Department of Artificial Intelligence & Data Science

Course Outcome

Vision

To be a globally recognized center of excellence in Artificial Intelligence and Data Science, fostering multidisciplinary collaborations, technological innovation and research to address real world challenges and enhance societal progress.

Mission

To equip students with strong theoretical foundations and practical skills in Artificial Intelligence and Data Science for multidisciplinary and technology driven academic framework, facilitate research and innovation to solve real-world problems, and enhance industry collaborations to develop ethical solutions for societal progress.

Program Educational Objectives

- To equip graduates with multidisciplinary knowledge and ethical AI expertise to solve real-world challenges responsibly.
- To enable graduates to apply research expertise and entrepreneurial skills for innovation and technological advancements.
- Graduates will possess industry relevant skills and exhibit ethical behavior and societal responsibility.

Program Outcomes:

PO1	**Engineering knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 to develop to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1 to WK4).
PO3	**Design/development of solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required (WK5).
PO4	**Conduct investigations of complex problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions (WK8).
PO5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
PO6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5 and WK7).
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
PO8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) Independent and life-long learning, ii) Adaptability to new and emerging technologies and iii) Critical thinking in the broadest context of technological change. (WK8).

Knowledge and Attitude Profile (WK)

WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Specific Outcomes:

PSO1	Apply core and advanced concepts of AI & Data Science to design and implement intelligent solutions for real-world challenges across various domains.
PSO2	Utilize research based knowledge for innovation and technological advancements while exploring emerging technologies to create societal and industrial impact.
PSO3	Develop solutions with a strong ethical foundation while working effectively both individually and in teams to address global technological challenges.

Course Outcome

Second Year B.Tech Information Technology (2024 Pattern)

Semester – I

CO	C201: Data Structures (161301)
C201.1	Select appropriate searching and sorting techniques in the application development.
C201.2	Solve problems using stack and queue data structure.
C201.3	Apply linked list data structure for solving problems.
C201.4	Solve problems based on tree and graph data structure.
C201.5	Apply hashing techniques for implementing data structures.

CO	C202: Digital Logic and Computer Organization (161302)
C202.1	Apply Boolean algebra and logic minimization techniques to simplify combinational logic expressions.
C202.2	Apply design techniques to develop Sequential Circuits.
C202.3	Study various concepts of Computer architectures and organization.
C202.4	Illustrate advanced features of 80386 Microprocessor.
C202.5	Apply knowledge of the 80386 instruction set to write and analyze assembly-level programs.

CO	C203: Discrete Mathematics (161303)
C203.1	Solve problems by applying set theory, propositional logic, and formal proof techniques.
C203.2	CO2: Illustrate problems logically by using function and relation models.
C203.3	CO3: Analyze the number of possible outcomes using permutations and combinations.
C203.4	CO4: Solve computing problems using appropriate graph and tree algorithms.
C203.5	CO5: Evaluate algebraic structures and coding theory.

CO	C204: MDM-I Artificial Intelligence (170404A)
C204.1	Explain the basic principles and scope of Artificial Intelligence and its relevance to different engineering disciplines.
C204.2	Apply search algorithms for solving simple engineering problems.
C204.3	Understand and differentiate between types of machine learning and data representations.
C204.4	Identify and analyze AI applications in domains such as predictive maintenance, smart cities, automation, and control systems.
C204.5	Recognize ethical, social, and professional issues in deploying AI solutions in engineering contexts.

CO	C205A: OEC-1 Intellectual Property Rights and Ethics (171305A)
C205A.1	Understand the basics of intellectual property rights.
C205A.2	Learn the patent filing process.
C205A.3	Understand the copyright/trademark/industrial design and filing process.
C205A.4	Understand the importance of ethics in their personal and professional life.
C205A.5	Learn the workplace responsibilities and rights as an engineer in the industry.

CO	C205B: OEC-1 Renewable Energy (171305B)
C205B.1	Describe the basics of renewable energy.
C205B.2	Explain the constructional details and working of hydro-electric power plant.
C205B.3	Describe the fundamentals and technology to harness solar energy.
C205B.4	Explain the wind energy conversion system.
C205B.5	Discuss the bio-energy conversion pathways.

CO	C205C: OEC-1 Health, Care and Management Systems (171305C)
C205C.1	Understand the structure and function of key human body systems relevant to healthcare and diagnosis.
C205C.2	Identify common health issues and explain their causes, symptoms.
C205C.3	Describe the working principles and applications of basic biomedical instruments used in diagnosis and monitoring
C205C.4	Analyze the role of advanced medical devices and imaging systems in clinical decision making and treatment.
C205C.5	Explain the components of hospital management system and significance of digital health technologies like Electronic Health Records (EHR), telemedicine and emergency tracking.

CO	C205D: OEC-1 Smart City and Infrastructure (171305D)
C205D.1	Describe concept, features and components of smart cities with relevant examples.
C205D.2	Demonstrate the structure and regulatory mechanisms of smart city development in context of Indian and international benchmarks.
C205D.3	Apply GIS and remote sensing techniques for spatial analysis and infrastructure planning in smart cities.
C205D.4	Relate smart transportation technologies and their role in improving urban mobility and sustainability.
C205D.5	Suggest smart solutions for urban water, air and waste management using IoT technologies.

CO	C206: EEM Business Economics (172406)
C206.1	CO1: Understand the role of economics in business decision-making and analyze real-world economic scenarios.
C206.2	CO2: Apply demand and supply principles to determine market equilibrium and pricing Strategies.
C206.3	CO3: Analyze cost structures, profitability and break-even points in business operations.
C206.4	CO4: Evaluate the impact of business cycles, inflation, and government economic policies on industries.
C206.5	CO5: Develop pricing strategies based on competitive analysis and consumer demand.

CO	C207: VEC Environmental Studies (173407)
C207.1	Describe the importance of environmental studies and the sustainable use of natural resources.
C207.2	Explain the structure and function of ecosystems and the significance of biodiversity.
C207.3	Identify various types of environmental pollution and their control measures.
C207.4	Discuss key environmental issues, policies and their impact on society.
C207.5	Observe and report environmental conditions and features through field activities.

CO	C208: CEP/FP Community Engagement / Field Projects (214449)
C208.1	Explore relevance between theory and practice through community-based problem Learning.
C208.2	Identify real-life socio-technical problems and develop the solution.
C208.3	Implement wisdom of empathy and social responsibility to meet complex global challenges.
C208.4	Develop innovative ideas in collaboration with society through community-based research methods.
C208.5	Analyze the need of research projects and develop a plan for betterment of public service values through active citizenship.

Second Year B.Tech Information Technology (2024 Pattern)

Semester – II

CO	C209: Operating Systems (161401)
C209.1	Analyze the role and functions of an Operating System in resource management.
C209.2	Apply process/thread scheduling algorithms in operating systems.
C209.3	Implement process synchronization techniques.
C209.4	Evaluate memory management techniques for optimization.
C209.5	Compare I/O management, disk scheduling, and file system techniques.

CO	C210: Database Management System (161402)
C210.1	Design E-R Model for given requirements and convert the same into database tables.
C210.2	Use SQL to write queries for given requirements.
C210.3	Implement normalization techniques, to construct optimized relational database designs.
C210.4	Analyze and implement transaction management strategies.
C210.5	Apply principles of NoSQL and MongoDB databases to perform the operations on databases.

CO	C211: Computer Graphics (161403)
C211.1	Understand the fundamentals of graphics systems and apply mathematics to perform elementary computer graphics operations.
C211.2	Apply the core concepts of transformation in two and three dimensions.
C211.3	Understand basics of hidden surface detection and apply clipping algorithm to clip lines outside the window.
C211.4	Describe methods and techniques for shading and apply mathematics to generate fractals.
C211.5	Understand the basics of animation, gaming and image processing.

CO	C212: MDM-2 Engineering Mathematics-III (170304A)
C212.1	Solve higher order linear differential equations using appropriate techniques.
C212.2	Apply Laplace transform and Z-Transform to solve differential equations, difference equations.
C212.3	Apply vector calculus concepts to analyze problems and solve system of linear equations by using numerical methods.
C212.4	Analyze discrete and continuous random variables using Binomial, Poisson and Normal distributions.
C212.5	Analyze data through hypothesis tests like Chi-square and t-tests.

CO	C213: OEC-2 Cyber Security and Laws (171405A)
C213.1	Understand the basics of cyber security.
C213.2	Study ethical hacking techniques and hacker methodologies.
C213.3	Identify and classify various types of cyber crimes and related cyber laws.
C213.4	Apply methods for cyber forensics.
C213.5	Use of AI in cyber security.

CO	C214: AEC Foreign Languages (174408)
C214.1	Learn the basic phonetics, alphabets and sounds of the selected foreign language.
C214.2	Interpret and use everyday vocabulary to manage simple social interaction.
C214.3	Form simple sentences using basic grammatical structures and sentence patterns.
C214.4	Participate in simple conversations and everyday communication situations relevant to academic, social and professional contexts.
C214.5	Demonstrate cultural awareness and appropriate language behaviour to facilitate global and cross-cultural interactions.

CO	C215: VSEC Java Programming (161409)
C215.1	Use various data types, conditional and looping constructs in Java.
C215.2	Demonstrate Java classes, various overloading and overriding methods in Java.
C215.3	Design and implement Java programs using OOP principles.
C215.4	Apply knowledge in handling files and implementing multithreading in Java applications.
C215.5	Justify real-time applications on the Java Platform.

Third Year (T.E.) Subjects Course Outcomes (2019 course)

Semester – I

CO	C301: Data Base Management Systems (310241)
C301.1	Analyze and design Database Management System using ER model.
C301.2	Implement database queries using database languages.
C301.3	Normalize the database design using normal forms.
C301.4	Apply Transaction Management concepts in real-time situations
C301.5	Use NoSQL databases for processing unstructured data.
C301.6	Differentiate between Complex Data Types and analyze the use of appropriate data types.

CO	C302: Computer Networks (311)
C302.1	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies.
C302.2	Analyze the working of physical layer protocols.
C302.3	Analyze the working of different routing protocols and mechanisms.
C302.4	Implementclient-server applications using sockets.
C302.5	Illustrate role of application layer with its protocols, client-server architectures.
C302.6	Summarize concepts of MAC and ethernet.

CO	C303: Web Technology (310252)
C303.1	Implement and analyze behavior of web pages using HTML and CSS.
C303.2	Apply the client side technologies for web development.
C303.3	Analyze the concepts of Servlet and JSP.
C303.4	Analyze the concepts of Servlet and JSP.
C303.5	Analyze the Web services and frameworks.
C303.6	Create the effective web applications for business functionalities using latest web development platforms.

CO	C304: Artificial Intelligence (310253)
C304.1	Identify and apply suitable Intelligent agents for various AI applications.
C304.2	Build smart system using different informed search / uninformed search or heuristic approaches
C304.3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
C304.4	Apply the suitable algorithms to solve AI problems.
C304.5	Implement ideas underlying modern logical inference systems.
C304.6	Represent complex problems with expressive yet carefully constrained language of representation.

CO	C305B: ELE- I 1) Human Computer Interface (310245)
C305B.1	Design effective Human-Computer-Interfaces for all kinds of users
C305B.2	Apply and analyze the user-interface with respect to golden rules of interface
C305B.3	Analyze and evaluate the effectiveness of a user-interface design.
C305B.4	Implement the interactive designs for feasible data search and retrieval.
C305B.5	Analyze the scope of HCI in various paradigms like ubiquitous computing, virtual reality ,multi-media, World wide web related environments.
C305B.6	Analyze and identify user models, user support, and stakeholder requirements of HCI systems

CO	C306: Software Laboratory I (317523)
C306.1	Implement SQL queries for given requirements, using different SQL concepts.
C306.2	Implement NoSQL queries using MongoDB.
C306.3	Design and develop application using database considering specific requirements.
C306.4	Design a system using different informed search / uninformed search or heuristic approaches
C306.5	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning
C306.6	Design and develop an interactive AI application

CO	C307: CN Laboratory (317524)
C307.1	Analyze the requirements of network types, topology and transmission media
C307.2	Demonstrate error control, flow control techniques and protocols and analyze them
C307.3	Demonstrate the subnet formation with IP allocation mechanism and apply various routing algorithms.
C307.4	Develop Client-Server architectures and prototypes.
C307.5	Implement web applications and services using application layer protocols.

CO	C308: ELE- I 1) Human Computer Interface Laboratory(317525)
C308.1	To design effective Human-Computer-Interfaces for all kinds of users
C308.2	To apply and analyze the user-interface with respect to golden rules of interface
C308.3	To implement the interactive designs for feasible data search and retrieval

CO	C309: Seminar and Technical Communication (317526)
C309.1	Analysis specialized topic of interest from core area
C309.2	Enhance Technical writing skills.
C309.3	Targeting specific problem and indentify working solution to resolve it.
C309.4	Developing professional communication skill.

CO	C310: Environmental Studies (317527)
C310.1	Aware the importance of environment.
C310.2	Understand the water pollution.
C310.3	Know the Air and noise pollution.
C310.4	Understand the E-waste and green computing.

CO	C311: Audit Course5 - Emotional Intelligence (317528)
C311.1	Expand their knowledge of emotional patterns in themselves and others.
C311.2	Discover how to manage their emotions, and positively influence themselves and others.
C311.3	Build more effective relationships with people at work and home.
C311.4	Positively influence and motivate colleagues, team members and managers.

Third Year (T.E.) Subjects Course Outcomes (2019 course)

Semester – II

CO	C312: Data Science (317529)
C312.1	Analyze needs and challenges for Data Science.
C312.2	Apply statistics for Data Analytics.
C312.3	Apply the lifecycle of Data analytics to real world problems
C312.4	Implement Data Analytics using Python programming.
C312.5	Implement data visualization using visualization tools in Python programming
C312.6	Design and implement Big Databases using the Hadoop ecosystem.

CO	C313: Cyber Security (317530)
C313.1	Gauge the security protections and limitations provided by today's technology
C313.2	Identify cyber security threats.
C313.3	Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
C313.4	Build appropriate security solutions against cyber-attacks.

CO	C314: Artificial Neural Network (317531)
C314.1	Understand the basic features of neural systems and be able to build the neural model
C314.2	Perform the training of neural networks using various learning rules
C314.3	Grasping the use of Associative learning Neural Network
C314.4	Describe the concept of Competitive Neural Networks
C314.5	Implement the concept of Convolutional Neural Networks and its models
C314.6	Use a new tool /tools to solve a wide variety of real-world problems

CO	C315B ELE – II 1) Natural Language Processing (317532B)
C315B.1	Understand the fundamental concepts in field of NLP
C315B.2	Understand morphological aspect and processing in NLP
C315B.3	Distinguish among various techniques of syntax parsing.
C315B.4	Understand use of various parsing techniques to parse sentence and extract meaning from its structure.
C315B.5	Apply different Machine translation techniques for translating a source to target languages.
C315B.6	Design and implement different application using NLP

CO	C316C: ELE – II 2) Cloud Computing (310254C)
C316C.1	Understand the different Cloud Computing environment.
C316C.2	Use appropriate data storage technique on Cloud, based on Cloud application.
C316C.3	Analyze virtualization technology and install virtualization software.
C316C.4	Develop and deploy applications on Cloud.
C316C.5	Apply security in cloud applications.
C316C.6	Use advance techniques in Cloud Computing.

CO	C317: Software Laboratory II (317533)
C317.1	Model artificial Neural Network, and to analyze ANN learning, and its applications
C317.2	Perform Pattern Recognition, Linear classification
C317.3	Develop different single layer/multiple layer Perception learning algorithms
C317.4	Design and develop applications using neural networks.

CO	C318: Software Laboratory III (317534)
C318.1	Apply principles of Data Science for the analysis of real time problems
C318.2	Implement data representation using statistical methods.
C318.3	Implement and evaluate data analytics algorithms.
C318.4	Perform text preprocessing.
C318.5	Implement data visualization techniques.
C318.6	Use cutting edge tools and technologies to analyze Data.

CO	C319: Internship (317535)
C319.1	To demonstrate professional competence through industry internship.
C319.2	To apply knowledge gained through academics to a professional environment during internship.
C319.3	To select appropriate technology and tools to solve a given real time problem.
C319.4	To demonstrate abilities of a responsible professional and use ethical practices in day today life.
C319.5	To create professional and social network and develop relationships with industry people and get exposure to future employers.
C319.6	To explore various career opportunities in different domains and decide career goals.

CO	C320: Mini Project (317536)
C320.1	Identify basic security attacks and services.
C320.2	Analyze the vulnerabilities and design a security solution.
C320.3	Implement symmetric and asymmetric key algorithms.
C320.4	Demonstrate network security applications, Firewall, IDs.

CO	C319: Audit Course 6 - Sustainable Energy Systems (317537B)
321.1	Understand the importance of Sustainable Energy Systems.
321.2	Develop the awareness towards Sustainable Energy Systems protection.
321.3	Know different types of natural resource pollution.
321.4	Develop the awareness towards the exploitation and utilization of conventional and nonconventional energy resources