

<i>Course</i>	Mechanical and Industrial Informatics			<i>Academic year</i>	2021/2022	
<i>Subject</i>	Machine Elements			ECTS	6	
<i>Type of course</i>	Compulsory					
<i>Year</i>	2nd	<i>Semester</i>	2nd	<i>Student Workload:</i>		
<i>Professor(s)</i>	Arlindo Augusto Marques Ferreira			<i>Total</i>	162	<i>Contact</i> 60
<i>Area Coordinator</i>	José Reinas dos Santos André					

Planned SD

1. LEARNING OBJECTIVES

Provide the student with knowledge about mechanical components and elements of power transmission systems in continuous operation.

At the end of the course, students should:

Know the movements of mechanical components and distinguish the capacity, power and torque; Identify and characterize any element and component of mechanical transmissions; Select the type of mechanical transmission appropriate to the specific service conditions; Size components and elements of mechanical transmissions. Select, using catalogues, the elements of mechanical transmissions; Identify construction and assembly details and maintenance actions applicable to mechanical transmissions.

2. PROGRAMME

1. Introduction

1.1 Notion of mechanical power and torque.

1.2 Transmission of motion, power and torque.

2 Bearings

2.1 Introduction to movements between mechanical components. The needs of bearings.

2.2 Definition, identification and characterization of the different types of bearings.

2.3 Sliding bearings and ball-bearings.

2.3.1 Type, characteristics, and applicability of bearings. Bearing disassembly and assembly. Bearing selection.

3 Axes and shafts

3.1 Difference between axe and shaft.

3.2 Shaft joints and shafts assembly.

3.3 Shafts sizing.

4 Brakes and clutches

5 Mechanical transmissions study

5.1 Comparative analysis of the main types of mechanical transmissions.

5.2 Transmission geometry. Nomenclature and geometric relations. Kinematic analysis.

5.3 Mechanical transmission selection - selection factors.

5.4 Mechanical elements selection, mechanical components sizing and mechanical transmissions design.

5.5 Construction and assembly details. Maintenance of mechanical transmissions.

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

Know the movements of mechanical components and distinguish the capacity, power and torque based on items 1.1, 1.2, 2.1 of the syllabus.

Identify and characterize any element and component of mechanical transmissions based on items 2.2; 2.3; 2.3.1; 3.1; 3.2; 4 of the syllabus.

Select the type of mechanical transmission appropriate to the specific service conditions based on items: 5.1; 5.3 of the syllabus.

Select, using catalogs, the elements of mechanical transmissions based on item 5.3 of the syllabus.

Size components and elements of mechanical transmissions based on items 3.3; 5.4 of the syllabus.

Identify construction and assembly details and maintenance actions applicable to mechanical transmissions based on item 5.5 of the syllabus.

4. MAIN BIBLIOGRAPHY

Shigley, J., "Mechanical Engineering Design", 10ª Edição, McGraw-Hill, 2019. ISBN-13: 978-0073398204; ISBN-10: 9780073398204

R.Juvinal, K.M. Marshek, "Fundamentals of Machine Component Design", 5th Edition, 2019. ISBN-13: 978-1118012895; ISBN-10: 1118012895

Robert L. Mott, Edward M. Vavrek and Jyhwen Wang "Machine Elements in Mechanical Design", 6th Edition, Pearson, 2017. ISBN13: 9780134441184; ISBN10: 0134441184,

Niemann. G., "Elementos de Máquinas", Vol.1, Blucher, 1971. ISBN-10: 8521200331; ISBN-13: 978-8521200338

Niemann. G., "Elementos de Máquinas", Vol.2, Blucher, 1971. ISBN-10: 852120034X; ISBN-13: 978-8521200345

Branco, C.M., Ferreira, J.M., Costa, J.D., Ribeiro, A.S., "Projecto de Órgãos de Máquinas", 2ª Edição, Fundação Calouste Gulbenkian, 2009.

Henriot, G.; "Traité Theorique et Pratique des Engrenages", Dunot, 1983. ISBN 10: 2040155260; ISBN 13: 9782040155261

Drago. R. J., "Fundamentals of Gear Design", Butterworths ,1988. ISBN-10: 040990127X; ISBN-13: 978-0409901276

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

Teaching methodologies:

Theory classes: lectures on the syllabus supported by projection of PowerPoint slides.

Theory and practical classes: solving applied exercises.

Evaluation:

One final written test evaluated at 10 (or more) out of 20 to finalize the ongoing assessment period.

One final written test evaluated at 10 (or more) out of 20 in the exam period.

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

This course aims to study the components and elements of machines used in the transmission of motion and power. Thus, the syllabus is supported by theory and practice as well as analysis and discussion of practical experiments to stimulate listening and retention of knowledge and demonstrations of experiments, which will develop competences in analysis and solving of applied exercises to select and design power transmission components for specific operational conditions.

7. ATTENDANCE

N.A.

8. CONTACTS AND OFFICE HOURS

Professor: Arlindo Augusto Marques Ferreira; arlindoferreira@ipg.pt; office n.º 5

Area Coordinator: José Reinas dos Santos André (Ph.D); jandre@ipg.pt; office n.º 13

Date: 30/06/2021