



National University of Engineering (UNI)
School of Computer Science
Syllabus 2027-I

1. COURSE

BMA103. Integral Calculus (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: BMA103. Integral Calculus
2.2 Semester	: 2 nd 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	: BMA102. Differential Calculus. (1 st Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Integral calculus is a fundamental mathematical tool shared by computer science and engineering disciplines, essential for modeling and solving problems involving accumulation, change, and areas under curves. This course provides the foundations of integral calculus, including integration techniques and their applications in scientific and engineering contexts.

5. GOALS

- Understand the concept of definite and indefinite integrals.
- Apply various integration techniques to solve problems.
- Use integral calculus to model and solve problems in scientific and engineering contexts.

6. COMPETENCES

AG-C07) Computing Knowledge: Applies knowledge of mathematics, science, and computing. (Familiarity)

7. TOPICS

Unit 1: Antiderivatives and Integration Techniques (20 hours)	
Competences Expected: AG-C07	
Topics	Learning Outcomes
• The Fundamental Theorem of Calculus and the antiderivative • Integration techniques: substitution, parts, partial fractions, and trigonometric substitution	• State the Fundamental Theorem of Calculus and explain the relationship between differentiation and integration [Familiarity] • Compute definite and indefinite integrals using standard techniques including substitution and integration by parts [Usage]
Readings : [Stewart2015], [LarsonEdwards2014]	

Unit 2: Improper Integrals (8 hours)	
Competences Expected: AG-C07	
Topics	Learning Outcomes
Improper integrals: convergence criteria and comparison tests	Determine convergence of improper integrals using comparison and other convergence tests [Assessment]
Readings : [Stewart2015], [LarsonEdwards2014]	

Unit 3: Sequences, Series, and Power Series (20 hours)	
Competences Expected: AG-C07	
Topics	Learning Outcomes
- Sequences and series: convergence tests (ratio, root, comparison, integral) - Power series, radius of convergence, Taylor and Maclaurin series	Determine convergence of power series and construct Taylor series for standard functions [Assessment]
Readings : [Stewart2015], [LarsonEdwards2014]	

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

Theory Sessions:

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

Lab Sessions:

In order to verify their competences, several activities including active learning and roleplay will be developed during lab sessions.

Oral Presentations:

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

Reading:

Throughout the course different readings are provided, which are evaluated. The average of the notes in the readings is considered as the mark of a qualified practice. The use of our virtual campus allows each student to access the course information, and interact outside the classroom with the teacher and with the other students.

The final grade NF depends on the following grades:

- PE : Partial Exam.
- FE : Final Exam.
- P : Permanent Evaluation (Average of practical work and graded assignments).

The final grade NF is calculated as follows:

$$NF = \frac{PE + FE + P}{3}$$

10. BASIC BIBLIOGRAPHY