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.

Generical:  
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.

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
### 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
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

Evaluation

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

GRADING SYSTEM

The mark of the subject will consist of: - Class work (NA). - Two exams (NE1 and NE2). 1. The work in class (NA) will include, among others, the resolution of problems in class. The voluntary participation in class will be valued positively. 2. The contents of the exams NE1 and NE2 will be in agreement with all the material taught from the beginning of the course. The mark of the exams will be calculated as: \( NE = \max(0.5 \times NE1 + 0.5 \times NE2, 0.3 \times NE1 + 0.7 \times NE2) \) The Final Note of the subject will be: \( \text{Final Note} = 0.35 \times NA + 0.65 \times NE \)

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: