National University of Engineering (UNI)
School of Computer Science
Syllabus 2027-I

1. COURSE

AI266. AI for Software Engineering (Elective)

2. GENERAL INFORMATION

2.1 Course	:	AI266. AI for Software Engineering
2.2 Cycle	:	CS300 Cycle.
2.3 Credits	:	4
2.4 Hours	:	2 HT; 4 HP;
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Elective
2.7 Learning modality	:	Face to face
2.8 Prerrequisites	:	• AI262. Natural Language Processing. • AI263. Introduction to Machine Learning. (6^{th} Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

This course integrates AI techniques into the software development lifecycle, covering practical applications like code generation, automated debugging, and system optimization through machine learning.

5. GOALS

- Implement MLOps pipelines in traditional development environments
- Design systems integrating AI models into software applications
- Evaluate ethical implications in development process automation

6. COMPETENCES

AG-C09) Design and Development of Solutions: Designs, implements, and evaluates solutions for complex computing problems. (Usage)

AG-C12) Uses systemic approaches to select, develop, apply, integrate, and manage secure computing technologies to achieve user objectives. (Usage)

7. TOPICS

Unit 1: AI-SE Fundamentals (12 hours)	
Competences Expected: AG-C09,AG-C12	
Topics	**Learning Outcomes**
• Design patterns for AI-SE systems • Hybrid system architectures (AI + traditional software) • Quality metrics for intelligent components	• Design software architectures incorporating AI components [Evaluar] • Evaluate trade-offs in hybrid systems [Usar]
Readings : [ZC22]	

Unit 2: Advanced Applications (24 hours)	
Competences Expected: AG-C09,AG-C12	
Topics	**Learning Outcomes**
• Automated code generation (Codex, CodeT5) • Intelligent debugging • Automated performance optimization	• Implement AI-assisted code generation tools [Usar] • Integrate recommendation systems into IDEs [Evaluar]
Readings : [All+18], [CLS21]	

Unit 3: Automation Ethics (8 hours)	
Competences Expected: AG-C09,AG-C12	
Topics	**Learning Outcomes**
• Risks of automated code generation • Biases in developer recommendation systems • Legal liability in autonomous systems	• Identify ethical critical points in AI-SE [Familiarizarse] • Propose mitigation protocols [Usar]
Readings : [ZC22]	

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

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

Lab Sessions:
In order to verify their competences, several activities including active learning and roleplay will be developed during lab sessions.

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

Reading:
Throughout the course different readings are provided, which are evaluated. The average of the notes in the readings is considered as the mark of a qualified practice. The use of our virtual campus allows each student to access the course information, and interact outside the classroom with the teacher and with the other students.

The final grade NF depends on the following grades:

- PE: Partial Exam.
- FE: Final Exam.
- P: Permanent Evaluation (Average of practical work and graded assignments).

The final grade NF is calculated as follows:

$$NF = \frac{PE + FE + P}{3}$$

10. BASIC BIBLIOGRAPHY

[All+18] Miltiadis Allamanis et al. "A Survey of Machine Learning for Big Code and Naturalness". In: *ACM Computing Surveys* 51.4 (2018).

[CLS21] Yue Chen, Xiao Liu, and Zijian Shi. "CodeT5: Identifier-aware Unified Pre-trained Encoder-Decoder Models for Code Understanding and Generation". In: *EMNLP*. 2021.

[ZC22] Mark Zhang and Sarah Chen. *AI Engineering: Applying AI in Software Development*. O'Reilly, 2022.