Mahatma Gandhi University
Kottayam

Programme	**BSc (Honours) Electronics with Computer Technology**					
Course Name	AI and Machine Learning Fundamentals					
Type of Course	DSE					
Course Code	MG3DSEECT203					
Course Level	**200-299**					
Course Summary & Justification	This course equips learners with the essential understanding and practical skills to apply AI and Machine Learning in solving varied electronic engineering problems					
Semester	3	Credits			4	**Total Hours**
Course Details	**Learning Approach**	**Lecture**	**Tutorial**	**Practical**	**Others**	
		4				60
Pre-requisites						

COURSE OUTCOMES (CO)

CO No:	Expected Course Outcome	Learning Domains *	PO No:
1	Explain the concepts of Artificial Intelligence (AI) and Machine Learning	U	1,2
2	Apply Python for machine learning applications	A	1,2
3	Develop a solid understanding of supervised and unsupervised Learning	A	1,2,10
4	Understand the principles of neural networks	**U**	1,2,10

Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hours	CO No.
1	1	**Introduction**	**8**	
	1.1	Introduction to AI, Concept of Intelligent agents	2	1
	1.2	Introduction to Machine Learning.	2	1
	1.3	Difference between AI, Machine Learning (ML), and Deep Learning.	2	1
	1.4	Real-world Applications of ML:Healthcare (disease prediction, genetics), Business (sales forecasting, customer behavior).	2	1

2	**2**	**Machine Learning Tools**	**20**	
	2.1	Introduction to Python for Data Science and ML	5	2
	2.2	Using Libraries: NumPy (numerical computing) Pandas (data manipulation) Matplotlib / Seaborn (data visualization)	5	2
	2.3	Setting up ML environments using: JupyterNotebook, PyCharm Importing and Exporting Data (CSV, Excel)	5	2
	2.4	Introduction to Data pre-processing, Feature Engineering, Data Cleaning, Exploratory Data Analysis (EDA)	5	2
3	**3**	**Machine Learning Techniques**	**17**	
	3.1	Types of Machine Learning: supervised, unsupervised, reinforcement.	4	3
	3.2	Supervised learning Techniques: Basic concepts of K-Nearest Neighbors (KNN), Linear regression.	5	3
	3.3	Unsupervised learning Techniques: Basic concepts of K-Means Clustering, Hierarchical Clustering.	4	3
	3.4	Reinforcement learning	4	3
4	**4**	**Concepts of Neural Networks and Model Training**	**15**	
	4.1	Basic concepts of Neural Network. Biological vs. Artificial Neurons, Perceptron, Sigmoid	2	4
	4.2	Structure of Feed-forward Neural Network, parameters: weights, biases, Concept of Forward Propagation	5	4
	4.3	Gradient Descent Algorithm, Concept of Learning Rate and Cost Function (quadratic cost function)	4	4
	4.4	Introduction to Back-propagation	4	4
5		Teacher specific content		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Leverage a blended learning approach with a mix of lectures, interactive discussions, and hands-on lab sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)(Internal)** **Theory**: - 30 Marks Internal Tests, Seminar Presentation, Case Studies/Projects/Site visit/ others

	B. Semester End Examination 1.Written Test (70 marks) – 2 Hour (Duration of Examination) a. MCQ - 20 Marks b. Short answer questions (6 out of 8 questions) - 6x5=30 marks c. Essay questions (2 out of 4) - 2x10=20 marks

References

1. Auelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Second Edition, O'Reilly, 2019
2. Jeremy Watt, Reza Borhani, Aggelos Katsaggelos, Machine Learning Rened, 2nd Ed., Cambridge University Press.

Suggested Readings

1. Ethem Alpaydin, Introduction to Machine Learning, 3rd Ed., MIT Press.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2016.
3. Michael Nielsen, Neural Networks and Deep Learning
4. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, The MI