SVKM'S
NMIMS
Deemed to be UNIVERSITY

Mukesh Patel School of Technology Management and Engineering

B.Tech Data Science

- **Program Educational Objectives (PEOs)**
- **Program Outcomes (POs)**
- **Course Outcomes (COs)**

Program Educational Objectives (PEOs):

1. **Professional Skills**
2. **Career Growth**
3. **Higher Studies**

Program Outcomes (POs):

PO-1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO-2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO-3: 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)

PO-4: 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).

PO-5: 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)

PO-6: 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).

PO-7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity, and inclusion; adhere to national & international laws. (WK9)

PO-8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO-9: 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

PO-10: 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.

PO-11: Life-Long Learning: Recognize the need for, and have the preparation and ability for independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change

Courses and Course Outcomes (COs):

Introduction to Data, Signal, and Image Analysis

- **CO-1**: Classify discrete and continuous data signals and learn the engineering mathematical aspect of it and perform operations on it
- **CO-2**: Model finite impulse and infinite impulse response filters
- **CO-3**: Simplify the concepts of Convolution and Sampling to solve and support problems
- **CO-4**: List the fundamental concepts in Image representation and state basic filtering techniques to facilitate noise removal

Data Driven program analysis

- **CO-1**: Describe the basic concepts of Data mining and components of Business Intelligence systems
- **CO-2**: Explain classification process and Predict decision tree using ID3 algorithm
- **CO-3**: Calculate frequent item sets and list strong association rule

Data Wrangling

- **CO-1**: Find data from a variety of sources into the tool environment. Explain the principles of tidy data, data wrangling and sharing
- **CO-2**: Make use of statistical and basic data analysis tool and fundamental functions for data cleaning and manipulation. Construct datasets and further modify and analyse it
- **CO-3**: Tell the basic terms in data warehousing like metadata, SCD, ETL etc

Technical Communication (Semester III)

- **CO-1**: Apply the fundamentals of written communication to create written documents that are coherent, error-free, and well organized.
- **CO-2**: Develop the ability to create effective and persuasive business correspondence, such as letters and emails, that follow etiquette and are able to achieve the desired outcomes.
- **CO-3**: Create basic reports such as memo, letter, and survey-based report, using their understanding of report writing.

Constitution of India

- **CO-1**: Recall the historical evolution of India's democratic values, emphasizing the foundational principles of justice, equality, and liberty as enshrined in the Preamble of the Constitution.
- **CO-2**: Understand the fundamental rights enshrined in the Constitution, their permissible restrictions, and how these rights are balanced with duties, to grasp their application within societal and professional frameworks.
- **CO-3**: Apply the knowledge of the structure of India's polity and the role of the Judiciary in maintaining the basic structure of the Constitution in real-world professional contexts

Critical Thinking

- **CO-1**: solve problems or take decisions by processing information in a clear, logical, reasoned, and reflective manner.
- **CO-2**: recognise, build, and appraise arguments
- **CO-3**: analyse contexts effectively
- **CO-4**: recognise bias and its impact on decision making

Programming for Problem Solving

- **CO-1**: Comprehend problem statements, build logic, and draw flowchart
- **CO-2**: Develop complex logic using control structures
- **CO-3**: Implement programs using arrays, function, and pointers
- **CO-4**: Solve real life problems using Object Oriented paradigm

Predictive Analysis

- **CO-1**: Classify Libraries, Diagram and Data structure.
- **CO-2**: Predict classification and regression models.
- **CO-3**: Evaluate and design different statistics for supervised and unsupervised models.

Foundations of Machine Learning

- **CO-1**: Describes several key aspects of the application of Machine learning algorithms
- **CO-2**: Use the fundamentals of linear algebra, calculus, vector and matrix operations underlying all of machine learning algorithms
- **CO-3**: Calculate eigenvectors, SVD, and estimate PCA to derive informative elements from the complex data

Marketing Strategy and Analytics (Practical)

- **CO-1**: Explain the implementation of marketing concepts and strategy to Business firms.
- **CO-2**: Apply the concepts of marketing and analytics to different products and markets.
- **CO-3**: Analyze various marketing environment variables and Plan for designing branding systems.

Elements of Biology

- **CO-1**: Identify the principles of biomimicry and explain their applications in engineering and sustainable design, demonstrating an understanding of biologically inspired solutions.
- **CO-2**: Classify the fundamental building blocks of life (carbohydrates, proteins, lipids, and nucleic acids) and describe their structural and functional roles in cellular processes and metabolism.
- **CO-3**: Explain the molecular basis of genetic information transfer, including DNA replication, transcription, and translation, and interpret Mendel's laws and their significance in genetics.
- **CO-4**: Describe the mechanisms of enzyme action, enzyme-substrate interactions, and enzyme inhibition, and discuss their industrial and biological applications.
- **CO-5:** Explain the principles of metabolism and energy transactions, and categorize microorganisms based on their characteristics, growth kinetics, and applications in biotechnology and drug discovery.

Advanced Data Structures for Analytics

- **CO-1**: Describe the concept of data structures and its computational complexity in terms of time and space.
- **CO-2**: Design and implement appropriate data structure for the given problem.
- **CO-3**: Analyze and differentiate various searching and sorting algorithms.

Optimization Methods

- **CO-1**: Use optimization techniques in Data Analytics and related areas.
- **CO-2**: Apply optimization techniques to business problems.
- **CO-3**: Develop and implement basic optimization techniques.

English Communication

- **CO-1**: Use their knowledge of vocabulary and grammar to articulate their ideas effectively
- **CO-2**: Demonstrate effective listening and speaking skills in oral communication situations such as speeches, conversations, power-presentations, etc.
- **CO-3**: Apply different reading techniques as needed to read passages effectively