

Course guide

330803 - GIHSEQ - Integrated Hseq Systems

Last modified: 21/05/2026

Unit in charge: Manresa School of Engineering
Teaching unit: 732 - OE - Department of Management.

Degree: MASTER'S DEGREE IN INDUSTRIAL FACILITY DESIGN AND MANAGEMENT (Syllabus 2026). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 5.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Lujan Blanco, Itziar

Others:

TEACHING METHODOLOGY

In the classroom, the methodology combines presentations by teachers (with or without multimedia support) with practical exercises by students (with or without computer support).

This subject allows the use of generative artificial intelligence (GAI) for different purposes, from auxiliary support to co-creation to explore alternatives or contrast solutions. The level of assistance allowed may vary depending on the task and will be communicated in the instructions for each activity. The student always keeps intellectual direction and final technical responsibility, having to validate the veracity, rigor and absence of bias. In case of using GAI tools, a note must be included specifying which tool and version has been used, and for what purpose:

Declaration of use of GAI tools

Tool used:

Tasks performed:

Human validation:

LEARNING OBJECTIVES OF THE SUBJECT

The objective of the QSHE subject is to provide a comprehensive vision of quality, safety and environmental management applied to the industrial sector and Facility Management. It is based on international standards, risk assessment methodologies and the practical application of Lean Six Sigma for continuous improvement.

At the end of the course, the student is expected to have achieved the following knowledge and worked on the following skills:

Knowledge

M2. K1: Identify the main causes, consequences and proposed solutions to sustainability and industrial safety problems in the context of industrial facilities, as well as the relevant regulations and legislation.

M2. K2: Describe continuous improvement processes.

M2. K3: Identify the main environmental and safety risks and impacts relevant to the most common industrial facilities.

M2. RAT_UPC_1.1: Define the approaches that promote sustainable development (e.g. circular economy) and their impact on the design of industrial facilities.

Skills

M2. S1: Determine the requirements of an industrial facility according to the needs of environmental control, waste generation, quality, safety.

M2. S2: Evaluate the state of the different environmental vectors (air, water, ...), as well as the direct and indirect consequences of these on the health and safety of people.

M2. RAT_UPC_1.2: Evaluate the environmental and social impact of a facility through an exhaustive life cycle analysis, as well as its economic viability.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	100.00

Total learning time: 45 h



CONTENTS

Block 1. Introduction to Facility Management and the QSHE System

Description:

This module addresses Facility Management (FM) from a strategic, conceptual and regulatory perspective, analyzing its scope, regulatory references, terms and definitions, as well as the scope and key concepts that define it according to international standards.

The background of Facility Management and its evolution as a business process support function are studied, analyzing the main activities, the allocation of support processes and their contribution to value creation. The module delves into the facilities management model, its functional and organizational scope, and its integration with Quality, Safety, Occupational Health and Environment (QSHE) management systems.

Based on the conceptual framework of ISO/TR 41013:2017 and ISO 41014:2020, the purpose and benefits of Facility Management are explored, analyzing its impact on productivity, people, risk mitigation, sustainability, corporate identity and the balance between cost and quality. The module enables students to understand, critically analyze and apply these principles in complex and highly regulated professional environments.

- 1.1.- Facility Management: Role and responsibilities FACILITY MANAGEMENT: Role and Responsibilities
- 1.2.- Quality, Safety and Environment in Facility Management
- 1.3.- ISO 41014:2020(en); ISO/TR 41013:2017(en) Facility management — Scope, key concepts and benefits

Specific objectives:

1. Identify and delimit the scope of application of Facility Management according to the international regulatory framework.
2. Interpret the regulatory references, terms and key definitions of Facility Management.
3. Analyze the background and evolution of Facility Management as a business process support function.
4. Relate Facility Management to the business process, main activities and the assignment of support processes.
5. Critically analyze the strategic role of Facility Management as a generator of value within the organization.
6. Evaluate the responsibilities of the facility manager in complex and multidisciplinary environments.
7. Analyze the facility management model and its functional, technical and organizational scope.
8. Integrate Facility Management within corporate governance, business continuity and risk management.
9. Develop advanced criteria for strategic decision-making in the management of assets, services and infrastructures.
10. Evaluate integrated Quality, Safety, Occupational Health and Environment (QSHE) systems applied to FM.
11. Analyze the impact of Facility Management on organizational productivity.
12. Evaluate the impact of FM on people, occupational health and safety.
13. Analyze the role of Facility Management in mitigating operational, legal and environmental risks.
14. Integrate sustainability criteria in the management of facilities and services.
15. Evaluate the contribution of Facility Management to corporate identity and reputation.
16. Analyze the balance between cost and quality in facilities management.
17. Evaluate the benefits of Facility Management according to ISO regulations.
18. Interpret the governance and leadership model established in ISO 41014:2020.
19. Apply the normative criteria for evaluating the performance and maturity of FM.
20. Develop a critical view on the actual implementation and limitations of ISO standards in professional environments.

Related activities:

- Guided reading and critical analysis of the structure of ISO/TR 41013:2017: scope, regulatory references, terms and definitions.
- Facility Management conceptual map: representation of the facilities management model, its scope and relationship with the business process.
- Advanced case study: analysis of FM in a complex organization, identifying main activities, support processes and benefits generated.
- Guided debate: Facility Management as a support function vs. strategic function.
- Critical report: assessment of the impact of Facility Management on productivity, people and risk mitigation in a real company.
- QSHE risk analysis: identification and assessment of risks related to facilities, services and processes.
- Design of an integrated QSHE system aligned with Facility Management objectives.
- Sustainability analysis: proposal of FM actions aimed at environmental and social sustainability.
- Regulatory benchmarking: comparison of the scope and maturity level of an organization's FM with respect to ISO criteria.
- Applied project: design of a Facility Management model that integrates purpose, benefits, cost and quality according to ISO 41014.
- Written assessment tests.

Full-or-part-time: 25h

Theory classes: 9h

Self study : 16h

Block 2: Safety and Environmental Management: Risk Assessments of Industrial Facilities

Description:

This module focuses on safety and environmental management through the assessment of risks associated with industrial facilities, addressing both environmental and industrial safety risks. It provides an integrated and systematic view of general and specific risk assessments, applying structured methodologies aligned with current regulations.

The content of the module includes a detailed analysis of the main environmental risk vectors - air pollution, water pollution and solid waste management - as well as industrial safety risks, especially those related to fire protection, electrical risk, hazardous materials management and indoor air quality.

Through practical approaches and real cases, students will acquire the necessary skills to identify, assess, control and mitigate risks, design preventive measures and ensure legal and regulatory compliance, thus contributing to safer, sustainable and resilient industrial facilities.

2.1.- General Assessment and Specific Assessments

2.2.- Environmental Risk Assessments

2.2.1.- Air Pollution Control

2.2.2.- Water Pollution

2.2.3.- Solid Waste

2.3.- Industrial Safety Risk Assessments

2.3.1. Fire Safety

2.3.2. Electrical Risk

2.3.3. Hazardous Materials

2.3.4. Air Quality

2.4.- Practical Cases

Specific objectives:

1. Understand and apply a general methodology for risk assessment in industrial facilities.
2. Distinguish between general and specific risk assessments, and apply them appropriately according to the context.
3. Evaluate environmental risks associated with industrial activities.
4. Analyze and manage risks derived from air pollution, including emission inventories and new detection standards.
5. Assess the environmental impact of the use of refrigerants, ozone-depleting substances and volatile organic compounds.
6. Identify and evaluate risks related to water pollution, including discharges, stormwater and watercourse protection.
7. Evaluate the management of solid waste, both hazardous and non-hazardous, in accordance with the requirements of the generator, transporter and manager.
8. Integrate criteria for prevention, minimization, recycling and recovery of waste.
9. Evaluate industrial safety risks, with special attention to fire safety.
10. Analyze fire protection, evacuation, alarm, smoke control and emergency power supply systems.
11. Identify and manage electrical risks in industrial facilities.
12. Evaluate the safe management of hazardous materials, including gases, flammable liquids and emergency equipment.
13. Analyze indoor air quality, pollution sources and mitigation measures.
14. Integrate the results of risk assessments in operational and strategic decision-making.
15. Apply the knowledge acquired to the resolution of real practical cases in industrial environments.

Related activities:

- Guided introduction to the general methodology of risk assessment, with examples applied to industrial facilities.
- Practical analysis of environmental assessments, differentiating between air pollution, water pollution and waste management.
- Preparation of an inventory of atmospheric emissions for a simulated industrial facility.
- Case study on the management of wastewater and rainwater discharges.
- Case study of hazardous waste management, including legal requirements and minimization proposals.
- Technical analysis of fire safety systems in a building or industrial facility.
- Applied exercise in electrical risk assessment, identifying preventive and corrective measures.
- Simulation of hazardous materials management and emergency response (showers and eye wash).
- Assessment of indoor air quality and definition of control and mitigation measures.
- Integrated resolution of practical cases, where environmental and industrial safety risks are simultaneously assessed.
- Technical debate on the importance of preventive management in industrial facilities.
- Written assessment tests and/or technical risk assessment reports.

Full-or-part-time: 50h

Theory classes: 18h

Self study : 32h

Block 3: Total Quality and Lean Six Sigma

Description:

This training block delves into advanced quality management models, focusing on Total Quality Management (TQM) and the Lean Six Sigma methodology as complementary approaches aimed at operational excellence, customer satisfaction and continuous improvement.

The principles, history and benefits of Lean Six Sigma are analyzed, as well as the requirements necessary for its effective implementation in different types of organizations. The block develops in detail the DMAIC and DMADV methodologies, as fundamental tools for improving existing processes and designing new robust and efficient processes.

Likewise, key roles and professional certifications (Yellow, Green and Black Belt) are studied, and examples and practical applications in real environments are worked on. The block is completed with the introduction of the concept of Kaizen as a pillar of the culture of continuous and participatory improvement within organizations.

3.1 TQM and Six Sigma

3.2 Lean Six Sigma: Principles, Benefits and History

3.3 Implementation Requirements

3.4 DMAIC and DMADV Methodologies

3.5 Roles and Certifications (Yellow, Green and Black Belt)

3.6 Examples and Practical Applications

3.7 Kaizen and Continuous Improvement

Specific objectives:

1. Understand the foundations of Total Quality (TQM) and its evolution towards advanced quality management models.
2. Analyze the key principles of Six Sigma and their integration with the Lean approach.
3. Identify the organizational, operational and economic benefits of Lean Six Sigma.
4. Explain the history and evolution of Lean Six Sigma and its main applications per industries.
5. Determine the organizational, cultural and technical requirements for the implementation of Lean Six Sigma.
6. Apply the DMAIC methodology for the improvement of existing processes.
7. Apply the DMADV methodology for the design of new quality-oriented processes.
8. Analyze the roles and responsibilities within a Lean Six Sigma project.
9. Differentiate the Yellow, Green and Black Belt certification levels and their functions.
10. Interpret key performance and quality indicators associated with Six Sigma projects.
11. Analyze practical cases and real experiences of implementing Lean Six Sigma.
12. Integrate the concept of Kaizen as a tool for continuous and participatory improvement.
13. Develop a mindset oriented towards continuous improvement and waste reduction.
14. Evaluate the role of Lean Six Sigma in data-based decision-making.
15. Apply the knowledge acquired to solving quality and efficiency problems in professional environments.

Related activities:

- Participatory master class on TQM, Six Sigma and Lean Six Sigma, with analysis of their fundamental principles.
- Comparative analysis between TQM, Lean, Six Sigma and Lean Six Sigma.
- Real case study of companies that have successfully implemented Lean Six Sigma.
- Practical DMAIC exercise: problem definition, data analysis and improvement proposal.
- DMADV project simulation for the design of a new quality-oriented process.
- Guided debate on the requirements and common difficulties in the implementation of Lean Six Sigma.
- Work on roles and certifications: analysis of functions and responsibilities in a Six Sigma team.
- Practical Kaizen workshops, focused on detecting incremental improvements in daily processes.
- Resolution of quality problems using Lean Six Sigma tools (cause-effect diagram, process maps, etc.).
- Preparation of a brief report on the application of Lean Six Sigma to a real or simulated organization.
- Written evaluation test on concepts, methodologies and practical cases.

Full-or-part-time: 50h

Theory classes: 18h

Self study : 32h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the [Action Framework for Academic Integrity in Assessment at the UPC](#).

Grading of this subject is based on:

- Continuous assessment, through applied activities and individual and group work.
- Transversal integration of the contents, especially in the final project of the module.
- Assessment of critical thinking, analytical skills, decision-making and professional application of knowledge.
- Balanced weight between conceptual knowledge, technical skills and professional competences.

Overall structure of the assessment

Evaluation element Weight

Continuous assessment activities and exercises 60%

Written assessment tests (individual) 40%

Total 100%

No minimum grade is required in any test. Failure to submit a practical activity on the set date implies a grade of zero points and loss of the associated transversal competence grade. The teaching staff will notify in good time so that everyone knows when a practice must be submitted and can act accordingly.

EXAMINATION RULES.

Written exams are taken individually and without notes. The only electronic support allowed are calculators. Mobile phones cannot be used, they must be turned off and put away. The exams include theoretical questions and the completion of numerical exercises. The different practices are done in groups, as stated in the statement of each one. They must be submitted written on a computer. Care must be taken with spelling, syntax and presentation in general, numbering the pages and, when appropriate, including an index and indicating the bibliography consulted (books, articles or websites), following a standardized system.

The timing of the teaching-learning activities of the semester will be provided to students on the first day of the course, as well as this subject guide.

BIBLIOGRAPHY

Basic:

- Rondeau, Edmond P; Brown, Robert Kevin; Lapidés, Paul D. Facility management [on line]. 2nd ed. Hoboken, N.J.: John Wiley & Sons, Inc, c2006 [Consultation: 29/05/2026]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upccatalunya-ebooks/detail.action?pq-origsite=primo&docID=699985>. ISBN 9781119461128.
- Pardy, Wayne; Andrews, Terri. Integrated management systems : leading strategies and solutions [on line]. Second edition. Lanham, Maryland: Bernan Press, ©2020 [Consultation: 29/05/2026]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upccatalunya-ebooks/detail.action?pq-origsite=primo&docID=5964533>. ISBN 9781641433723.
- Baquero Serrano, Carmen. Manual básico de prevención de riesgos laborales. 9ª edición. Madrid: Centro de Estudios Financieros, 2024. ISBN 9788445447512.
- Pyzdek, T. ; Keller, P. A. The Six Sigma handbook [on line]. 5th edition. New York, N.Y.: McGrawHill Education, 2019 [Consultation: 29/05/2026]. Available on: <https://www-accessengineeringlibrary-com.recursos.biblioteca.upc.edu/content/book/9781260121827?implicit-login=true>. ISBN 1-260-12183-6.

Complementary:

- Pichtel, John. Waste management practices: municipal, hazardous, and industrial [on line]. Boca Raton, FL: CRC Press, 2014 [Consultation: 29/05/2026]. Available on : <https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/b16576/waste-management-practices-john-pichtel>. ISBN 1000762645.
- Zhang, Y.. Indoor air quality engineering [on line]. Boca Raton, Florida: CRC Press, 2005 [Consultation: 11/06/2026]. Available on: <https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/b12485/indoor-air-quality-engineering-yuanhui-zhang>. ISBN 9786610243877.
- Porras Criado, A. ; Guerrero Fernández, A. Riesgo eléctrico. Madrid: Fundación Confemetal, 2006. ISBN 8496300196.
- González Maestre, Diego. Seguridad en máquinas. Madrid: Fundación Confemetal, 2008. ISBN 8496743772.
- Moreno Ramírez, Antonio; Hidalgo Morillo-Velarde, Carmen. Calidad y seguridad en el laboratorio. Madrid: Editorial Síntesis, 2024. ISBN 9788413573731.

RESOURCES

Audiovisual material:

- Nom recurs. Resource

Other resources:

PowerPoint slides to support each lesson from the textbook or prepared by the teacher. Printed material: Texts provided by the course teachers.