DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE OUTCOMES (REGULATION 2021)

SEMESTER III

Course Code / Course Name: MA3354 / Discrete Mathematics

CO No.	Course Outcomes (COs)
C201.1	Apply the concepts of mathematical logics to solve problems using theory of inference and quantifiers.
C201.2	Understand the process of solving problems in recurrence relations to find programs in Fibonacci numbers.
C201.3	Analyze the model to solve real-world problems using graphs and apply the theory to application problems such as computer networks.
C201.4	Analyze the fundamental mathematical concepts of algebraic structures.
C201.5	Understand the concepts of lattices and Boolean algebra to perform logical problems.

Course Code / Course Name: CS3351 / Digital Principles and Computer Organization

CO No.	Course Outcomes (COs)
C202.1	Design various combinational digital circuits using logic gates
C202.2	Design sequential circuits and analyze the design procedures
C202.3	State the fundamentals of computer systems and analyze the execution of an instruction
C202.4	Analyze different types of control design and identify hazards
C202.5	Identify the characteristics of various memory systems and I/O communication

Course Code / Course Name: CS3352 / Foundations of Data Science

CO No.	Course Outcomes (COs)
C203.1	Recall the steps and key components of the data science process.
C203.2	Describe and differentiate various data types and their roles in the data science process.
C203.3	Analyze and interpret relationships and patterns in data using statistical methods.
C203.4	Apply Python libraries such as Pandas and NumPy to manipulate and prepare data for analysis.
C203.5	Create data visualizations using Python libraries such as Matplotlib and Seaborn to effectively communicate findings and insights from data.

Course Code / Course Name: CS3301 / Data Structures

CO No.	Course Outcomes (COs)
C204.1	Understand the distinctions between linear and non-linear data structures and their characteristics.
C204.2	Implement operations for both linear (lists, stacks, queues) and non-linear (trees, graphs) data structures.
C204.3	Select and apply the right data structure operations to effectively solve specific computational problems.
C204.4	Implement and utilize relevant graph algorithms to address real-world problems involving graph-based data.
C204.5	Evaluate and compare the efficiency and performance of different searching and sorting algorithms.

Course Code / Course Name: CS3391 / Object Oriented Programming

CO No.	Course Outcomes (COs)
C205.1	Apply the concepts of classes and objects to solve simple problems.
C205.2	Develop programs using inheritance, packages and interfaces.
C205.3	Understand exception handling mechanisms and multithreaded model to solve real world problems.
C205.4	Build Java applications with I/O packages, string classes, Collections and generics concepts.
C205.5	Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications.

Course Code / Course Name: CS3311 / Data Structures Laboratory

CO No.	Course Outcomes (COs)
C206.1	Understand how to manipulate linear data structures efficiently to perform various operations like insertion, deletion, and traversal
C206.2	Create programs using Stacks and queue, applying theoretical concepts to practical solutions and evaluating their effectiveness.
C206.3	Develop the ability to use appropriate tree data structure to solve real world problem.
C206.4	Apply graph algorithms effectively, integrating analysis and synthesis skills to solve complex graph problems.
C206.5	Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

Course Code / Course Name: CS3381 / Object Oriented Programming Laboratory

CO No.	Course Outcomes (COs)
C207.1	Apply the knowledge of mathematics and object oriented programming concepts like inheritance, polymorphism and encapsulation to design and develop simple java programs.
C207.2	Build java applications using exceptions and packages by applying the knowledge of mathematics and engineering fundamentals.
C207.3	Apply the concept of multi-threading and generics to develop a real time java application

CO No.	
C207.4	Apply the concept of Java FX controls to build a Graphical User Interface with the help of mathematics and engineering fundamentals
C207.5	Implement and deploy web applications using Java

Course Code / Course Name: CS3361 / Data Science Laboratory

CO No.	Course Outcomes (COs)
C208.1	Utilize Python data science libraries for effective data manipulation, analysis, and visualization.
C208.2	Apply fundamental statistical and probability concepts to analyze and interpret data in a data science context.
C208.3	Employ descriptive analytics techniques to understand and summarize the characteristics of benchmark datasets.
C208.4	Conduct correlation and regression analyses on standardized datasets to uncover relationships and make predictions.
C208.5	Utilize Python visualization packages to create meaningful and insightful visual representations of data, aiding in its interpretation and communication.

Course Code / Course Name: GE3361 / Professional Development

CO No.	Course Outcomes (COs)
C209.1	Use MS Word to create well-organized, professional-quality documents for technical and academic purposes.
C209.2	Use MS Excel to perform data operations, analyze information, and process data for various needs.
C209.3	Use MS Excel to create charts, graphs, and tables to present data in a clear and understandable way.
C209.4	Use MS PowerPoint to design academic presentations, including multimedia elements, charts, and tables to make the content engaging.
C209.5	Combine and link different elements like tables, charts, and media objects in MS PowerPoint to create cohesive and professional presentations.

SEMESTER IV

Course Code / Course Name: CS3452 / Theory of Computation

CO No.	Course Outcomes (COs)
C210.1	Construct automata theory using Finite Automata to recognize specific languages, identify states, design transitions and patterns, which is a fundamental skill in automata theory and formal languages.
C210.2	Understand the pattern, write regular expressions for any pattern, and test the regular expression for text processing, pattern matching, validation, extraction, and transformation and lexical analysis
C210.3	Define the Alphabet , identify Non-terminal symbols, define production rules, design context free grammar and construct Pushdown Automata
C210.4	Design Turing machine for computational functions defining the machine's states, transitions, tape alphabet, and logic to perform specific tasks or computations

CO No.	Course Outcomes (COs)
C210.5	Differentiate between decidable and undecidable problems. Understanding this distinction is essential for comprehending the boundaries and limitations of computation and problem-solving in computer science

Course Code / Course Name: CS3491 / Artificial Intelligence and Machine Learning

CO No.	Course Outcomes (COs)
C211.1	Apply the knowledge of mathematics, engineering fundamentals, problem solving approaches and various search techniques to build AI based applications.
C211.2	Build a Bayesian network that identify solutions for exact and approximate inference for any complex engineering problems by using first principles of mathematics and engineering sciences.
C211.3	Build Linear, Logistic regression models, probabilistic models, decision trees, naïve bayes classifier and random forests by applying the knowledge of mathematics and engineering fundamentals.
C211.4	Analyse a suitable unsupervised machine learning models like K-means, K-Nearest Neighbour, bagging and boosting by applying first principles of mathematics to design a solution for any complex engineering problem.
C211.5	Apply the concept of Perceptron, Multilayer perceptron, activation functions and error backpropagation techniques to build a neural network model using the knowledge of mathematics, science and engineering fundamentals to solve complex problems.

Course Code / Course Name: CS3492 / Database Management Systems

CO No.	Course Outcomes (COs)
C212.1	Understand relational database model with database system architecture and construct SQL Queries using relational algebra.
C212.2	Create a database design using Entity Relationship model and decompose the database using normalization.
C212.3	Construct queries to handle transaction processing and maintain consistency of the database using concurrency control
C212.4	Compare and contrast various indexing strategies and apply query optimization techniques to tune the performance of the database.
C212.5	Appraise how advanced distributed databases differ from Relational Databases and construct different NoSQL databases with enhanced security.

Course Code / Course Name: CS3401 / Algorithms

CO No.	Course Outcomes (COs)
C213.1	Evaluating algorithm efficiency across various analytical frameworks to optimize computational processes.
C213.2	Apply graph algorithms effectively to tackle diverse problem sets and evaluate their computational efficacy.
C213.3	Make use of algorithmic design techniques like divide and conquer, dynamic programming, and greedy strategies for efficient problem-solving.
C213.4	Utilize the state space tree method as a systematic approach to navigating complex problem spaces and finding solutions.

CO No.	Course Outcomes (COs)
C213.5	Apply approximation and randomized algorithms to address real-world challenges where precise solutions are impractical or computationally expensive.

Course Code / Course Name: CS3451 / Introduction to Operating Systems

CO No.	Course Outcomes (COs)
C214.1	Understand the concepts of OS, the basic principles used in the design of Operating system and process.
C214.2	Implement various CPU Scheduling Algorithms and understand semaphore, Deadlock Avoidance and Deadlock Detection Algorithms.
C214.3	Understand the purpose of Memory Allocation Methods in a computer and can compare and contrast between the various memory allocation methods
C214.4	Understand File Organization and File Allocation Strategies to improve the performance of a computer.
C214.5	Understand the concept of virtualization and types of virtual machines and mobile OS.

Course Code / Course Name: GE3451 / Environmental Sciences and Sustainability

CO No.	Course Outcomes (COs)
C215.1	Understand the Concept of Environment and bio diversity, duty of individual in conservation of environment and bio diversity.
C215.2	Create Awareness on Environmental Pollution, its causes, effects and control, management of natural disasters.
C215.3	Understand energy management and conservation and also the importance of new sources of energy.
C215.4	Understand the sustainability and management process and analyse climate changes, concept of carbon credit and the challenges of environmental management.
C215.5	Analyse the role of sustainable urbanization and to understand green materials, energy cycles and explain the rules and regulation of Sustainability practices

Course Code / Course Name: CS3461 / Operating Systems Laboratory

CO No.	Course Outcomes (COs)
C216.1	Understand the installation process of windows OS in a step by step procedure, and implement UNIX commands.
C216.2	Implement various CPU Scheduling Algorithms, and understand Semaphore, Deadlock Avoidance and Deadlock Detection Algorithms.
C216.3	Develop various Memory Allocation Methods and Page Replacement Algorithms
C216.4	Implement various File Organization and File Allocation Strategies to improve the performance of a computer.
C216.5	Use various Disk Scheduling Algorithms to minimize the seek time and rotational latency, thereby improving the overall performance of the system.

Course Code / Course Name: CS3481 / Database Management Systems Laboratory

CO No.	Course Outcomes (COs)
C217.1	Write SQL queries using typical data definition language and data manipulation language with different types of Key constraints in relational database management system
C217.2	Construct SQL queries using where clause and perform different join operations, apply Data Control Language for complex transactions.
C217.3	Apply advanced features of PL/SQL such as stored procedures and triggers, incorporate in GUI based application development.
C217.4	Apply view, index for an SQL database and Create an web application to retrieve data from XML database with XML Schema Validation.
C217.5	Create and manipulate NoSQL database to perform CRUD operations, apply the database design for a real time application.

SEMESTER V

Course Code / Course Name: CS3591 / Computer Networks

CO No.	Course Outcomes (COs)
C301.1	Describe the foundational layers of computer networks and their associated functions
C301.2	Analyze the principles governing the flow of data between individual network nodes.
C301.3	Evaluate the performance and efficiency of routing algorithms in computer networks through critical analysis
C301.4	Explain the specific protocols utilized for diverse network functions, emphasizing their roles and implementations
C301.5	Evaluate the operational mechanisms of diverse application layer protocols through in-depth analysis.

Course Code / Course Name: CS3501 / Compiler Design

CO No.	Course Outcomes (COs)
C302.1	Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc.
C302.2	Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.
C302.3	Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.
C302.4	Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.
C302.5	Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization

Course Code / Course Name: CB3491 / Cryptography and Cyber Security

CO No.	Course Outcomes (COs)
C303.1	Apply the principles of network security to analyze and evaluate security architecture, threats, and vulnerabilities, fostering a deeper understanding through critical thinking and synthesis
C303.2	Apply the various synthesis levels to effectively implement these operations, ensuring adopt encryption practices for securing data.
C303.3	Understand the various cryptographic operations within public key cryptography through analysis and evaluation.
C303.4	Analyze the range of authentication methods utilized in various digital contexts. Formulate informed strategies to enhance security measures based on comprehensive authentication evaluations.
C303.5	Analyze different cybercrimes and their implications within the realm of cybersecurity. Develop comprehensive insights to fortify defenses against evolving digital threats.

Course Code / Course Name: CS3551 / Distributed Computing

CO No.	Course Outcomes (COs)
C304.1	Apply the principles of network security to analyze and evaluate security architecture, threats, and vulnerabilities, fostering a deeper understanding through critical thinking and synthesis
C304.2	Apply the various synthesis levels to effectively implement these operations, ensuring adopt encryption practices for securing data.
C304.3	Understand the various cryptographic operations within public key cryptography through analysis and evaluation.
C304.4	Analyze the range of authentication methods utilized in various digital contexts. Formulate informed strategies to enhance security measures based on comprehensive authentication evaluations.
C304.5	Analyze different cybercrimes and their implications within the realm of cybersecurity. Develop comprehensive insights to fortify defenses against evolving digital threats.

Course Code / Course Name: CCS375 / Web Technologies

CO No.	Course Outcomes (COs)
C305.1	Apply the concept of HTML, HTML5, Cascading Style Sheets 3 and Bootstrap framework to construct a basic website.
C305.2	Build dynamic web pages using java script form validation, event handling, DHTML to find solutions to the complex engineering problems
C305.3	Develop a web application using java servlets and JDBC connectivity using the knowledge of mathematics and engineering fundamentals
C305.4	Construct a web application using PHP, XML, XML Schema and XSLT which helps to build a dynamic web pages.
C305.5	Develop interactive web pages using Angular JS framework, node JS, react JS, Firebase and Docker using the knowledge of mathematics and engineering fundamentals.

Course Code / Course Name: CCS336 / Cloud Services Management

CO No.	Course Outcomes (COs)
C306.1	Apply theoretical concepts to analyse and propose effective cloud service deployment strategies, integrating perspectives from information technology service management and diverse service models.
C306.2	Formulate and justify strategic decisions regarding cloud policy, risk management, and IT capacity optimization, integrating principles of change management and cloud service architecture into strategic planning processes.
C306.3	Analyse the Cloud Service Reference Model and Cloud Service Lifecycle to formulate effective strategies for cloud service management, demonstrating proficiency in conceptualizing cloud service design.
C306.4	Evaluate various pricing models for cloud services, such as freemium and subscription-based charging, employing analytical skills to determine COst-effective procurement strategies.
C306.5	Analyze the concepts of IT governance and cloud governance frameworks to establish effective structures for managing cloud services, utilizing critical thinking skills to address governance considerations.

Course Code / Course Name: MX3084/ Disaster Risk Reduction and Management

CO No.	Course Outcomes (COs)
C307.1	Identify and recall definitions and key components of disasters, vulnerability, and disaster risk reduction.
C307.2	Describe hazards, vulnerability factors, and the principles of disaster risk assessment.
C307.3	Utilize specific tools and technologies for effective disaster response.
C307.4	Outline the institutional disaster response frameworks in place within the country.
C307.5	Demonstrate basic disaster response techniques in simulations or controlled environments.

SEMESTER VI

Course Code / Course Name: CCS356/ Object Oriented Software Engineering

CO No.	Course Outcomes (COs)
C308.1	Build a software process model, perspective model, specialized model and agile models by applying the knowledge of mathematics and engineering fundamentals.
C308.2	Design various use case models like class diagram, interaction diagram, activity diagram and state chart diagram for complex engineering problems.
C308.3	Develop various design patterns like Model-view-controller, Publish- Subscribe models using first principles of mathematics and engineering fundamentals.
C308.4	Apply appropriate testing techniques like unit testing, black box testing, and integration testing and white box testing using various IT tools.
C308.5	Build a software model using DevOps with the help of modern tools like AgroUML.

Course Code / Course Name: CS3691 / Embedded Systems and IoT

CO No.	Course Outcomes (COs)
C309.1	Analyze the architecture, instruction set and programming of embedded processors.
C309.2	Apply the concept of embedded C programming in embedded system devices and understand the operating system concepts, types and choosing RTOS
C309.3	Understand the basic components and building blocks of Internet of Things and apply skills to conduct interfacing of arduino boards with embedded components.
C309.4	Understand the characteristics and high level requirements to design new IoT devices and summarize different communication technologies and protoclols of IoT.
C309.5	Implement real field problem by gained knowledge of Embedded Systems with IoT applications using Arduino/Raspberry Pi /open platform.

Course Code / Course Name: OCE351 / Environment and Social Impact Assessment

CO No.	Course Outcomes (COs)
C310.1	Understand the basic concept of Environmental impact assessment, Flow of EIA, EIA Product and Process, Step wise structure of EIA, types of environmental impacts, significance and criteria for selection of EIA consultant.
C310.2	Select methodology for identification of environmental impacts, environmental indices and indicators.
C310.3	Apply the knowledge of predicting impact of proposed project on air, water, land, energy, flora and fauna and Acquire the skills of preparing environment management plans and EIA report.
C310.4	Acquire knowledge of predicting impact of proposed project on Socio-economic conditions and Ability to evaluate environmental impact assessment report.
C310.5	Acquire knowledge of obtaining EC from central Government for proposed project by analyzing the case studies of different projects.

Course Code / Course Name: CCS334 / Big Data Analytics

CO No.	Course Outcomes (COs)
C311.1	Analyze the knowledge of Big Data key trends and effectively evaluate Web analytics and mobile business intelligence to formulate Big Data applications leveraging open-source technology such as Hadoop.
C311.2	Apply the knowledge of Schemaless database, NoSQL, and distribution models to solve complex database design challenges using the open-source tool Cassandra.
C311.3	Utilize the comprehension of MapReduce job execution and employ analytical skills to evaluate failures within classic MapReduce processes, subsequently formulating strategies for effective task execution.
C311.4	Formulate the knowledge of Hadoop Distributed File System (HDFS) and proficiently design Java and Hadoop Interface to create a database incorporating both Cassandra and Hadoop.

C311.5	Implement the knowledge of HBase to formulate and execute examples involving HBase, Big Data models, Hive, and HiveQL queries, with the aim of constructing a complex database.

Course Code / Course Name: CCS367/ Storage Technologies

CO No.	Course Outcomes (COs)
C312.1	Understand the Basics of Information Storage Management and Cloud Infrastructure.
C312.2	Demonstrate proficiency in configuring and managing Master Advanced Intelligent Storage Systems and RAID Technology
C312.3	Comprehend Storage Networking Architectures and Virtualization Technologies.
C312.4	Analyze Disaster Recovery and Remote Replication Technologies.
C312.5	Recognize and Identify the security risks associated with information storage management, security requirements for protecting sensitive data and ensuring compliance with regulations.

Course Code / Course Name: CCS354 / Network Security

CO No.	Course Outcomes (COs)
C313.1	Understand the fundamental principles of cryptography and its role in securing digital communications and data.
C313.2	Understand the process of configure and deploy Kerberos authentication systems for centralized authentication and single sign-on across distributed networks, including Kerberos realms, authentication servers, and ticket-granting servers.
C313.3	Explore authentication protocols such as Extensible Authentication Protocol and its variants in secure network authentication.
C313.4	Analyse real-world email security threats and attacks, including email spam, phishing, malware distribution, and email interception.
C313.5	Design comprehensive firewall and IDS architectures to protect network assets and mitigate security risks, considering factors such as traffic patterns and regulatory requirements.

Course Code / Course Name: MX3089 / Industrial Safety

CO No.	Course Outcomes (COs)
C314.1	Understand the introduction and basic terminologies safety like hazards, risks and important of personal protective equipment's in industries.
C314.2	Understand about the Important Statutory Regulations and standards followed by Indian Factories Act 1948.
C314.3	Conduct and participate the various Safety activities which should be followed in the Industries.
C314.4	Understand about workplace exposures and hazards in various types of industries and their safety precautions.
C314.5	Use various hazards and consequences through various risk assessment techniques with effective manner.

Course Code / Course Name: GE3791 / Human Values and Ethics

CO No.	Course Outcomes (COs)
C401.1	Explain the impact of the French Revolution, American Independence, and the Indian Freedom Movement on the development and implementation of democratic values.
C401.2	Apply secular principles to contemporary issues of religious tolerance and discrimination, proposing practical solutions based on secular values.
C401.3	Analyze the role of evidence-based approaches in validating facts and developing scientific knowledge.
C401.4	Assess the role of inclusive practices in promoting social equity, justice and promote gender equality.
C401.5	Propose ethical guidelines for responsible scientific research, innovation and frameworks for ensuring fairness and accountability in scientific advancements.

Course Code / Course Name: GE3751**/** Principles of Management

CO No.	Course Outcomes (COs)
C402.1	Discuss the evolution of management thoughts and the challenges of managerial activities in a global business environment.
C402.2	Explain the types of planning and decision making methodologies in organizations.
C402.3	Summarize various types of organization structure and associated Human Resources activities for man-power utilization.
C402.4	Explain about motivation theories, behaviour, leadership theories and communication for effective directing.
C402.5	Explain various controlling techniques to maintain standards in organizations.

Course Code / Course Name: AI3021 **/** IT in Agricultural System

CO No.	Course Outcomes (COs)
C403.1	Gain foundational knowledge of agricultural processes and how automation techniques can enhance productivity and efficiency in farming.
C403.2	Understand practical farming techniques and methodologies that support continuous learning and adaptation in agricultural practices.
C403.3	Learn about various sensors and automation tools used in agriculture to monitor and optimize farming operations.
C403.4	Grasp the concepts of climate variability, weather forecasting, and how global models and seasonal applications impact agricultural planning and decision-making.
C403.5	Explore the role of expert systems, e-commerce platforms, and agricultural databases in modern farming. Additionally, the course will cover how technology can support rural development and e-learning initiatives in agriculture.

Course Code / Course Name: OHS351 **/** English for Competitive

CO No.	Course Outcomes (COs)
C404.1	Expand their vocabulary and gain practical techniques to read and comprehend a wide range of texts with the emphasis required.
C404.2	Identify errors with precision and write with clarity and coherence.
C404.3	Understand the importance of task fulfilment and the usage of task-appropriate vocabulary.
C404.4	Communicate effectively in group discussions, presentations and interviews.
C404.5	Write topic based essays with precision and accuracy.

Course Code / Course Name: OHS352 / Project Report Writing

CO No.	Course Outcomes (COs)
C405.1	Develop the ability to create clear, structured, and well-organized project reports that communicate key findings and insights.
C405.2	Apply statistical tools proficiently to analyze data and derive meaningful conclusions in various project contexts.
C405.3	Explain the purpose and intension of the proposed project coherently and with clarity.
C405.4	Customize written content effectively to align with the specific needs and goals of the audience or project.
C405.5	Develop strong skills in crafting persuasive proposals and project plans that stand out and achieve success.

Course Code / Course Name: CS3711 / Summer internship

CO No.	Course Outcomes (COs)
C406.1	To learn the application of knowledge in real world problems.
C406.2	To get exposure to team-work and leadership quality.
C406.3	To deal with industry-professionals and ethical issues in the work environment.
C406.4	Describe the nature and function of the organization in which the internship experience takes place.
C406.5	Evaluate the internship experience in terms of their personal, educational and career needs.

Course Code / Course Name: CS3811 / Project Work / Internship

CO No.	Course Outcomes (COs)
C407.1	Understand concepts of Project and Production Management.
C407.2	Get capable of self-education and clearly understand the value of achieving perfection in project implementation & completion.
C407.3	Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach.
C407.4	Make sound decisions, to progress and develop time and resource management skills to complete the project successfully.
C407.5	Deliver presentations that are required as engineers.