Course guides
2500000 - GECFONMAT - Mathematical Fundamentals

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: 2021 ECTS Credits: 6.0 Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: FRANCISCO JAVIER OZON GORRIZ
Others: FRANCISCO JAVIER OZON GORRIZ, MARCOS PEDRO TERÉS PERNICHI

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 course consists of 2 hours per week of classroom activity (large size group) and 1.6 hours weekly with half the students (medium size group).

The 2 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1.6 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.
LEARNING OBJECTIVES OF THE SUBJECT


1. Ability to solve engineering problems related to trigonometric functions, derivation and integration techniques.
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.


STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30.0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>6.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84.0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>24.0</td>
<td>16.00</td>
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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  
Cauchy sequences  
Sequences of real numbers  
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  
Improper integrals  
Problems

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

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

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: