

## **Proposed Curriculum Framework**

### **Bachelor of Science (B.Sc.) in Data Science**

#### **University of Engineering & Management (UEM), Jaipur**

(NEP 2020 Aligned | AI & Analytics Driven | Industry-Integrated | Effective from Academic Session 2026–27)

Programme Duration: 4 Years (8 Semesters)

Total Credits: 160 Credits (20 Credits per Semester)

Eligibility: 10+2 with Mathematics (Computer Science/Statistics preferred)

Multiple Exit Options (NEP 2020)

- \* After 1 Year: Certificate in Data Analytics
- \* After 2 Years: Diploma in Data Science
- \* After 3 Years: B.Sc. Data Science
- \* After 4 Years: B.Sc. Data Science (Honours/Research)

The curriculum is designed by benchmarking contemporary NEP-based undergraduate Data Science programmes offered by Indian universities and global curriculum recommendations. It integrates mathematics, statistics, computer science, artificial intelligence, cloud computing, big data, machine learning, business analytics, and responsible AI with extensive laboratory work, internships, and industry projects.

---

Programme Educational Objectives (PEOs)

Graduates will be able to:

- \* Develop strong mathematical, statistical, and computational foundations.
- \* Build intelligent data-driven solutions using AI and machine learning.

- \* Design scalable data pipelines and cloud-based analytics systems.
  - \* Apply ethical and responsible AI practices in solving industrial and societal problems.
  - \* Pursue careers in analytics, AI, fintech, healthcare, manufacturing, e-commerce, and research.
- 

## Programme Outcomes (POs)

Graduates will be able to:

- \* Collect, clean, process, and analyze structured and unstructured datasets.
  - \* Design predictive and prescriptive analytical models.
  - \* Develop AI-enabled applications using modern programming languages.
  - \* Build data visualization dashboards and business intelligence solutions.
  - \* Deploy machine learning models on cloud platforms.
  - \* Conduct research using modern analytical methodologies.
  - \* Demonstrate leadership, innovation, entrepreneurship, and ethical professional practice.
- 

## Semester I (20 Credits)

| Course                                                 | Credits |
|--------------------------------------------------------|---------|
| Python Programming for Data Science                    | 4       |
| Mathematical Foundations-I (Calculus & Linear Algebra) | 4       |
| Statistics for Data Science-I                          | 4       |
| Communication Skills                                   | 2       |
| Data Science Laboratory-I                              | 4       |

## Course Highlights

### Python Programming

- \* Python Fundamentals
- \* Functions
- \* File Handling
- \* Object-Oriented Programming
- \* NumPy
- \* Pandas

### Mathematics

- \* Differential Calculus
- \* Matrices
- \* Vector Spaces
- \* Eigenvalues

### Statistics

- \* Probability
- \* Descriptive Statistics
- \* Sampling
- \* Data Visualization

---

| Course                                            | Credits |
|---------------------------------------------------|---------|
| Data Structures & Algorithms                      | 4       |
| Database Management Systems                       | 4       |
| Statistics-II & Probability                       | 4       |
| Data Visualization                                | 3       |
| Laboratory-II                                     | 3       |
| Community Engagement / Ability Enhancement Course | 2       |

## Topics

- \* Arrays
- \* Trees
- \* Graphs
- \* SQL
- \* NoSQL
- \* Probability Distributions
- \* Hypothesis Testing
- \* Tableau
- \* Power BI

---

## Semester III (20 Credits)

| Course                      | Credits |
|-----------------------------|---------|
| Machine Learning-I          | 4       |
| Exploratory Data Analysis   | 4       |
| Big Data Technologies       | 4       |
| Data Engineering Laboratory | 2       |

Skill Enhancement Course      3

Internship-I 3

Topics

- \* Regression
  - \* Classification
  - \* Clustering
  - \* Feature Engineering
  - \* Hadoop
  - \* Spark
  - \* ETL Pipelines
  - \* Data Warehousing
- 

Semester IV (20 Credits)

| Course | Credits |
|--------|---------|
|--------|---------|

|                         |   |
|-------------------------|---|
| Artificial Intelligence | 4 |
|-------------------------|---|

|                           |   |
|---------------------------|---|
| Data Mining & Warehousing | 4 |
|---------------------------|---|

|                                  |   |
|----------------------------------|---|
| Cloud Computing for Data Science | 4 |
|----------------------------------|---|

|                      |   |
|----------------------|---|
| Research Methodology | 2 |
|----------------------|---|

|               |   |
|---------------|---|
| Laboratory-IV | 3 |
|---------------|---|

|               |   |
|---------------|---|
| Minor Project | 3 |
|---------------|---|

Topics

- \* Intelligent Agents
- \* Search Algorithms

- \* Knowledge Representation
  - \* Association Rules
  - \* AWS
  - \* Microsoft Azure
  - \* Google Cloud Platform
  - \* Cloud Storage
- 

## Semester V (20 Credits)

| Course                            | Credits |
|-----------------------------------|---------|
| Deep Learning                     | 4       |
| Natural Language Processing       | 4       |
| Business Intelligence & Analytics | 4       |
| Laboratory-V                      | 2       |
| Elective-I                        | 3       |
| Internship-II                     | 3       |

## Topics

- \* Neural Networks
- \* CNN
- \* RNN
- \* Transformers
- \* Sentiment Analysis
- \* Chatbots
- \* Dashboard Design
- \* KPI Analytics

---

## Semester VI (20 Credits)

| Course                    | Credits |
|---------------------------|---------|
| Time Series & Forecasting | 4       |
| Computer Vision           | 4       |
| MLOps & Model Deployment  | 4       |
| Laboratory-VI             | 2       |
| Elective-II               | 3       |
| Industry Project          | 3       |

### Topics

- \* ARIMA
- \* LSTM
- \* Image Processing
- \* Object Detection
- \* Docker
- \* Kubernetes
- \* CI/CD
- \* ML Pipelines

---

## Semester VII (20 Credits)

| Course                                | Credits |
|---------------------------------------|---------|
| Generative AI & Large Language Models | 4       |
| Responsible AI & Data Ethics          | 4       |

Advanced Data Engineering      4

Elective-III      2

Research Project-I      3

Industrial Internship      3

## Topics

- \* Large Language Models (LLMs)
- \* Prompt Engineering
- \* Retrieval-Augmented Generation (RAG)
- \* AI Agents
- \* Explainable AI
- \* Fairness & Bias
- \* Data Governance
- \* Lakehouse Architecture

---

## Semester VIII (20 Credits)

| Course | Credits |
|--------|---------|
|--------|---------|

|                                       |   |
|---------------------------------------|---|
| Advanced Analytics & Decision Science | 4 |
|---------------------------------------|---|

|                                       |   |
|---------------------------------------|---|
| Emerging Technologies in Data Science | 4 |
|---------------------------------------|---|

|                                                  |   |
|--------------------------------------------------|---|
| Dissertation / Research Thesis / Startup Project | 8 |
|--------------------------------------------------|---|

|         |   |
|---------|---|
| Seminar | 2 |
|---------|---|

|           |   |
|-----------|---|
| Viva Voce | 2 |
|-----------|---|

---

## Suggested Electives

## Artificial Intelligence

- \* Reinforcement Learning
- \* Explainable AI
- \* Generative AI Applications

## Data Engineering

- \* Apache Kafka
- \* Data Lakes
- \* Distributed Systems

## Business Analytics

- \* Marketing Analytics
- \* Financial Analytics
- \* Supply Chain Analytics

## Healthcare Analytics

- \* Medical Imaging
- \* Clinical Data Analytics
- \* Bioinformatics

## FinTech

- \* Risk Analytics
- \* Fraud Detection
- \* Algorithmic Trading

## Smart Technologies

- \* IoT Analytics
  - \* Smart Cities Analytics
  - \* Digital Twin Analytics
- 

## Laboratory Components

Students will receive hands-on training in:

- \* Python Programming
- \* R Programming
- \* SQL & PostgreSQL
- \* MongoDB
- \* Data Visualization
- \* Tableau
- \* Power BI
- \* Hadoop
- \* Apache Spark
- \* TensorFlow
- \* PyTorch
- \* OpenCV
- \* Scikit-learn
- \* Docker
- \* Kubernetes
- \* Apache Airflow
- \* Jupyter Notebook

- \* Git & GitHub

---

## Software & Industry Tools

The programme will provide exposure to:

- \* Python

- \* R

- \* SQL

- \* MongoDB

- \* PostgreSQL

- \* Apache Spark

- \* Hadoop

- \* TensorFlow

- \* PyTorch

- \* Scikit-learn

- \* Power BI

- \* Tableau

- \* Excel

- \* AWS Academy

- \* Microsoft Azure

- \* Google Cloud Platform

- \* Docker

- \* Kubernetes

- \* Apache Kafka

- \* Airflow

- \* MLflow

- \* LangChain

- \* Hugging Face
- \* OpenAI API (subject to licensing)
- \* GitHub Actions

---

## Internship Structure

### Semester III

4 Weeks: Data Analytics Internship

### Semester V

6 Weeks: AI / Data Science Internship

### Semester VII

8–10 Weeks: Industry Research Internship or Live Data Science Project

---

## Suggested Industry Collaborations

- \* Microsoft
- \* Google
- \* Amazon Web Services (AWS)
- \* IBM
- \* Oracle
- \* NVIDIA

- \* Intel
- \* TCS
- \* Infosys
- \* Wipro
- \* Accenture
- \* Deloitte
- \* Capgemini
- \* Cognizant
- \* Fractal Analytics
- \* Mu Sigma
- \* Tiger Analytics
- \* LatentView Analytics
- \* Quantiphi
- \* ZS Associates
- \* PwC
- \* EY
- \* KPMG
- \* FinTech, HealthTech, EdTech, and AI startups

---

## Skill Enhancement Certifications

Students should complete industry-recognized certifications in:

- \* Python for Data Science
- \* SQL & Database Management
- \* Tableau Desktop
- \* Microsoft Power BI
- \* AWS Cloud Practitioner

- \* Microsoft Azure AI Fundamentals
  - \* Google Data Analytics
  - \* TensorFlow Developer
  - \* Machine Learning
  - \* Deep Learning
  - \* MLOps
  - \* Data Engineering
  - \* Generative AI
  - \* Prompt Engineering
  - \* Git & GitHub
- 

## Assessment Pattern

- \* Continuous Internal Assessment: 40%
- \* End Semester Examination: 60%

Evaluation methods include:

- \* Coding assignments
- \* Data analysis case studies
- \* Laboratory exercises
- \* Kaggle competitions
- \* Industry datasets
- \* Technical presentations
- \* Mini-projects
- \* Research papers
- \* Internship reports
- \* Open-source contributions

- \* Capstone project

- \* Viva voce

---

## Career Opportunities

Graduates can pursue careers as:

- \* Data Scientist

- \* Data Analyst

- \* Business Intelligence Analyst

- \* Machine Learning Engineer

- \* AI Engineer

- \* Data Engineer

- \* Analytics Consultant

- \* Quantitative Analyst

- \* Big Data Engineer

- \* MLOps Engineer

- \* Cloud Data Engineer

- \* NLP Engineer

- \* Computer Vision Engineer

- \* Data Architect

- \* Research Associate

- \* Product Analyst

- \* Decision Scientist

- \* AI Solutions Consultant

- \* Entrepreneur

The programme also provides excellent preparation for M.Sc. Data Science, M.Sc. AI, MCA, M.Tech., MBA (Business Analytics), Integrated Ph.D., and Ph.D. programmes, as well as competitive examinations and research careers.

---

### Distinctive Features for UEM Jaipur

To position UEM Jaipur among India's leading institutions in Data Science, the programme should incorporate:

- \* UEM Centre for Artificial Intelligence, Data Science & Analytics with GPU-enabled high-performance computing facilities.
- \* Industry-Integrated Data Science Laboratory equipped with cloud computing, big data, and AI platforms.
- \* Mandatory three-credit internship every academic year with live datasets from industry.
- \* Annual UEM Data Science & AI Summit, national hackathons, Kaggle competitions, and analytics challenges.
- \* Integration of Generative AI, Large Language Models, Responsible AI, MLOps, Cloud Computing, Data Engineering, and Business Intelligence throughout the curriculum.
- \* Collaboration with leading technology companies, analytics firms, research laboratories, and startups for internships, certifications, research, and placements.
- \* Innovation and Startup Incubation focused on AI, analytics, fintech, healthcare analytics, agritech, and smart manufacturing.
- \* Dedicated Research Track in the fourth year with publication-oriented dissertation work, enabling direct progression to doctoral studies under NEP 2020.

This curriculum balances strong foundations in mathematics, statistics, and computer science with modern artificial intelligence, machine learning, cloud computing, and business analytics. It is designed to produce industry-ready graduates capable of addressing the growing demand for data professionals in India and globally while supporting research, innovation, and entrepreneurship.