

GANPAT UNIVERSITY				
FACULTY OF DIPLOMA ENGINEERING				
Programme	Diploma in Artificial Intelligence and Machine Learning			
Semester	II	Version	1.0.0.0	
Effective from Academic Year	2026-2027		Effective for the batch Admitted in	JULY 2026
Course Code	1AIML2101	Course Name	Fundamentals of AI and ML	

I. TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course code	Course Title	Teaching & Learning Scheme										Examination Scheme						
			Credit				Actual Contact Hrs/week			SLH	Total Learning Hrs/Week	TH			PR			SLA	Total
			CL	TL	LL	Total	CL	TL	LL			CE	SEE	Total	CE	SEE	Total		
DSC	1AIML2101	FUNDAMENTALS OF AI AND ML	3	-	1	4	3	-	2	2	7	40	60	100	30	20	50	20	170

Abbreviation:	CL - Classroom Learning	TL - Tutorial Learning	LL - Laboratory Learning
	SLH - Self Learning Hours	SLA - Self Learning Assessment	CE - Continuous Evaluation
	SEE – Semester End Examination		

II. PRE-REQUISITES

Basic knowledge of computer fundamentals and elementary mathematics, including sets, basic statistics, and logical reasoning, is required. Familiarity with basic problem-solving techniques and general computer operations is expected.

III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES

- Technological Literacy: Be able to use No-Code/Low-Code AI platforms to build basic prototypes.
- Data Handling: Understand the "Garbage In, Garbage Out" principle and perform basic data cleaning.
- Logical Troubleshooting: Use algorithmic thinking to decompose complex business problems.
- Ethical Compliance: Apply ethical frameworks when designing or using AI tools in a corporate setting.
- Collaborative Mindset: Work effectively with data scientists and engineers by speaking the "language of AI."

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

- CO1.** Explain the fundamental architecture and evolution of operating systems alongside the transition from traditional programming to modern AI ecosystems, including Generative AI and LLMs.
- CO2.** Identify and categorize different types of learning (Supervised, Unsupervised, Reinforcement).
- CO.3** Apply logical reasoning and problem-solving techniques to AI-based scenarios.
- CO4.** Recognize the ethical implications, biases, and societal impact of AI technologies.
- CO5.** Demonstrate familiarity with AI tools and industry-standard applications in agriculture, healthcare, and finance.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's)&CO's	Marks	Hours
Unit-1 AI Revolution & Ecosystem	TLO1.1 Define Artificial Intelligence and its origin. TLO1.2 Differentiate Human Intelligence and Artificial Intelligence. TLO1.3 Explain the historical evolution of AI.	1.1 Definition and origin of Artificial Intelligence; the Turing Test and early AI concepts 1.2 Human intelligence versus artificial intelligence 1.3 Historical evolution of AI and the AI Winters	10	9

	<p>TLO1.4 Categorize types of AI systems.</p> <p>TLO1.5 Identify AI applications in daily life.</p> <p>TLO1.6 Explain the importance of data in AI systems.</p> <p>TLO1.7 Apply algorithmic thinking to AI problems.</p> <p>TLO1.8 Describe the AI Project Cycle.</p> <p>TLO1.9 Explain Generative AI and Large Language Models (LLMs).</p> <p>TLO1.10 Differentiate AI, Automation, and Robotics.</p>	<p>1.4 Types of AI systems: Narrow AI, General AI, and Super AI</p> <p>1.5 AI applications in daily life</p> <p>1.6 Importance of data in AI systems</p> <p>1.7 Algorithmic thinking and decision logic using flowcharts</p> <p>1.8 The AI Project Cycle: from problem scoping to deployment</p> <p>1.9 Generative AI and Large Language Models (LLMs)</p> <p>1.10 Distinction between AI, Automation, and Robotics</p>		
<p>Unit-2</p> <p>Basic of Machine Learning</p>	<p>TLO2.1 Define Machine Learning.</p> <p>TLO2.2 Explain Supervised Learning.</p> <p>TLO2.3 Explain Regression models.</p> <p>TLO2.4 Explain Classification models.</p> <p>TLO2.5 Explain Unsupervised Learning.</p> <p>TLO2.6 Describe clustering techniques.</p> <p>TLO2.7 Explain Reinforcement Learning principles.</p> <p>TLO2.8 Explain Semi-Supervised Learning.</p> <p>TLO2.9 Identify features and labels in datasets.</p> <p>TLO2.10 Explain model training and testing.</p> <p>TLO2.11 Explain Overfitting and Underfitting in ML models.</p> <p>TLO2.12 Describe model evaluation metrics: Accuracy, Precision, Recall, and F1-Score.</p> <p>TLO2.13 Interpret a Confusion Matrix to evaluate model performance.</p>	<p>2.1 Definition of Machine Learning and its comparison with traditional programming</p> <p>2.2 Supervised Learning and learning from labelled data</p> <p>2.3 Regression models for continuous value prediction</p> <p>2.4 Classification models: binary and multi-class</p> <p>2.5 Unsupervised Learning and pattern identification</p> <p>2.6 Clustering techniques and K-Means</p> <p>2.7 Reinforcement Learning: reward and penalty mechanisms</p> <p>2.8 Semi-Supervised Learning</p> <p>2.9 Features and labels in datasets</p> <p>2.10 Model training and testing; dataset splitting</p> <p>2.11 Overfitting and underfitting in ML models</p> <p>2.12 Model evaluation metrics: Accuracy, Precision, Recall, and F1-Score</p> <p>2.13 Interpretation of the Confusion Matrix</p>	12	8
<p>Unit-3</p> <p>AI Domains & Problem Solving</p>	<p>TLO3.1 Explain Computer Vision fundamentals.</p> <p>TLO3.2 Explain Natural Language Processing concepts.</p>	<p>3.1 Fundamentals of Computer Vision</p> <p>3.2 Natural Language Processing concepts</p> <p>3.3 AI in robotics systems</p>	12	10

	<p>TLO3.3 Describe AI in robotics systems.</p> <p>TLO3.4 Explain search algorithms.</p> <p>TLO3.5 Explain decision tree models.</p> <p>TLO3.6 Explain Neural Network fundamentals.</p> <p>TLO3.7 Describe Expert Systems.</p> <p>TLO3.8 Interpret data visualization used in AI.</p> <p>TLO3.9 Distinguish between Machine Learning and Deep Learning.</p> <p>TLO3.10 Describe Heuristic Search and the A* algorithm concept.</p>	<p>3.4 Search algorithms: Breadth-First and Depth-First Search</p> <p>3.5 Decision tree models</p> <p>3.6 Fundamentals of Neural Networks</p> <p>3.7 Expert Systems and rule-based reasoning</p> <p>3.8 Data visualization used in AI</p> <p>3.9 Machine Learning versus Deep Learning</p> <p>3.10 Heuristic Search and the A* algorithm</p>		
<p>Unit-4</p> <p>AI Ethics & Social Impact</p>	<p>TLO4.1 Define AI Ethics.</p> <p>TLO4.2 Explain Algorithmic Bias.</p> <p>TLO4.3 Explain data privacy issues in AI.</p> <p>TLO4.4 Discuss AI impact on jobs.</p> <p>TLO4.5 Explain Sustainable AI concepts.</p> <p>TLO4.6 Describe Human-AI collaboration.</p> <p>TLO4.7 Explain Explainable AI (XAI) and the importance of transparency in AI decisions.</p> <p>TLO4.8 Identify ethical issues arising from Deepfakes and AI-generated misinformation.</p> <p>TLO4.9 Discuss AI governance frameworks and regulations (e.g. EU AI Act, India AI Policy).</p>	<p>4.1 Fundamentals of AI Ethics</p> <p>4.2 Algorithmic Bias and its sources</p> <p>4.3 Data privacy issues in AI</p> <p>4.4 Impact of AI on jobs</p> <p>4.5 Sustainable AI concepts</p> <p>4.6 Human-AI collaboration</p> <p>4.7 Explainable AI (XAI) and transparency in AI decisions</p> <p>4.8 Deepfakes and AI-generated misinformation</p> <p>4.9 AI governance frameworks and regulations: EU AI Act and India AI Policy</p>	14	8
<p>Unit-5</p> <p>Industry Applications & Tools</p>	<p>TLO5.1 Explain AI applications in agriculture.</p> <p>TLO5.2 Explain AI applications in healthcare.</p> <p>TLO5.3 Explain AI applications in finance and e-commerce.</p> <p>TLO5.4 Explain AI applications in education.</p>	<p>5.1 AI applications in agriculture</p> <p>5.2 AI applications in healthcare</p> <p>5.3 AI applications in finance and e-commerce</p> <p>5.4 AI applications in education</p> <p>5.5 AI applications in manufacturing</p> <p>5.6 Python in AI development</p> <p>5.7 AI frameworks: TensorFlow and PyTorch</p> <p>5.8 Cloud-based AI services</p>	12	10

	<p>TLO5.5 Explain AI applications in manufacturing.</p> <p>TLO5.6 Describe Python usage in AI development.</p> <p>TLO5.7 Identify AI frameworks.</p> <p>TLO5.8 Explain cloud-based AI services.</p> <p>TLO5.9 Explain AI Product Management concepts.</p> <p>TLO5.10 Develop AI project ideas.</p> <p>TLO5.11 Identify and use No-Code/Low-Code AI platforms to build simple AI prototypes.</p> <p>TLO5.12 Demonstrate awareness of Generative AI tools (ChatGPT, Gemini, Copilot) and their industry applications.</p>	<p>5.9 AI Product Management concepts</p> <p>5.10 AI project ideation</p> <p>5.11 No-Code/Low-Code AI platforms for building prototypes</p> <p>5.12 Generative AI tools (ChatGPT, Gemini, Copilot) and their industry applications</p>		
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VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
SR. NO	PRACTICAL/LABORATORY LEARNING OUTCOME(LLO)	PRACTICAL TITLES	RELEVANT COs
1	LLO 1.1 Write and execute a basic Python program using print statements, variables, and arithmetic operations to understand Python syntax and its role in AI development.	Hello, AI World! – Python Basics: Write and run your first Python program using print statements, variables, and basic arithmetic.	CO1
2	LLO 1.2 Demonstrate the use of Python data types – integer, float, string, boolean, and list – with AI-related examples such as model accuracy, AI tool names, and training flags.	Data Types – Building Blocks of AI Data: Explore int, float, string, boolean, and list data types using AI and ML context examples.	CO1
3	LLO 1.3 Accept user input at runtime using the input() function, apply type conversion, and process the data using conditional logic to build a simple interactive AI program.	Input from User – Making AI Interactive: Use the input() function to take user data and display personalised responses with type conversion.	CO1
4	LLO 1.4 Implement conditional statements (if, elif, else) in Python to simulate rule-based AI decision-making, such as a health assistant and a simple spam detector.	If-Else Decisions – Algorithmic Thinking: Implement if-elif-else conditions to simulate AI decision logic like a health diagnosis assistant.	CO1 / CO3
5	LLO 1.5 Apply for and while loops to process lists of data, compute averages, find maximum values, and simulate AI model training epochs through repeated iteration.	Loops – Repeating Tasks Like a Machine: Use for and while loops to process student marks lists and simulate AI model training epochs.	CO1 / CO3

6	LLO 1.6 Define and call Python functions with arguments and return values to perform reusable calculations such as percentage, grade classification, and model accuracy evaluation.	Functions – Reusable AI Logic: Create and use Python functions to calculate percentage, assign grades, and evaluate model accuracy.	CO1 / CO2
7	LLO 1.7 Use Python lists and dictionaries to store and manage structured data, representing a small crop or student dataset to understand how AI systems organise features and labels.	Lists & Dictionaries – Managing AI Datasets: Store and manage AI domain data and crop records using lists and dictionaries.	CO1 / CO2
8	LLO 1.8 Apply Python string functions – split(), lower(), replace(), count(), and find() – to process and analyse text data, simulating the basic pre-processing steps used in NLP pipelines.	String Operations – Text Data for NLP: Apply string functions like split(), replace(), and count() to process text data as done in NLP.	CO1 / CO3
9	LLO 1.9 Build a rule-based classifier using Python functions and conditional logic to predict labels from input features, simulating how a Decision Tree in Supervised Learning makes predictions.	Simple Rule-Based Classifier – Supervised Learning Logic: Build a fruit classifier using features and if-else rules to simulate Decision Tree prediction.	CO1 / CO2
10	LLO 1.10 Integrate all Python concepts – variables, data types, loops, functions, lists, and conditionals – into a complete mini project that generates a student report with grades and class statistics.	Mini Project – AI Student Report Generator: Combine all Python concepts to build a complete report generator that processes student marks and displays grades.	CO1 / CO5

VII. SUGGESTED MICRO PROJECT/ASSIGNMENTS/ACTIVITIES FOR SELF LEARNING/SKILL DEVELOPMENT (SELF LEARNING)

Micro Projects (Use Cases)

- Skill Developed: Understanding the origin of AI and the critical role of data in the AI Project Cycle.
- Create a 3-level Minimax Game Tree for a Tic-Tac-Toe match to demonstrate how AI makes optimal decisions.
- Research the "Energy Impact" of AI by comparing the estimated carbon footprint of training a large model versus a traditional computing task, emphasizing "Green AI" concepts.
- Bridging theoretical AI components with industry-specific needs and AI Product Management concepts.

Self-Learning / Skill Building Activities

1. Complete the 'Elements of AI' free online course (<https://www.elementsofai.com>) and submit a one-page summary of key learnings.
2. Practice Python basics on Kaggle Learn (<https://www.kaggle.com/learn/python>) and complete at least 3 exercises from the course.
3. Explore Google's Teachable Machine (<https://teachablemachine.withgoogle.com>) and train a simple image classifier with at least 3 categories.
4. Watch NPTEL 'An Introduction to Artificial Intelligence' (<https://nptel.ac.in/courses/106102220>) and complete 2 topic summaries.
5. Identify 3 real-world examples of Narrow AI used in daily life in India (e.g. Google Maps, Swiggy recommendations, UPI fraud detection) and write a brief description of each.

6. Explore any one Generative AI tool (ChatGPT, Gemini, or Microsoft Copilot) and demonstrate 5 different use cases relevant to diploma students.
7. Browse Kaggle (<https://www.kaggle.com/datasets>) and find one AI/ML dataset related to agriculture, healthcare, or education. Write a short description of the dataset and what problem it could solve.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

1	Computer Lab with Python 3.x installed (Anaconda Distribution recommended); Jupyter Notebook / Google Colab for running Python programs.
2	VS Code or any Python-compatible IDE (e.g. IDLE, Thonny) for writing and executing Python scripts.
3	Internet connectivity for accessing Google Colab, Kaggle Learn, Teachable Machine, and online AI tools (ChatGPT, Gemini, Copilot).
4	Projector / Smart Board for demonstrating Python programs, AI tool outputs, and classroom discussions on AI concepts.

IX. LIST OF REFERENCE BOOKS

Sr.No	Title	Author	Publication
1	Artificial Intelligence: A Modern Approach, 4th Edition	Stuart Russell and Peter Norvig	Pearson Education, ISBN: 978-0134610993
2	Introduction to Machine Learning, 4th Edition	Ethem Alpaydin	MIT Press, ISBN: 978-0262043793
3	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy	MIT Press, ISBN: 978-0262018029
4	Artificial Intelligence: Foundations of Computational Agents, 2nd Edition	David L. Poole and Alan K. Mackworth	Cambridge University Press, ISBN: 978-1107195394
5	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	O'Reilly Media, ISBN: 978-1492032649

X. LINK OF LEARNING WEB RESOURCE

Sr. No.	Resource Title	URL
1	Elements of AI (Free Course)	https://www.elementsofai.com
2	Google AI Explore (Project Cycle & Tools)	https://ai.google/education
3	Teachable Machine (No-Code AI Activity)	https://teachablemachine.withgoogle.com
4	NPTEL: An Introduction to Artificial Intelligence	https://nptel.ac.in/courses/106102220
5	Machine Learning Visualization (R2D3)	http://www.r2d3.us/visual-intro-to-machine-learning-part-1/
6	Responsible AI & Ethics (NITI Aayog India)	https://niti.gov.in/responsible-ai-all
7	Kaggle: Intro to Machine Learning	https://www.kaggle.com/learn/intro-to-machine-

	learning
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XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE							
Unit	Unit Title	Align ed COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	AI Revolution & Ecosystem	CO1	9	4	4	2	10
2	Basic of Machine Learning	CO2	8	4	4	4	12
3	AI Domains & Problem Solving	CO3	10	4	4	4	12
4	AI Ethics & Social Impact	CO4	8	5	5	4	14
5	Industry Applications & Tools	CO5	10	4	4	4	12
Grand Total			45	21	21	18	60

XIII. COs AND POs AND PSOs MAPPING										
Course Outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	2	1	0
CO2	3	3	2	1	2	1	1	2	2	1
CO3	2	3	3	2	2	1	1	2	3	1
CO4	1	2	1	2	1	3	3	1	1	1
CO5	2	2	3	2	3	1	1	3	2	2

Legends: - 3-High; 2-Moderate/Medium; 1-Slight/Low; 0-None