National University of Engineering (UNI)
School of Computer Science
Syllabus 2026-I

1. COURSE
AI263. Introduction to Machine Learning (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	AI263. Introduction to Machine Learning
2.2 Semester	:	6^{th} Semester
2.3 Credits	:	4
2.4 Horas	:	2 HT; 4 HP;
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Mandatory
2.7 Learning modality	:	Face to face
2.8 Prerrequisites	:	CS261-CS2023. Artificial Intelligence. (5^{th} Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE
This course introduces the fundamentals of machine learning, covering classical and modern algorithms for classification, regression, and clustering problems. It focuses on practical implementation using scikit-learn and TensorFlow, with applications in computer vision and natural language processing.

5. GOALS

- Understand the mathematical principles behind ML algorithms.
- Implement complete ML pipelines with Python.
- Evaluate and optimize models using standard metrics.

6. COMPETENCES

2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. (Assessment)

AG-C09) Solution Design and Development: Designs, implements, and evaluates solutions for complex computing problems. (Assessment)

6) Apply computer science theory and software development fundamentals to produce computing-based solutions. (Assessment)

AG-C12) Applies computer science theory and software development fundamentals to produce computer-based solutions. (Assessment)

4) Recognize professional responsabilities and make informed judgments in computing practice based on legal and ethical principles. (Usage)

AG-C02) Ethics: Applies ethical principles and commits to professional ethics and standards of computing practice. (Usage)

7. TOPICS

Unit 1: ML Fundamentals (15 hours)	
Competences Expected: 6,AG-C12	
Topics	**Learning Outcomes**
• Supervised vs unsupervised learning • Overfitting and regularization • Cross-validation and learning curves	• Explain the bias-variance tradeoff [Familiarizarse] • Implement k-fold cross-validation [Usar]
Readings : [Bis06], [GBC16]	

Unit 2: Linear Models (15 hours)	
Competences Expected: 6,AG-C12	
Topics	**Learning Outcomes**
• Linear and logistic regression • Support Vector Machines (SVM) • Linear discriminant analysis	• Program linear models with scikit-learn [Usar] • Interpret regression coefficients [Evaluar]
Readings : [HTF09], [Mur12]	

Unit 3: Ensembles and Trees (15 hours)	
Competences Expected: 6,AG-C12	
Topics	**Learning Outcomes**
• Decision trees and random forests • Gradient Boosting (XGBoost, LightGBM) • Stacking and voting	• Optimize hyperparameters with GridSearch [Usar] • Visualize decision trees [Evaluar]
Readings : [HTF09], [Gér22]	

Unit 4: Basic Neural Networks (15 hours)	
Competences Expected: 6,AG-C12	
Topics	**Learning Outcomes**
• Multilayer perceptrons (MLP) • Backpropagation and optimizers • Introduction to Keras/TensorFlow	• Build simple neural networks [Usar] • Monitor training with TensorBoard [Evaluar]
Readings : [GBC16], [Cho21]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

********* EVALUATION MISSING ********

10. BASIC BIBLIOGRAPHY

[Bis06] Christopher M. Bishop. *Pattern Recognition and Machine Learning*. Springer, 2006.

[HTF09] Trevor Hastie, Robert Tibshirani, and Jerome Friedman. *The Elements of Statistical Learning*. 2nd. Springer, 2009.

[Mur12] Kevin P. Murphy. *Machine Learning: A Probabilistic Perspective*. MIT Press, 2012.

[GBC16] Ian Goodfellow, Yoshua Bengio, and Aaron Courville. *Deep Learning*. MIT Press, 2016.

[Cho21] François Chollet. *Deep Learning with Python*. 2nd. Manning, 2021.

[Gér22] Aurélien Géron. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*. 3rd. O'Reilly, 2022.