Degree competences to which the subject contributes

Specific:
1. CE1. Ability to solve arithmetic problems related to engineering. Aptitude to apply knowledge concerning: linear algebra, geometry, differential geometry, differential and integral calculus, differential and partial equations, numerical methods, numerical algorithms, statistics and optimization.

Teaching methodology

The theoretical foundations of the subject will be taught to the large groups, if necessary with the help of media, such as transparencies, video or computer-assisted simulations.
At the beginning of each content will be given a list of representative problems, the numerical solution if necessary, to serve as motivation for students to realize them.
Also will be proposed problems that require the use of a computer medium.

Learning objectives of the subject

The general objectives to get from the students at the end of the course are:
- Understand and apply, if necessary using specific software, the basic techniques of differential calculus of several variables and integral calculus of several variables.
- Understand and apply, if necessary using specific software, integration of scalar and vector fields on curved surfaces, as well as the integral theorems of Gauss and Stokes.
# 340026 - CAAV-F2O43 - Advanced Calculus

## Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 52h 30m</th>
<th>35.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<tr>
<td></td>
<td>Hours small group: 7h 30m</td>
<td>5.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
### Content

<table>
<thead>
<tr>
<th>(ENG) 1- Differential multivariable calculus</th>
<th>Learning time: 36h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study : 21h</td>
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</tbody>
</table>

**Description:**
1.1 Conics and quadrics  
1.2 Scalar functions of two variables  
1.3 Partial derivatives and directional derivatives. Tangent plane and normal vector

<table>
<thead>
<tr>
<th>(ENG) 2- Aplications of multivariable calculus</th>
<th>Learning time: 36h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study : 21h</td>
</tr>
</tbody>
</table>

**Description:**
2.1 Double Integral. Change to polar coordinate  
2.2 Triple Integral. Changes in cylindrical and spherical coordinates

<table>
<thead>
<tr>
<th>(ENG) 3- Integral multivariable calculus</th>
<th>Learning time: 42h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 11h</td>
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<td></td>
<td>Practical classes: 6h</td>
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<tr>
<td></td>
<td>Self study : 25h</td>
</tr>
</tbody>
</table>

**Description:**
3.1 Vector functions of several variables. differential operators  
3.2 Curves and Surfaces. Parameterization  
3.3 Line integral  
3.4 Surface integral

<table>
<thead>
<tr>
<th>(ENG) 4- Aplications of integral multivariable calculus</th>
<th>Learning time: 30h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
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<tr>
<td></td>
<td>Practical classes: 6h</td>
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<tr>
<td></td>
<td>Self study : 17h</td>
</tr>
</tbody>
</table>

**Description:**
4.1 Stokes Theorem  
4.2 Conservative Fields  
4.3 Divergence Theorem
### Planning of activities

| (ENG) 1- PROBLEMS AND EXERCISES BY SPECIFIC SOFTWARE | Hours: 16h  
Laboratory classes: 4h  
Self study: 12h |
|------------------------------------------------------|--------------------------------------------------|
| (ENG) 2- EXAM OF CONTENTS 1 AND 2 | Hours: 2h  
Guided activities: 2h |
| (ENG) 3- EXAM OF CONTENTS 3 AND 4 | Hours: 2h  
Guided activities: 2h |
| (ENG) 4- EXAM OF CONTENTS 1, 2, 3 AND 4 | Hours: 3h  
Guided activities: 3h |

### Qualification system

The course evaluation will be: or the activities 1, 2 and 3 or 1 and 4 activities.
In the first case, each activity has the following weights in the final:
- Activity 1. Problems and exercises using specific software: 20%
- Activity 2. Exam of Contents 1 and 2: 35%
- Activity 3. Exam of Contents 3 and 4: 45%

And in the second case:
- Activity 1. Problems and exercises using specific software: 20%
- Activity 4. Exams of Contents 1, 2, 3 and 4: 80%

Activitat 4 is the only re-gradable activity.

### Regulations for carrying out activities

In no case is not allowed copying, breach of this rule in any of the activities involve a 0 in the note or in the corresponding final note.
Conditions and days of carrying out activities in each event will be announced in time.
The second activity will be reserved in the first week testing period of the course, which goes to the 2012-13 Academic Calendar EPSEVG.
Activity 3 and 4 will be held simultaneously in the final evaluation period has the Academic Calendar for 2012-13 EPSEVG.
At the time of the activities the student will have the statements of the two exams and decide what to do.
Bibliography

Basic:


Others resources:

Hyperlink

"3D CALC PLOTTER" de Paul Seeburger de Brighton Campus

Aplicació interactiva que permet visualitzar:
- funcions escalars de dues variables, les seves derivades parcials i direccional i les corresponents rectes tangents, les corbes de nivell i el vector gradient,
- corbes i superfícies parametritzades.

"CALCULUS APPLETS AT SLU" del Dept. of Mathematics and Computer Science of Saint Louis University
http://www.slu.edu/classes/maymk/MathApplets-SLU.html#Understanding_surfaces_and_graphs_of

Col.lecció d'aplicacions interactives per al Càlcul de diverses variables, de les quals destaquem:
- visualització de funcions escalars de dues variables, corbes de nivell i seccions,
- visualització de corbes i superfícies,
- visualització i càlcul d'integrals de línia,
- visualització i càlcul d'integrals de superﬁcie.