National University of Engineering (UNI)
School of Artificial Intelligence
Syllabus 2027-I

1. COURSE

CS401. Research Methodology (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	CS401. Research Methodology
2.2 Semester	:	4th Semester.
2.3 Credits	:	2
2.4 Hours	:	1 HT; 2 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	:	CS100. Introduction to Computer Science. (2nd Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

This course aims to teach students how to conduct scientific research in the field of computer science. The course instructors will determine a specific study area for each student and provide relevant bibliography for analysis. Based on this and additional bibliographic sources researched by the student, the student should be able to construct a survey-type article on the assigned topic.

5. GOALS

- Learn how to initiate scientific research in computer science with methodological rigor.
- Know the main academic bibliographic sources: IEEE Xplore, ACM Digital Library, Google Scholar, and arXiv.
- Critically analyze existing proposals on a topic and relate them coherently in a literature review.
- Write technical documents in computer science using LaTeXwith IEEE and ACM conference templates.
- Reproduce existing results in a topic through implementation and experimentation.
- Build a survey-type article with taxonomy, synthesis, and comparison of existing approaches.
- The deliverables for this course are:

  Partial Progress: Mastery of the article topic and preliminary bibliography in LaTeXarticle format.

  Final: Completed survey-type article, optionally containing experimental results of the studied technique(s).

6. COMPETENCES

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

AG-C04) Communication: Communicates effectively in complex computing activities. (Assessment)

AG-C05) Project Management: Applies management principles in computing to manage projects. (Assessment)

AG-C08) Problem Analysis: Identifies, formulates, and analyzes complex computing problems. (Assessment)

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

7. TOPICS

Unit 1: Foundations of Scientific Research in Computer Science (8 hours)	
Competences Expected: AG-C05,AG-C08	
Topics	**Learning Outcomes**
• Types of research in computer science: empirical, theoretical, constructive, and evaluative. • The scientific method applied to research in computer science. • Main academic databases: IEEE Xplore, ACM Digital Library, Google Scholar, Semantic Scholar, and arXiv. • Bibliographic search strategies: Boolean operators, citation tracking, and systematic search. • Reference managers: Zotero, Mendeley, and BibTeX integration.	• Identify the types of research in computer science and their methodological differences. [Familiarizarse] • Use the main academic databases to find relevant literature on a given topic. [Usar] • Organize bibliographic references using reference managers and BibTeX format. [Usar]
Readings : [**ieee**], [**acm**]	

Unit 2: Critical Reading and Analysis of Scientific Literature (8 hours)	
Competences Expected: AG-C08,AG-C09	
Topics	**Learning Outcomes**
• Structure of a scientific article: abstract, introduction, related work, methodology, results, and conclusions. • Techniques for efficient reading of scientific articles (three-pass reading). • Critical evaluation: identifying contributions, limitations, and open problems. • Building a reading matrix and comparative tables of related works. • Classification and taxonomy design of existing approaches on a topic.	• Read and critically evaluate scientific articles identifying their contributions and limitations. [Usar] • Build an organized reading matrix that synthesizes multiple works on a given topic. [Usar] • Design a preliminary taxonomy of approaches for an assigned research area. [Evaluar]
Readings : [**ieee**], [**acm**], [**citeseer**]	

Unit 3: Research Ethics and Academic Integrity (6 hours)	
Competences Expected: AG-C02,AG-C04	
Topics	**Learning Outcomes**
• Academic integrity: plagiarism, self-plagiarism, data fabrication, and falsification. • Ethics in computer science research: privacy, algorithmic bias, and human subjects studies. • Open access, licenses (Creative Commons, GPL), and intellectual property in software. • Good citation and authorship attribution practices in collaborative work. • The peer review process: role of the reviewer and responsibilities of the author.	• Distinguish forms of academic misconduct and apply correct citation practices. [Usar] • Analyze ethical dilemmas in computational research applying integrity principles. [Evaluar] • Explain intellectual property rights and relevant licenses in computer science. [Familiarizarse]
Readings : [**ieee**], [**acm**]	

Unit 4: Technical Writing and Scientific Writing Tools (10 hours)	
Competences Expected: AG-C04,AG-C09	
Topics	**Learning Outcomes**
• LaTeX structure: preamble, sections, equations, figures, tables, and cross-references. • Conference and journal templates: IEEE and ACM. • Academic writing style in computer science: clarity, precision, and active voice. • Writing each section of the article: abstract, introduction, related work, methodology, results, and conclusions. • Document version control with Git for LaTeXprojects. • Bibliography management with BibTeX and JabRef.	• Write a complete technical article in LaTeXusing IEEE or ACM templates. [Usar] • Apply academic writing conventions of the computer science community. [Usar] • Evaluate the writing quality of an article based on clarity and structure criteria. [Evaluar]
Readings : [**ieee**], [**acm**]	

Unit 5: Systematic Literature Review and Survey Articles (10 hours)	
Competences Expected: AG-C04,AG-C08,AG-C09	
Topics	**Learning Outcomes**
• Types of reviews: narrative, systematic, mapping study, and meta-analysis. • Systematic literature review (SLR) protocol: research questions, search strategy, and selection criteria. • PRISMA guidelines: flowchart for selection of primary studies. • Synthesis techniques: narrative synthesis, vote counting, and thematic analysis. • Taxonomy design and classification schemes for a survey. • Structure and writing of a survey-type article.	• Design and execute a systematic literature review protocol for a computer science topic. [Usar] • Apply PRISMA guidelines to document and report the study selection process. [Usar] • Write a survey article with taxonomy, critical synthesis, and comparison of approaches. [Evaluar]
Readings : [**ieee**], [**acm**], [**citeseer**]	

Unit 6: Presentation and Dissemination of Research Results (6 hours)	
Competences Expected: AG-C02,AG-C04,AG-C05	
Topics	**Learning Outcomes**
• Oral presentation techniques for scientific audiences: structure, time management, and Q&A sessions. • Poster design for research conferences and symposia. • Responding to reviewers: addressing comments constructively and with evidence. • Research project planning: schedule, milestones, and deliverables. • Collaboration and co-authorship practices in scientific research.	• Prepare and deliver an oral presentation of research results to an academic audience. [Usar] • Develop a work plan for a research project with schedule and milestones. [Usar] • Respond constructively to reviewer comments in the publication process. [Evaluar]
Readings : [**ieee**], [**acm**]	

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