



National University of Engineering (UNI)

School of Civil Engineering
Syllabus 2026-II

1. COURSE

BMA102. Differential Calculus (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: BMA102. Differential Calculus
2.2 Semester	: 1 st Semester.
2.3 Credits	: 5
2.4 Hours	: 4 HT; 2 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

Differential calculus is a fundamental mathematical tool shared by computer science and engineering disciplines, providing the foundations for the rigorous study of change, the analysis of rates of change, the optimization of systems and functions, and the modeling of continuous phenomena. This course provides a solid foundation in the concepts and techniques of differential calculus of one variable, with emphasis on its application in scientific and engineering contexts.

5. GOALS

- Rigorously understand the concepts of limit, continuity, and derivative of functions of one variable.
- Apply differentiation rules to compute derivatives of algebraic, composite, and implicit functions arising from scientific and engineering contexts.
- Use differential calculus to solve optimization problems, related rates problems, and function behavior analysis.

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 (12 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 : [Ste15], [LE14]	

Unit 2: Differential Calculus (36 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 : [Ste15], [LE14]	

Unit 3: Parametric Equations and Polar Coordinates (6 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
- Parametric curves and their calculus, applied to trajectories in kinematics - Polar coordinates and their conversion to Cartesian coordinates	- Calculate the velocity and acceleration of a trajectory described parametrically [Usage] - Convert between polar and Cartesian coordinates when modeling engineering geometries [Usage]
Readings : [Ste16], [TWH14]	

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

- [LE14] Ron Larson and Bruce H. Edwards. *Calculus*. Cengage Learning, 2014.
- [TWH14] George B. Thomas, Maurice D. Weir, and Joel Hass. *Cálculo de una variable*. 13th. Pearson, 2014.
- [Ste15] James Stewart. *Calculus: Early Transcendentals*. Cengage Learning, 2015.
- [Ste16] James Stewart. *Cálculo de una variable: Trascendentes tempranas*. 8th. Cengage Learning, 2016.