Course guide
250564 - AMATMEAM2 - Fundamentals of Mathematics for Environmental Science 2

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

Degree: BACHELOR'S DEGREE IN MARINE SCIENCE AND TECHNOLOGY (Syllabus 2018). (Compulsory subject).

Academic year: 2022    ECTS Credits: 6.0    Languages: Spanish

LECTURER

Coordinating lecturer: IRENE ARIAS VICENTE
Others: IRENE ARIAS VICENTE, DAVID MODESTO GALENDE

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
13388. To know and apply the lexicon and concepts of the Marine Sciences and Technologies and other related fields.

General:
13380. Develop a professional activity in the field of Marine Sciences and Technologies.
13381. Address in a comprehensive manner the analysis and preservation of the marine environment with sustainability criteria.

TEACHING METHODOLOGY

Theoretical classes will be given, solving problems and practices. The subject is face-to-face and the work in class will be evaluated, in addition to the exams proposed for the course. The participation in class will be very positive. Class attendance will not be enough to pass the subject, which means that the student must spend about 4 hours a week on a regular basis outside the classroom. Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of assessment activities and directed learning and bibliography.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

LEARNING OBJECTIVES OF THE SUBJECT

In this subject, mathematical tools for the study of environmental phenomena will be provided, such as vector fields and line and surface integrals. Computer and numerical simulation tools will also be provided for the practical application of these concepts.

1.- Relate the differential equations in partial derivatives to problems of environmental processes, especially Fluid Mechanics.
2.- Develop analytical solutions to complex boundary and initial value problems in several dimensions and with simple geometric conditions, which allow an analysis of these solutions, including a parametric study.
3.- Analytically describe curves and surfaces, calculate their properties and carry out differential and integral calculation operations.

This subject focuses on highlighting aspects related to the state of health of the marine environment, mainly oriented to two well differentiated but complementary aspects. On the one hand, the ecological, ecosystemic and environmental aspects, which will give the students a specific vision of the environmental problems present in the marine environment, produced by the use and exploitation of the resources that it provides.
On the other hand, this subject represents a transition of knowledge for students between the Extension of the subject of Basic Sciences, the subject of Applied Sciences and Techniques
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Higher order linear ODE

Description:
EDO concept
EDO systems
Numerical resolution of systems
Environmental applications

Full-or-part-time: 52h 48m
Theory classes: 16h
Laboratory classes: 6h
Self study: 30h 48m

Boundary value problems in ODE

Description:
Introduction. Shooting method
Environmental applications

Full-or-part-time: 19h 12m
Theory classes: 4h
Laboratory classes: 4h
Self study: 11h 12m

Approximation

Description:
Introduction to interpolation
Environmental requests
Minimum square
Applications

Full-or-part-time: 45h 36m
Theory classes: 8h
Practical classes: 11h
Self study: 26h 36m
Mathematical representation of wave phenomena

**Description:**
Complex numbers, concept and representation
Application to environmental phenomena

**Full-or-part-time:** 14h 23m
Theory classes: 2h
Practical classes: 4h
Self study : 8h 23m

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**Evaluation**

**Full-or-part-time:** 12h
Laboratory classes: 5h
Self study : 7h

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**GRADING SYSTEM**

The grade for the course will consist of:

- Practical works (NA).
- Two exams (NE1 and NE2).

1. The practical work (NA) will include, among others, the resolution of problems and the performance of directed work.

2. The contents of the NE1 and NE2 exams will be in accordance with all the subject taught from the beginning of the course.

- The NE1 exam will be taken approximately halfway through the semester and the subject taught so far will enter.

- The NE2 exam will be a final exam, where the complete subject taught throughout the course will enter.

The note of the exams will be calculated as:

\[ NE = \max (0.5 \times NE1 + 0.5 \times NE2, NE2) \] if NE1 greater than or equal to 2 out of 10

\[ NE = 0.5 \times NE1 + 0.5 \times NE2 \] if NE1

In other words, it will be the maximum between the grade obtained through the calculation \((0.5 \times NE1 + 0.5 \times NE2)\) or the final exam score NE2. In order to be eligible for this scoring criterion, the student must have obtained a minimum score of 2 out of 10 in NE1, otherwise the NE grade will necessarily be the one obtained by calculating \(NE = 0.5 \times NE1 + 0.5 \times NE2\).

The final grade for the course will be:

\[ \text{Final Note} = 0.25 \times NA + 0.75 \times NE \]
EXAMINATION RULES.

Students who fail the ordinary assessment that have been submitted regularly to the evaluation tests of the subject suspended will have the option to carry out a reassessment test in the period set in the academic calendar. Students who have already passed the qualification as not yet submitted may not be submitted to the re-evaluation test of a subject. The maximum grade in the case of re-evaluation will be five (5.0). The non-attendance of a student summoned to the test of re-evaluation, celebrated in the fixed period, will not be able to give rise to the accomplishment of another test with later date. Extraordinary assessments will be made for students who have not been able to complete some of the continuous assessment tests because of their proven accreditation. These tests must be authorized by the corresponding head of studies, at the request of the professor responsible for the subject, and will be carried out within the corresponding teaching period.

Once each exam has been completed, there is the possibility that a student may be called to conduct an oral interview as validation of their written exam, this interview being on the subject of the exam. In case of not obtaining a satisfactory grade in the interview, the exam will be considered as failed with a grade of zero.

BIBLIOGRAPHY

Basic: