Syllabus

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Instructor:	Dr. Shay Abtahi
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Lecture Time and Location:	Fri 14:00 – 16:50, NRE 2-122

Course Description

This course provides a structured introduction to Research Methods tailored to Civil Engineering disciplines. Whether or not students have an existing research project at the start of the course, they will learn how to systematically formulate research problems, identify knowledge gaps, and develop defensible research questions and methodologies relevant to Civil Engineering practice and research. Students will be guided through the full research lifecycle, from problem definition and literature review to research design, data collection, analysis, interpretation, and dissemination. Those with an established thesis or research topic will refine and strengthen their research plans, while students without a defined project will be supported in developing a viable and well-scoped research concept by the end of the term. The course emphasizes critical thinking, methodological rigor, ethical conduct of research, and effective communication of research outcomes. Experimental, numerical, and field-based research methods commonly used in Civil Engineering are integrated throughout the course, along with exposure to emerging data-driven and AI-assisted tools. The course is project-based and activity-driven, with no exams, and culminates in a written research proposal and oral presentation aligned with each student's research interests.

Learning Outcomes

- Identify, formulate, and clearly articulate research problems in Civil Engineering, whether originating from an existing research project or developed during the course.
- Critically assess the current state of knowledge in a chosen Civil Engineering topic and identify meaningful research gaps.
- Develop coherent research objectives, questions, and testable hypotheses appropriate for experimental, numerical, analytical, or field-based studies.
- Design a rigorous and defensible research methodology aligned with defined objectives, including justification of assumptions, limitations, and sources of uncertainty.

- Select appropriate data collection strategies, instrumentation, or simulation approaches relevant to Civil Engineering research contexts.
- Apply fundamental quantitative data analysis and visualization techniques and interpret results within an engineering framework.
- Evaluate validity, reliability, and uncertainty in research design, data, and analysis.
- Communicate research plans and findings effectively through well-structured written documents, clear figures and tables, and professional oral presentations.
- Demonstrate ethical and responsible conduct of research consistent with university policies and professional engineering standards.

Grading Policy

In-Class Quizzes and Activities ……..…….…. 15%

Assignments ……..……..…. 30%

Midterm Project ……..…….…. 20%

Final Project ……..…..……..……..……...…. 35%

Course Delivery

- Lectures: This course will be delivered through a combination of weekly lectures and interactive workshop-style sessions conducted in person by the instructor. Lectures will introduce core concepts related to research methods in Civil Engineering, while workshops will focus on applying these concepts through guided activities such as research question formulation, literature review exercises, research design discussions, and peer feedback. Selected in-class activities and short reflective exercises may be used to reinforce learning and support engagement.
- Office hours: The instructor will hold in-person or online office hours per request. These sessions are intended to support students at different stages of research development, including those refining an existing research project and those developing a research topic during the course.
- Project and assignment submission: All assignments must be submitted electronically through Canvas as per the due date and time. Submission instructions for projects and deadlines will be clearly stated.

Course Policies

Materials and Lectures

- All course materials, including slides, readings, assignment descriptions, and announcements, will be made available through Canvas.
- Lectures may be delivered using a combination of slides, whiteboard discussion, and guided examples. Some material will be intentionally developed during class to encourage active

engagement.
- Students are responsible for taking their own notes and for engaging with the material presented during lectures and workshops.

Assignments and Projects

- This course is **project-based**. Assignments are designed to progressively build toward a complete research proposal aligned with each student's research interests.
- Assignments must be submitted by the stated deadline. Late submissions will not be accepted unless explicitly approved in advance by the instructor under exceptional circumstances.
- Written submissions are expected to be clear, well-structured, and professional. Unless otherwise specified, assignment reports should include:
  - Student name and course number
  - Assignment title
  - Clear statement of objectives
  - Appropriate use of figures, tables, and references
  - Proper citation of sources and acknowledgment of any collaboration
- Assignments will be evaluated based on clarity of thinking, methodological rigor, justification of decisions, and quality of communication.
- When computational tools, simulations, or data analysis are used, submissions must include sufficient explanation of methods, assumptions, and interpretation of results. Raw outputs alone are not sufficient.

Class Policy

- Active participation in lectures, workshops, and discussions is strongly encouraged and forms a component of the course assessment.
- Collaborative discussion and peer feedback are encouraged as part of the learning process. However, all submitted work must be the student's own, with any collaboration clearly acknowledged.

Academic Honesty

- Students are expected to uphold academic integrity in all aspects of the course. Students are accountable for every assignment, quiz, or project they submit. Lack of awareness of the academic honesty policy is not an acceptable explanation for any violations. Details of the Code of Student behavior policy can be found online.

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