Course guide
330128 - CDM - Kinematics and Machine Dynamics

Last modified: 03/09/2026

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

Degree: BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2016). (Compulsory subject).
BACHELOR'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Optional subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JOSE IGNACIO ALCELAY LARRION
PAU CATALÀ CALDERÓN

Others: JOSÉ IGNACIO ALCELAY LARRIÓN
PAU CATALÀ CALDERÓN

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Evaluate the transmission ratios, forces and powers of the different types of gear trains.
2. Analytically calculate the speeds and accelerations of the cams applying the different methods developed in the subject.
3. Calculate internal and external forces and reactions to mechanisms.
4. Distinguish the strategies used in the analysis of the statics and dynamics of a machine from the mechanisms that make it up.

Transversal:
5. 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.
6. 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.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	15,0	10.00
Hours small group	45,0	30.00

Total learning time: 150 h

CONTENTS

(ENG) Títol del contingut 1: Trens d'engranatges.

Full-or-part-time: 25h
Theory classes: 2h
Laboratory classes: 8h
Self study : 15h

(ENG) Títol del contingut 2: Lleves i excèntriques

Full-or-part-time: 25h
Theory classes: 4h
Laboratory classes: 6h
Self study : 15h

(ENG) Títol del contingut 3: Estàtica de mecanismes

Full-or-part-time: 17h
Theory classes: 1h
Laboratory classes: 6h
Self study : 10h

(ENG) Títol del contingut 4: Dinàmica directa.

Full-or-part-time: 42h
Theory classes: 3h
Laboratory classes: 14h
Self study : 25h

(ENG) Títol del contingut 5: Equilibrat

Full-or-part-time: 41h
Theory classes: 5h
Laboratory classes: 11h
Self study : 25h

ACTIVITIES

(ENG) TÍTOL DE L'ACTIVITAT 1: PRÀCTICA DE LABORATORI

Full-or-part-time: 8h
Laboratory classes: 5h
Self study: 3h

(ENG) TÍTOL DE L'ACTIVITAT 2: PRÀCTICA DE LABORATORI

Full-or-part-time: 8h
Laboratory classes: 5h
Self study: 3h

(ENG) TÍTOL DE L'ACTIVITAT 3: PRÀCTICA DE LABORATORI

Full-or-part-time: 8h
Laboratory classes: 5h
Self study: 3h

(ENG) TÍTOL DE L'ACTIVITAT 4: PRÀCTICA DE LABORATORI

Full-or-part-time: 17h
Laboratory classes: 10h
Self study: 7h

(ENG) TÍTOL DE L'ACTIVITAT 5: PRÀCTICA DE LABORATORI

Full-or-part-time: 17h
Laboratory classes: 10h
Self study: 7h

(ENG) TÍTOL DE L'ACTIVITAT 6: PRÀCTICA DE LABORATORI

Full-or-part-time: 17h
Laboratory classes: 10h
Self study: 7h

(ENG) TÍTOL DE L'ACTIVITAT 7: PRIMERA PROVA INDIVIDUAL D'AVALUACIÓ CONTINUA

Full-or-part-time: 12h
Theory classes: 2h
Self study: 10h

(ENG) TÍTOL DE L'ACTIVITAT 8: SEGONA PROVA INDIVIDUAL D'AVALUACIÓ CONTINUA

Full-or-part-time: 12h
Theory classes: 2h
Self study: 10h

(ENG) TÍTOL DE L'ACTIVITAT 9: PROVA FINAL

Full-or-part-time: 18h
Theory classes: 3h
Self study: 15h

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**.

BIBLIOGRAPHY

Basic:

- Beer, Ferdinand P., i altres. Mecánica vectorial para ingenieros. Vol. 1, Estática [on line]. 11ª ed. México: McGraw-Hill Education, 2017 [Consultation: 08/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8077. ISBN 9781456255275.
- Beer, Ferdinand P., i altres. Mecánica vectorial para ingenieros. Vol. 2, Dinámica [on line]. 11ª ed. México: McGraw-Hill Education, 2017 [Consultation: 08/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8078. ISBN 9781456255268.
- Mabie, Hamilton H. ; Reinholtz, Charles F. Mecanismos y dinámica de maquinaria. 2ª ed. México: Limusa, 1998. ISBN 9681849264.
- Norton, Robert L. Machine design: an integrated approach [on line]. 4ª ed. Boston: Pearson, 2011 [Consultation: 12/09/2025]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=12312. ISBN 9780131384385.
- Calero Pérez, Roque; Carta Gonzalez, José Antonio. Fundamentos de mecanismos y máquinas para ingenieros. Madrid: McGraw Hill, 1999. ISBN 844812099X.

Complementary:

- Khamashta Shahin, M. ; Capdevila, R. ; Álvarez Martínez, L. Problemas de cinemática y dinámica de máquinas. Vol 1, Problemas resueltos de cinemática de mecanismos planos. Barcelona: Edicions de la Universitat Politècnica de Catalunya, 1993. ISBN 847653003X.
- Khamashta Shahin, M.; Capdevila, R.; Álvarez Martínez, L. Problemas de cinemática y dinámica de máquinas. Vol 2, Problemas resueltos de dinámica de mecanismos planos. Barcelona: Edicions de la Universitat Politècnica de Catalunya, 1986. ISBN 8476530048.
- Bertran Bertran, Juan M. Cinemática y dinámica de máquinas. Manresa: Universitat Politècnica de Barcelona. Escola Universitària Politècnica, 1983.
- Suñer Martínez, Josep Lluís, i altres. Problemas resueltos de teoría de máquinas y mecanismos. Valencia: Universidad Politécnica de Valencia, 2001. ISBN 8497050142.
- García Prada, J. C. ; Castejón Sisamón, C. ; Rubio Alonso, H. Problemas resueltos de teoría de máquinas y mecanismos. 2a ed. act.. Madrid: Paraninfo, 2014. ISBN 9788428334426.
- Hernández, Alfonso. Cinemática de mecanismos : análisis y diseño. Madrid: Sintesis, 2004. ISBN 8497562240.