The initial idea is to learn how to solve fluid mechanics problems which due to its complex mathematical resolution cannot be solved in a first stage fluid mechanics subject. The information gathered will also be applicable to similar problems in different subjects.

As in many universities a very important part of a second level of fluid mechanics is related to gasdynamics, this is exactly what would be lectured next in the present subject. Many applications of gas-dynamics are to be found in industry and aeronautics.

The last part of this small subject will introduce some applications of computer fluid dynamics, related to the previous sub chapters. It is very important for the students to realize that some problems can just be solved via using some specific techniques.
# 220132 - Fluid Mechanics II

## Content

<table>
<thead>
<tr>
<th>Module 1: Numerical integration of differential equations obtained in fluid mechanics problems</th>
<th>Learning time: 25h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td></td>
<td>Self study: 15h</td>
</tr>
</tbody>
</table>

**Description:**

1. The students will need to solve real fluid mechanics problems via finding out the differential equations related and solving them using software's like Maple or Matlab.

**Related activities:**

Via working in teams the students will solve real problems which will need the use of medium level mathematics and software's available. Each group will need to solve 2 or three real problems. The use of software and basic programming will be needed.

<table>
<thead>
<tr>
<th>Module 2: Gasdynamics</th>
<th>Learning time: 35h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 15h</td>
</tr>
<tr>
<td></td>
<td>Self study: 20h</td>
</tr>
</tbody>
</table>

**Description:**

2. The bases of gas-dynamics will be established and will be linked with the design of valves, pipes, aeroplanes, rockets etc. Normal and oblique shock waves will be part of the information to be gathered.

**Related activities:**

Via working in teams the students will solve real problems which will need the use of medium level mathematics and software's available. Each group will need to solve 2 or three real problems. The use of software and basic programming will be needed.

<table>
<thead>
<tr>
<th>Module 3: Introduction to computer fluid dynamics</th>
<th>Learning time: 15h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Self study: 10h</td>
</tr>
</tbody>
</table>

**Description:**

3. As it will be clearly stated in the previous two sections. There are many problems in fluid mechanics in which the differential equations governing the physics related are too complex to be solved using medium level mathematics; it is therefore needed to use a different approach. So far, and mostly due to the shortage of time some examples of integrating the Reynolds equation of lubrication will be covered.

**Related activities:**

Via working in teams the students will solve one real problem. The use of basic programming will be needed.

## Regulations for carrying out activities

Students, in teams, will need to complete some assessments and present them in class. The qualification will be linked to the quality of the work performed.
220132 - Fluid Mechanics II

Bibliography

Basic:


Complementary:

