



Course guide

330100 - GM - Maintenance Management

Last modified: 04/05/2023

Unit in charge: Manresa School of Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MINING ENGINEERING (Syllabus 2016). (Optional subject).
BACHELOR'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Optional subject).
BACHELOR'S DEGREE IN MINERAL RESOURCE ENGINEERING AND MINERAL RECYCLING (Syllabus 2021). (Optional subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: ESTEBAN PEÑA PITARCH

Others: JOSE ORTUÑO MARTIN - FERRAN MARTINEZ CANO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Knowledge and skills for maintenance management.
2. Increase their opinions and those of third parties in a logical and coherent way in multilingual contexts. Use technical-scientific terminology related to maintenance management in different languages, especially English.
3. Write technical reports and projects related to the maintenance of products, industrial machines and facilities.

Transversal:

4. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
5. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

TEACHING METHODOLOGY

- Expository class of theory and problems: in this class it is not intended to make an exhaustive demonstration of the subject, but rather the student will be given a global vision of it insisting on the key concepts for a better understanding, doubts will be discussed and resolved standard problems and questions that guarantee understanding of the subject. Problem solving in face-to-face class aims for the student to learn to analyze them and identify the key elements for their approach and resolution. For each face-to-face session, the student will be provided, with sufficient anticipation in the virtual classroom, the notes on the subject dealt with in the session, and a series of problems. The reading of the theoretical content before the face-to-face session is mandatory and will be controlled by formulating questions during the class.
- Carrying out laboratory practices in small groups. Preparation of reports.
- Resolution and delivery of problems proposed individually.
- Tutoring, study and personal and team work.
- Exams and evaluation tests.



LEARNING OBJECTIVES OF THE SUBJECT

Upon completion of this course, the student must be able to:

- Acquire basic theoretical knowledge about maintenance management.
- Apply the main tools and methodology that facilitate, in each of the phases of industrial maintenance, the fulfillment of objectives in order to achieve the satisfaction of customer needs.
- Model maintenance systems.
- Plan, manage and analyze maintenance management.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Hours small group	30,0	20.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Content Title 1: Introduction to Maintenance Management

Description:

The maintenance function, maintenance action areas and their organization. Types and levels of maintenance. Advantages, disadvantages and applications of each type of maintenance.

Related activities:

A1.

Full-or-part-time: 10h

Theory classes: 3h

Laboratory classes: 1h

Self study : 6h

Content Title 2: Team Management

Description:

Equipment classification, machine dossier, machine historical file, type of spare parts and other materials.

Related activities:

A2.

Full-or-part-time: 10h

Theory classes: 3h

Laboratory classes: 1h

Self study : 6h



Content Title 3: Human Resources Management

Description:

Maintenance Organization Chart. Functions. Cash. Staff training. Work climate: TPM. Maintenance Outsourcing. Safety at work.

Related activities:

A3.

Full-or-part-time: 10h

Theory classes: 3h

Laboratory classes: 1h

Self study : 6h

Content Title 4: Job Management

Description:

Establishment of a maintenance plan. Failure Modes and Effects Analysis (FMEA). Maintenance planning and scheduling. Planning and scheduling of works. Execution of works.

Related activities:

A4.

Full-or-part-time: 10h

Theory classes: 3h

Laboratory classes: 1h

Self study : 6h

Content Title 5: Corrective Maintenance

Description:

Bankruptcy analysis in mechanical components. Analysis of breakdowns in process machines. Mechanisms and forms of wear. Surface treatment techniques. Analysis for system breakdowns. Tools for breakdown analysis.

Related activities:

A5.

Full-or-part-time: 40h

Theory classes: 12h

Laboratory classes: 4h

Self study : 24h

Content Title 6: Preventive Maintenance

Description:

Definition and basic principles. Parameters for state control. Establishment of a preventive maintenance system. Preventive maintenance techniques.

Related activities:

A6.

Full-or-part-time: 40h

Theory classes: 12h

Laboratory classes: 4h

Self study : 24h



Content Title 7: Predictive Maintenance

Description:

Definition and basic principles. Parameters for state control. Establishment of a predictive maintenance system. Predictive maintenance techniques.

Related activities:

The implementation of a preventive maintenance system will be designed.

Full-or-part-time: 30h

Theory classes: 9h

Laboratory classes: 3h

Self study : 18h

ACTIVITIES

TITLE OF ACTIVITY 1: STUDY OF A MACHINE

Description:

The project of a maintenance system will be analyzed.

Specific objectives:

Once the activity is finished, the student must know how to interpret the maintenance and its management of an already implemented management system.

Material:

Practice guide (available on the digital Campus) and teacher's notes.

Delivery:

Students must prepare a report of the practice carried out, according to the instructions indicated and deliver to the teacher in the set time.

The evaluation of this activity together with the other activities will form part of the evaluation as specified in the corresponding section of the qualification system.

Full-or-part-time: 4h

Laboratory classes: 1h

Self study: 3h



TITLE OF ACTIVITY 2: TEAM MANAGEMENT

Description:

A model for the classification of equipment, machine dossier, machine historical file, type of spare parts and other materials will be created.

Specific objectives:

Once the activity is finished, the student must be able to manage the maintenance teams.

Material:

Practice guide (available on the digital Campus) and teacher's notes.

Delivery:

Students must prepare a report of the practice carried out, according to the instructions indicated and deliver to the teacher in the set time.

The evaluation of this activity together with the other activities will form part of the evaluation as specified in the corresponding section of the qualification system.

Full-or-part-time: 4h

Laboratory classes: 1h

Self study: 3h

TITLE OF ACTIVITY 3: MANAGEMENT OF HUMAN RESOURCES

Description:

Creation and interpretation of a maintenance organization chart.

Specific objectives:

Once the activity is finished, the student must be able to interpret any maintenance flowchart.

Material:

Practice guide (available on the digital Campus) and teacher's notes.

Delivery:

Students must prepare a report of the practice carried out, according to the instructions indicated and deliver to the teacher in the set time.

The evaluation of this activity together with the other activities will form part of the evaluation as specified in the corresponding section of the qualification system.

Full-or-part-time: 4h

Laboratory classes: 1h

Self study: 3h



TITLE OF ACTIVITY 4: JOB MANAGEMENT

Description:

Study of an AMFE model.

Specific objectives:

Once the activity is finished, the student must be able to size axes.

Material:

Practice guide (available on the digital Campus) and teacher's notes.

Delivery:

Students must prepare a report of the practice carried out, according to the instructions indicated and deliver to the teacher in the set time.

The evaluation of this activity together with the other activities will form part of the evaluation as specified in the corresponding section of the qualification system.

Full-or-part-time: 10h

Laboratory classes: 1h

Self study: 9h

TITLE OF ACTIVITY 5: CORRECTIVE MAINTENANCE

Description:

Study of a corrective maintenance model.

Specific objectives:

Once the activity is finished, the student must be able to study and create a corrective maintenance.

Material:

Practice guide (available on the digital Campus) and teacher's notes.

Delivery:

Students must prepare a report of the practice carried out, according to the instructions indicated and deliver to the teacher in the set time.

The evaluation of this activity together with the other activities will form part of the evaluation as specified in the corresponding section of the qualification system.

Full-or-part-time: 12h

Laboratory classes: 3h

Self study: 9h



TITLE OF ACTIVITY 6: PREVENTIVE MAINTENANCE

Description:

Study of a predictive maintenance model.

Specific objectives:

Once the activity is finished, the student must be able to study and create preventive maintenance.

Material:

Practice guide (available on the digital Campus) and teacher's notes.

Delivery:

Students must prepare a report of the practice carried out, according to the instructions indicated and deliver to the teacher in the set time.

The evaluation of this activity together with the other activities will form part of the evaluation as specified in the corresponding section of the qualification system.

Full-or-part-time: 12h

Laboratory classes: 3h

Self study: 9h

TITLE OF ACTIVITY 7: PREDICTIVE MAINTENANCE

Description:

Study of a preventive maintenance model.

Specific objectives:

Once the activity is finished, the student must be able to study and create predictive maintenance.

Material:

Practice guide (available on the digital Campus) and teacher's notes.

Delivery:

Students must prepare a report of the practice carried out, according to the instructions indicated and deliver to the teacher in the set time.

The evaluation of this activity together with the other activities will form part of the evaluation as specified in the corresponding section of the qualification system.

Full-or-part-time: 11h

Laboratory classes: 2h

Self study: 9h

GRADING SYSTEM

- Delivery of the Proposed Problems: 10% of the grade for the course.
- First Individual Continuous Assessment Test: 35% of the grade for the subject.
- Second Individual Continuous Assessment Test: 35% of the grade for the subject.
- Attendance to the practices (5%) and the preparation of reports (15%) related to the results obtained in said practices: 20% of the grade for the subject.

Therefore, the Note for Written Tests (NPE) = 35% * (First Written Test Note) + 35% * (Second Written Test Note) + 20% * (Practice Note) + 10% * (Delivery Note of the Proposed problems).

It is important to note that the partial written tests are liberating, in such a way that, if the student obtains an $NPE > 4.95$, he will be exempt from passing the final test. Students who fail to pass the course by partial exams or those who want to improve their grade will have a second chance with a new final test.

Thus, the Final Test Note (NPF) = 70% * (Final Written Test Note) + 20% * (Practice Note) + 10% * (Delivery Note of Proposed Problems).

Re-evaluation:

Students who have obtained a 'failed' grade in the regular evaluation period can access the reevaluation process.

Those students who have a 'no-show' or have passed the course in the regular evaluation period cannot access the re-evaluation process.

The result of the re-evaluation is a grade that replaces the grade obtained in the ordinary evaluation process, which is higher than this and, in any case, it will be a maximum of 'pass' 5.

If RR is the result of the reassessment process:

$RR = \text{minimum} \{5, \text{weighted sum of partial grades}\}$

EXAMINATION RULES.

- In order to pass the course, it is mandatory to attend and carry out all the activities, delivering all the laboratory practice reports, and the resolution of all the proposed problems within the indicated deadlines.
- In solving the proposed problems, the students will use the contents studied in the expository part of the face-to-face session and will be able to clarify the doubts and difficulties they may encounter with the teacher. The deadline for delivery of the resolution of the proposed problems and the reports of the laboratory practices will be specified, and no delivery will be accepted after the deadline.
- The reports of the practices will be original, so that the copy of the practices (total or partial) will be sanctioned with the global failure of the activity and the subject. It will be taken into account that the responsibility of the laboratory practice is shared by all the members of the group, therefore, in the case of detecting a copy, the rule will be applied to all the members of all the groups involved in the copy (both the that they copy as those that allow themselves to be copied).
- In the delivery of the resolution of the proposed problems, any total or partial copy of the solutions will suppose the suspension of the activity. The student must ensure the privacy and security of their data.
- If it is detected that a student has copied in a written test, it will be evaluated as a failure of the subject.
- In no case will it be possible to have any type of form or notes both in the partial tests and in the final.



BIBLIOGRAPHY

Complementary:

- Mobley, R. K., ed. Maintenance engineering handbook. 8th ed. New York: McGraw-Hill, 2014. ISBN 9780071826617.
- Kelly, A.; Harris, M. J. Management of industrial maintenance. London: Butterworths, 1987. ISBN 040801377X.
- Bloch, H. P.; Geitner, F. K. Machinery failure analysis and troubleshooting [on line]. 2nd ed. Houston: Gulf, 1994 [Consultation: 25/11/2022]. Available on: <https://www.sciencedirect-com.recursos.biblioteca.upc.edu/book/9780123860453/machinery-failure-analysis-and-troubleshooting>. ISBN 0872012328.
- Monchy, F. Teoría y práctica del mantenimiento industrial. Barcelona: Masson, 1990. ISBN 8431105240.
- Navarro Elola, L.; Pastor Tejedor, A. C.; Mugabaru Lacabrera, J. M. Gestión integral de mantenimiento [on line]. Barcelona: Marcombo, 1997 [Consultation: 27/05/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=3185475>. ISBN 8426711219.