List of CO 2019 Pattern

SE Sem-I

CO number	List of Course Outcome
Discrete Mathematics	
214441.1	Formulate and apply formal proof techniques and solve the problems with logical reasoning.
214441.2	Analyze and evaluate the combinatorial problems by using probability theory.
214441.3	Apply the concepts of graph theory to devise mathematical models.
214441.4	Analyze types of relations and functions to provide solution to computational problems.
214441.5	Identify techniques of number theory and its application.
214441.6	Identify fundamental algebraic structures.
Logic Design and Computer Organization	
214442.1	To Perform basic binary arithmetic & simplify logic expressions.
214442.2	To Grasp the operations of logic ICs and Implement combinational logic functions using ICs.
214442.3	To Comprehend the operations of basic memory cell types and implement sequential logic functions using ICs.
214442.4	To Elucidate the functions & organization of various blocks of CPU
214442.5	To Understand CPU instruction characteristics, enhancement features of CP

List of CO 2019 Pattern

214442.6	To Describe an assortment of memory types (with their characteristics) used in computer systems and basic principle of interfacing input, output devices.
Data Structures and Algorithms	
CO214443.1	Perform basic analysis of algorithms with respect to time and space complexity.
CO214443.2	Select appropriate searching and/or sorting techniques in the application development.
CO214443.3	Implement abstract data type (ADT) and data structures for given application.
CO214443.4	Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.
CO214443.5	Apply knowledge to implement learned algorithm design techniques and data structures to solve problems
CO214443.6	Design different hashing functions and use files organizations.
Object Oriented Programming	
CO214444.1	Differentiate various programming paradigms.
CO214444.2	Identify classes, objects, methods, and handle object creation, initialization, and Destruction to model real-world problems.
CO214444.3	Identify relationship among objects using inheritance and polymorphism principles.
CO214444.4	Handle different types of exceptions and perform generic programming.
CO214444.5	Use of files for persistent data storage for real world application.

List of CO 2019 Pattern

CO214444.6	Apply appropriate design patterns to provide object-oriented solutions.
Basics of Computer Network	
214445.1	Understand and explain the concepts of communication theory and compare functions of OSI and TCP/IP model.
214445.2	To Analyze data link layer services, error detection and correction, linear block codes, cyclic codes, framing and flow control protocols.
214445.3	To Compare different access techniques, channelization and Ethernet standards.
214445.4	To Apply the skills of subnetting, supernetting and routing mechanisms.
214445.5	To Differentiate IPv4 and IPv6.
214445.6	To Illustrate services and protocols used at transport layer
Logic Design and Computer Organization Lab	
C214446.1	Use logic function representation for simplification with K-Maps and design Combinational logic circuits using SSI & MSI chips. (Applying)
C214446.2	Design Sequential Logic circuits: MOD counters using synchronous counters. (Understanding)
C214446.3	Understand the basics of simulator tool & to simulate basic blocks such as ALU & memory. (Understanding)
Data Structures and Algorithms Lab	
C214447.1	Analyze algorithms and to determine algorithm correctness and time efficiency class
C214447.2	Implement abstract data type (ADT) and data structures for given

List of CO 2019 Pattern

	application.
C214447.3	Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.
C214447.4	Solve problems using algorithmic design techniques and data structures
C214447.5	Analyze algorithms with respect to time and space complexity.
Object-Oriented Programming Lab	
CO214444.1	Differentiate various programming paradigms.
CO214444.2	Identify classes, objects, methods, and handle object creation, initialization, and Destruction to model real-world problems.
CO214444.3	Identify relationship among objects using inheritance and polymorphism principles.
CO214444.4	Handle different types of exceptions and perform generic programming.
CO214444.5	Use of files for persistent data storage for real world application.
CO214444.6	Apply appropriate design patterns to provide object-oriented solutions.
Soft Skill Lab	
CO214449.1	Introspect about individual's goals, aspirations by evaluating one's SWOC and think creatively.

List of CO 2019 Pattern

CO214449.2	Develop effective communication skills including Listening, Reading, Writing and Speaking.
CO214449.3	Constructively participate in group discussion, meetings and prepare and deliver Presentations.
CO214449.4	Write precise briefs or reports and technical documents.
CO214449.5	Practice professional etiquette, present oneself confidently and successfully handle personal interviews.
CO214449.6	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

SE Sem II

CO number	List of Course Outcome
Engineering Mathematics- III	
207003.1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
207003.2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
207003.3	Apply Statistical methods like correlation& regression analysis and probability theory for data analysis and predictions in machine learning.
207003.4	Solve Algebraic &Transcendental equations and System of linear equations using numerical techniques.
207003.5	Obtain Interpolating polynomials, numerical differentiation and integration,

List of CO 2019 Pattern

	numerical solutions of ordinary differential equations used in modern scientific computing.
Processor Architecture	
214451.1	Apprehend architecture and memory organization of PIC 18 microcontroller
214451.2	Implement embedded C programming for PIC 18
214451.3	Use concepts of timers and interrupts of PIC 18.
214451.4	Demonstrate real life applications using PIC 18
214451.5	Analyze architectural details of ARM processor.
Database Management System	
CO214452.1	Apply fundamental elements of database management systems.
CO214452.2	Design ER-models to represent simple database application scenarios.
CO214452.3	Formulate SQL queries on data for relational databases.
CO214452.4	Improve the database design by normalization & to incorporate query processing.
CO214452.5	Apply ACID properties for transaction management and concurrency control.
CO214452.6	Analyze various database architectures and technologies.

List of CO 2019 Pattern

Computer Graphics	
214453.1	Apply mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines, circle, and apply it for problem solving.
214453.2	Employ techniques of geometrical transforms to produce, position and manipulate Objects in 2 dimensional and 3-dimensional space respectively.
214453.3	Describe mapping from a world coordinates to device coordinates, clipping, and Projections in order to produce 3D images on 2D output device.
214453.4	Apply concepts of rendering, shading, animation, curves and fractals using computer Graphics tools in design, development and testing of 2D, 3D modeling applications.
214453.5	Perceive the concepts of virtual reality.
214453.1	Apply mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines, circle, and apply it for problem solving.
Software Engineering	
214454.1	Classify various software application domains.
214454.2	Analyze software requirements by using various modeling techniques.
214454.3	Translate the requirement models into design models.
214454.4	Apply planning and estimation to any project.
214454.5	Use quality attributes and testing principles in software development life cycle.
214454.6	Discuss recent trends in Software engineering by using CASE and agile tools.
Programming Skill Development Lab	

List of CO 2019 Pattern

214455.1	Apply concepts related to embedded C programming.
214455.2	Develop and Execute embedded C program to perform array addition, block transfer, sorting operation.
214455.3	Perform interfacing of real-world input and output devices to PIC18FXXX microcontroller.
214455.4	Use source prototype platform like Raspberry-Pi/Beagle board/Arduino.
Database Management System Lab	
CO214456.1	Install and configure database systems.
CO214456.2	Analyze database models & entity relationship models.
CO214456.3	Design and implement a database schema for a given problem-domain.
CO214456.4	Implement relational database systems.
CO214456.5	Populate and query a database using SQL DDL / DML / DCL commands.
CO214456.6	Design a backend database of any one organization: CASE STUDY
Computer Graphics Lab	
214457.1	Apply line& circle drawing algorithms to draw the objects.
214457.2	Apply polygon filling methods for the object.
214457.3	Apply polygon clipping algorithms for the object.
214457.4	Apply the 2D transformations on the object.
214457.5	Implement the curve generation algorithms.

List of CO 2019 Pattern

214457.6	Demonstrate the animation of any object using animation principles.
214457.1	Apply line& circle drawing algorithms to draw the objects.
Project Based Learning	
214458.1	Design solution to real life problems and analyze its concerns through shared cognition
214458.2	Apply learning by doing approach in PBL to promote lifelong learning
214458.3	Tackle technical challenges for solving real world problems with team efforts
214458.4	Collaborate and engage in multi-disciplinary learning environments for the problems coming from various Hackathon
C314442.5	Make use of concept of I/O management and File system.

Mrs. S. D. Deshpande
HOD (IT)

PES' Modern College of Engineering
IT Department
Pune-411005

Progressive Education Society's
Modern College Of Engineering, Pune-05.
DEPARTMENT OF INFORMATION TECHNOLOGY
TE IT Sem I

CO No.	Course Outcome (2019 pattern)
314441	**Theory of Computation**
C314441.1	Construct finite automata and its variants to solve computing problems.
C314441.2	Write regular expressions for the regular languages and finite automata.
C314441.3	Identify types of grammar, design and simplify Context Free Grammar.
C314441.4	Construct Pushdown Automata machine for the Context Free Language.
C314441.5	Design and analyze Turing machines for formal languages.
C314441.6	Understand decidable and undecidable problems, analyze complexity classes.
314442	**Operating Systems**
C314442.1	Understanding the role of Modern Operating Systems.
C314442.2	Apply the concepts of process and thread scheduling.
C314442.3	Apply the concept of process synchronization, mutual exclusion and the deadlock.
C314442.4	Understand and apply the concepts of various memory management techniques.
C314442.5	Make use of concept of I/O management and File system.
C314442.6	Understand Importance of System software.
314443	**Machine Learning**
C314443.1	Apply basic concepts of machine learning and different types of machine learning algorithms.
C314443.2	Differentiate various regression techniques and evaluate their performance.
C314443.3	Compare different types of classification models and their relevant application.
C314443.4	Illustrate the tree-based and probabilistic machine learning algorithms.
C314443.5	Identify different unsupervised learning algorithms for the related real world problems.
C314443.6	Apply fundamental concepts of ANN.
314444	**Human Computer Interaction**
C314444.1	Explain importance of HCI study and principles of user-centered design (UCD) approach.
C314444.2	Develop understanding of human factors in HCI design.
C314444.3	Develop understanding of models, paradigms, and context of interactions.
C314444.4	Design effective user-interfaces following a structured and organized UCD process.
C314444.5	Evaluate usability of a user-interface design.
C314444.6	Apply cognitive models for predicting human-computer-interactions.
314445A	**Elective-I : - Design and Analysis of Algorithm**
C314445A.1	Calculate computational complexity using asymptotic notations for various algorithms.
C314445A.2	Apply Divide & Conquer as well as Greedy approach to design algorithms.
C314445A.3	Understand and analyze optimization problems using dynamic programming.
C314445A.4	Illustrate different problems using Backtracking.
C314445A.5	Compare different methods of Branch and Bound strategy.
C314445A.6	Classify P, NP, NP-complete, NP-Hard problems.
314445B	**Elective-I : - Advanced Database and Management System**
C314445B.1	Understand relational and object-oriented databases.
C314445B.2	Learn and understand of parallel & distributed database architectures..

C314445B.3	Learn the concepts of NoSQL Databases.
C314445B.4	Understand data warehouse and OLAP technologies.
C314445B.5	Apply data mining algorithms and to learn various software tools.
C314445B.6	Learn emerging and enhanced data models for advanced applications.
314445(D)	**Elective -I : - Internet of Things**
C314445D.1	**Discuss fundamentals, architecture and framework of IoT.**
C314445D.2	**Select suitable sensors and actuators for real time scenarios.**
C314445D.3	**Justify the significance of protocol for wireless communication and IoT challenges**
C314445D.4	**Understand the Python programming for development of IoT applications.**
C314445D.5	**Understand the cloud interfacing technologies.**
C314445D.6	**Design and Implement real time IoT applications.**
314446	**Operating Systems Lab**
C314446.1	Apply the basics of Linux commands.
C314446.2	Build shell scripts for various applications.
C314446.3	Implement basic building blocks like processes, threads under the Linux.
C314446.4	Develop various system programs for the functioning of OS concepts in user space like concurrency control, CPU Scheduling, Memory Management and Disk Scheduling in Linux.
C314446.5	Develop system programs for Inter Process Communication in Linux.
314447	**Human Computer Interaction- Lab**
C314447.1	Differentiate between good design and bad design.
C314447.2	Analyze creative design in the surrounding.
C314447.3	Assess design based on feedback and constraint.
C314447.4	Design paper-based prototypes and use wire frame.
C314447.5	Implement user-interface design using web technology.
C314447.6	Evaluate user-interface design using HCI evaluation techniques.
314448	**Laboratory Practice-I (ML)**
C314448.1	Implement different supervised and unsupervised learning algorithms.
C314448.2	Evaluate performance of machine learning algorithms for real-world applications.
314448 (A)	**Laboratory Practice-I (Design of Analysis Algorithm)**
C314449 (A).1	Implement the various algorithmic design strategies and use it to solve real time problems/ applications
C314449 (A).2	Apply Divide & Conquer as well as Greedy approach to design algorithms.
C314449 (A).3	Understand and analyze optimization problems using dynamic programming.
314448 (B)	**Laboratory Practice-I (ADBMS)**
C314449 (B).1	Understand Advanced Database Programming Languages.
C314449 (B).2	Master the basic concepts of NoSQL Databases.
C314449 (B).3	Install and configure database systems.
C314449 (B).4	Populate and query a database using MongoDB commands.
C314449 (B).5	Design data warehouse schema of any one real-time: CASE STUDYC
C314449 (B).6	Develop small application with NoSQL Database for back-end.
314448 (D)	**Laboratory Practice-I (Internet of Things)**
314449 (D).1	Design and implement real time applications with sensors and actuators.
314450 (D).2	Design and develop real time IoT based application by cloud interfacing.
314449	**Seminar**

C314449.1	Understand, interpret and summarize technical literature.
C314449.2	Demonstrate the techniques used in the paper.
C314449.3	Distinguish the various techniques required to accomplish the task.
C314449.4	Identify intended future work based on the technical review.
C314449.5	Prepare and present the content through various presentation tools and techniques in effective manner.
C314449.6	Keep audience engaged through improved interpersonal skills.

Mrs. S. D. Deshpande
HOD IT

Progressive Education Society's

Modern College Of Engineering, Pune-05.

DEPARTMENT OF INFORMATION TECHNOLOGY

TE IT Sem II

CO No.	Course Outcome (2019 pattern)
314451	**Computer Networks& Security**
C314451.1	Explain Responsibilities, services offered and protocol used at application layer of network
C314451.2	Apply concepts of wireless network and different wireless standards.
C314451.3	Recognize the Adhoc Network's MAC layer, routing protocol and Sensor network architecture.
C314451.4	Implement the principal concepts of network security and Understand network security threats, security services, and countermeasures
C314451.5	Apply basic cryptographic techniques in application development.
C314451.6	Gain a good comprehension of the landscape of cyber security Vulnerabilities & describe typical threats to modern digital systems.
314452	**Data Science and Big Data Analytics**
C314452.1	Understand Big Data primitives.
C314452.2	Learn and apply different mathematical models for Big Data.
C314452.3	Demonstrate Big Data learning skills by developing industry or research applications.
C314452.4	Analyze and apply each learning model comes from a different algorithmic approach and it will perform differently under different datasets.
C314452.5	Understand, apply and analyze needs, challenges and techniques for big data visualization.
C314452.6	Learn different programming platforms for big data analytics.
314453	**Web Application Development**
C314453.1	Develop Static and Dynamic website using technologies like HTML, CSS, Bootstrap.
C314453.2	Demonstrate the use of web scripting languages.
C314453.3	Develop web application with Front End & Back End Technologies.
C314453.4	Develop mobile website using JQuery Mobile.
C314453.5	Deploy web application on cloud using AWS.
314454B	**Elective-II : - Cyber Security**
C314454B.1	CO1: To develop basic understanding of cyber security.
C314454B.2	CO2: Differentiate among different types of cyber threats and cyber-crimes.
C314454B.3	CO3: Illustrate cyber forensic techniques to identify the criminal activities.
C314454B.4	CO4: Apply forensic analysis tools to recover important evidence for identifying computercrime
C314454B.5	CO5: Distinguish and classify the forms of cybercriminal activity and the technological and social engineering' methods used to undertake such crimes
C314454B.6	CO6: Evaluate the effectiveness of cyber-security, cyber-laws and other countermeasures against cybercrime

314454C	Elective-II : - Cloud Computing
C314454C.1	Articulate the main concepts, key technologies and fundamentals of cloud computing.
C314454C.2	Understand cloud enabling technologies and virtualization.
C314454C.3	Analyze various cloud programming models and apply them to solve problems on the cloud.
C314454C.4	Explain data storage and major security issues in the cloud.
C314454C.5	Understand trends in ubiquitous cloud and internet of things.
C314454C.6	Explore future trends of cloud computing.
314455	Internship
C314455.1	Develop professional competence through industry internship.
C314455.2	Apply academic knowledge in a personal and professional environment
C314455.3	Build the professional network and expose students to future employees
C314455.4	Apply professional and societal ethics in their day-to-day life.
C314455.5	Become a responsible professional having social, economic and administrative considerations.
C314455.6	Make own career goals and personal aspirations.
314456	Computer Networks& Security-Lab
C314456.1	Design and configure small size network and associated networking commands.
C314456.2	Understand various client/server environments to use application layer protocols.
C314456.3	Use basic cryptographic techniques in software and system design.
C314456.4	Apply methods for authentication, access control, intrusion detection.
314457	DS & BDA-Lab
C314457.1	Apply Big data primitives and fundamentals for application development.
C314457.2	Explore different Big data processing techniques with use cases.
C314457.3	Apply the Analytical concept of Big data using Python.
C314457.4	Visualize the Big Data using Tableau.
C314457.5	Design algorithms and techniques for Big data analytics.
C314457.6	Design and develop Big data analytic application for emerging trends
314458	Laboratory Practice-II (Web Application Development)
C314458.1	Develop Static and Dynamic responsive website using technologies HTML, CSS, Bootstrapand AJAX.
C314458.2	Create Version Control Environment.
C314458.3	Develop an application using front end and backend technologies.
C314458.4	Develop mobile website using JQuery Mobile.
C314458.5	Deploy web application on cloud using AWS.
314458(B)	Laboratory Practice-II (Cyber Security)
C314458(B).1	To know the different guidelines for Packet Sniffing in networking and internetworking environment.

C314458(B).2	To know the different types of cyber-attacks and will be able analyze theattacks.
C314458(B).3	Apply the knowledge of IDS to secure network and performing analysis of IDS attack on network.
314458(B)	**Laboratory Practice-II (Cloud Computing)**
C314458(B).1	To design and develop cloud based applications.
C314458(B).2	To Simulate a cloud scenario using CloudSim.
C314458(B).3	To design and deploy web applications in cloud environment.

Mrs. S. D. Deshpande
HOD IT