

Centre	University College of Engineering of Vitoria-Gasteiz
Name of subject	26046 – Kinematics and Dynamics of Machines
Qualification	Degree in Mechanical Engineering
Type	Compulsory
Credits	6 ECTS
Year	3
Term(s)	1st
Department	Mechanical Engineering
Language	Spanish and Basque

Outcomes / Objectives

Understand the structure of mechanisms: elements and kinematic pairs of mechanisms, number of degrees of freedom of mechanism, concept of kinematic chain.

Learn the fundamental theorems of planar motion, complementing what has been learnt in the course of Applied Mechanics, as a theoretical basis for the dimensional analysis and synthesis of mechanisms.

Acquire capabilities to perform the kinematic analysis of planar mechanisms. Study of rotativity, singular position analysis and obtaining quality parameters of mechanisms.

Carry out the direct and inverse dynamic analysis of planar mechanisms (rigid body hypothesis) based on the principles studied in Applied Mechanics and through specific procedures for desmodromic mechanisms.

Carry out the deformable body dynamic analysis of single- and multiple-degree-of-freedom systems.

Acquire capabilities to analyse planar cams. Notions of the different types of cams and their applications.

Study the kinematics and dynamics of gears, in particular cylindrical gears. Notions of the capabilities of gear systems.

Syllabus

Unit 1: Basic concepts of mechanisms and machines.

Unit 2: Geometry of the planar motion.

Unit 3: Kinematic analysis of planar mechanisms.

Unit 4: Kinematics of cams.

Unit 5: Kinematics of gears.

Unit 6: Inverse dynamics problem.

Unit 7: Direct dynamics problem.

Unit 8: Theory of vibrations.

Methodology

Teaching Method

Face-to-Face Teaching Hours

Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
54		21	3	12				

Student Hours of Non Face-To-Face Activities

Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
81		32	4	18				

Assessment System

General criteria

- Written essay exam
- Practical tasks (exercises, case studies or problems)
- Individual assignments
- Group assignments

Bibliography

Basic Bibliography

- Guía del estudiante para el curso 2012-2013
- Colección de enunciados de examen de Cinemática y Dinámica de Máquinas 2005 – 2012
- Hernández, A.; CINEMÁTICA DE MECANISMOS. ANÁLISIS Y DISEÑO. ISBN: 84-7738-224-0. Ed. Síntesis, 2004.
- Hernández, A.; Pinto, Ch.; Agirrebeitia, J.; Petuya, V.; DINÁMICA DE MAQUINARÍA. ISBN: 978-84-95809-41, 2008.
- Hernández, A.; Pinto, Ch.; Petuya, V.; Agirrebeitia, J.; INTRODUCCIÓN A LA TEORÍA DE VIBRACIONES. ISBN: 84-95809-16-8, 2003.
- Hernández, A.; Pinto, Ch.; Petuya, V.; Agirrebeitia, J.; BIBRAZIOEN TEORÍA. OINARRIZKO JAKINGARRIAK. ISBN: 84-95809-17-6. 2002.
- Lecturer's software:
 - MECAN4 (Hernández, A.; Casado, H.; Castillo, J; Urruchi, J.V.; Abascal, L.; Pinto, Ch.)
 - BIEMAN (Hernández, A.; Alonso, A.; Macho, E.; Petuya, V.)
 - Pinto, Ch.; Agirrebeitia, J; Petuya, V.; Hernández, A. MANUAL DE USUARIO DE MECAN4 Y BIEMAN.

In-depth Bibliography

- Uicker, J.J. (Jr.); Pennock, G.R.; Shigley, J.E. Theory of Machines and Mechanisms. Oxford University Press, 2003.
- Erdman, A. G.; Sandor, G. N.; Mechanism Design. Analysis and Synthesis. Prentice-Hall, 1997.
- Nieto, J.; Síntesis de Mecanismos. Ed. A. C. Madrid, 1978.
- Norton, R. L.; Diseño de Maquinaria, 1995.
- Shabana, A. A.; Theory of Vibration. An introduction. Springer, 1996.
- Juvinall, R.; Fundamentos de Diseño para Ingeniería Mecánica. Limusa, 1991.
- Shigley, J.E.; Mischke, Ch.R. Diseño en Ingeniería Mecánica. Mc Graw-Hill, 1995.
- Mott, R.L. Diseño de Elementos de Máquinas, Prentice Hall, 1992.

Websites

- <http://www.biblioteca.ehu.es> Página web de la biblioteca de la UPV/EHU.
- www.thinkmotion.eu Página web del proyecto thinkMOTION para la creación de una base datos europea online sobre contenidos de Teoría de Máquinas.
- www.dmg-lib.org Librería online sobre modelos mecánicos, bibliografía e investigadores alemanes.
- www.technologystudent.com Ejercicios sobre análisis y diseño de sistemas mecánicos.
- www.howstuffworks.com Vídeos y animaciones sobre el funcionamiento de diferentes sistemas mecánicos.
- www.tribology-abc.com Herramientas para la cálculo online de diferentes elementos de máquinas.