Course guides
280639 - 280639 - Mathematical Methods for Engineering

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Compulsory subject).
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2021 ECTS Credits: 9.0 Languages: Catalan

LECTURER
Coordinating lecturer: MARIA MONTSERRAT VELA DEL OLMO
Others: Primer quadrimestre:
JOAN CARLES LARIO LOYO - GTM
MARIA MONTSERRAT VELA DEL OLMO - DT, GESTN

PRIOR SKILLS
Know the topics of Fonaments de Matemàtiques I i II.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
GTM.CE0. Ability to solve math problems that may arise in engineering. Ability to apply knowledge about: linear algebra, geometry, differential geometry to, differential and integral calculus, differential equations and partial differential, numerical methods, algorithmic numerical and statistical optimization.
GESTN.CE1. Ability to solve math problems that may arise in the field of naval engineering technology. Ability to apply knowledge of: linear algebra, geometry, differential geometry, differential and integral calculus, differential equations and partial, numerical methods, numerical algorithms, statistical and optimization.

TEACHING METHODOLOGY
- Receive, understand and summarize knowledge.
- Posing and solving problems.
- Developing arguments from a critical point of view and defending them.
- Doing work in group and individually.

LEARNING OBJECTIVES OF THE SUBJECT
- To solve the mathematical problems that arise in engineering.
- To be able to apply the knowledge on differential geometry and vectorial calculus, differential equations, integral transforms and optimization.
- To develop the capacity of abstraction while solving problems.
- To recognize the aims of the group and to plan for being able to reach them.
- To identify the responsibilities of each member and assume the corresponding commitments.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>9.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Self study</td>
<td>126.0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>40.0</td>
<td>17.78</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>50.0</td>
<td>22.22</td>
</tr>
</tbody>
</table>

Total learning time: 225 h

CONTENTS

1. Vector functions

Description:

Full-or-part-time: 25h
Theory classes: 10h
Self study: 15h

2. Curves, surfaces and solids

Description:
Parametrization. Tangent and normal vectors. Computation of lengths, areas and volumes.

Full-or-part-time: 25h
Theory classes: 10h
Self study: 15h

3. Scalar and vector fields

Description:

Full-or-part-time: 25h
Theory classes: 10h
Self study: 15h

4. Flux and circulation of vector fields

Description:

Full-or-part-time: 31h
Theory classes: 12h
Guided activities: 4h
Self study: 15h
5. Ordinary differential equations.

Description:
Numerical resolution: methods of Euler and Runge-Kutta.

Full-or-part-time: 28h 30m
Theory classes: 12h
Self study : 16h 30m

6. Integral transforms

Description:
Laplace transform: definition and properties. Application to solve linear ordinary differential equations (ODE's).
Fourier transform: definition, properties, inverse transform. Convolution.
Step and impulse ('delta'-Dirac) functions. Transfer function of a system.

Full-or-part-time: 30h
Theory classes: 12h
Self study : 18h

7. Partial differential equations

Description:

Full-or-part-time: 44h 30m
Theory classes: 18h
Guided activities: 4h
Self study : 22h 30m

8. Optimization.

Description:
Definition and basics concepts. Linear programming. Simplex method.

Full-or-part-time: 16h
Theory classes: 6h
Guided activities: 1h
Self study : 9h

GRADING SYSTEM

The final grade, Nfinal, is obtained from the results of partial exercises (exams, tests,...) and the rating of activities (exercises, assignments, ...) that will take place throughout the semester, according to the expression:

Nfinal = 0.90 * Nex + 0.10 * Nc

where: Nex = average of the ratings of the partial exercises
Nc = rating of the course activities.

Any activity or exercise not presented have a score of 0 points.
Reevaluation: If you have obtained a grade between 3 and 4.9, you can choose to reassessment will consist of a final test.
EXAMINATION RULES.

- The exams are required.
- Not passed the exams will be recovered at the end of course exam.
- The final exam will also be presented students who, having completed a partial wish to improve their grade.

BIBLIOGRAPHY

Basic:

Complementary: