



Walchand Institute of Technology, Solapur
(An Autonomous Institute)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University,
Solapur

Choice Based Credit System (CBCS)

Structure and Syllabus

For

Multidisciplinary Minor Program in
Artificial Intelligence and Machine Learning

offered by

Department of Artificial Intelligence and Machine
Learning

W.E.F. 2026-27

Department of Artificial Intelligence and Machine Learning

Vision

To nurture competent Artificial Intelligence and Machine Learning professionals with strong analytical skills, technical expertise and ethical responsibility for developing intelligent solutions to industrial and societal challenges.

Mission

- M1: To impart quality education in Artificial Intelligence and Machine Learning through a strong foundation in computing, data-driven technologies and intelligent systems.
- M2: To develop critical thinking, innovation and lifelong learning skills for designing and deploying AI-enabled solutions to real-world problems.
- M3: To promote research, industry interaction and professional ethics for developing responsible AI professionals.

Department of Artificial Intelligence and Machine Learning

Program Educational Objectives (PEOs)

Graduates will apply

1. Strong knowledge in Artificial Intelligence, Machine Learning and Data Science to address industrial and societal computing requirements.
2. AI techniques to analyze complex problems and design intelligent, ethical and scalable solutions for real-world applications.
3. Pursue continuous learning, research and innovation to adapt to emerging technologies and build careers in industry, entrepreneurship and higher education.

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 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 difference
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 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)
Program Specific Outcomes (PSOs)	
<ol style="list-style-type: none"> 1. Apply mathematical, statistical, and algorithmic foundations to analyse data and solve problems using Artificial Intelligence and Machine Learning techniques. 2. Design, implement, and evaluate AI and ML models for intelligent tasks such as prediction, classification and decision-making using appropriate tools and platforms. 3. Develop ethical, efficient, and sustainable AI-based solutions by integrating machine learning methods, domain knowledge, and software engineering practices for industrial and societal applications. 	

Multidisciplinary Minor Program in Artificial Intelligence and Machine Learning

Legends Used

L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
MOOC	Massive Open Online Course
HSS	Humanity and Social Science
NPTEL	National Programme on Technology Enhanced Learning
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
B. Tech.	Bachelor of Technology

Multidisciplinary Minor Program in Artificial Intelligence and Machine Learning

Course Code Format

2	1	I	T	U/P	2	C	C	1	T/L
Year of Syllabus revision	Program Code		U-Under Graduate P-Post Graduate	Semester No./ Year1/2/3/...8	Course Type	Course Serial No 1-9	T-Theory, L-Lab session P- Programming		

Program Code

AI	Artificial Intelligence and Machine Learning
Course Type	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning <i>N* indicates the serial number of electives offered in the respective category</i>
EN*	Core Elective <i>N* indicates the serial number of electives offered in the respective category</i>
ON*	Open Elective <i>N* indicates the serial number of electives offered in the respective category</i>
SK	Skill Based Course
SM	Seminar
MP	Mini project
PR	Project
IN	Internship

Sample Course Code

25AITU3MD6T	Fundamentals of Machine Learning
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Multidisciplinary Minor Program in Artificial Intelligence and Machine Learning

Semester	Course Code	Name of Course	Engagement Hours			Credits	SA	FA		Total
			L	T	P		Theory	ISE	ICA	
III	25AITU3MD6T	Fundamentals of Machine Learning	2	-	-	2	60	40	-	100
IV	25AITU4MD6T	Data Science and Visualization	1	-	-	1	-	50	-	50
V	25AITU5MD6T	Reinforcement Learning	3	-	-	3	60	40	-	100
VI	25AITU6MD6T	Applied Machine Learning	2	-	-	2	60	40	-	100
VII	25AITU7MD6T	Generative AI	3	-	-	3	60	40	-	100
VII	25AITU7MD6A	Generative AI (Tutorial)	-	1	-	1	-	-	25	25
		Subtotal	11	1	-	12	240	210	25	475
IV	25AITU4MD6L	Data Science and Visualization	-	-	2	1	-	-	25	25
VI	25AITU6MD6L	Applied Machine Learning	-	-	2	1	-	-	25	25
		Subtotal	-	-	4	2	-	-	50	50
		Grand Total	11	1	4	14	240	210	75	525

Note:

- N* indicates the serial number of electives offered in the respective category
- ## indicates program code of offering Programme



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(An Autonomous Institute)
MDM offered by (Artificial Intelligence and Machine Learning), Semester-III

25AITU3MD6T - FUNDAMENTALS OF MACHINE LEARNING

Teaching Scheme		Examination Scheme	
Lectures	2 Hour/week	ESE	60 Marks
Practical	-	ISE	40 Marks
Credits	2	ICA	--

Course Prerequisite:

Basic knowledge of engineering mathematics and introductory programming concepts.

Course Objectives:

1. To introduce fundamental concepts of Machine Learning and data-driven learning systems.
2. To explain data preparation and representation techniques used in Machine Learning.
3. To describe basic supervised and unsupervised learning methods.
4. To introduce model evaluation concepts and engineering applications of Machine Learning..

Course Outcomes:

At the end of the course, students will be able to:

1. Understand fundamental concepts and types of Machine Learning used in engineering applications.
2. Apply basic data preparation, supervised and unsupervised learning techniques for simple problems.
3. Interpret model evaluation methods and relate Machine Learning techniques to real-world engineering applications.

Unit – I	Introduction to Machine Learning	7 Hours
Introduction to Artificial Intelligence and Machine Learning, Need for Machine Learning in engineering, Types of Machine Learning, Machine Learning Project Life cycle		
Unit – II	Data Preparation and Representation	7 Hours
Types of data in engineering systems, Data collection and preprocessing, Missing data and outliers handling, Feature Engineering, Data scaling and normalization		
Unit – III	Supervised Learning and Unsupervised Learning	8 Hours
Concept of supervised learning, Regression and classification, Types of regression, Logistic Regression, KNN, Decision Tree, Random Forest. Concept of unsupervised learning, Clustering techniques, K-Means clustering, Hierarchical clustering.		
Unit – IV	Model Evaluation and Applications	8 Hours
Model evaluation concepts, Train-test split, Accuracy and error rate, Overfitting and underfitting, Applications of Machine Learning in Civil Engineering, Applications of Machine Learning in Mechanical Engineering		

Text Books

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das – Machine Learning, Pearson India
2. Tom M. Mitchell – Machine Learning, McGraw Hill
3. Ethem Alpaydin – Introduction to Machine Learning, MIT Press

Reference Books

1. Charu C. Aggarwal – Data Mining: The Textbook, Springer
2. Gopi K. – Artificial Intelligence and Machine Learning, Elsevier India



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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MDM offered by (Artificial Intelligence and Machine Learning), Semester-IV

25AITU4MD6T – DATA SCIENCE AND VISUALIZATION

Teaching Scheme		Examination Scheme	
Lectures	1 Hour/week	ESE	--
Practical	2 Hour/week	ISE	50 Marks
Credits	2	ICA	25 Marks

Course Prerequisite:

Basic knowledge of Python programming, computer fundamentals, and elementary concepts of mathematics and data representation.

Course Objectives:

- 1.To introduce basic concepts of Data Science for engineering applications.
- 2.To develop skills in data handling, analysis, and interpretation.
- 3.To enable students to visualize and communicate data effectively using simple tools. Learning.

Course Outcomes:

At the end of the course, students will be able to:

1. Explain fundamental concepts of Data Science and its engineering applications.
2. Perform basic data preparation and exploratory analysis using Python tools.
3. Create and interpret data visualizations for engineering decision-making.

Unit – I	Introduction to Data Science	3 Hours
Introduction to Data Science, importance of data in engineering, types of data, basic data science workflow, applications in Mechanical and Civil Engineering, introduction to Python environment, Jupyter Notebook, overview of NumPy and Pandas.		
Unit – II	Data Preparation and Basic Analysis	4 Hours
Data collection and importing datasets, understanding datasets, data cleaning, handling missing values, simple data transformation, descriptive statistics, mean, median, mode, basic data interpretation using real engineering examples.		
Unit – III	Data Visualization Techniques	4 Hours
Introduction to data visualization, importance of graphical representation, principles of good visualization, line chart, bar chart, pie chart, histogram, scatter plot, box plot, heat map, visualization using Matplotlib and Seaborn, interpretation of graphs.		
Unit – IV	Applications and Practical Visualization	4 Hours
Data-driven decision making, interpretation of engineering datasets, introduction to Google Charts, creating simple bar charts and pie charts using Google Charts, reporting and presentation of results, simple case studies from Civil and Mechanical engineering, ethical use of data.		

Internal Continuous Assessment (ICA): ICA shall consist of a minimum 6 experiments based on following topics:

1. Introduction to Python, Jupyter Notebook
2. Basic NumPy operations
3. Pandas' DataFrame creation and dataset loading
4. Data cleaning and missing value handling
5. Descriptive statistics on datasets
6. Exploratory data analysis
7. Visualization using Matplotlib (bar, line, pie charts)
8. Visualization using Seaborn (heatmap, distribution)
9. Google Charts basic visualization
10. Mini project (Engineering dataset analysis + charts)

Text Books

1. V. K. Jain, Data Science and Analytics, Khanna Publishing House
2. Wes McKinney, Python for Data Analysis, O'Reilly Media

Reference Books

1. Joel Grus, Data Science from Scratch
2. Jake VanderPlas, Python Data Science Handbook
3. Cole Nussbaumer Knaflitz, Storytelling with Data
4. Cathy O'Neil, Doing Data Science

e-Resources

1. Pandas Documentation – <https://pandas.pydata.org/docs/>
2. Matplotlib Documentation – <https://matplotlib.org/stable/>
3. Seaborn Documentation – <https://seaborn.pydata.org/>
4. Kaggle Learn – Data Science & Visualization – <https://www.kaggle.com/learn>