

66215 - Safety and Risk Analysis in the Chemical Industry

Syllabus Information

Academic year: 2024/25

Subject: 66215 - Safety and Risk Analysis in the Chemical Industry

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 531 - Master's in Chemical Engineering

ECTS: 6.0

Year: 1

Semester: Second semester

Subject type: Compulsory

Module:

1. General information

Industrial facilities are legally required to prepare a risk analysis to demonstrate that they meet the requirements and that the individual risk to a third party is less than 1×10^{-6} casualties/year as a result of a major accident. To do so, it is necessary to know the usual hazard identification techniques, quantify the probability or frequency of occurrence of a certain event and carry out a consequence and vulnerability analysis to quantify the intensity of the damage produced in the event of a serious accident. The product of both factors (frequency of occurrence and magnitude of damage) is the risk.

2. Learning results

The student, in order to pass this subject, must demonstrate the following results...

- To know how to identify hazards and quantify the risks associated with the materials, operating conditions and units where they are processed.
- To develop individual and social risk assessment reports, as well as reports on the safety conditions of an industrial facility.
- To know the regulations applicable to installations where serious accidents may occur.
- To apply recognized and accepted methodologies for the identification and quantification of major accident hazards.
- To design strategies to minimize the risk associated with an industrial facility, linking them to their economic cost.

3. Syllabus

- 0 Introduction to industrial safety and risk analysis.

BLOCK A.- HAZARD ANALYSIS AND IDENTIFICATION

- A.1 Comparative hazard identification methods
- A.2 Risk indexes. Dow indexes
- A.3 Comparative hazard identification methods Internal analysis
- A.4 Quantitative methods of hazard analysis. Fault and event tree analysis
- A.5 Reliability engineering

BLOCK B.- CONSEQUENCE ANALYSIS

- B.1 Liquid and vapor containment losses
- B.2 Explosions of gases and vapours
- B.3 Dust explosions
- B.4 Fires
- B.5 BLEVE explosions
- B.6 Toxic clouds
- B.7 Vulnerability analysis
- B.8 Chemical reactivity

BLOCK C.- REGULATIONS AND LEGISLATION

- C.1 Emergency planning
- C.2 Spanish and European regulations and legislation

4. Academic activities

This subject is English Language Friendly (ELF) in at least one group. The study and class material is available in English and the teachers will attend office hours and prepare and evaluate students in English if they don't speak Spanish.

Compulsory subject of 6 ECTS (150 hours of student work). Proposed activities:

- Master classes (30 h)
- Problem solving and case studies (30 h).
- Tutored works (24 hours) individually or in groups (1 or 2 activities)

- Individual study (50 hours).
- Personalized tutoring teacher-student (10 h).
- Assessment (6 h).

The detailed schedule of the beginning of the activities, as well as the teaching place each of them is the responsibility of the School of Engineering and Architecture (EINA), and can be consulted in due time and form at the web address (<http://eina.unizar.es>).

5. Assessment system

Option 1:

This is the most recommended option for the progressive acquisition of the contents, skills and competencies of the subject. Assessment is global and includes:

- Solving the problems and cases proposed in class (CPP)
- Tutored works (TTE) 1-2 exercises (case studies).
- Complementarily, individual qualitative formative evaluation (without grade to be included in the overall grade) on the transversal competence of teamwork.
- Open-book exam (EXA) (practical exercises). If non-communication between students is required, a personal computer may be used.

$$\text{Grade} = 0.1 \times \text{CPP} + 0.2 \times \text{TTE} + 0.7 \times \text{EXA}$$

A minimum grade of 4 out of 10 in the exam (EXA) will be required to pass the subject.

- CPP and TTE will only be assessable during the teaching period of the subject.

Option 2:

The grade for the subject will be equal to the grade of the exam, which must be greater than or equal to 5.0 to pass the subject.

Options 1 and 2 are mutually exclusive. This option is available in both calls. Grades valid during the academic year.

6. Sustainable Development Goals

- 3 - Good Health & Well-Being
- 8 - Decent Work and Economic Growth
- 12 - Responsible Production and Consumption