COURSE OUTCOMES (COs)

ADVANCED DATA STRUCTURES (SE313)
CO1: Possess an understanding of different tree, heap and graph-based advanced data structures covered in the course.
CO2: Formulate, design and analyze algorithms and complexity analysis of the main operations of advanced data structures covered in the course.
CO3: Develop and analyze the efficiency and proof of correctness of the algorithms covered in the course.
CO4: Choose appropriate data structures and algorithms, understand the abstract data types/libraries, and use them to design algorithms for a specific problem.
CO5: Comprehend and gain the ability to apply and implement learned algorithm design techniques and data structures to solve problems.

SOFTWARE RELIABILITY (SE308)
After studying the course Software Reliability, the students shall be able to:
CO1: To learn reliability mathematics to examine software reliability of a system.
CO2: To understand system reliability concepts and terminologies.
CO3: To analyze and compare and evaluate Software Reliability Growth Models.
CO4: To design, select and apply appropriate ML algorithm to solve computer engineering problems.
CO5: To implement procedures for testcase generation, preparing test, executing test and developing operational profile for a system.

Web Technology (SE325)
CO1: Understand the appropriate network model for data communication.
CO2: Evaluate the most commonly used various Application Layer protocols.
CO3: Analyze various types of Webs and itsevolution
CO4: Create web pages using the HTML and CSS features withdifferent layouts as per need of applications.
CO5: Apply PHP in simple web pages and also represent data inXML format.
CO6: Remember the concept and types of various Web mining framework and Web IR systems.

Compiler Design (SE306)

CO1: Represent language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language and design syntax directed translation schemes for a given context free grammar. **CO2:** Understand the different types of parsing techniques and should be in a position to solve the problem. **CO3:** Explain the concepts and different phases of compilation with compile time error handling. **CO4**: Compare top down with bottom up parsers, and produce parse tree representation of the input and generate intermediate code for statements in high level language. **CO5:** Apply optimization techniques to intermediate code and generate machine code for high level language program.

Theory of Computation (SE323):
CO1: Will apply knowledge of computing and mathematics appropriate to the discipline.
CO2: Learn about Automata theory and its application in Language Design.
CO3: Learn about Turing Machines and Pushdown Automata and understand Linear Bound Automata and its applications

CO4: Discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.

CO5: Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.

Natural Language Processing (SE316):

CO1: Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams, POS tagging, and parsing.

CO2: Develop speech-based applications that use speech analysis (phonetics, speech recognition, and synthesis).

CO3: Analyze the syntax, semantics, and pragmatics of a statement written in a natural language.

CO4: Apply machine learning algorithms to natural language processing.

CO5: Evaluate the performance of NLP tools and systems.

Operating System(SE 205):

CO1: Will be able to control access to a computer and the files that may be shared.

CO2: Demonstrate the knowledge of the components of computer and their respective roles in computing

CO3: Ability to recognize and resolve user problems with standard operating environments

CO4: Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively

CO5: Ability to perform operations of operating system and use their functionality.

Data Warehouse & Data Mining (SE 429)

CO1: Understand Data Warehouse, Need of Data Warehouse, Architecture of Data Warehouse.

CO2: Understand KDD process, applications of Data Mining.

CO3: Understand Classification and various models of Classification like KNN, Rule Based Mining.

CO4: Apply Association Rule Mining.

CO5: Analyse and Evaluate various Classification Models on different problems.

CO6: Understand clustering and various types of clustering.

CO7: Apply clustering algorithms like k-means, DBSCAN etc.

Object-Oriented Software Engineering (SE202)

CO1: Understand the basics of software engineering, object-oriented paradigms, object-oriented methodologies used, and various basic terminologies.

CO2: Develop real-world software using conventional software development life cycle models, and object-oriented software development life cycle models.

CO3: Apply various techniques to gather requirements from the customers such as interviews, brainstorming session, FAST, and prototyping.

CO4: Design software requirement specification document, software design document, and test case matrix.

CO5: Design UML diagrams such as use case diagrams, class diagrams, sequence diagrams, state chart diagrams, and activity diagrams.
CO6: Analyze existing software by considering the issues of software risk management, and approaches to estimate the risk.

Machine Learning (SE204)
CO1: Understand the basic concepts of machine learning, supervised, unsupervised, regression analysis, and machine learning algorithms.
CO2: Apply the learned concepts of machine learning to interpret various problems.
CO3: Analyze the different mathematical machine learning models for various systems.
CO4: Evaluate the performance of the machine learning model using various performance measures.
CO5: Develop an efficient machine learning system to solve various real-time problems.

Subject Name: Software Testing (SE301)
CO1: Understand the basics of software engineering, object-oriented paradigms, object-oriented methodologies used, and various basic terminologies.
CO2: Develop real-world software using conventional software development life cycle models, and object-oriented software development life cycle models.
CO3: Apply various techniques to gather requirements from the customers such as interviews, brainstorming session, FAST, and prototyping.
CO4: Design software requirement specification document, software design document, and test case matrix.

Software Quality & Metrics (SE303)

CO1: Understand the concept and significance of Software Quality Attributes, Software Quality Assurance (SQA) in software development, focusing the importance of quality.

CO2: Explain the components of Software Quality Assurance and their respective roles in ensuring software quality.

CO3: Develop a comprehensive Software Quality Assurance Plan.

CO4: Evaluate various Quality Standards and models like ISO 9000, CMM, CMMI, McCall Model, and 6 Sigma, and assess their applicability in software development contexts.

CO5: Apply measurement techniques to ensure both external and internal product attributes in order to have a good quality software.

CO6: Analysis of software quality using software metrics.

Machine Learning (SE326)
CO1: Understand the basic concepts of machine learning, supervised, unsupervised, regression analysis, and machine learning algorithms.
CO2: Apply the learned concepts of machine learning to interpret various problems.
CO3: Analyze the different mathematical machine learning models for various systems.
CO4: Evaluate the performance of the machine learning model using various performance measures.
CO5: Develop an efficient machine learning system to solve various real-time problems.

Methods in Data Analysis (SE327)

CO1: Understand the principles and importance of data analysis, including effective data collection strategies and mining software repositories.
CO2: Identify and classify different types of variables, and analyze data using appropriate measurement scales.
CO3: Apply descriptive statistics techniques to summarize data and inferential statistics methods to draw meaningful conclusions.
CO4: Implement data preparation techniques such as feature selection, and feature extraction in order to have quality data for model development.
CO5: Apply various data analysis techniques, including statistical and machine learning methods, to analyze data effectively.
CO6: Apply data analysis skills to real-world case studies, to address practical challenges in data analysis.

Empirical Software Engineering (SE301)
CO1: Understand the fundamentals of empirical software engineering, including the types of empirical studies, research process, and ethical considerations, to conduct and evaluate empirical research effectively.
CO2: Apply systematic literature review procedure to extract findings from existing empirical studies in a structured manner.
CO3: Evaluate software metrics values to improve software development processes.
CO4: Design experimental studies using hypothesis formulation, and statistical testing to investigate research questions in software engineering effectively.
CO5: Utilize data mining techniques to extract valuable insights from software repositories, including configuration management systems, and bug tracking systems, to inform software development practices, and decision-making.

DBMS (SE 206)
CO1: To understand the concepts of DBMS and would have acquired skills to analyse the real-world problem domains in the context of DBMS and demonstrate the same through ER diagram.
CO2: To apply and demonstrate with understanding of relational query languages such as SQL, Relational Algebra and Relational Calculus.
CO3: To relate the concepts of inference rules, data constraints and normalization. Students would also have acquired skills to identify application of the same.
CO4: Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing. To appraise the basic issues of Transaction processing and Serializability.
CO5: To classify various concurrency control techniques and recovery procedures
CO6: Familiar with case studies regarding commercial database, Oracle platforms, Postgres and MYSQL.

Advances in Software Engineering (SE
CO1: Have an understanding of the terminology, the process and the models of the software reliability engineering
CO2: Have learned techniques to predict and measure reliability of the software systems
CO3: Know how to improve software requirement during the various stages of the software development life cycle & apply the principles and methods of software testing.
CO4: Know how to improve reliability during the various stages of the software development life cycle
CO5: To select and apply any software reliability model with appropriate technologies and techniques for different types of testing research in different domains and contexts.

Software Requirement Engineering (SE 305)

CO1: Understanding of the terminology, the process and the models of the software requirement engineering in science, mathematics, fundamentals of computer science, software engineering and multidisciplinary engineering to begin in practice as a software engineer.
CO2: Learned techniques to predict and measure reliability of the software systems and Design an applicable solution in one or more application domains using software engineering approaches.
CO3: Know how to improve software requirement during the various stages of the software development life cycle & apply the principles and methods of software testing.
CO4: Effectively gather and analyze software requirements for the development of cost-effective and efficient technical solutions and use the standard requirements engineering techniques for eliciting, analyzing, validating and managing software requirements.
CO5: Create models of requirements using a variety of notations and techniques, prepare software requirements specifications using an industry standard and also prepare for, and undertake formal specification reviews all over the software process development in different domains and contexts.

Engineering Analysis and Design (SE 207)

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

IPR (SE 425)
CO1: To gain a comprehensive understanding of intellectual property rights, including their historical development and various types.
CO2: To understand the legal framework governing IPR, including the Indian Patent Act of 1970 and 2002
CO3: To acquire a deep understanding of trademarks and the Indian trademark act 1999.
CO4: To acquire a deep understanding of trademarks and the Indian copyright act 1957.
CO5: To acquire a deep understanding of Industrial design and the Industrial act, 2000.
CO6: To gain information about various treaties and case laws relevant to IPR.

Algorithm and Design COURSE (SE 208)
CO1: To learn the Algorithm and Design Concepts of linear and non linear structures and complexity
CO2: To understand concept of searching and sorting
CO3: To learn concepts of searching and sorting

CO4: To learn concepts of Greedy method

CO5: To understand concepts of Dynamic programming

CO6: To understand the concepts of Branch and Bound

CO7: To understand computational complexity

Computer Network (SE304)
CO1: To learn the concepts for introduction to computer network
CO2: To understand Medium Access sub layer concepts
CO3: To learn concepts of Network Layer
CO4: To understand concepts of Transport Layer:
CO5: To understand the concepts of Presentation Layer

CO6: To learn the concepts of Application Layer

Data Structure (SE 201)
CO1: To have a basic understanding of data structure
CO2: To learn the Data Structure Concepts of linear and non linear structures
CO3: To understand concept of lists
CO4: To learn concepts of searching and sorting
CO5: To understand concepts of Graphs
CO6: To understand the concepts of file structure

Machine Learning (SWE-5406)
CO1: Demonstrate the advanced concepts of various types of Machine learning techniques.
CO2: Develop the innovative solution by applying ML techniques on existing datasets.
CO3: Analyse the classification and regression problem using machine learning techniques.
CO4: Apply the various machine learning techniques in real life smart application.
CO5: Understand Predictive modelling steps in model prediction and analyse the data using various attribute selection methods.

Advanced Operating System (SWE5405)
CO1: To learn about Operating system concepts: history, evolution and philosophy of operating systems.
CO2: To learn about Concurrent processes, process coordination and CPU scheduling.
CO3: To learning about process synchronization and deadlocks
CO4: To understand memory management, virtual memory
CO5: To learn about secondary storage and file management, device management,
CO6: To understand the security and protection, networking, and distributed and real-time systems.

Software Requirement Engineering (SE305)
CO1: Understand essential software requirements components and dimensions. Apply good practices in requirements engineering, emphasizing processes and risk management.
CO2: Understand current trends in requirements elicitation, analysis models, and methods for verifying requirements.
CO3: Apply principles and practices of Software Requirements Management (RM). Utilize requirements attributes and the Change Management Process.
CO4: Analyse the importance of Requirements Traceability Matrix and links in the requirements chain. Evaluate the benefits of RM tools like Rational Requisite Pro and Caliber RM.
CO5: Evaluate commercial requirements management techniques and tools. Compare and assess the advantages and challenges of implementing requirements management automation.
CO6: Understand latest trends in requirements engineering, including aspect-oriented and agent-based approaches.

Software Project Management (SE427)
CO1: Understand basic project management concepts and software life cycle models.
CO2: Understand and apply various estimation models for cost, effort, schedule and productivity.
CO3: Analyse various project organizations & responsibilities and Project Tracking and Control Defect Tracking Concepts
CO4: Understand the importance of project closure analysis and apply it.
CO5: Analyse the evolution of software economics from conventional to modern practices.
CO6: Understand the upcoming trends in software project management and explore modern practices.

Statistical Tool (DSC6205)

CO1: To study the theoretical concept of statistical tools to use statistical methods to identify patterns and trends in data.
CO2: To demonstrate proficiency with statistical analysis of data to identify and assess the assumptions underlying statistical tests.
CO3: To execute statistical tools to design and conduct experiments to test hypotheses.
CO4: To apply mathematical concept of statistical tools and methods to solve problems in real-world contexts and will communicate these solutions effectively.

Mathematical foundation of computer science (DSC501)

CO1: Select appropriate mathematical routines to solve problems.

CO2: Compile and summarize current research on the Mathematical aspect behinddata science to discuss the data analytics impacts.

CO3: Prepare documents that coherently present information for technical andnon-technical audiences.

CO4: Students will develop relevant programming abilities.

CO5: Students will apply data science concepts and methods to solve problems inreal-world contexts and will communicate these solutions effectively.

Internet Of Things (DSC6405)
CO1: Interpret the impact and challenges posed by IoT networks leading to new architectural models.
CO2: Illustrate the smart objects and the technologies to connect them to network.
CO3: Compare different Application protocols for IoT.
CO4: Infer the role of Data Analytics and Security in IoT.
CO5: Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

Data Preparation and Analysis (DSC502)
CO1: Understanding the various data collection strategies and types of repositories
CO2: Applying descriptive statistics techniques to perform Univariate and Bi-variate analysis.
CO3: Evaluate various test performed in Inferential statistics
CO4: Create various types of samples from population and also determine confidence interval for them.
CO5: Analyze various attribute reduction and extraction methods
CO6: Remember different categories of variables and also the levels of data it represents

Data Management and Ethics (DSC503)
CO1: Understanding the various DBMS architectures and its relevance
CO2: Applying different Database languages to interact with DBMS
CO3: Evaluate the effective Database design using various normalization techniques
CO4: Create the effective and consistent transactions in DBMS ensuring database security and integrity.
CO5: Analyze various concurrency control protocols with applicability.
CO6: Remembering various Ethical issues related to data collection and storage, also to recognizing DBA code of ethics.

Machine Learning (DSC 504):
CO1: Demonstrate the advanced concepts of various types of Machine learning techniques.
CO2: Develop the innovative solution by applying ML techniques on existing datasets.
CO3: Analyse the classification and regression problem using machine learning techniques.
CO4: Apply the various machine learning techniques in real life smart application.

CO5: Understand Predictive modelling steps in model prediction and analyse the data using various attribute selection methods.

DEEP Learning (DSC5406)

CO1: Understand Deep Learning and various applications of Deep Learning.

CO2: Understand, apply and evaluate performance of CNN for image classification.

CO3: Understand and apply various Object Detection algorithms like Sliding Window Protocol, RCNN, Faster RCNN, YOLO etc.

CO4: Understand and Apply BERT algorithm.

CO5: Understand and apply Text processing deep learning models like RNN, LSTM, GRU.