Course guide
2500000 - GECFONMAT - Fundamentals of Mathematics

Last modified: 22/05/2025

Unit in charge:	Barcelona School of Civil Engineering
Teaching unit:	751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN CIVIL ENGINEERING (Syllabus 2020). (Compulsory subject).

Academic year: 2025   **ECTS Credits:** 6.0   **Languages:** Catalan, English

LECTURER

Coordinating lecturer: M. ROSA ESTELA CARBONELL

Others: M. ROSA ESTELA CARBONELL, FRANCISCO JAVIER MARCOTE ORDAX, FRANCISCO JAVIER OZON GORRIZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14392. Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithmic; Statistics and optimization. (Basic training module)

TEACHING METHODOLOGY

The subject consists of 4 hours a week of face-to-face classes in the classroom and 2 hours a week of voluntary workshop.

In face-to-face classes, the teaching staff presents the basic concepts and materials of the subject, presents examples and carries out exercises.

The volunteer workshop hours are mostly devoted to consolidating concepts previous to entering university and solving problems, always having a great deal of interaction with the students.

Support material is used in the form of a detailed teaching plan through the ATENEA virtual campus: contents, schedule of assessment and directed learning activities and bibliography.

Although the majority of sessions will be held in the language indicated in the guide, sessions supported by other guest experts from time to time may be held in another language.

LEARNING OBJECTIVES OF THE SUBJECT

Knowledge of basic mathematical notions. Numerical successions and series. Functions of real variables. Riemann Integral.

1 Ability to solve engineering problems related to trigonometric functions, derivation and integration tehniques.
2 Ability to solve maximum and minimum problems through differential calculation related to simple engineering problems.
3 Ability to solve integrals of a variable, and identify how this technique can be applied to simple engineering problems.

Knowledge of differential and integral calculation of a variable. Ability to solve the mathematical problems posed in engineering involving these concepts. Knowledge of real numbers. Trigonometry knowledge. Knowledge of successions and calculation of limits. Knowledge of logic, set theory and algebraic structures. Knowledge of function theory including continuity and limit analysis. Knowledge of differential calculation of real variable functions including maximum and minimum problems in simple engineering problems.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	20,0	13.33
Hours medium group	30,0	20.00
Hours small group	10,0	6.67

Total learning time: 150 h

CONTENTS

Basic concepts

Description:
Real numbers
Trigonometry
Metric spaces
Problems

Full-or-part-time: 19h 12m
Theory classes: 5h
Practical classes: 3h
Self study : 11h 12m

Sequences and series of real numbers

Description:
Convergent sequences
Calculation of limits, infinite and infinitesimal
Series of real numbers
Problems

Full-or-part-time: 40h 48m
Theory classes: 7h
Practical classes: 7h
Laboratory classes: 3h
Self study : 23h 48m

Differential calculus of functions of one variable

Description:
Real functions of real variable. Elementary functions.
Limits of a function
Indeterminations
Continuity of functions
Derivative of a function
Tangent and normal lines
Rolle and mean value theorems
Taylor polynomial
Extremes of functions of one variable
Problems

Full-or-part-time: 40h 48m
Theory classes: 10h
Practical classes: 7h
Self study : 23h 48m

Riemann integral

Description:
Indefinite integral and calculation of primitives
Definition and properties of the Riemann integral
First fundamental theorem of calculus
Second fundamental theorem of calculus (Barrow's rule)
Application to the calculation of areas and volumes
Problems

Full-or-part-time: 43h 12m
Theory classes: 8h
Practical classes: 7h
Laboratory classes: 3h
Self study : 25h 12m

GRADING SYSTEM

The subject's grade is obtained from the continuous assessment grades and the corresponding laboratory and/or computer lab grades. There will be a global test with 50% of the weight of the assessment and the remaining 50% will be continuous assessment tests.

The continuous assessment consists of doing different activities, both individual and group, of an additive and formative nature, carried out during the course (inside and outside the classroom).

The assessment tests consist of a part with questions about concepts associated with the learning objectives of the subject in terms of knowledge or understanding, and a set of application exercises.

Criteria for qualification and admission to the re-evaluation: Students suspended from the ordinary evaluation who have appeared regularly in the evaluation tests of the suspended subject will have the option to take a re-evaluation test in the period set in the academic calendar Students who have already passed it, or students classified as not present, will not be able to take the revaluation test of a subject. The maximum grade in the case of taking the reassessment exam will be five (5.0). The non-attendance of a student called to the re-evaluation test, held in the fixed period, cannot give rise to the completion of another test with a later date. Extraordinary assessments will be carried out for those students who, due to accredited force, have not been able to take any of the continuous assessment tests.

These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will be carried out within the corresponding teaching period.

EXAMINATION RULES.

It is mandatory to do the exams and their corresponding make up tests (where appropriate); otherwise the student will fail the course and will get an NP (Incomplete) final grade.

BIBLIOGRAPHY

Basic:
- Estela, M.R. Fonaments de càlcul per a l'enginyeria. Barcelona: Edicions UPC, 2008. ISBN 9788483019696.
- Estela, M.R.; Saà, J. Cálculo con soporte interactivo en Moodle [on line]. Madrid: Pearson Educación, 2008 [Consultation: 26/09/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4668. ISBN 9788483224809.
- Apostol, T.M. Calculus [on line]. 2a ed. Barcelona: Reverté, 1972 [Consultation: 26/09/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8019. ISBN 8429150013.
- Salas, S.L.; Hille, E.; Etgen, G. Calculus [on line]. 4a ed. Barcelona: Reverté, 2002 [Consultation: 26/09/2024]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=7715. ISBN 8429151567.