

1. COURSE

AR401. Capstone project I (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: AR401. Capstone project I
2.2 Semester	: 8 th Semester.
2.3 Credits	: 4
2.4 Hours	: 4 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 Prerequisites	: AR400. Methodology of Research. (5 th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Thesis I: Research and Program introduces students to the systematic process that precedes architectural design development: selecting and scoping a thesis topic, conducting a rigorous review of precedents, case studies and literature, building a theoretical and conceptual framework, and – where applicable to the chosen thesis approach – formulating research hypotheses and operationalizing their variables. The course closes by applying design research methods to translate these findings into an architectural program (design brief) that will directly drive the preliminary design developed in Thesis II (AR402).

5. GOALS

- Select and scope a thesis topic within the field of architecture, identifying its relevance and feasibility.
- Conduct a systematic review of precedents, case studies and scientific/technical literature relevant to the chosen topic.
- Build a theoretical and conceptual framework that positions the thesis's contribution and identifies a knowledge gap.
- Formulate research hypotheses and operationalize their variables, where applicable to the thesis's research approach.
- Apply design research methods (research through design, case study, evidence-based design) to translate research findings into an architectural program (brief) that will guide the preliminary design developed in Thesis II.

6. COMPETENCES

- AG-A01)** Evaluates the impact of architectural solutions on sustainable development, economy, health and safety, the legal framework, architectural-urban heritage, and the environment. (Assessment)
- AG-A04)** Communicates effectively and inclusively with the architecture community and society through reports, design documentation, and presentations tailored to different audiences. (Assessment)
- AG-A09)** Creates architectural designs that satisfy aesthetic and technical requirements. (Assessment)
- AG-A10)** Conducts studies of complex problems using research methods, experimental design, data analysis, and information synthesis to reach valid conclusions. (Assessment)

7. TOPICS

Unit 1: Research Design and Methodologies (10 hours)	
Competences Expected: AG-A01,AG-A04,AG-A09,AG-A10	
Topics	Learning Outcomes
• Formulating research questions in architecture: descriptive, relational, causal; turning design problems into researchable questions • Choosing a research methodology: quantitative (hypothesis testing, statistical), qualitative (interpretive, case study), mixed methods, • Validity and reliability in architectural research: internal validity, external validity (generalizability), construct validity, • Research ethics in architectural research: informed consent, privacy (anonymization of building users), institutional review board (IRB) protocols, • Mixed methods research: sequential (qualitative then quantitative) and concurrent designs; integrating qualitative findings (user interviews) with quantitative data (occupancy)	• Describe the main research methodologies in architecture - quantitative, qualitative, mixed methods, practice-based - and explain their appropriate applications [Familiarity] • Develop a research design for an architectural inquiry, including research question, literature review, methodology selection, data collection protocol, and analysis plan [Usage] • Evaluate the research design of a published architectural study for validity, reliability, and ethical soundness, identifying methodological strengths and weaknesses [Assessment]
Readings : [GroatWang2013], [Creswell2018], [Zeisel2006]	

Unit 2: Theoretical Framework and Literature Review (10 hours)	
Competences Expected: AG-A01,AG-A04,AG-A09,AG-A10	
Topics	Learning Outcomes
• Systematic search of scientific and technical literature: specialized databases (Scopus, Web of Science, ASCE Library), keywords, and Boolean operators • Critical reading and synthesis of scientific articles, technical standards, and prior research reports • Building the conceptual and theoretical framework: defining key concepts, relationships between variables, and reference theoretical models • Identifying knowledge gaps (research gap) and justifying the originality of the proposed contribution • Bibliographic reference management and citation styles (APA, IEEE) using tools such as Zotero or Mendeley	• Explain the structure and purpose of a theoretical framework within a civil engineering research project [Familiarity] • Conduct a systematic search of scientific and technical literature on a chosen research topic using specialized databases [Usage] • Synthesize the state of the art of a research topic into a coherent theoretical framework that identifies a knowledge gap [Assessment]
Readings : [GroatWang2013], [Creswell2018], [Zeisel2006]	

Unit 3: Research Hypotheses and Variables (8 hours)	
Competences Expected: AG-A01,AG-A04,AG-A09,AG-A10	
Topics	Learning Outcomes
• Types of hypotheses: null, alternative, directional, and non-directional, and their relationship to research questions • Classification of variables: independent, dependent, control, and confounding • Operationalizing variables: defining measurable indicators and measurement scales (nominal, ordinal, interval, ratio) • Relationship between hypotheses, variables, and statistical significance tests: significance level, Type I and Type II error • Graphical representation of the relationship between variables through conceptual or operational models	• Distinguish between null and alternative hypotheses, and between independent, dependent, and control variables, in a civil engineering research problem [Familiarity] • Formulate a testable research hypothesis and operationalize its variables for a specific problem in the chosen specialization area [Usage] • Evaluate the consistency between the theoretical framework, the stated hypothesis, and the proposed data-collection design [Assessment]
Readings : [GroatWang2013], [Creswell2018], [Zeisel2006]	

Unit 4: Design Research Methods (10 hours)	
Competences Expected: AG-A01,AG-A04,AG-A09,AG-A10	
Topics	Learning Outcomes
• Research through design: using the design project itself as a research instrument; documenting, reflecting on, and theorizing the design process as a form of knowledge production • Architectural case study methodology: selecting, documenting, and analyzing built projects as evidence; comparative case studies across typology, culture, or climate • Evidence-based design: drawing on post-occupancy evaluation data, environmental psychology research, and user behavior studies to inform spatial and material design decisions • Literature review and theoretical framing in architectural research: identifying relevant scholarship, positioning a design project within architectural discourse, • Architectural criticism and evaluation frameworks: applying formal, phenomenological, typological, and sociocultural lenses to critically assess architectural works and proposals • Dissemination of design research: writing architectural essays, preparing conference papers and journal submissions, and presenting design-research projects to academic	• Describe the main modes of architectural design research - research through design, case study, and evidence-based design - and explain how each produces architectural knowledge [Familiarity] • Apply a design research methodology to frame, conduct, and document an investigation into an architectural design problem, producing a structured argument supported by evidence [Usage] • Critically evaluate an architectural design research project for the rigor of its methodology, the quality of its evidence, [Assessment]
Readings : [GroatWang2013], [Creswell2018], [Zeisel2006]	

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