

## SUBJECT TEACHING GUIDE

G755 - Machine Design and Testing

Degree in Mechanical Engineering

Academic year 2018-2019

1. IDENTIFYING DATA					
Degree	Degree in Mechanical Engineering			Type and Year	Compulsory. Year 4
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Design and Testing of Machines Module: Further Mechanical Technology				
Course unit title and code	G755 - Machine Design and Testing				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ESTRUCTURAL Y MECANICA				
Name of lecturer	PABLO GARCIA FERNANDEZ				
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Other lecturers	JUAN MARTIN OSORIO SAN MIGUEL JAVIER SANCHEZ ESPIGA				

### 3.1 LEARNING OUTCOMES

- The student will be intellectually and conceptually trained in the fundamental aspects of machine design, will have the capacity to take on the study of the Elements of Basic Machines to subsequently study and apply technical texts, regulations, etc. necessary for the projects development of construction, maintenance or modification of machines.

### 4. OBJECTIVES

Acquire the necessary capacity to approach the study of Elements of Machines and acquire the appropriate training to proceed to the mechanical design of machines, vehicles and mechanical engineering assisted by computer.

## 6. COURSE ORGANIZATION

### CONTENTS

1	<p>Topic 1 Introduction.</p> <p>1.1 - Introduction to mechanical design: General considerations on design in mechanical engineering.</p> <p>1.2 - Materials and their properties in machine design.</p> <p>1.3 -Tribology and surface damage in the design of machines .</p>
2	<p>Topic 2 Analysis of stresses, extensions and displacements in mechanical components and systems.</p> <p>2.1 - Analysis of stresses, deformations and displacements in elements of machines.</p> <p>2.2 - Theories of static failure, analysis of the criteria for yield and break in the design to static resistance, safety and reliability coefficient, criteria of the Main Tensions, Tresca-Guest and Von Mises-Henky-Huber.</p>
3	<p>Topic 3 Plasticity in structural elements of machines.</p> <p>3.1 - Moments and plastic modules, calculation according to section.</p> <p>3.2 - Types of section, classification and determination of the class.</p> <p>3.3 - Methods for the determination of the requests according to section class.</p> <p>3.4 Methods for determining the strength of sections according to section class.</p> <p>3.5 Application of the plastic calculation to the structural elements of the machines.</p>
4	<p>Topic 4 Fatigue of materials in the analysis and mechanical design.</p> <p>4.1 - Study of strength by fatigue, low and high cycles.</p> <p>4.2 - Failure models, cycle types.</p> <p>4.3 - Wöhler, Smith and Goodman diagrams modified.</p> <p>4.4 - Factors of influence on fatigue strength, notches, surface, etc.</p> <p>4.5 - Design models for notch sensitivity.</p> <p>4.6 - Calculation of the notch sensitivity using MEF.</p> <p>4.7 - Fatigue in complex tension states.</p> <p>4.8 - Application to the calculation of axles and shafts.</p> <p>4.9 - Fatigue in welded joints of machines.</p>
5	<p>Topic 5 Fatigue in metal structures for machines.</p> <p>5.1 - Calculation of stress strokes, reservoir method, cyclegrams.</p> <p>5.2 - Curves S-N,</p> <p>5.2 - Fatigue test, accumulated damage method, Miner-Palgreem law.</p> <p>5.3 - Checking cycles of constant and variable amplitude.</p> <p>5.4 - S-N curves according to detail and detail tables.</p>

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Computational laboratory practices exam	Written exam	Yes	Yes	15,00
Exam Part I	Written exam	Yes	Yes	42,50
Exam Part II	Written exam	Yes	Yes	42,50
TOTAL				100,00
Observations				
<p>If the student get a score equal to or higher than the minimum required in each evaluation section, the total score of the subject will be obtained as:            Total score= Score Exam Part I x 0.425 + Score Exam Part II x 0.425 + Score Exam Practices x 0.15.            If the student did not obtain a score equal to or higher than the minimum required in any of the evaluation sections, the total score will also be calculated according to the previous formula, but limiting its value to a maximum of 4.0 points.            To pass the subject it will be necessary to obtain a total score equal to or higher than 5 points out of 10.            If the ordinary subject does not approve the complete subject, the partial scores greater than 5 points will be preserved for the extraordinary call. Partial scores will not be kept for successive courses, including the laboratory practices score.</p>				
Observations for part-time students				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

- Diseño en Ingeniería Mecánica , Shigley, R.G Budynas, J.K. Nisbett. Ed. McGraw Hill 2008.
- Análisis de Fatiga en Máquinas , R. Aviles Ed. Thomson 2005.
- Elementos de Máquinas, G. Niemann, Ed Labor S.A
- Elementos de Máquinas B.J. Hamrock, B. Jacobson, S.R. Schimd, Ed. McGraw Hill 2000.
- Diseño de Máquinas, Robert L. Norton. Ed. Pearson Prentice Hall, 1999.
- Diseño de Maquinaria, Robert L. Norton Ed. McGraw Hill 2007.
- Fatiga según E.A.E (Instrucción de Acero Estructural EURC3)
- Paul Schimpke; Hans August Horn;" Tratado general de soldadura" Edit. Gustavo Gili
- Apuntes de la asignatura.