

## SUBJECT TEACHING GUIDE

### G756 - Machine Elements

### Degree in Mechanical Engineering

Academic year 2023-2024

| 1. IDENTIFYING DATA              |   |                  |                    |                  |                    |
|----------------------------------|---|------------------|--------------------|------------------|--------------------|
| Degree                           | Degree in Mechanical Engineering  |                  |                    | Type and Year    | Compulsory. Year 4 |
| Faculty                          | School of Industrial Engineering and Telecommunications                   |                  |                    |                  |                    |
| Discipline                       | Subject Area: Machine Components<br>Module: Further Mechanical Technology |                  |                    |                  |                    |
| Course unit title and code       | G756 - Machine Elements   |                  |                    |                  |                    |
| Number of ECTS credits allocated | 6   | Term             | Semester based (2) |                  |                    |
| 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   |  |  |  |  |
| E-mail           | pablo.garcia@unican.es   |  |  |  |  |
| Office           | E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO (S2044) |  |  |  |  |
| Other lecturers  | JESUS PASCUAL GARCIA   |  |  |  |  |

### 3.1 LEARNING OUTCOMES

- The student will be intellectually and conceptually trained in the fundamental aspects of machine design, will have the ability to interpret technical texts, standards, etc. necessary for projects development of construction, maintenance or modification of machines.

**4. OBJECTIVES**

The student will acquire the necessary capacity to approach the mechanical design of machines, vehicles and mechanical engineering assisted by computer

Getting technical language related to the design of machines.

Knowledge of the different elements that are part of a machine, its operating principles, usefulness, alternatives and failures.

Critical aptitude to select, within the different alternatives, the most appropriate type of element for a requirement.

Ability to design and/or select different machine elements and their integration into the machine as a whole.

Knowledge of the limitations of the basic calculation methods used in the design of certain machine elements.

**6. COURSE ORGANIZATION**

## CONTENTS

|   |   |
|---|---|
| 1 | <ul style="list-style-type: none"> <li>- Introduction to mechanical design</li> <li>- Stress and strain analysis of members</li> <li>- Failures criteria</li> <li>- Fatigue of materials</li> </ul>   |
| 2 | <p>Topic 2. Couplings and brakes</p> <ul style="list-style-type: none"> <li>- Permanent couplings.</li> <li>- Clutches.</li> <li>- Friction brakes</li> </ul>   |
| 3 | <p>Topic 3: Permanent joints.</p> <ul style="list-style-type: none"> <li>- Welding joints</li> <li>- Interference-fit joints.</li> <li>- Cylinders under uniform radial load</li> <li>- Rivets.</li> </ul>  |
| 4 | <p>Topic 4. Non-permanent joints.</p> <ul style="list-style-type: none"> <li>- Bolted connections in metal structures of machines.</li> <li>- Power screws: forces, torque, performance, resistance.</li> <li>- Pins and keys</li> <li>- Splined and polygonal shafts.</li> <li>- Conical and other hub-shaft joints.</li> </ul>  |
| 5 | <p>Topic 5. Springs</p> <ul style="list-style-type: none"> <li>- Characteristic curves, elasticity work, elastic degree and oscillation conditions, frequencies.</li> <li>- Plate spring in bending</li> <li>- Arm spring in torsion.</li> <li>- Torsion bar spring.</li> <li>- Disk springs in compression.</li> <li>- Compression and tension springs, cylindrical round wire.</li> </ul> |
| 6 | <p>Topic 6. Gear transmission systems.</p> <ul style="list-style-type: none"> <li>- Spur and helical gears</li> <li>- Tooth breaking strength</li> <li>- Wear strength of gear tooth</li> <li>- Lubrication</li> <li>- Other gear types.</li> </ul>   |
| 7 | <p>Topic 7. Transmission systems: belts and chains</p> <ul style="list-style-type: none"> <li>- Flat belts, operation, materials, pulleys, tension rollers, strength.</li> <li>- Trapezoidal belts, types and shapes, pulleys, strength.</li> <li>- Toothed belts, form of work, strength.</li> <li>- Transmissions by chains, wheels, strength, lubrication.</li> </ul>                    |

### 7. ASSESSMENT METHODS AND CRITERIA

| Description   | Type         | Final Eval. | Reassessn | %             |
|---|--------------|-------------|-----------|---------------|
| Computational laboratory practices exam   | Written exam | No          | Yes       | 15,00         |
| Exam Part I   | Written exam | No          | Yes       | 42,50         |
| Exam Part II  | Written exam | Yes         | Yes       | 42,50         |
| <b>TOTAL</b>  |              |             |           | <b>100,00</b> |
| <b>Observations</b>   |              |             |           |               |
| <p>If the mean score is less than five points, The student can attend the extraordinary call exam. The scores of the partial exams will be kept and the student must take at least the part of the extraordinary exam corresponding to the partial exam in which he has obtained a grade of less than 5 points.</p> |              |             |           |               |
| <b>Observations for part-time students</b>  |              |             |           |               |
| <p>Part-time students may either take the exam in partial blocks like the rest of the students, or take a single exam of the entire subject in the ordinary call, which can be recovered, if necessary, in the extraordinary call.</p>  |              |             |           |               |

### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

#### BASIC

- Diseño en Ingeniería Mecánica , Shigley, R.G Budynas, J.K. Nisbett. Ed. McGraw Hill 2008.
- Diseño de Elementos de Máquinas, Libardo Vicente Vanegas Useche, Ediciones UTP 2018.
- Elementos de Máquinas, Karl-Heinz Decker, Ed. Urmo S.A. de Ediciones.
- Problemas de Elementos de Máquinas, Karl-Heinz Decker y Kabus, Ed. Urmo S.A. de Ediciones.
- 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.
- Elementos de Máquinas, G. Niemann, Ed Labor S.A
- Apuntes de la asignatura.