230450 - CAL1 - Calculus 1

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, differential and integral calculus, ordinary and partial differential equations, probability and statistics.
2. Ability to select numerical and optimization methods suitable for solving physical and engineering problems. Ability to apply the knowledge of numerical algorithms and optimization.

Generical:
3. ABILITY TO IDENTIFY, FORMULATE, AND SOLVE PHYSICAL ENGINEERING PROBLEMS. Planning and solving physical engineering problems with initiative, making decisions and with creativity. Developing methods of analysis and problem solving in a systematic and creative way.

Transversal:
1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
2. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

Teaching methodology

There will be two classes of sessions: the main lectures will be devoted to a careful presentation of the basic concepts and results of Calculus in one variable, developing complete proofs when possible, while the lab sessions will be devoted to the solution of a variety of exercises and problems.

Learning objectives of the subject

The main objective is that the student know the basic concepts, techniques and results from the Calculus of one variable in order to be able to apply them in other scientific contexts. Moreover, this course serves also as a basic background for future courses.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 65h 43.33%</th>
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<tbody>
<tr>
<td></td>
<td>Self study: 85h 56.67%</td>
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</table>
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## Content

<table>
<thead>
<tr>
<th>1. Numbers and functions</th>
<th><strong>Learning time:</strong> 10h 50m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 3h 20m</td>
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<tr>
<td></td>
<td>Self study: 2h 30m</td>
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**Description:**

<table>
<thead>
<tr>
<th>2. Limits and continuity</th>
<th><strong>Learning time:</strong> 10h 50m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 4h 30m</td>
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<tr>
<td></td>
<td>Guided activities: 1h 40m</td>
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<td>Self study: 1h 40m</td>
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**Description:**

<table>
<thead>
<tr>
<th>3. Derivatives and approximation of functions</th>
<th><strong>Learning time:</strong> 46h 40m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 12h</td>
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<tr>
<td></td>
<td>Practical classes: 8h</td>
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<td></td>
<td>Guided activities: 2h 30m</td>
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<td></td>
<td>Self study: 24h 10m</td>
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**Description:**
4. Integration

Learning time: 45h 50m
- Theory classes: 12h
- Practical classes: 8h
- Guided activities: 2h 30m
- Self study: 23h 20m

Description:

5. Numerical series and power series

Learning time: 35h 50m
- Theory classes: 9h
- Practical classes: 6h
- Guided activities: 2h 30m
- Self study: 18h 20m

Description:

Qualification system

There will be a final exam (EF) and a partial exam (EP). The students participation in practical sessions will also be taken into account (P). The final score will follow from

max(EF, 0.65*EF+0.30*EP+0.05*P)

Regulations for carrying out activities

The exams will consist of some theoretical questions and some exercises and problems.
Bibliography

**Basic:**


Marsden, J.; Weinstein, A. Calculus. 2nd ed. New York: Springer Verlag, 1986. ISBN 0387909745 (V.1); 0383909753 (V.2); 0387909850 (V.3).


**Others resources:**