

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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: AD3391 / Database Design and Management

CO No.	Course Outcomes (COs)
C203.1	Understand the database development life cycle and apply conceptual modelling.
C203.2	Apply SQL and programming in SQL to create, manipulate and query the database, and to write and optimizing queries for data management.

C203.3	Analyze to design normalized and efficient database schemas, ensuring data integrity and minimizing redundancy.
C203.4	Analyze the serializability of any non-serial schedule using concurrency techniques
C203.5	Apply the data model and querying in Object-relational and No-SQL databases.

Course Code / Course Name: AD3351 / Design and Analysis of Algorithms

CO No.	Course Outcomes (COs)
C204.1	Critically analyze the efficiency of alternative algorithmic solutions for the same problem
C204.2	Illustrate brute force and divide and conquer design techniques.
C204.3	Explain dynamic programming and greedy techniques for solving various problems.
C204.4	Apply iterative improvement technique to solve optimization problemA
C204.5	Examine the limitations of algorithmic power and handling it in different problems.

Course Code / Course Name: AD3301 / Data Exploration and Visualization

CO No.	Course Outcomes (COs)
C205.1	Analyze the difference between Exploratory Data Analysis (EDA) and classical/Bayesian analysis to effectively interpret and manipulate data.
C205.2	Create customized and advanced visualizations using Matplotlib and Seaborn to effectively communicate data insights.
C205.3	Evaluate the distribution and variability of single-variable data using numerical summaries and scaling techniques.
C205.4	Analyze the relationships between two variables using contingency tables and scatterplots to interpret bivariate data.
C205.5	Apply the fundamentals of time series analysis (TSA) to clean, index, and visualize time-based data.

Course Code / Course Name: AL3391 / Artificial Intelligence

CO No.	Course Outcomes (COs)
C206.1	Understand the foundational principles of intelligent agent frameworks, by exploring their components and architecture in real-world scenarios.
C206.2	Apply various problem-solving methodologies to solve complex tasks with expected outcomes in diverse contexts.
C206.3	Utilize game-playing strategies and constraint satisfaction problem (CSP) techniques to specific scenarios.
C206.4	Apply principles of formal logic to construct arguments, logical consistency and inductive reasoning methods.
C206.5	Develop probabilistic models to uncertainty scenarios and make well-informed decisions based on the outcomes.

Course Code / Course Name: AD3381 / Database Design and Management Laboratory

CO No.	Course Outcomes (COs)
C207.1	To understand the database development life cycle
C207.2	To learn database design using conceptual modelling, Normalization
C207.3	To implement database using Data definition, Querying using SQL manipulation and SQL programming
C207.4	To implement database applications using IDE/RAD tools
C207.5	To learn querying Object-relational databases

Course Code / Course Name: AD3311 / Artificial Intelligence Laboratory

CO No.	Course Outcomes (COs)
C208.1	Implement AI algorithms, such as search algorithms, machine learning models, and optimization methods, to address complex real-world problems.
C208.2	Design and develop intelligent agents using frameworks with insights into system improvements.
C208.3	Understand the principles of supervised and unsupervised learning, apply machine learning techniques to real datasets.
C208.4	Construct systems for knowledge representation using logic-based techniques, reasoning algorithms to infer new knowledge from existing data.
C208.5	Analyze the ethical considerations surrounding the use of AI with critical thinking to assess the societal impacts for mitigating potential biases and risks in AI applications.

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: MA3391 / Probability and Statistics

CO No.	Course Outcomes (COs)
C210.1	Understand the fundamental knowledge of the concepts of probability to analyze uncertainty in real-world problems.
C210.2	Relate the concepts of one and two-dimensional random variables to model relationships in datasets.
C210.3	Demonstrate testing of hypothesis for small and large samples to solve real-life challenges.
C210.4	Apply the basic concepts of classifications of design of experiments to improve processes in agriculture.
C210.5	Interpret the concept of sampling, apply appropriate sampling methods, and analyze the resulting data to draw meaningful insights from a population.

Course Code / Course Name: AL3452 / Operating Systems

CO No.	Course Outcomes (COs)
C211.1	Analyze various scheduling algorithms and process synchronization to optimize CPU utilization.
C211.2	Explain deadlock, prevention, and avoidance algorithms to understand system reliability.
C211.3	Compare and contrast various memory management schemes to evaluate their efficiency.
C211.4	Demonstrate the functionality of file systems, I/O systems, and virtualization to understand storage and processing mechanisms.
C211.5	Compare iOS and Android operating systems to identify their unique features.

Course Code / Course Name: AL3451 / Machine Learning

CO No.	Course Outcomes (COs)
C212.1	Explain the basic concepts of machine learning to understand its foundational principles.
C212.2	Construct supervised learning models to predict outcomes based on labelled data.
C212.3	Construct unsupervised learning algorithms to uncover hidden patterns in data.
C212.4	Evaluate and compare different models to determine their accuracy and efficiency.
C212.5	Apply supervised and unsupervised learning algorithms to solve classification, regression, and clustering tasks.

Course Code / Course Name: AD3491 / Fundamentals of Data Science and Analytics

CO No.	Course Outcomes (COs)
C213.1	Explain the data analytics pipeline to understand the sequential stages of data processing to optimize workflows for better insights.
C213.2	Describe and visualize data to uncover patterns and trends effectively to make complex information more comprehensible
C213.3	Perform statistical inferences from data to draw meaningful conclusions to support decision-making under uncertainty.

C213.4	Analyze the variance in the data to identify sources of variability in the data to assess its impact on outcomes.
C213.5	Build models for predictive analytics to forecast future trends and behaviors for predictive analytics to make data-driven predictions.

Course Code / Course Name: CS3591 / Computer Networks

CO No.	Course Outcomes (COs)
C214.1	Describe the foundational layers of computer networks and their associated functions
C214.2	Analyze the principles governing the flow of data between individual network nodes.
C214.3	Evaluate the performance and efficiency of routing algorithms in computer networks through critical analysis
C214.4	Explain the specific protocols utilized for diverse network functions, emphasizing their roles and implementations
C214.5	Evaluate the operational mechanisms of diverse application layer protocols through in- depth analysis.

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: AD3411 / Data Science and Analytics Laboratory

CO No.	Course Outcomes (COs)
C216.1	Develop Python programs to handle data using Numpy and Pandas for efficient data manipulation and to process and analyze large datasets.
C216.2	Perform descriptive analytics to summarize and interpret data characteristics and gain insights into data distribution and trends.
C216.3	Perform data exploration using Matplotlib to visualize and understand data patterns to create informative visual representations of data.
C216.4	Perform inferential data analytics to make conclusions and predictions based on sample data to estimate population parameters and assess relationships.
C216.5	Build models of predictive analytics to forecast future trends and to generate data-driven solutions for decision-making.

Course Code / Course Name: AD3461 / Machine Learning Laboratory

CO No.	Course Outcomes (COs)
C217.1	Apply suitable algorithms for selecting the appropriate features for analysis to improve model performance.
C217.2	Implement supervised machine learning algorithms on standard datasets and evaluate the performance to solve classification and regression problems.
C217.3	Demonstrate unsupervised machine learning algorithms on standard datasets and evaluate the performance to discover hidden patterns in data.
C217.4	Build graph-based learning models for standard datasets to capture relationships and dependencies in data.
C217.5	Assess and compare the performance of different ML algorithms and select the suitable one based on the application to optimize model selection.

SEMESTER V**Course Code / Course Name: AD3501 / Deep Learning**

CO No.	Course Outcomes (COs)
C301.1	Understand the foundational concepts of deep neural networks, and the principles of their architecture and its functions.
C301.2	Apply convolutional neural networks (CNNs) for image processing tasks, applying CNN architectures to analyse and classify visual data effectively.
C301.3	Demonstrate recurrent neural networks (RNNs) and their variants for text analysis by applying these models to understand sequential patterns and contextual information.
C301.4	Analyze model evaluation techniques for different machine learning applications to ensure the effectiveness of models in various domains.
C301.5	Implement autoencoders and generative models for specific applications to study and generate data for unsupervised learning tasks.

Course Code / Course Name: CW3551 / Data and Information Security

CO No.	Course Outcomes (COs)
C302.1	Understand the foundational concepts of data and information security and protection mechanisms in information systems.
C302.2	Apply ethical decision-making frameworks to address challenges and ensure compliance in real-world scenarios.
C302.3	Apply various authentication schemes to simulate different applications and their effectiveness in securing systems.
C302.4	Evaluate Electronic mail security and IP Security System Standards in various environments.
C302.5	Develop web security protocols, effectiveness in securing ecommerce applications and ensuring safe transactions over the internet.

Course Code / Course Name: CS3551 / Distributed Computing

CO No.	Course Outcomes (COs)
C303.1	Understand the basic principles of distributed systems and involve multiple Independent entities work together to achieve a common goal.
C303.2	Demonstrate techniques to manage concurrency and maintain a consistent view of data across multiple nodes by addressing synchronization challenges
C303.3	Examine resource sharing methods like load balancing and distributed file systems to optimize the use of resources in distributed environments.
C303.4	Explore consensus algorithms like Paxos and Raft to achieve agreement across distributed nodes to ensure reliability and fault tolerance.
C303.5	Illustrate the core concepts of cloud computing and cloud service models to understand on-demand access to computing resources.

Course Code / Course Name: CCS334 / Big Data Analytics

CO No.	Course Outcomes (COs)
C304.1	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.
C304.2	Apply the knowledge of Schemaless database, NoSQL, and distribution models to solve complex database design challenges using the open-source tool Cassandra
C304.3	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.
C304.4	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.
C304.5	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: CCS360/ Recommender Systems (Professional Elective I)

CO No.	Course Outcomes (COs)
C305.1	Apply the basic concepts of recommender systems concepts to study user preferences and recommend relevant items effectively.
C305.2	Apply machine-learning and data-mining algorithms to recommender system datasets to identify patterns and optimize recommendation accuracy.
C305.3	Demonstrate collaborative filtering methods in recommender systems to evaluate the performance and assess the quality and relevance of recommendations.
C305.4	Develop a simple recommender system using basic algorithms to provide personalized recommendations based on user data.
C305.5	Apply advanced techniques in recommender systems to enhance system performance, scalability, and real-world applicability.

Course Code / Course Name: CCS345/ Ethics and AI (Professional Elective II)

CO No.	Course Outcomes (COs)
C306.1	Understand and learn the principles of morality and ethics in AI, applying ethical frameworks to assess AI behavior and decision-making processes.
C306.2	Find the ethical harms that can arise in AI systems, apply ethical initiatives to mitigate risks and promote responsible AI development.
C306.3	Make use of AI standards and regulations to ensure safe design practices for autonomous and semi-autonomous systems in real-world applications.
C306.4	Demonstrate the concepts of Roboethics and the morality of robotic systems to evaluate the professional responsibilities involved in designing and deploying robots.
C306.5	Survey the societal issues in AI, applying national and international strategies to address challenges and promote the responsible use of AI technologies worldwide.

Course Code / Course Name: AD3511 / Deep Learning Laboratory

CO No.	Course Outcomes (COs)
C307.1	Implement deep neural networks to solve basic problems like classification and regression to build and train models to handle structured data tasks.
C307.2	Use Convolutional Neural Networks (CNNs) for image recognition, classification, and processing tasks to detect patterns and features in visual data.
C307.3	Implement Recurrent Neural Networks (RNNs) and their variants (LSTMs, GRUs) to process sequential data for sentiment analysis and language translation.
C307.4	Utilize generative models like GANs to create synthetic data for augmentation to improve model generalization and performance.
C307.5	Create practical solutions for real-world problems by selecting and applying the appropriate deep neural network architectures to specific applications.

Course Code / Course Name: AD3512 / Summer internship

CO No.	Course Outcomes (COs)
C308.1	Participate in real-world projects and tasks that provide practical to develop professional skills and knowledge applicable to career goals.
C308.2	Utilize academic concepts and techniques to address real-life challenges to enhance problem-solving abilities by working on industry-relevant projects.
C308.3	Sole as teams with professionals and peers to complete tasks and projects through effective communication, collaboration, and conflict resolution.
C308.4	Make use of the tools, software, and technologies commonly used in industry by gaining proficiency in platforms that will enhance future career prospects.
C308.5	Motivation from the industry mentors who provide feedback and advice on career development that can support career progression.

SEMESTER VI

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 protocols 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/ Environmental and Social Impact Assessment (Open Elective – I*)

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: CCS345/ Ethics and AI (Professional Elective III)

CO No.	Course Outcomes (COs)
C311.1	Understand and learn the principles of morality and ethics in AI, applying ethical frameworks to assess AI behavior and decision-making processes.
C311.2	Find the ethical harms that can arise in AI systems, apply ethical initiatives to mitigate risks and promote responsible AI development.
C311.3	Make use of AI standards and regulations to ensure safe design practices for autonomous and semi-autonomous systems in real-world applications.
C311.4	Demonstrate the concepts of Roboethics and the morality of robotic systems to evaluate the professional responsibilities involved in designing and deploying robots.

C311.5	Survey the societal issues in AI, applying national and international strategies to address challenges and promote the responsible use of AI technologies worldwide.
C311.6	Understand and learn the principles of morality and ethics in AI, applying ethical frameworks to assess AI behavior and decision-making processes.

Course Code / Course Name: CCS359/ Quantum Computing (Professional Elective VI)

CO No.	Course Outcomes (COs)
C314.1	Explain the fundamental concepts of quantum computing, including complex numbers, linear algebra, matrices, and quantum mechanics postulates, and differentiate them from classical computing.
C314.2	Implement quantum gates and circuits using single and multiple qubit operations, and apply quantum error correction techniques in quantum computing environments.
C314.3	Implement and analyze quantum algorithms using programming frameworks, and evaluate their computational performance.
C314.4	Apply quantum information theory to data compression, channel coding, and analyze classical information transfer over noisy quantum channels.
C314.5	Apply quantum cryptographic techniques and implement Shor's algorithm for cryptanalysis.

Course Code / Course Name: CCS360/ Recommender Systems (Professional Elective IV)

CO No.	Course Outcomes (COs)
C312.1	Apply the basic concepts of recommender systems concepts to study user preferences and recommend relevant items effectively.
C312.2	Apply machine-learning and data-mining algorithms to recommender system datasets to identify patterns and optimize recommendation accuracy.
C312.3	Demonstrate collaborative filtering methods in recommender systems to evaluate the performance and assess the quality and relevance of recommendations.
C312.4	Develop a simple recommender system using basic algorithms to provide personalized recommendations based on user data.
C312.5	Apply advanced techniques in recommender systems to enhance system performance, scalability, and real-world applicability.

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.
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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.