280639 - Mathematical Methods for Engineering

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2020
Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010).
(Teaching unit Compulsory)
BACHELOR'S DEGREE IN MARINE TECHNOLOGIES/BACHELOR'S DEGREE IN NAVAL SYSTEMS AND
TECHNOLOGY ENGINEERING (Syllabus 2016). (Teaching unit Compulsory)
ECTS credits: 9
Teaching languages: Catalan

Degree competences to which the subject contributes

Specific:
1. 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.
2. 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>Total learning time: 225h</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40h</td>
<td>50h</td>
<td>0h</td>
<td>9h</td>
<td>126h</td>
</tr>
<tr>
<td></td>
<td>17.78%</td>
<td>22.22%</td>
<td>0.00%</td>
<td>4.00%</td>
<td>56.00%</td>
</tr>
</tbody>
</table>
## Content

### Vector geometry

**Learning time:** 25h  
- Theory classes: 10h  
- Self study: 15h

**Description:**  

### curves, surfaces and solids

**Learning time:** 25h  
- Theory classes: 10h  
- Self study: 15h

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

### Scalar and vector fields

**Learning time:** 25h  
- Theory classes: 10h  
- Self study: 15h

**Description:**  

### Flux and circulation of vector fields

**Learning time:** 25h  
- Theory classes: 10h  
- Self study: 15h

**Description:**  
### Applications of vector calculus

**Learning time:** 15h  
Theory classes: 6h  
Self study: 9h

**Description:**  

### Ordinary differential equations.

**Learning time:** 27h 30m  
Theory classes: 11h  
Self study: 16h 30m

**Description:**  

**Related activities:**  
(ENG)  
**Specific objectives:**  
(ENG)

### Integral transforms

**Learning time:** 30h  
Theory classes: 12h  
Self study: 18h

**Description:**  

### Partial differential equations

**Learning time:** 37h 30m  
Theory classes: 15h  
Self study: 22h 30m

**Description:**  
The final grade, $N_{final}$, is obtained from the results of partial exercices (exams, tests,...) and the rating of activities (exercises, assignments, ...) that will take place throughout the semester, according to the expression:

$$N_{final} = 0.90 \times Nex + 0.10 \times Nc$$

where: $Nex = \text{average of the ratings of the partial exercises}$  
$Nc = \text{rating of the course activities}$.

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.

**Qualification system**

**Learning time:** 15h  
Theory classes: 6h  
Self study: 9h

<table>
<thead>
<tr>
<th>Optimization</th>
<th>Related activities</th>
<th>Specific objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition and basics concepts. Linear programming. Simplex method.</td>
<td>(ENG)</td>
<td>(ENG)</td>
</tr>
</tbody>
</table>

**Optimization.**

**Description:**

Definition and basics concepts. Linear programming. Simplex method.

**Related activities:**

(ENG)

**Specific objectives:**

(ENG)

**Regulations for carrying out activities**

- 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.
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Bibliography

Basic:


Complementary:

