Republic of the Philippines
Laguna State Polytechnic University
Province of Laguna

COLLABORATIVE FINAL PROJECT			
Topic:	**Hybrid AI System (ML + KRR)**	**Duration:**	9 Weeks
Course Code:	**CSST101, CSST102**	**Term:**	1st Semester
Course Title:	**KRR, Machine Learning**	**Academic Year:**	2025-2026
Student Name	Bulos, Ramos, R., Rosario	**Section**	BSCS 3B
Due date		**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
    - ML model
    - KRR rules
    - 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	Points
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.

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B. CSST102 (Machine Learning) – 100 pts

Criteria	Description	Points
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