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.
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- Analyse and quantify the risk.

<table>
<thead>
<tr>
<th>Study load</th>
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<td><strong>Total learning time:</strong> 150h</td>
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| Hours large group: 54h | 36.00%  
| Hours medium group: 0h | 0.00%  
| Hours small group: 0h | 0.00%  
| Guided activities: 0h | 0.00%  
| Self study: 96h | 64.00%  

**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.

**Learning time:** 44h 12m
- Theory classes: 10h
- Practical classes: 6h 12m
- Self study: 28h
### 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 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
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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.