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 principles of logic and proof techniques to validate Mathematical statements
C201.2	Analyse the combinatorial problems using counting techniques, recurrence relations and generating functions.
C201.3	Analyse graph-based models for real-world problems using graph theory concepts.
C201.4	Apply the properties of groups, rings and fields to address and solve mathematical problems.
C201.5	Evaluate logical expressions and Boolean functions using lattice theory and Boolean algebra for digital logic applications.

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 linear (lists, stacks, queues) 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	Understand object-oriented programming concepts by designing and implementing solutions using classes and objects for simple problems.
C205.2	Develop modular Java applications by utilizing inheritance, packages, and interfaces to promote reusability and maintainability.
C205.3	Apply exception handling and multithreading to solve real-world problems involving concurrent execution and error management.
C205.4	Discuss efficient Java programs using I/O operations, string manipulation, collections, and generics for data processing and management.
C205.5	Apply event handling mechanisms and JavaFX components to create interactive and user-friendly 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	Design and develop Java programs using object-oriented programming concepts.
C207.2	Develop simple applications using object oriented concepts such as package, exceptions.
C207.3	Implement multithreading and generics concepts.
C207.4	Create GUIs and event driven programming applications for real world problems.
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	Create well-structured and formatted documents using MS Word for academic and technical purposes.
C209.2	Apply advanced formatting tools in MS Word to organize content using tables, styles, headers/footers, and references.
C209.3	Use MS Excel to perform data entry, manipulation, and basic calculations using formulas and functions.
C209.4	Analyze and visualize data in MS Excel using charts, graphs, pivot tables, and conditional formatting for effective decision-making.
C209.5	Design engaging academic presentations using MS PowerPoint by integrating tables, charts, media, and hyperlinks

SEMESTER IV

Course Code / Course Name: CS3452 / Theory of Computation

CO No.	Course Outcomes (COs)
C210.1	Construct finite automata, including deterministic (DFA) and non-deterministic (NFA) models, and apply DFA minimization techniques to optimize automata structures using mathematical principles for solving complex engineering problems
C210.2	Construct regular expressions and regular languages for given patterns, applying formal proofs such as the Pumping Lemma to determine language regularity, and utilize these concepts to solve complex problems.
C210.3	Determine Context-Free Grammars (CFG) and Pushdown Automata (PDA) for a given language using mathematical principles to formulate solutions for various Computational problems.
C210.4	Design a Turing Machine for simple computational problems and also simplify the Context Free Grammar (CFG) into Chomsky Normal Form (CNF) and Greibach Normal Form (GNF)
C210.5	Analyze unsolvable problems, recursive languages, and NP-completeness to solve computational problems using algorithms like Kruskal's, Traveling Salesman, and 3-CNF SAT.

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

CO No.	Course Outcomes (COs)
C211.1	Understand the fundamental concepts of Artificial Intelligence, problem-solving techniques and various search algorithms to develop intelligent agents.
C211.2	Develop a Bayesian network that applies first principles of mathematics and engineering sciences to identify solutions for both exact and approximate inference in complex engineering problems.
C211.3	Apply Linear, Logistic regression models, probabilistic models, decision trees, naïve bayes classifier and random forests for any real-world problem which helps in solving complex engineering problems.
C211.4	Understand the fundamental concepts of Artificial Intelligence, problem-solving techniques and various search algorithms to develop intelligent agents.
C211.5	Develop a Bayesian network that applies first principles of mathematics and engineering sciences to identify solutions for both exact and approximate inference in complex engineering 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	Understand 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.
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 fundamental concepts, design principles of Operating Systems, process management techniques and their role in maintaining system performance.
C214.2	Analyse various CPU Scheduling Algorithms to evaluate their efficiency and understand Semaphore mechanisms, Deadlock Avoidance and Deadlock Detection.
C214.3	Interpret the purpose of Memory Allocation Methods in a computer system and evaluate different memory allocation techniques for efficiency and performance.
C214.4	Analyse different File Organization, File Allocation Strategies to optimize data storage and retrieval to evaluate their impact on system performance and efficiency.
C214.5	Understand the concept of virtualization and explore different types of virtual machines, various mobile operating systems and their functionalities.

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	Implement 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 normalization.
C303.3	Understand the various cryptographic operations within public key cryptography through analysis and evaluation.
C303.4	Analyze the range of authentication methods used in various digital environments to enhance security measures based on comprehensive authentication evaluations.
C303.5	Analyze different cybercrimes and their implications within the realm of cybersecurity to identify effective measures for strengthening defences against evolving digital threats.

Course Code / Course Name: CS3551 / Distributed Computing

CO No.	Course Outcomes (COs)
C304.1	Understand the basic principles of distributed systems and involve multiple Independent entities work together to achieve a common goal.
C304.2	Demonstrate techniques to manage concurrency and maintain a consistent view of data across multiple nodes by addressing synchronization challenges
C304.3	Examine resource sharing methods like load balancing and distributed file systems to optimize the use of resources in distributed environments.
C304.4	Explore consensus algorithms like Paxos and Raft to achieve agreement across distributed nodes to ensure reliability and fault tolerance.
C304.5	Illustrate the core concepts of cloud computing and cloud service models to understand on-demand access to computing resources.

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 JavaScript 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	Understand the fundamental concepts of cloud ecosystems, service models, deployment models, and IT service management perspectives.
C306.2	Apply cloud strategy frameworks and IT capacity planning techniques to implement demand–capacity matching, risk mitigation, and change management.
C306.3	Analyze the cloud service lifecycle and reference models to manage operations, capacity, and migration of legacy systems.
C306.4	Evaluate cloud pricing models, cost structures, and economic implications to support optimized decision-making for procurement and operations.
C306.5	Design a cloud governance framework and recommend an optimized multi-cloud deployment strategy based on service value and total cost of ownership.

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

CO No.	Course Outcomes (COs)
C307.1	To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)
C307.2	To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction
C307.3	To develop disaster response skills by adopting relevant tools and technology
C307.4	Enhance awareness of institutional processes for Disaster response in the country
C307.5	Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity.

SEMESTER VI

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

CO No.	Course Outcomes (COs)
C308.1	Understand the requirements for a given software system and document them in a Software Requirements Specification (SRS).
C308.2	Apply various use case models, Domain Models, and UML diagrams for the identified software system.
C308.3	Relate various design patterns like Model-view-controller, Publish- Subscribe models based on the detailed design specifications.
C308.4	Analyze test cases to validate the functionality of the implemented system based on the defined use cases.
C308.5	Develop software maintainability and reusability by incorporating suitable design patterns and implementing the system to enhance efficiency.

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: C CS359/Quantum Computing

CO No.	Course Outcomes (COs)
C312.1	Recall and explain the basics of quantum computing, including qubits, superposition, and entanglement, highlighting their differences from classical computing
C312.2	Summarize the principles of Quantum Mechanics, such as quantum postulates and wave-particle duality, and relate them to quantum computing.
C312.3	Analyze the structure and behavior of computation models in quantum computing, identifying their advantages over classical models.
C312.4	Design quantum circuits using single and multiple qubit gates, and implement them in environments like IBM Qiskit.
C312.5	Explain quantum operations like noise handling and error correction, and evaluate their impact on quantum system performance.

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: MX3085 / Well-Being with Traditional Practices-Yoga, Ayurveda and Siddha

CO No.	Course Outcomes (COs)
C314.1	Interpret importance of maintain health and diseases with environment and illustrate different types of health with risk factors.
C314.2	Importance of Diet in maintaining health and role of necessary seven different components in diet.
C314.3	Formulate secrets of sidda and Ayurveda systems and specific production of body from illness by Ayush.
C314.4	Recognize physiological response of people, import the maintance of emotional disturbances and practices self compassion.
C314.5	Categorize types of yoga and choose right kind for individuals based on age and demonstrate simple yogassana.

SEMESTER VII

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	Understand the concepts of management fundamentals, Business organizations and its types and also current trends in management
C402.2	Discuss the nature and purpose of planning in management and also describe various types of planning and tools.
C402.3	Summarize the concepts of organizational structure, authority, job design, and human resource management, including planning, recruitment, training, and performance evaluation.
C402.4	Explain the foundations of individual and group behavior, motivation, leadership theories, and communication processes, including barriers and the role of IT in effective communication.
C402.5	Elaborate the system and process of managerial control, including various control techniques, the role of IT in control, and the relationship between control, productivity, and performance

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 vocabulary and apply practical techniques to read and comprehend a wide range of texts with the appropriate emphasis required for academic and professional contexts.
C404.2	Identify and correct errors in writing with precision, while ensuring clarity and coherence in the expression of ideas.
C404.3	Understand the importance of task fulfillment and utilize task-appropriate vocabulary to enhance written and spoken communication.
C404.4	Communicate effectively in group discussions, presentations, and interviews by practicing active listening, clear articulation, and engaging with others' ideas.
C404.5	Write topic-based essays with precision and accuracy, focusing on developing well-structured arguments and clear, concise writing.

Course Code / Course Name: OHS352 / Project Report Writing

CO No.	Course Outcomes (COs)
C405.1	Apply essential grammar and vocabulary for formal writing, distinguishing between technical and general writing styles.
C405.2	Analyze the structure, types, and purpose of reports, and apply knowledge of plagiarism and data analysis in STEM-related writing.
C405.3	Construct the initial sections of a project report including title, abstract, introduction, research questions, and theoretical framework.
C405.4	Develop comprehensive research content including literature review, methodology, data analysis, findings, and conclusions.
C405.5	Demonstrate effective proofreading, formatting, and oral presentation skills to deliver a professional project report.

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.

SEMESTER VIII

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.