

Course guide

330526 - SAM - Mechanical Auxiliary Systems

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 AUTOMOTIVE ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: Català Calderón, Pau

Others: Tirado Galbany, Manel
Peña Pitarch, Esteban

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. (ENG) Coneixements i capacitats per el càlcul, disseny i assaig de sistemes auxiliars mecànics.

Generical:

CG4. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and skills in the field of automotive engineering.

CG11. Ability to write and develop projects for vehicles and/or their components.

Transversal:

2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

03 TLG. 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.

04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

05 TEQ N3. 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.

TEACHING METHODOLOGY

- Master class or conference.
- Problem solving and case study.
- Project, activity or work of reduced scope.
- Project or work of wide scope.
- Evaluation activities.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, students must be able to:

- To apply correctly the fundamental concepts of the statics, kinematics and dynamics of the rigid solid and to be able to apply them to practical cases of automotive engineering.
- Know the different auxiliary mechanisms of a vehicle, as well as be able to carry out its design.



STUDY LOAD

Type	Hours	Percentage
Self study	67,5	60.00
Hours large group	15,0	13.33
Hours small group	30,0	26.67

Total learning time: 112.5 h

CONTENTS

1. Spring design

Description:

Helical springs design, curvature and bending effects. Extension and compression springs. Belleville springs. Leaf spring. Fatigue loads in springs.

Related activities:

PRO, PAR, EP1, EFINAL

Full-or-part-time: 16h

Theory classes: 2h

Laboratory classes: 4h

Self study : 10h

2. Efforts in gears

Description:

Lewis equation for gears. AGMA stress equation on gears. Gear analysis.

Related activities:

PRO, PAR, EP1, EFINAL

Full-or-part-time: 32h

Theory classes: 4h

Laboratory classes: 8h

Self study : 20h

3. Mechanical transmissions

Description:

Types of belts. Stress and power. Movement and dimensioning. Motive and receiving power.

Related activities:

PRO, PAR, EP2, EFINAL

Full-or-part-time: 21h

Theory classes: 2h

Laboratory classes: 4h

Self study : 15h



4. Clutches and brakes

Description:

Drum clutches and brakes, band brakes, disc brakes and conical. Energy considerations, temperature rise and friction materials.

Related activities:

PRO, PAR, EP2, EFINAL

Full-or-part-time: 21h

Theory classes: 2h

Laboratory classes: 4h

Self study : 15h

5. Bearings and lubrication

Description:

Types of bearings. Calculations and dimensioning. Lubrication.

Related activities:

PRO, PAR, EP2, EFINAL

Full-or-part-time: 16h

Theory classes: 2h

Laboratory classes: 4h

Self study : 10h

6. Gearbox: criteria and calculation.

Description:

Types of gearboxes. Main components.

Related activities:

PRO, PAR, EP1, EP2, EFINAL

Full-or-part-time: 19h

Theory classes: 3h

Laboratory classes: 6h

Self study : 10h

ACTIVITIES

Partial Exam 1

Description:

Assessment of acquired knowledge

Delivery:

Delivered exam.

Full-or-part-time: 2h

Theory classes: 2h



Partial Exam 2

Description:

Assessment of acquired knowledge.

Delivery:

Delivered exam.

Full-or-part-time: 2h

Theory classes: 2h

Final Exam

Description:

Assessment of acquired knowledge.

Delivery:

Delivered exam.

Full-or-part-time: 3h

Theory classes: 3h

Project (PRO)

Description:

Delivery and oral presentation of a technical report explaining the design results of different auxiliary elements that make up subsystems of a vehicle.

Delivery:

Technical report and oral exposition.

Full-or-part-time: 16h

Self study: 16h

Class participation

Description:

Attendance and participation in class. Online tests can be proposed to be solved by the students of the content explained in class.

Delivery:

Class participation and tests

Full-or-part-time: 1h

Theory classes: 1h

GRADING SYSTEM

- PRO: Project (25%).
- PAR: Class attendance and participation (5%).
- EP1: Partial exam 1 (35%).
- EP2: Partial exam 2 (35%).
- EFINAL: Recovery exam (70%).

The final grade (NFINAL), rounded to the tenth, will be the next weighted average.

$$NFINAL = \max(70\% \cdot EFINAL, 35\% \cdot EP1 + 35\% \cdot EP2) + 25\% \cdot PRO + 5\% \cdot PAR.$$

Students who fail to pass the subject in part (EP1, EP2) or those who want to improve their qualification, they will have a second chance with a new final test (EFINAL).

EXAMINATION RULES.

- Late deliveries will not be accepted (PRO). Deliveries must be made via the ATENEA campus.
- In the delivery any total or partial copy of solutions will suppose the suspension to the activity. The student must ensure the privacy and security of their data.
- The structure and rules of the exams of the subject (EP1, EP2, EFINAL) are the following:
Duration: 2 h - 3 h
Part of theory (3 points). Test questions and open-ended questions. No form or notes.
Part of problems (7 points). Between one and three problems. With form and / or notes.

BIBLIOGRAPHY

Basic:

- Budynas, Richard G; Nisbett, J. Keith. Diseño en ingeniería mecánica de Shigley [on line]. 10a ed. Ciudad de México: McGraw-Hill, 2019 [Consultation: 27/05/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=5485813>. ISBN 9781456267568.
- Font Mezquita, José; Dols Ruiz, J. F. Tratado sobre automóviles: tomo I y II. Tecnología del automóvil. València: Universitat Politècnica de Valencia (UPV), 2004. ISBN 9788477215011.
- Peña-Pitarch, E.. Diseño de máquinas. 2a. Manresa, 2020.
- Norton, R. L.. Diseño de máquinas. Un enfoque integrado [on line]. 4a. Mèxic: Pearson, 2011 [Consultation: 28/07/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5701. ISBN 978-607-32-059-4.
- Luque, P., Álvarez, D., Vera, C.. Ingeniería del automóvil. Sistemas y comportamiento dinámico.. Madrid: Paraninfo, 2004. ISBN 8497322835.