



COLLABORATIVE FINAL PROJECT			
Topic:	Hybrid AI System (ML + KRR)	Duration:	9 Weeks
Course Code:	CSST101, CSST102	Term:	1 st Semester
Course Title:	KRR, Machine Learning	Academic Year:	2025-2026
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Due date	January 2026	Points	

I. PROJECT OVERVIEW

For your FINAL COLLABORATIVE PROJECT, you will develop a **Hybrid Artificial Intelligence System** integrating:

- **Machine Learning (ML) — for prediction or classification**
- **Knowledge Representation & Reasoning (KRR) — for rule-based logic and explanations**

Your system must solve a **real-world problem aligned with any Sustainable Development Goal (SDG)**. You may choose **ANY project title**, provided it uses:

- A Machine Learning model
- A rule-based reasoning engine
- A combined hybrid output (ML + KRR)
- Clear, explainable AI recommendations
- A simple user interface

This project requires **technical implementation, documentation, and a final presentation**.

II. LEARNING OUTCOMES

By the end of this project, students will be able to:

1. Apply ML algorithms to solve real-world problems.
2. Construct a rule-based reasoning system using KRR.
3. Integrate data-driven ML with symbolic reasoning.
4. Develop a functional hybrid AI system.
5. Write complete technical documentation.
6. Present, demonstrate, and justify their work professionally.

III. PROJECT REQUIREMENTS

A. Machine Learning Requirements (CSST102)

Each group must:

1. Use or create a dataset with ≥ 300 records



2. Perform preprocessing (cleaning, encoding, scaling)

3. Train **at least one classifier**, such as:

- Random Forest
- Decision Tree
- SVM
- Naïve Bayes

4. Evaluate the model using:

- Accuracy
- Precision
- Recall
- F1 Score

5. Provide visual outputs:

- Confusion matrix
- Feature importance

6. Save/load the model using joblib/pickle

7. Integrate ML output with KRR reasoning

B. Knowledge Representation & Reasoning Requirements

(CSST101) Groups must create:

1. A **rule-based reasoning engine** with at least 10–20 rules

2. An ontology or concept hierarchy showing:

- Agents/Users
- Inputs
- Knowledge concepts
- Risk/Classification levels
- Recommendations

3. IF-THEN rules using:

- Forward chaining
- OR backward chaining

4. Logical refinement of ML predictions

5. Explanation component:

- “The system classified you as High Risk because... (Rule triggers)”

C. HYBRID SYSTEM INTEGRATION

Your final system **must combine ML + KRR**:

1. User inputs features
2. ML predicts class/risk/output
3. KRR refines or modifies the ML prediction based on rules
4. Final output = refined result + recommendation
5. Display reasoning
6. Provide a user-friendly interface (UI)

Accepted UIs:

- Web UI (Flask, Streamlit)

- Desktop UI



- CLI (neat formatting)

IV. DELIVERABLES

1. Working Hybrid System

- ML model
- Rule-based engine
- API or UI interface
- Final output with explanations

2. Complete Documentation (20+ Pages)

Required chapters:

1. Cover Page (Your Title)
2. Abstract
3. Introduction
4. Review of Related Literature
5. Methodology
 - o ML model
 - o KRR rules
 - o Integration process
6. System Architecture
7. UML Diagrams (Use Case, Activity, Class, Sequence)
8. Dataset Description
9. Testing & Evaluation
10. Results & Discussion
11. Conclusion & Future Recommendations
12. References (IEEE format)
13. Appendices (Screenshots, Code Snippets)

3. Final Presentation Video (5–8 minutes)

Include:

- Problem background
- SDG relevance
- ML model explanation
- KRR rules explanation
- System demonstration
- Results
- Team contributions



4. Group Contribution Sheet

List member responsibilities.

5. GitHub / Google Drive Folder

Must contain:

- Source code
- Trained ML model
- Documentation
- Presentation
- Dataset

V. RUBRICS (CSST101 + CSST102)

A. CSST101 (Knowledge Representation & Reasoning) - 100 pts

Criteria	Description	Point s
Rules & Logic	Correct, complete, logical, 10–20 rules	25
Ontology & Representation	Clear hierarchy and knowledge design	20
Reasoning Engine	Correct implementation of inference	20
Explainability	Clear explanations for decisions	15
Integration with ML	How well KRR refines ML	10
Documentation (KRR)	Clarity, rules listed, screenshots	10
		Total 100 pts.

B. CSST102 (Machine Learning) - 100 pts

Criteria	Description	Point s
Dataset Preparation	Clean, preprocessed, encoded	20
Model Training	Correct algorithm + tuning	20
Evaluation Metrics	Accuracy, precision, recall, F1	20
Visualizations	Confusion matrix, feature importance	15
Integration with KRR	Correct ML → KRR flow	15
Documentation (ML)	Clarity, methodology, screenshots	10



Total 100 pts.

VI. PROJECT TIMELINE (9 Weeks)

Week	Milestone
Week 1	Grouping, topic selection, title approval
Week 2	Dataset gathering/preparation
Week 3	ML model development
Week 4	KRR rule creation + ontology
Week 5	Hybrid integration
Week 6	System UI development
Week 7	Testing & debugging
Week 8	Documentation writing
Week 9	Presentation & final submission