

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL AND METALLURGICAL ENGINEERING
ABET COURSE SYLLABI

ICM 2022 MECHANICAL DESIGN

Credits and contact hours:	10 UC credits / 10 hours (3 hours in lectures and 7 individual work hours per week)
Instructor's name:	Diego Celentano
Course coordinator's name	To be defined
Textbook:	Luzzadder, W. J. & J. M. Duff Fundamentos de dibujo en Ingeniería. México, Prentice Hall Hispanoamericana, 1994.
Course Catalog Description:	<p>This course provides students the tools needed to design a 3D parts, using a clear and unambiguous graphical expression, and to achieve a faster spatial analysis capacity.</p> <p>This course also describes the mechanical design methodology and delivers the basic concepts for students to apply on preliminary design of a mechanical product and its components. Fundamental rules of mechanical techniques will be reviewed, and the normalized mechanical elements will be analyzed, in order to set the foundations to select and calculate mechanical components. The students will use graphic design programs (CAD) and software to calculate strength of materials: joint and transmission elements.</p>
Prerequisite Courses:	ICM2028 Mechanics of Materials or ICE2313 Mechanics of Solids
Co-requisite Courses:	None
Status in the Curriculum:	Required
Course Learning Outcomes:	<ol style="list-style-type: none">1. To represent 3D objects, according to Chilean and international standards of drawing in engineering2. To model parts and pieces using CAD software.3. To produce mechanical blueprints of a machine.4. To apply Newton's laws, principles of rigid-body dynamics, stress strain formula, principles of engineering materials and mechanical science, related to mechanical design.5. To design joint elements, choosing from threaded or permanent joints.6. To identify transmission elements to select the most efficient according to requirements.7. To apply foundations of mechanical engineering to contribute in

mechanical design projects .

**Relation of Course to ABET
Criteria:**

- a. Knowledge of mathematics, science and engineering
- b. Design and conduct experiments: analyze and interpret data
- c. Design a system, component, or process
- e. Identify, formulate, and solve engineering problems
- f. Professional and ethical responsibility
- j. Knowledge of contemporary issues
- k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

1. Foundations of projection systems.
 - 1.1 System of projection planes and orthographic projection.
 - 1.2 Deducing orthographic view over: point, line y limited surface.
 - 1.3 Basic solids and general pieces.
 - 1.4 Sizing, projection plane transformation y auxiliary views.
 - 1.5 Entity intersection.
 - 1.6 Flat sections.
 - 1.7 Loss of material.
 - 1.8 Section views.
 - 1.9 Lateral surfaces development.
 - 1.10 Rotation and folding.
 - 1.11 Prismatic and cylindrical ducts, Prismatic and conical hopper and Metallic transition pieces.
2. Basic concepts of mechanical design.
3. Technical drawing in mechanics.
 - 3.1 Taper and tilt.
 - 3.2 Flanges.
 - 3.3 Superficial finish.
 - 3.4 Thread representation
4. CAD drawing.
 - 4.1 CAD software usage as a drawing tool, developing sheets and 3D
5. Development of manufacturing blueprints of a project.
6. Materials used in mechanical engineering.
 - 6.1 Engineering materials, terminology and classification.
7. Joint elements.
 - 7.1 Basic structural joints, using bolts, rivets and welding.
 - 7.2 Threaded elements: representation, thread classification, design of bolted joints.
 - 7.3 Rivets, pins, keys, locks.
 - 7.4 Welding: joint classification, welds and welding symbols, design of welding joints.
8. Shape tolerance, dimension and piece fitting.
 - 8.1 Piece sizing, with concepts and symbols from dimensional tolerance and shape of pieces. Piece fitting.
9. Transmission elements.
 - 9.1 Elements used to transmit motion from an engine to a machine.
 - 9.2 Selection of bearings from catalogs.

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