

Sheet course ()

Course	MSc IN MECHANICAL ENGINEERING		
Unit	Tribology	Mandatory	<input checked="" type="checkbox"/>
		Optional	<input type="checkbox"/>
Unit scientific area	Industrial and Maintenance Engineering	Category	B

Unit category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 2nd	Semester: 1st	ECTS: 6,0				
Contact time	Total:	T:	TP: 67,5	PL:	S:	OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Unit Director	Title	Position
José Augusto da Silva Sobral	Ph.D.	Assistant Professor

Learning Objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

Objective: To enable the student of Mechanical Engineering (MSc) with basic knowledge of the science and technology of the phenomena associated with the mechanical behavior of interacting surfaces of the mechanical components.

Skills: Control the phenomena of friction, wear and lubrication, to maximize mechanical strength of technical surfaces of the mechanical components. To know the basic properties of materials commonly used in typical tribological applications, to properly design the said components for achieving that desideratum.

Syllabus

(max. 1000 characters)

1. Introduction
2. Surface Condition
3. Friction
4. Wear
5. Lubricants
6. Lubrication

7. Plain Bearings

8. Rolling Bearings

9. Gears

9. Predictive Maintenance. Oil condition and wear particles control

Demonstration of consistency of the syllabus with the objectives of the course

(max. 1000 characters)

To achieve the objectives, the program of the course includes:

In chapter 1, the basics of links and kinematic pairs. In Chapter 2, some characteristics of the functional surfaces. In Chapter 3, source of friction and their types. In chapter 4, the phenomenon of wear, their types and measures for their control. In Chapters 5 and 6, the various types of lubricants, additives and their functions and characteristics, types and basic mechanisms of lubrication. In chapter 7, sliding bearings, its classification and special design, project and selection. In chapter 8, rolling bearings, its classification and constructive arrangements, capacity and duration, project and selection. In Chapter 9, the operation of the gears in their tribological aspects. In chapter 10, the subject of preventive maintenance by inspecting oils in service.

Teaching methodology (evaluation included)

(max. 1000 characters)

Teaching methodology - Theoretical classes (approx. 60%) and practical (on issues related with practical cases, approx. 40%); - Lecture exposition supported on the board (approx. 60%) and by IT (powerpoint, approx. 40%).

Assessment. It can be done by one of two alternative modes:

- Continuous assessment based on two tests (one carried out at mid-semester and another one at the end of the same). The "weights" of the tests are 50% each, being required, for approval on the chair, a minimum of 8 points in any of the tests and an average of 10 points minimum (in 20 max.) on both tests. The retrial of one of the two tests, during the 1st season of examination, is allowed.

- Examination. In this mode, the test questionnaire is in fact, and whichever the examination season, a set of two tests - one 1st test and one 2nd test. For approval on the chair, the same rules as above apply to the set of tests.

Demonstration of consistency of teaching methods with the learning objectives of the course

(max. 3000 characters)

Teaching methodology contributes to achieve the objectives once students will have the opportunity to perform in class a lot of practical exercises, using tables, graphs, abacuses and other sources of information, therefore they can apply all the theoretical concepts learned.

This practice is complemented by the results of two tests covering the whole syllabus of the course, where students can also thereby demonstrate the skills acquired.

The classes, taught using new technologies, promote greater interactivity with students, including a lot of images and videos.

Main Bibliography

(max. 1000 characters)

CARINHAS, H.P., "Tribologia" (Didactic Tribology Manual for students support)

NEALE, M.J., "A Tribology Handbook", SAE/Butterworth, 1993

SILVA, F.P., "Tribologia", Fundação Calouste Gulbenkian, 1995

SHIGLEY, J.E., et al, "Mechanical Engineering Design", 7th Ed., 2004

ASM, "Friction, Lubrication and Wear Technology", ASM Handbook, Vol.18, 1992