



NATIONAL UNIVERSITY OF ENGINEERING COLLEGE OF CIVIL ENGINEERING

CIVIL ENGINEERING PROGRAM

SYLLABUS - INTRODUCTION TO PHYSICS

I. GENERAL INFORMATION

CODE	: --
SEMESTER	: 0
CREDITS	: 0
TOTAL HOURS	: 20 (Theory, Practice)
PRERREQUISITES	: None
CONDITION	: Mandatory
DEPARTAMENT	: Basic Sciences
INSTRUCTOR	: Fredy Loayza, Gabriel Cermeño, Jesus Basurto, Julio Barraza
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II. COURSE DESCRIPTION

The course provides to students the fundamentals of Calculus for the analysis and application of Physics principles. In this introductory course, students learn and apply the concepts and methods of limits, derivatives, integrals and vector algebra to solve problems in mechanics, motion analysis, hydrostatics and other Physics fields. The course is offered before the beginning of each academic semester. All freshmen students are required to take the course.

III. COURSE OUTCOMES

1. Formulate and solve problems applying basic elements of vectorial analysis in Cartesian coordinate systems.
2. Draw, analyze and solve problems related to mathematical functions.
3. Understand the meaning of derivatives and apply them to solve diverse problems related to mechanics and rate of change.
4. Understand the meaning of integral and apply them to compute areas as well as to solve problems in mechanics.
5. Interpret the equations of line, parabola, circumference, ellipse and hyperbola and draw the corresponding figures.
6. Understand the concept of curve fitting and apply minimum errors square techniques to solve diverse Math and Physics problems.
7. Understand the importance of Calculus for a proper modeling and analysis of mechanics problems.

IV. LEARNING UNITS

1. VECTORS / 4 HOURS

Coordinate systems. One-dimensional and multi-dimensional variables. Vectors. Vector algebra. Scalar product. Vectorial product. Problems and applications.

2. FUNCTIONS, LIMITS AND DERIVATIVES / 4 HOURS

Functions. Functions drawing. Operations with functions. Continuous function. Limits. Rate of change. Derivatives. Derivatives of common functions. Derivatives rules. Applications of derivatives. Problems.

3. FUNCTION INTEGRATION / 4 HOURS

Anti-derivatives. Integrals. Undefined integrals. Integrals of common functions. Integration methods. Defined integrals. Area below a function. Applications of integrals. Problems.

4. VECTORIAL FUNCTIONS / 4 HOURS

Vector function. Derivatives and integrals of vectorial functions.

5. CURVE FITTING / 2 HOURS

Minimum squares methods. Linear and quadratic regression.

6. CONICS / 2 HOURS

Equations of line, parabola, circumference, ellipse and hyperbola. Drawing and analysis.

VI. METHODOLOGY

The course consists of theory and practice. The principles of Calculus and Physics are presented in a didactic way focusing on student understanding. Learning is strengthened by intense problem solving sessions motivating students to develop analytical and critical thinking skills. Instructors have prepared a special reprint containing the theory as well as solved and proposed problems. At the end of the course, students take a written examination whose grade is considered as part of the grade of the course CB105 Physics I.

VII. EVALUATION FORMULA

There is only one final exam. The obtained grade is considered as part of the grade of the course CB105 Physics I.

VIII. BIBLIOGRAPHY

1. MURRAY R. SPIEGEL

Vector Analysis and Introduction to Tensor Analysis.
McGraw Hill Latinamerican.

2. L. LEITHOLD

Calculus with Analytical Geometry
Oxford University Press

3. STEVENC. CHAPRA, RAYMOND P. CANALE

Numerical Methods for Engineers
McGraw Hill