ANNEXURE I

Days	Description of the content to be covered	Duration (hrs.)
Unit 1: Foundation of Green Skilling, Sustainability, and AI Contributions		4
	Chapter 1: Green skilling and Sustainability	
	· Environmental Awareness and Literacy · Sustainable Practices and Resource Management · Green Technologies and Innovation · Adaptation to Green Job Markets · Government and Institutional Support · Role of Education and Training Institutions	2
	Lab/Case Studies	
	· Introduction to Skill Council for Green Jobs (SCGJ) · Swachh Bharat Mission (Waste Management)	2
Unit 2: Python Programming for Green Skilling and Sustainability		10
	Chapter 1: Introduction to Python · What is Python? Overview of Python's features and advantages. · Installation: How to install Python and set up a	2

	development environment (e.g., using Anaconda) · Variables and Data Types: Integers, floats, strings, and Booleans. · Control Structures: If-else statements, loops (for, while). · Functions: Defining and using functions, lambda functions. ·	
	Lab/ Case Studies	
	· Installing Python and setting up the environment (Python / Anaconda, and VS Code) · Creating Python Variables and Assigning values to Variables with different data types. · To implement control structures with a climate dataset using Python to filter, manipulate, and analyze the data.	2

	Chapter 2: Python Syntax and Fundamentals · Variables and Data Types: Integers, floats, strings, and booleans. · Control Structures: If-else statements, loops (for, while). · Functions: Defining and using functions, lambda functions	1
	Lab/case Studies	
	· Understand and implement the function and lambda function· To create the function that calculates the carbon footprint based on	1

	energy consumption (in kilowatt-hours) and the emission factor (kg CO2 per kWh).	
	Chapter 3: Data Manipulation and Analysis - Working with Data · Pandas Library: Introduction to data frames, series, and basic operations. · NumPy Library: Handling arrays and numerical data. · Data Cleaning: Techniques for handling missing values and data preprocessing.	1
	Lab/Case Studies	
	· To creating a Series for Renewable Energy Sources · To creating a Data Frame for Green Technology Projects · Implementation of the basic Operations with Pandas (accessing columns, filtering data, adding new columns, aggregating, and grouping.) · To Create a NumPy array for energy consumption (in MWh) for different renewable sources · NumPy Arrays: Efficient storage and manipulation of numerical data. · Basic Operations: Sum, mean, standard deviation, and reshaping. · To Handling Energy Consumption Data	1

	with · Handling Missing Values: Remove rows/columns, impute values with mean/median or use forward/backward filling, Flag missing values. · Variables and Feature Engineering	
	Chapter 4: Data Visualization · Matplotlib Library: Creating plots, charts, and graphs.	1
	Lab/ Case Studies	
	· Line Plot: To Plotting energy consumption over several months. · Bar Chart: To Comparing energy consumption by different types of renewable energy sources. · Pie Chart: To Showing the share of each renewable energy source in the total energy consumption. · Scatter Plot: To Analyzing the relationship between energy consumption and carbon emissions · Customization: Customizing a bar chart using Add titles, labels, legends, and adjust styles.	1
Unit 3: Machine Learning		6

	Chapter 1: Introduction to Machine Learning · Overview of AI and ML · AI-ML Importance of Sustainability · Types of Machine Learning · Machine Learning Workflow	3
	Chapter 2: Supervised Learning · Regression: Linear regression, polynomial regression. · Model Evaluation - Regression Performance Metrics: R2, MSE, RMSE, MAE · Applications of Supervised ML Algorithms in sustainability	2
	Lab/Case Studies	
	· Predicting Solar Power Output Using Linear Regression	1
Unit 4: Deep Learning		6
	Chapter 1: Introduction to Deep Learning · Neurons and Layers: Basic building blocks of neural networks, including input, hidden, and output layers. · Activation Functions: Functions like ReLU, Sigmoid, and Tanh that introduce non-linearity into the network.	2

	· Chapter 2: Deep Learning Frameworks and Libraries · Keras API for high-level model building, and Tensorflow, TorchVision for image processing	2
	Lab/Case Studies	
	· Implementation of Neural Network concepts	2
Unit 5: Computer Vision for Green Technology and Sustainability		6
	Chapter 1: Introduction to Computer Vision · Applications of Computer Vision in Green Technology · Tools and Libraries (OpenCV) · Image Classification - Categorizing an image into predefined classes. · Object Detection - Identifying and locating objects within an image. · Image Segmentation - Dividing an image into segments to simplify analysis. · Feature Extraction - Identifying and extracting significant features from images.	3
	Lab/Case Studies	
	Forest Fire Detection Using Satellite Imagery Waste Sorting Using Computer Vision	3
Unit 6: Generative AI		4

	Chapter 1: Introduction to Generative AI · Generative Models: Algorithms that create new data samples similar to the training data. · Training and Inference: Training involves learning from data, while inference involves generating new content based on the learned model.	2
	Lab/Case Studies · Understanding the Gen AI Application (chat GPT), and other Gen AI Applications	2
Unit 7: Model Deployment with Streamlit		6
	Chapter 1: GitHub · Create a Project Directory · Initialize GitHub Repository · Set Up Virtual Environment	2
	Chapter 2: Building the ML/DL/Generative Model · Train or Load Your Model · Test Your Model Locally	1
	Chapter 3: Creating the Streamlit App	1

	· Install Streamlit · Build the Streamlit Application · Test the Streamlit App Locally · Push Your Code to GitHub	
	Lab/Case Studies	
	· Model Deployment with Streamlit for a solar energy model Green AI Project	2
Unit 8: AI Ethics, Fairness, and Sustainability		3
	Chapter 1: Introduction to AI Ethics, Fairness, and Sustainability · AI Ethics: The study of moral issues related to the development and deployment of AI systems. · Fairness: Ensuring AI systems make decisions that are unbiased and equitable across different groups. · Sustainability: Ensuring that AI technologies are developed and deployed in ways that promote long-term environmental, social, and economic well-being.	
	Chapter 2: AI Ethics: Fundamental Principles · Transparency: AI systems should be understandable and explainable, allowing	1

	users and stakeholders to know how decisions are made. · Accountability: AI developers and organizations must be accountable for the outcomes of AI systems, especially when they go wrong. · Privacy: Data used in AI should be protected, respecting users' rights to privacy. · Autonomy: AI should enhance human autonomy, ensuring that human control remains at the center of AI-driven decisions. · Non-Maleficence: AI should avoid harm, ensuring safety and avoiding unintended negative consequences.	
	Lab/Case studies	
	Implementing AI Ethics in a Smart City Traffic Management System	
	Chapter 3: Future Trends in AI Ethics, Fairness, and Sustainability	1
	· Explainable AI (XAI): The push for models that provide clearer explanations of their decision-making process, enabling better understanding and trust. · Sustainable AI Development: Research into making AI development more environmentally friendly (e.g., reducing the	1

	carbon footprint of AI models). · AI for Social Good: Exploring AI applications aimed at solving global challenges, such as poverty, health, and education, while ensuring fairness and ethical use.	
	Lab/ Case Studies	
	AI-Driven Smart Urban Agriculture	

ANNEXURE II

Industry use-cases:

1. To implement control structures with a climate dataset using Python to filter, manipulate, and analyze the data.

2. Develop a Python-based tool that calculates the carbon footprint of various activities within an organization.

3. Students can work with energy companies to visualize renewable energy consumption using *Matplotlib* and *Pandas*. They can create predictive models that show how energy consumption patterns change over months, visualizing the data with line plots and bar charts to support decision-making on sustainable energy sources.

4. Students can work with solar energy companies to apply supervised learning models (such as linear regression) for predicting solar energy output based on historical weather data. This use case will enhance energy planning and resource management in the renewable energy sector.

5. To create the Classifying Waste Types for Recycling (to classify them into different categories: Plastic, Metal, Organic, etc) using classification algorithms

6. Clustering Energy Consumption Patterns for Smart Cities.

7. Build a machine learning model in Python to predict future energy demands for urban areas using historical consumption data.

8. Identifying regions prone to extreme poverty based on historical economic and demographic data.

9. Create an AI-powered irrigation system that adjusts water usage based on soil moisture data.

10. Use computer vision to identify and count animal species from images captured by camera.

11. Create an ML model to predict water quality in rivers, helping policymakers ensure safe water resources.

12. Build a machine learning model to analyze automotive engine sensor data and predict maintenance needs, reducing unexpected breakdowns, repair costs, and improving vehicle performance and safety.

13. Utilizing machine learning and generative AI for solid waste management

14. Solar Power Generation Prediction & Analysis using ML

15. To predict the wind power that could be generated from the windmill for the next couple of days

ANNEXURE III

Assessment Plan

S. No.	**Assessment Component**	**Evaluation Parameters**	**Maximum Marks**
1	Attendance in mentor-led sessions	>=60%	10
2	Final Assessment Score	>=60%	50
3	Case Study submission	100 %	10
Total			70 marks