



## National University of Engineering (UNI)

School of Civil Engineering  
Syllabus 2026-II

### 1. COURSE

BMI201. Methodology of Engineering Research (Mandatory)

### 2. GENERAL INFORMATION

|                            |                                               |
|----------------------------|-----------------------------------------------|
| 2.1 Course                 | : BMI201. Methodology of Engineering Research |
| 2.2 Semester               | : 8 <sup>th</sup> 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          | : 150Cr                                       |

### 3. PROFESSORS

Meetings after coordination with the professor

### 4. INTRODUCTION TO THE COURSE

Research Methodology in Engineering introduces students to the systematic process of formulating, conducting, and communicating engineering research. The course covers the foundations of the scientific and engineering research process – problem formulation, literature review, research design, data collection and analysis, and academic writing and citation norms – and then applies them directly: each student develops an original research or applied-engineering proposal under individualized faculty advising, presenting and defending it through continuous and final evaluation.

### 5. GOALS

- Formulate a well-defined engineering research problem and conduct a supporting literature review.
- Design a research approach appropriate to an engineering problem, selecting suitable data-collection and data-analysis methods.
- Apply academic-integrity principles and standard citation norms when producing engineering research writing.
- Develop, under individualized advising, an original research or applied-engineering proposal from problem formulation through preliminary results.
- Present and defend engineering research work, responding to continuous and final evaluation.

### 6. COMPETENCES

**ABET-6)** An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (Familiarity)

### 7. TOPICS

| Unit 1: Problem Formulation and Literature Review (10 hours)                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                            |
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| Competences Expected: ABET-6                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                            |
| Topics                                                                                                                                                                                                                                                                                                                                                       | Learning Outcomes                                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>• The engineering research process: from problem identification to dissemination of results</li> <li>• Formulating a research problem and specific, investigable research questions for engineering practice</li> <li>• Literature review methodology: search strategies, source evaluation, and synthesis</li> </ul> | <ul style="list-style-type: none"> <li>• Formulate a specific, investigable engineering research problem [Usage]</li> <li>• Conduct a supporting literature review, evaluating and synthesizing sources [Usage]</li> </ul> |
| Readings : [Boo+16], [LO19], [Civ19]                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                            |

| Unit 2: Research Design and Data Methods (10 hours)                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                          |
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| Competences Expected: ABET-6                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                          |
| Topics                                                                                                                                                                                                                                                                                                                                                                              | Learning Outcomes                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Research design: quantitative, qualitative, and mixed-methods approaches applied to engineering problems</li> <li>• Data collection instruments and methods for engineering research (surveys, experiments, field measurements, simulation)</li> <li>• Data analysis methods and interpretation of engineering research results</li> </ul> | <ul style="list-style-type: none"> <li>• Design a research approach, appropriate for an engineering research question, including data collection and analysis methods [Usage]</li> <li>• Select data collection instruments and analysis methods appropriate to a given engineering research question [Usage]</li> </ul> |
| Readings : [Boo+16], [LO19], [Civ19]                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                          |

| Unit 3: Research Communication and Academic Integrity (10 hours)                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| Competences Expected: ABET-6                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Topics                                                                                                                                                                                                                                                                                             | Learning Outcomes                                                                                                                                                                                                                                                                                                                                                                                                    |
| <ul style="list-style-type: none"> <li>• Academic integrity, plagiarism, and citation standards (reference norms) in engineering writing</li> <li>• Structure of a research proposal, thesis, and technical paper</li> <li>• Oral presentation and defense of engineering research work</li> </ul> | <ul style="list-style-type: none"> <li>• Apply academic integrity principles and standard citation norms in an engineering research write-up [Usage]</li> <li>• Structure a research proposal or technical paper following standard engineering academic conventions [Assessment]</li> <li>• Present and defend engineering research work in response to an evaluation committee's questions [Assessment]</li> </ul> |
| Readings : [Boo+16], [LO19], [Civ19]                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                      |

## 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

- [Boo+16] Wayne C. Booth et al. *The Craft of Research*. 4th. University of Chicago Press, 2016.
- [Civ19] American Society of Civil Engineers (ASCE). *Guide to Preparing Engineering Research Reports and Theses*. Tech. rep. ASCE, 2019.
- [LO19] Paul D. Leedy and Jeanne Ellis Ormrod. *Practical Research: Planning and Design*. 12th. Pearson, 2019.