



National University of Engineering (UNI)

School of Civil Engineering
Syllabus 2027-I

1. COURSE

MA111. Calculus I (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: MA111. Calculus I
2.2 Semester	: 1 st Semester.
2.3 Credits	: 5
2.4 Hours	: 3 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	: None

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

This course introduces the fundamental concepts of differential calculus of single-variable real functions. It provides the mathematical foundations necessary for analyzing change and motion in science and engineering, developing logical reasoning through the study of limits, continuity, and derivatives.

5. GOALS

- Understand the fundamental concepts of limits and continuity.
- Master differentiation techniques for algebraic and transcendental functions.
- Apply derivatives to solve optimization problems and analyze rates of change.
- Develop a rigorous approach to the formal definition of a derivative.

6. COMPETENCES

ABET-1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Familiarity)

7. TOPICS

Unit 1: Limits and Continuity (20 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Limits and continuity of single-variable functions	• Interpret the concept of limit and continuity of a function and its relevance to modeling the behavior of engineering systems near a point [Familiarity]
Readings : [Stewart2016], [Larson2018], [Thomas2014]	

Unit 2: Differential Calculus (20 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
Derivatives and rules of differentiation	- Apply differentiation rules to find rates of change and optimize engineering design parameters [Usage] - Formulate and solve optimization problems for engineering systems using differential calculus [Assessment]
Readings : [Stewart2016], [Larson2018], [Thomas2014]	

Unit 3: Integral Calculus (10 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
- The Fundamental Theorem of Calculus - Integration techniques including substitution and parts - Engineering applications of integration: areas, volumes, centroids, and moments of inertia	- State and explain the Fundamental Theorem of Calculus [Familiarity] - Calculate definite integrals arising from engineering problems such as work, fluid pressure, and heat transfer [Usage]
Readings : [Stewart2016], [Larson2018], [Thomas2014]	

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