240EQ031 - Risk and Safety

Degree competences to which the subject contributes

With this course, the student would be able to:
- Identify the different risks associated to industrial plants and activities
- Assess the effects and consequences of the major accidents which can occur in an industrial facility or in the transportation of hazardous materials.

Teaching methodology

Blackboard and the usual audiovisual resources.
Exercises solved by the students, individually or in a team.
Analysis of real cases.
240EQ031 - Risk and Safety

- Analyse and quantify the risk.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>36h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time: 150h</td>
<td>Hours medium group:</td>
<td>0h</td>
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<td></td>
<td>Hours small group:</td>
<td>18h</td>
<td>12.00%</td>
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<td></td>
<td>Guided activities:</td>
<td>0h</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>96h</td>
<td>64.00%</td>
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1. Introduction

Description:
1. Introductory concepts
   - Hazardous materials: types, classification, etc.
   - Definition of risk. Types
   - Individual and collective risk
   - FAR
   - Tolerability of risk
   - Types of accidents: fires, explosions, toxic releases
   - Domino effect
   - Risk analysis
     - Historical analysis.
2. Substances dangers
   - Methodologies for danger identification
   - Classification of substances
   - Labelling and risk phrases
3. Methodologies for risks identification and frequencies determination
   - Hazop
   - Event trees
   - Fault trees.
4. Source term
   - Types of releases
   - Estimation of flowrates.

Specific objectives:
Learning the essential concepts on risk and major accidents, as well as the methodologies for risk identification and frequencies determination.
### II. Modelling of major accidents

**Description:**
6. Fires  
   - Flammability  
   - Types of fires  
   - Modelling  
   - Study of the cases  

7. Explosions  
   - Types  
   - Overpressure wave  
   - Explosions of a gas cloud. Calculation of the overpressure  
   - BLEVE explosions  
   - Smoke explosions  
   - Study of the cases  

8. Spread of toxic substances  
   - Atmospheric variables  
   - Models of dispersion  
   - Study of the cases  

9. Runaway reactions  

10. Vulnerability  
    - Vulnerability of people  
    - Vulnerability of devices

**Learning time:** 75h 12m  
- Theory classes: 16h  
- Practical classes: 11h 12m  
- Self study: 48h

### III. Methodologies for the risk analysis

**Description:**
10. Environmental risk  
    - Different aspects  
    - Calculation method  

11. Quantitative analysis of the risk  
    - Estimation of the individual risk  
    - Risk maps  

12. Security reports

**Learning time:** 29h 48m  
- Theory classes: 6h 30m  
- Practical classes: 4h 18m  
- Self study: 19h
# Planning of activities

## 1. RESOLUTION OF EXERCISES

**Description:**
Resolution of exercises in class

**Support materials:**
Problem statement, data

**Descriptions of the assignments due and their relation to the assessment:**
No

**Specific objectives:**
Application of the theory concepts

## 2. ANALYSIS OF REAL CASES

**Description:**
Analysis of cases

**Support materials:**
Information about the accident

**Descriptions of the assignments due and their relation to the assessment:**
In some cases

**Specific objectives:**
Apply the calculations and theory in a real case

## 3. TESTS

**Description:**
Carry out our exercises in class

**Support materials:**
Bibliographic material

**Descriptions of the assignments due and their relation to the assessment:**
Yes

**Specific objectives:**
Evaluation

## 4. EXAMS

**Description:**
A partial and a final exam

**Support materials:**
Bibliographic material

**Descriptions of the assignments due and their relation to the assessment:**
Yes
**Specific objectives:**

Evaluation

**Qualification system**

Partial exam (25 %)
Final exam (60 %)
Continuous evaluation (15 %)
Reevaluation: examination of the whole subject

**Regulations for carrying out activities**

Some exams will be performed using documentation, some without it (students will be previously informed about this aspect).

**Bibliography**

**Basic:**


**Others resources:**

Power points and additional material given by the professors.