO5	Use of files for persistent data storage for real world application.
CO6	Apply appropriate design patterns to provide object-oriented solutions.

Name: Basics of Computer Network **Code:214445**

CO1	Understand and explain the concepts of communication theory and compare functions of OSI and TCP/IP model.
CO2	Analyze data link layer services, error detection and correction, linear block codes, cyclic Codes, framing and flow control protocols.
CO3	Compare different access techniques, channelization and IEEE standards.
CO4	Apply the skills of subnetting, supernetting and routing mechanisms.
CO5	Differentiate IPv4 and IPv6.
CO6	Illustrate services and protocols used at transport layer.

Name: Logic Design & Computer Organization Lab **Code: 214446**

CO1	Use logic function representation for simplification with K-Maps and design Combinational logic circuits using SSI & MSI chips.
CO2	Design Sequential Logic circuits: MOD counters using synchronous counters.
CO3	Understand the basics of simulator tool & to simulate basic blocks such as ALU & memory.

Name: Data Structure & Algorithms Lab **Code: 214447**

CO1	Analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2	Implement abstract data type (ADT) and data structures for given application.
CO3	Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.).
CO4	Solve problems using algorithmic design techniques and data structures.
CO5	Analyze of algorithms with respect to time and space complexity.

Name: Object oriented Programming Lab **Code: 214448**

CO1	Differentiate various programming paradigms.
CO2	Identify classes, objects, methods, and handle object creation, initialization, and



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	destruction to model real-world problems.
CO3	Identify relationship among objects using inheritance and polymorphism.
CO4	Handle different types of exceptions and perform generic programming.
CO5	Use file handling for real world application.
CO6	Apply appropriate design patterns to provide object-oriented solutions.

Name: Soft Skill Lab

Code: 214449

CO1	Introspect about individual's goals, aspirations by evaluating one's SWOC and think creatively.
CO2	Develop effective communication skills including Listening, Reading, Writing and Speaking.
CO3	Constructively participate in group discussion, meetings and prepare and deliver Presentations.
CO4	Write precise briefs or reports and technical documents.
CO5	Practice professional etiquette, present oneself confidently and successfully handle personal interviews .
CO6	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

Name: Engineering Mathematics III

Code:207003

CO1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
CO2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
CO3	Apply Statistical methods like correlation & regression analysis and probability theory for data analysis and predictions in machine learning.
CO4	Solve Algebraic & Transcendental equations and System of linear equations using numerical techniques.
CO5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

Name: Processor Architecture

Code:214451

CO1	Apprehend architecture and memory organization of PIC 18 microcontroller.
CO2	Implement embedded C programming for PIC 18.



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Table with 2 columns: CO ID and Description. Rows include CO3 (timers and interrupts of PIC 18), CO4 (real life applications using PIC 18), and CO5 (ARM processor architectural details).

Name: Database Management System Code:214452

Table with 2 columns: CO ID and Description. Rows include CO1 (fundamental elements of database management systems), CO2 (ER-models), CO3 (SQL queries), CO4 (normalization & query processing), CO5 (ACID properties), and CO6 (database architectures and technologies).

Name: Computer Graphics Code:214453

Table with 2 columns: CO ID and Description. Rows include CO1 (mathematical and logical aspects for graphics), CO2 (geometrical transforms), CO3 (mapping from world to device coordinates), CO4 (rendering, shading, animation), and CO5 (virtual reality).

Name: Software Engineering Code: 214454

Table with 2 columns: CO ID and Description. Rows include CO1 (software application domains), CO2 (software requirements modeling), CO3 (requirement models to design models), CO4 (planning and estimation), CO5 (quality attributes and testing), and CO6 (software engineering trends).

Name: Programming Skill Development Lab Code: 214455

Table with 2 columns: CO ID and Description. Rows include CO1 (embedded C programming), CO2 (embedded C program for array operations), CO3 (interfacing of real-world devices to PIC18FXXX), and CO4 (source prototype platform like Raspberry-Pi).



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Name: Database Management System Lab

Code: 214456

CO1	Install and configure database systems.
CO2	Analyze database models & entity relationship models.
CO3	Design and implement a database schema for a given problem-domain
CO4	Implement relational database systems.
CO5	Populate and query a database using SQL DDL / DML / DCL commands.
CO6	Design a backend database of any one organization: CASE STUDY

Name: Computer Graphics Laboratory

Code: 214457

CO1	Apply line& circle drawing algorithms to draw the objects.
CO2	Apply polygon filling methods for the object.
CO3	Apply polygon clipping algorithms for the object.
CO4	Apply the 2D transformations on the object.
CO5	Implement the curve generation algorithms.
CO6	Demonstrate the animation of any object using animation principles.

Name: Project Based Learning

Code: 214458

CO1	Design solution to real life problems and analyze its concerns through shared cognition.
CO2	Apply learning by doing approach in PBL to promote lifelong learning.
CO3	Tackle technical challenges for solving real world problems with team efforts.
CO4	Collaborate and engage in multi-disciplinary learning environments.

TE (IT)

Name: Theory of Computation

Code:314441

CO1	To construct finite state machines to solve problems in computing.
CO2	To write mathematical expressions for the formal languages
CO3	To apply well defined rules for syntax verification.
CO4	To construct and analyze Push Down, Post and Turing Machine for formal languages.
CO5	To express the understanding of the decidability and decidability problems.
CO6	To express the understanding of computational complexity.



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Name: Database Management System

Code:314442

CO1	To define basic functions of DBMS & RDBMS.
CO2	To analyze database models & entity relationship models.
CO3	To design and implement a database schema for a given problem-domain.
CO4	To populate and query a database using SQL DML/DDL commands.
CO5	Do Programming in PL/SQL including stored procedures, stored functions, cursors and packages.
CO6	To appreciate the impact of analytics and big data on the information industry and the external ecosystem for analytical and data services.

Name: Software Engineering and Project Management

Code:314443

CO1	To identify unique features of various software application domains and classify software applications.
CO2	To choose and apply appropriate lifecycle model of software development.
CO3	To describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.
CO4	To analyze software requirements by applying various modelling techniques.
CO5	To list and classify CASE tools and discuss recent trends and research in software engineering.
CO6	To understand IT project management through life cycle of the project and future trends in IT Project Management.

Name: Operating System

Code:314444

CO1	Fundamental understanding of the role of Operating Systems.
CO2	To understand the concept of a process and thread.
CO3	To apply the cons of process/thread scheduling.
CO4	To apply the concept of process synchronization, mutual exclusion and the deadlock
CO5	To realize the concept of I/O management and File system
CO6	To understand the various memory management techniques.

Name: Human Computer Interaction

Code:314445

CO1	To explain importance of HCI study and principles of user-centred design (UCD) approach.
CO2	To develop understanding of human factors in HCI design.
CO3	To develop understanding of models, paradigms and context of interactions.



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CO4	To design effective user-interfaces following a structured and organized UCD process.
CO5	To evaluate usability of a user-interface design.
CO6	To apply cognitive models for predicting human-computer-interactions.

Name: Software Laboratory I

Code:314446

CO1	To install and configure database systems.
CO2	To analyze database models & entity relationship models.
CO3	To design and implement a database schema for a given problem-domain.
CO4	To understand the relational and document type database systems.
CO5	To populate and query a database using SQL DML/DDI commands.
CO6	To populate and query a database using MongoDB commands.

Name: Software Laboratory II

Code:314447

CO1	To understand the basics of Linux commands and program the shell of Linux.
CO2	To develop various system programs for the functioning of operating system.
CO3	To implement basic building blocks like processes, threads under the Linux.
CO4	To develop various system programs for the functioning of OS concepts in user space like concurrency control and file handling in Linux.
CO5	To design and implement Linux Kernel Source Code.
CO6	To develop the system program for the functioning of OS concepts in kernel space like embedding the system call in any Linux kernel.

Name: Software Laboratory III

Code:314448

CO1	To identify the needs of users through requirement gathering.
CO2	To apply the concepts of Software Engineering process models for project development.
CO3	To apply the concepts of HCI for user-friendly project development.
CO4	To deploy website on live webserver and access through URL.
CO5	To understand, explore and apply various web technologies.
CO6	To develop team building for efficient project development.



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Name: Computer Network Technology

Code:314450

CO1	To know Responsibilities, services offered and protocol used at each layer of network.
CO2	To understand different addressing techniques used in network.
CO3	To know the difference between different types of network.
CO4	To know the different wireless technologies and IEEE standards.
CO5	To use and apply the standards and protocols learned, for application development.
CO6	To understand and explore recent trends in network domain.

Name: System Programming

Code:314451

CO1	To learn independently modern software development tools and creates novel solutions for language processing applications.
CO2	To design and implement assemblers and macro processors.
CO3	To use tool LEX for generation of Lexical Analyzer.
CO4	To use YACC tool for generation of syntax analyzer.
CO5	To generate output for all the phases of compiler.
CO6	To apply code optimization in the compilation process.

Name: Design and Analysis of Algorithms

Code:314452

CO1	To calculate computational complexity using asymptotic notations for various algorithms.
CO2	To apply Divide & Conquer as well as Greedy approach to design algorithms.
CO3	To practice principle of optimality.
CO4	To illustrate different problems using Backtracking.
CO5	To compare different methods of Branch and Bound strategy
CO6	To explore the concept of P, NP, NP-complete, NP-Hard and parallel algorithms.

Name: Cloud Computing

Code:314453

CO1	To understand the need of Cloud based solutions.
CO2	To understand Security Mechanisms and issues in various Cloud Applications.
CO3	To explore effective techniques to program Cloud Systems.
CO4	To understand current challenges and trade-offs in Cloud Computing.
CO5	To find challenges in cloud computing and delve into it to effective solutions.
CO6	To understand emerging trends in cloud computing.



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Name: Data Science and Big Data Analytics

Code:3144454

CO1	To understand Big Data primitives.
CO2	To learn and apply different mathematical models for Big Data.
CO3	To demonstrate their Big Data learning skills by developing industry or research applications.
CO4	To analyze each learning model come from a different algorithmic approach and it will perform differently under different datasets.
CO5	To understand needs, challenges and techniques for big data visualization.
CO6	To learn different programming platforms for big data analytics.

Name: Software Laboratory IV

Code: 3144455

CO1	To implement small size network and its use of various networking commands.
CO2	To understand and use various networking and simulations tools.
CO3	To configure various client/server environments to use application layer protocols.
CO4	To understand the protocol design at various layers.
CO5	To explore use of protocols in various wired and wireless applications.
CO6	To develop applications on emerging trends.

Name: Software Laboratory V

Code: 3144456

CO1	To design and implement two pass assembler for hypothetical machine instructions.
CO2	To design and implement different phases of compiler (Lexical Analyzer, Parser, Intermediate code generation)
CO3	To use the compile generation tools such as "Lex" and "YACC".
CO4	To apply algorithmic strategies for solving various problems.
CO5	To compare various algorithmic strategies.
CO6	To analyze the solution using recurrence relation.

Name: Software Laboratory VI

Code: 3144457

CO1	To apply Big data primitives and fundamentals for application development.
CO2	To explore different Big data processing techniques with use cases.
CO3	To apply the Analytical concept of Big data using R/Python.
CO4	To visualize the Big Data using Tableau.
CO5	To design algorithms and techniques for Big data analytics.
CO6	To design Big data analytic application for emerging trends.



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Name: Project based seminar

Code: 3144458

CO1	To Gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.
CO2	To write a technical report summarizing state-of-the-art on an identified topic.
CO3	Present the study using graphics and multimedia presentations.
CO4	Define intended future work based on the technical review.
CO5	To explore and enhance the use of various presentation tools and techniques.
CO6	To understand scientific approach for literature survey and paper writing.

BE (IT)

Name: Information and Cyber Security

Code:414453

CO1	Use basic cryptographic techniques in application development
CO2	Apply methods for authentication, access control, intrusion detection and prevention
CO3	To apply the scientific method to digital forensics and perform forensic investigations.
CO4	To develop computer forensics awareness.
CO5	Ability to use computer forensics tools.

Name: Machine Learning and Applications

Code:414454

CO1	Model the learning primitives.
CO2	Build the learning model.
CO3	Tackle real world problems in the domain of Data Mining and Big Data Analytics, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

Name: Software Design and Modeling

Code:414455

CO1	Understand object oriented methodologies, basics of Unified Modeling Language (UML)
CO2	Understand analysis process, use case modeling, domain/class modeling
CO3	Understand interaction and behavior modeling.
CO4	Understand design process and business, access and view layer class design
CO5	Get started on study of GRASP principles and GoF design patterns.



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CO6	Get started on study of architectural design principles and guidelines in the various type of application development.
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Name: Elective I- Business analytics and Intelligence

Code:414456

CO1	Comprehend the Information Systems and development approaches of Intelligent Systems.
CO2	Evaluate and rethink business processes using information systems.
CO3	Propose the Framework for business intelligence.
CO4	Get acquainted with the Theories, techniques, and considerations for capturing organizational intelligence.
CO5	Align business intelligence with business strategy.
CO6	Apply the techniques for implementing business intelligence systems.

Name: Elective II-Software Testing and Quality Assurance

Code: 414457

CO1	Test the software by applying testing techniques to deliver a product free from bugs.
CO2	Investigate the scenario and to select the proper testing technique.
CO3	Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.
CO4	Understand how to detect, classify, prevent and remove defects
CO5	Choose appropriate quality assurance models and develop quality.
CO6	Ability to conduct formal inspections, record and evaluate results of inspections.

Name: Computer Laboratory VII

Code: 414458

CO1	The students will be able to implement and port controlled and secured access to software systems and networks.
CO2	The students will be able to build learning software in various domains.

Name: Computer Laboratory VIII

Code: 414459

CO1	Draw, discuss different UML 2.0 diagrams, their concepts, notation, advanced notation, forward and reverse engineering aspects.
CO2	Identify different software artifacts used to develop analysis and design model from requirements.
CO3	Develop use case model.
CO4	Develop, implement analysis model and design model.
CO5	Develop, implement Interaction and behavior Model.
CO6	Implement an appropriate design pattern to solve a design problem.



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Name: Project Phase 1

Code: 414460

CO1	To show preparedness to study independently in chosen domain of Information Technology and programming languages and apply their acquired knowledge to variety of real time problem scenarios.
CO2	To function effectively as a team to accomplish a desired goal.
CO3	An understanding of professional, ethical, legal, security and social issues and responsibilities related to Information Technology Project.

Name: Distributed Computing System

Code: 414462

CO1	Understand the principles and desired properties of distributed systems based on different application areas.
CO2	Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
CO3	Recognize the inherent difficulties that arise due to distributed-ness of computing resources.
CO4	Identify the challenges in developing distributed applications

Name: Ubiquitous computing

Code:414463

CO1	Demonstrate the knowledge of design of Ubiomp and its applications..
CO2	Explain smart devices and services used Ubiomp
CO3	Describe the significance of actuators and controllers in real time application design.
CO4	Use the concept of HCI to understand the design of automation applications.
CO5	Classify Ubiomp privacy and explain the challenges associated with Ubiomp privacy.
CO6	Get the knowledge of ubiquitous and service oriented networks along with Ubiomp management.

Name: Information Storage Retrieval

Code:414464

CO1	Understand the concept of Information retrieval.
CO2	Deal with storage and retrieval process of text and multimedia data.
CO3	Evaluate performance of any information retrieval system.
CO4	Design user interfaces.
CO5	Understand importance of recommender system.
CO6	Understand concept of multimedia and distributed information retrieval.



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Name: Rural Technologies and Community Development

Code:414465

CO1	Understand rural development model.
CO2	Learn different measures in rural development and its impact on overall economy.
CO3	Understand and learn importance of technologies in rural and community development.
CO4	Understand challenges and opportunities in rural development.

Name: Computer Laboratory IX

Code: 414466

CO1	Demonstrate knowledge of the core concepts and techniques in distributed systems.
CO2	Learn how to apply principles of state-of-the-Art Distributed systems in practical application.
CO3	Design, build and test application programs on distributed systems.

Name: Computer Laboratory X

Code: 414467

CO1	Set up the Android environment and explain the Evolution of cellular networks.
CO2	Develop the User Interfaces using pre-built Android UI components.
CO3	Create applications for performing CURD SQLite database operations using Android.
CO4	Create the smart android applications using the data captured through sensors.
CO5	Implement the authentication protocols between two mobile devices for providing Security.
CO6	Analyze the data collected through android sensors using any machine learning algorithm.

Name: Project Work

Code: 414468

CO1	Learn teamwork.
CO2	Be well aware about Implementation phase.
CO3	Get exposure of various types of testing methods and tools.
CO4	Understand the importance of documentation.