

## ANNEXURE

### Course Name: Certificate Course in Responsible Artificial Intelligence

**Course Objective:** This course delves into advanced topics in Responsible AI, exploring cutting-edge concepts and strategies for developing ethical and unbiased artificial intelligence systems. Participants will gain in-depth knowledge and practical skills to address challenges related to bias, fairness, privacy, and accountability in AI applications.

**Course Prerequisite:** Any Engineering, Science, Statistics, (10+2+3/ 10+2+4) OR higher qualification

**Course Outcome:** By the end of the course, participants will be skilled in data preprocessing, machine learning, and deep learning model deployment using Python tools like TensorFlow and PyTorch. They will understand and address algorithmic biases, apply privacy-preserving methods, and use tools for explainability, causal inference, and counterfactual analysis. Participants will also improve model performance through error analysis and collaboratively develop real-world AI solutions.

**Course Duration:** 80 Hrs (8 hours/ day for 2 Weeks)

### Teaching Schema:

S. No.	Modules	Hours
1	Understand your datasets	6
2	Machine Learning & Deep Learning	8
3	Intro to RAI & Data Privacy Techniques	6
4	Algorithm Fairness and Bias Mitigating Strategies	8
5	Causal Inference	6
6	Error Analysis	4
7	Explainable AI (XAI) Frameworks	8
8	Counterfactual Analysis	6
9	Privacy preserving Machine Learning	8
10	Live Project	12
	<b>Total</b>	<b>80</b>

### Detailed Course Content:

- 1. Understand Your Datasets (6 hours)**
  - a. Exploring Data and Identifying Patterns.
  - b. Data Cleaning and Pre-processing Techniques.
  - c. Hands-on Exercises with Python Tools (Pandas, Matplotlib).
- 2. Machine Learning & Deep Learning (8 hours)**
  - a. Core Concepts of ML and Neural Networks.
  - b. Model Building, Optimization, and Deployment.
  - c. Practical Implementation with TensorFlow and PyTorch.
- 3. Intro to RAI & Data Privacy Techniques (6 hours)**
  - a. Basics of Responsible AI (RAI) Principles.
  - b. Overview of Data Privacy Techniques like Anonymization and Differential.
  - c. Practical Case Studies and Exercises.
- 4. Algorithm Fairness and Bias Mitigating Strategies (8 hours)**

- a. Understanding Algorithmic Bias and Its Impacts.
  - b. Implementation of Bias Reduction Strategies.
- 5. Causal Inference (6 hours)**
- a. Introduction to Cause-and-Effect Analysis in Data.
  - b. Real-world Applications with Interactive Exercises.
- 6. Error Analysis (4 hours)**
- a. Diagnosing and Interpreting Model Errors.
  - b. Strategies for Error Reduction and Model Debugging.
  - c. Case Studies and Practical Tools.
- 7. Explainable AI (XAI) Frameworks (8 hours)**
- a. The Need for Transparency in AI.
  - b. Applications in Diverse Domains with Hands-on Practice.
- 8. Counterfactual Analysis (6 hours)**
- a. Tools and Techniques for Counterfactual Evaluation.
  - b. Applications in Decision Support Systems.
- 9. Privacy-Preserving Machine Learning (8 hours)**
- a. Techniques for Secure Model Training (Federated Learning, Encryption).
  - b. Challenges and Applications in Real-world Scenarios.
- 10. Live Project (12 hours)**
- a. Comprehensive Application of Course Concepts.
  - b. Collaborative Real-world Problem-Solving.
  - c. Project Presentation, Discussion, and Feedback.