

Syllabus
Research Seminar



A. General Information

1. Academic Unit	Facultad de Ingeniería					
2. Program	Ingeniería Civil Industrial					
3. Code	IIR321A					
4. Location in the curriculum	II Semester, III Year					
5. Credits	UDD	8	SCT	5		
6. Type of course	Mandatory	X	Elective		Optional	
7. Duration	Bimonthly		Semi-annual	X	Annual	
8. Modules per week	Theoretical	1	Practical	1	T.A.	
9. Class hours	Classes	68	Teaching Assistance			
10. Prerequisites	Capstone de Ciencias, Tecnología y Diseño; Optimización; Inglés Nivel B1.					

B. Contribution to the Graduate's Profile

The **Research Seminar** course, belonging to the bachelor's degree Cycle, contributes to the engineering students graduate profile by strengthening crucial competencies for their academic and professional performance in a globalized context. This subject fosters the development of communication skills in English, which are essential in the field of contemporary engineering.

Students will perfect their ability to articulate complex ideas, present research results, and participate in academic discussions in both Spanish and English. This dual linguistic competency enhances the graduate's versatility to integrate into multicultural teams and access professional opportunities in an internationalized labour market. Additionally, it promotes an international perspective, raising students' awareness of the challenges and opportunities of engineering on a global scale. Through exposure to international scientific literature and participation in debates on globally relevant topics, students broaden their understanding of the global context in which engineering practice develops. This holistic vision prepares graduates to address engineering problems with an intercultural perspective and awareness of the global implications of their decisions.

The course fosters the capacity for critical analysis and rigorous evaluation of information, which are indispensable skills in the training of engineers. Through the formulation of research questions, study design, and data analysis, students develop a systematic and analytical approach to addressing complex problems. This competency strengthens the graduate's ability to make informed decisions and propose evidence-based solutions in their professional field.

This course belongs to the **Capstone Courses** formative area and contributes to the UDD Generic Competencies: **Communication, Critical Thinking, and Global Vision**, as well as to the Specific Competencies: **Problem Solving with a Systemic Approach, Project Management, and Analytical Thinking and Inquiry**, as stated in the program's graduate profile.

The integration of these competencies not only enriches the student's academic formation but also increases their competitiveness in the labour market. Graduates, equipped with bilingual communication skills, critical thinking, and a global vision, are prepared to face the complex and interdisciplinary challenges that characterize modern engineering practice.

This pedagogical approach aligned with the graduate profile competencies ensures that future engineers develop not only technical expertise but also the transversal skills necessary to lead projects, collaborate in multicultural environments, and contribute significantly to the advancement of the discipline in a global context.

C. Competencies and Learning Outcomes from the Course

Generic Competencies	General Learning Outcomes
Communication	Effectively communicates research results in English, both orally and in writing, using scientific and technical evidence to support their arguments.
Critical Thinking	
Global Vision	
Specific Competencies	Critically evaluates scientific literature and empirical evidence to formulate research questions and support methodological decisions. Integrates an international and interdisciplinary perspective in the design and execution of engineering research. Applies a systemic approach in the definition, planning, and development of engineering research projects. Efficiently manages research projects, demonstrating autonomy, responsibility, and fulfilment of defined objectives. Employs analytical and scientific inquiry tools to obtain, process, and interpret data according to research objectives.
Problem Solving with a Systemic Approach	
Project Management	
Analytical Thinking and Inquiry	

D. Units, Content and Learning Outcomes

Units and Content	Competency	Learning Outcomes
Unit I: Fundamentals of Research. • Introduction to Research • Why Do We Conduct Research? • Distinction between qualitative and quantitative approaches • Formulation of research questions • Literature review process: how to effectively search for, evaluate, and synthesize existing research.	<i>Global Vision</i> <i>Critical Thinking</i> <i>Problem Solving with a Systemic Approach</i> <i>Project Management</i>	Recognizes the relevance of the global context in the generation of scientific knowledge, identifying how local problems are linked to international trends and challenges. Critically evaluates relevant scientific and technical literature to build an analytical framework that supports their conclusions. Identifies complex engineering problems, considering the interrelationships among the components of the system being studied. Plans the initial stages of a research project, defining objectives, resources, and execution timelines in a realistic and organized manner.
Unit II: Research Design and Methodological Framework. • Research Methodological Approaches (quantitative and qualitative) • Measurement concepts: reliability and validity. Selection of appropriate instruments for data collection. • Sampling techniques: how to choose the most suitable method for your research questions? • Data collection methods for quantitative research (e.g., surveys, experiments) and qualitative research (e.g., interviews, focus groups, fieldwork). • Ethical considerations specific to research design and data collection.	<i>Communication</i> <i>Problem Solving with a Systemic Approach</i> <i>Analytical Thinking and Inquiry</i> <i>Project Management</i>	Formulates clear and achievable research questions and objectives, consistent with theoretical and methodological foundations. Presents the foundations of the methodological design with clarity and coherence, effectively communicating their research proposal. Integrates different theoretical and contextual perspectives to design research that considers the interaction between variables and systems. Organizes the activities and responsibilities of the research project, applying basic planning and progress monitoring tools.

Unit III: Data Analysis and Interpretation of Results. • Selection and application of analysis techniques. • Preparation of quantitative and qualitative data for analysis. • Analysis and interpretation of data generated from research. • Interpretation of results: how to draw meaningful conclusions from your analyses? Ethical considerations in data analysis and interpretation, biases and participant confidentiality.	<i>Communication</i> <i>Analytical Thinking and Inquiry</i> <i>Problem Solving with a Systemic Approach</i> <i>Project Management</i>	Applies appropriate analytical techniques to interpret data and build conclusions grounded in evidence. Presents results clearly, using academic language and visual tools to facilitate understanding of the findings. Analyzes the results obtained by identifying relationships and implications among the components of the study system, proposing integrated interpretations. Monitors the progress of data analysis and processing tasks, adjusting strategies and timelines to ensure fulfillment of project objectives.
Unit IV: Presentation and Dissemination of Research • Oral and written communication of research results to diverse audiences. • Writing the results and discussion sections of research papers. • Creation of visual aids such as tables, graphs, and diagrams to enhance data presentation. • Preparation of reports, research papers, and presentation of work to a general audience. • Ethical considerations in research presentation (accurate reporting of results and maintaining participant anonymity).	<i>Global Vision</i> <i>Communication</i> <i>Project Management</i> <i>Problem Solving with a Systemic Approach</i>	Communicates research results in English through oral and written presentations, using relevant scientific evidence. Integrates interdisciplinary perspectives and international trends, demonstrating a global understanding of the impact of their research. Effectively manages the final stages of the research project, evidencing the achievement of established objectives. Evaluates the practical application of research results, proposing integrated and sustainable solutions to complex problems.

E. Teaching Methods

During the course development, different methodological strategies will be used, each formulated based on the knowledge and skills to be transferred and developed in the student:

- **Flipped Classroom Approach:** Provide pre-class materials (readings, videos) for students to review independently. Use class time for discussions, problem-solving, and application of concepts.
- **Collaborative Learning:** Implement think-pair-share activities to discuss research concepts. Use jigsaw techniques for literature review exercises, where students become "experts" in different sources and teach others.
- **Peer Teaching and Assessment:** Assign students the task of teaching specific research methods or concepts to their peers. Organize student-led discussions on research ethics case studies. Use reflections at the end of each unit to consolidate learning and identify areas for improvement.
- **Reflective Learning:** Implement research journals where students reflect on their learning process and challenges.
- **Incremental Project Development:** Break down the cross-cutting project into smaller, manageable tasks aligned with each unit. Provide regular feedback and revision opportunities.
- **Technology Integration:** Use online collaboration tools for group work and peer feedback. Implement online discussion forums to extend class discussions.

F. Evaluation

For the different assessment instances, a grading rubric with clear criteria known to students will be available.

Research Project:

- **Project Proposal:** Submitted at the end of Unit 1. Includes research question, brief literature review, and proposed methodology. Evaluated for clarity, relevance, and feasibility. Includes self-assessment and peer evaluation.
- **Research Design Document:** Submitted at the end of Unit 2. Detailed description of methodology, data collection instruments, and sampling strategy. Evaluated for suitability, thoroughness, and ethical considerations. Includes self-assessment and peer evaluation.
- **Data Analysis Report:** Submitted at the end of Unit 3. Presentation of collected data and analysis results. Evaluated for accuracy, depth of analysis, and interpretation of findings. Includes self-assessment and peer evaluation.
- **Research Pre-Report:** Submitted at the end of Unit 4. Complete report including all stages of the research process. Evaluated for overall quality, coherence, and adherence to academic writing standards. Includes self-assessment and peer evaluation.
- **In-Class Activities:** Throughout the course, students will participate in various in-class activities designed to reinforce learning, promote engagement, and provide opportunities for immediate feedback. These activities will include: Research Workshops, Ethical Case Studies, Group discussions and analysis of ethical dilemmas in research, Mini-Presentations, Canvas Quizzes, Activities based on the cross-cutting project.

Final Exam:

- **Oral Presentation:** Group presentation of research findings. Evaluated for clarity, engagement, and effective use of visual aids.
- **Research Report:** Final submission including all stages of the research process. Evaluated for overall quality, coherence, and adherence to academic writing standards. Article format.

This cross-cutting project allows students to apply their learning in a practical context, progressively developing research skills throughout the course. The variety of assessment methods ensures comprehensive evaluation of both individual and group performance in different aspects of the research process.

G. Learning Resources

Required Bibliography:

- Leedy, P., & Ormrod, J. (2020). Practical research: Planning and design, eBook, global edition. London, England: Pearson Education.
- Salkind, N. J. (2012). Encyclopedia of measurement and statistics. Thousand Oaks, CA: SAGE Publications.

Supplementary Bibliography:

- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. In *Journal of Applied Psychology* (Vol. 88, Issue 5, pp. 879–903). American Psychological Association (APA). <https://doi.org/10.1037/0021-9010.88.5.879>
- Podsakoff, P. M., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Common Method Bias: It's Bad, It's Complex, It's Widespread, and It's Not Easy to Fix. In *Annual Review of Organizational Psychology and Organizational Behavior* (Vol. 11, Issue 1, pp. 17–61). Annual Reviews. <https://doi.org/10.1146/annurev-orgpsych-110721-040030>