



**NATIONAL UNIVERSITY OF ENGINEERING  
COLLEGE OF MECHANICAL ENGINEERING  
MECHATRONICS ENGINEERING PROGRAM**

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**MC401 – MACHINE ELEMENTS**

**I. GENERAL INFORMATION**

<b>CODE</b>	: MC 401
<b>SEMESTER</b>	: 2
<b>CREDITS</b>	: 1
<b>WEEKLY HOURS</b>	: 2 (Theory)
<b>PREREQUISITES</b>	: Technical drawing.
<b>CONDITION</b>	: Mandatory

**II. COURSE DESCRIPTION**

Introduction to the elements of the machine. Characteristics and properties of materials, manufacturing processes, methods of protection, machine elements. Basic descriptive knowledge of the elements of machines, parts, components of: Mechanisms, machines, engines, systems and subsystems. Rivets Connections screwed. Welding. Flexible drives: flat belts, V-belts, chains, metal cables. Rigid transmissions: Gears, rigid shafts, flexible, grooved, couplings, brakes, clutches, bearings. Quays and springs. Structural profiles. Pipelines. Packaging.

**III. COURSE OUTCOMES**

El estudiante:

1. Identifies the machine elements that make up the mechanisms, machines and systems used in engineering.
2. Knows the materials, the manufacturing processes, the thermal treatments, thermochemicals, treatments of protection against the corrosion of the elements of machines that compose the mechanisms, machines and systems, applied in engineering.
3. Identifies the types of joints and their component parts, seals and roadblocks, as well as welding procedures used at joints; that compose the machines and systems.
4. Knows and identifies the rigid, flexible transmission elements and couplings that compose the machines and systems.
5. Knows and identifies the structural profiles, quays and springs that compose the machines and systems.

**IV. LEARNING UNITS**

**1. GENERAL INTRODUCTION / 2 HOURS**

General: About the machine elements.

**2. MATERIAL CHARACTERISTICS / 2 HOURS**

Characterization of materials / Requirements / Properties of materials manufacturing processes / Thermal treatments / Thermo-chemical treatments / Galvanic treatments / Normativity.

**3. MACHINE ELEMENTS / 2 HOURS**

Concepts and definitions: Machine elements, part, mechanism, types of mechanisms / Machines. Types of machines / Engine / Applications / Sources and energy transformation.

**4. REARED JOINTS / 2 HOURS**

Rivets, materials, types, shapes, riveting techniques / Applications / Basic calculations, problems.

**5. SCREWED UNIONS / 3 HOURS.**

Generalities, bolts, screws, types of screws, geometric relations, dimensions and proportions, nomenclature, nuts, washers, materials, applications.

**6. UNION SOLDIERS / 3 HOURS**

General / Types of welding / Types of joints / Welding positions / Welding equipment / Electrodes nomenclature / Applications.

**7. FLEXIBLE TRANSMISSIONS / 3 HOURS**

General / Shapewear, Shapewear, Shapewear, V-Belts, Pulleys, Belt Materials / Chains, Chain Types, Chain Materials, Lubrication Systems, Applications / Metallic Cables, Cable Types, Applications.

**8. RIGID TRANSMISSIONS: COUPLINGS / 3 HOURS**

Types, applications, assembly considerations / Clutches, types of clutches, applications / Brakes, brake types, applications / Axes, axle types: rigid, flexible, grooved, materials, applications.

**9. GEARS / 2 HOURS**

Types of gears: cylindrical gears of straight teeth, cylindrical of helical teeth, bevel gears with straight teeth, dimensions and proportions, bevel gears with straight and helical teeth, V-tooth gears / Applications.

**10. PACKAGING / 1 HOUR**

General, types of packing, materials, applications.

**11. PERFILES ESTRUCTURALES / 1 HORA**

Types of profiles, technical specifications, handling of the manual of the AISC, uses and applications.

**12. LUBRICANTS / 1 HOUR**

Characteristics, properties, viscosity, applications.

**13. RESORT / 1 HOUR**

Generalities, types, applications.

**14. BEARINGS / 2 HOURS**

Types of bearings, Ball bearings, cylindrical roller bearing, needle roller, tapered roller, semi-spherical roller, materials, applications.

#### **V. METHODOLOGY.**

The course will be developed in sessions of theory, in which the teacher, with the help of multimedia, videos, separatists, develops the concepts about the syllabic content, related to the characteristics, of the different elements of machines, materials and Manufacturing processes, examples of applications more common in industry and engineering, as well as their nomenclature, simple problems of application of each treated topic. Students will be advised to visit the faculty's workshops and laboratories in order to observe in a practical and direct way the different elements of machines and mechanical parts.

#### **VI. GRADING FORMULA**

Evaluation System "D". There will be 4 graded practices which are considered the three improvements for the arithmetic average.

Calculation of Final Average:  $PF = (P1 + P2 + P3) / 3$ ; P1, P2, P3, P4. Qualified practices eliminate the practice of lower scoring.

#### **VII. BIBLIOGRAPHY**

"Mechanical Engineering Project" - Author: Shigley. Editorial Mc. Graw Hill - Mexico 2008.

- Design of machine elements - Author: Alex Balance.
- Design of machine elements - Author: Faires.
- Manual of the Mechanical Engineer - Author Marks Lionell.
- Manual of the Mechanical Engineer - Author Kent.
- Manual of the Mechanical Engineer - Author Hütte.
- Tables of design of machine elements: Author Juan Hori Asano.
- Tables of design of machine elements: Author Fortunato Alva.
- Catalogs and technical manuals of the manufacturers of parts and elements of machines.