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

1. COURSE

AI264. Deep Learning (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	AI264. Deep Learning
2.2 Semester	:	7^{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	:	AI263. Introduction to Machine Learning. (6^{th} Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

This course covers modern deep learning fundamentals, including convolutional networks, transformer architectures, and training techniques for advanced AI systems.

5. GOALS

- Implement deep neural networks using modern frameworks (PyTorch/TensorFlow)
- Design architectures for specific domains (vision, language, etc.)
- Analyze ethical limitations of deep models

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)

AG-C10) Investigation: Studies complex computing problems using information science methods. (Usage)

7. TOPICS

Unit 1: DL Foundations (15 hours)	
Competences Expected: 6,AG-C12	
Topics	**Learning Outcomes**
• Modern backpropagation • Regularization (Dropout, BatchNorm) • Advanced optimizers	• Implement DNNs from scratch [Evaluar] • Diagnose training problems [Usar]
Readings : [GBC16]	

Unit 2: Advanced Architectures (25 hours)	
Competences Expected: 2,AG-C09	
Topics	**Learning Outcomes**
• ResNets and deep CNNs • Transformers and attention • Generative models (VAEs, GANs)	• Adapt architectures to specific domains [Evaluar] • Train transformers on real datasets [Usar]
Readings : [Vas+17], [He+16]	

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

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

[He+16] Kaiming He et al. "Deep Residual Learning for Image Recognition". In: *CVPR* (2016), pp. 770–778.

[Vas+17] Ashish Vaswani et al. "Attention Is All You Need". In: *Advances in Neural Information Processing Systems* 30 (2017).