

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE  
SCHOOL OF ENGINEERING  
DEPARTAMENT OF CHEMICAL ENGINEERING AND BIOPROCESSES  
ABET COURSE SYLLABI

**IIQ2243 CHEMICAL PROCESSES DESIGN**

<b>Credits and contact hours:</b>	10 UC credits /10 hours (3 h. Lectures; 1,5 h. Assistantship; 5,5 h. Independent learning experiences)
<b>Instructor's name:</b>	Fernando de la Barra / Armin Lauterbach
<b>Course coordinator's name</b>	None
<b>Textbook:</b>	Perry, R. H. & D. W. Green Perry's Chemical Engineering's Handbook. 7 <sup>a</sup> Ed. Mc Graw Hill, 1997.
<b>Course Catalog Description:</b>	The process design course provides students with the necessary tools to apply knowledge of basic courses of process and operations to the design of equipments and chemical plants, combining economic analysis, design methods and fast costing with support of computational techniques. The evaluation is based on the development of a semester project.
<b>Prerequisite Courses:</b>	IIQ2113 Reactor Design and IIQ2013 Unit Operations I or IIQ2683 Microbial Biotechnology and IIQ2023 Unit Operations II or IIQ2673 Bioseparations.
<b>Co-requisite Courses:</b>	None
<b>Status in the Curriculum:</b>	Minimum course
<b>Course Learning Outcomes:</b>	<ol style="list-style-type: none"><li>1. Sizing and calculate equipment for mixing and stirring, separating and solids transporting.</li><li>2. Determine the steps to follow to transform a business opportunity or social necessity in an engineering problem, analyzing multiple alternatives.</li><li>3. Use the acquired knowledge in basic courses in fluid mechanics, heat transfer, processes and unit operations to bring a laboratory process to industrial scale.</li><li>4. Manage engineering diagrams to perform mass and energy balances and to assess processes performance and operational costs.</li><li>5. Designing, mechanically, equipment subjected to pressure; thickness calculations, bases, brackets and accessories. Engineering material handling.</li><li>6. Using computer programs to process design; processes, plants and costs recovery based on rates and factors.</li><li>7. Analyze a process from the concept of "producer services" (water,</li></ol>

steam, electricity, waste, etc.), Safety and legal, using as close to reality projects.

8. Working Group, developing leadership, job assignments, discussion of solution alternatives, etc and present and defend, in public, the progress of their projects. Simulating an engineering company or consultants.

**Relation of Course to ABET  
Criteria:**

- b. Design and conduct experiments: analyze and interpret data
- c. Design a system, component, or process
- d. Multidisciplinary teams
- e. Identify, formulate, and solve engineering problems
- f. Professional and ethical responsibility
- g. Effective communication
- h. Broad education necessary for global, economic, environmental and societal context
- i. Recognition of the need for, and an ability to engage in life-long learning
- j. Knowledge of contemporary issues
- k. Techniques, skills, and modern tools for engineering practice.

**Topics covered:**

1. Introduction to the process design.
  - 1.1 Alternatives, design level, block diagrams.
2. Process design.
  - 2.1 Batch and continuous processes, production services, layout and plants location.
  - 2.2 Optimization, engineering and uncertainty. Patents, MR, security.
3. Plant design.
  - 3.1 Materials: Corrosion, protection and selection.
  - 3.2 Mechanical Design.
  - 3.3 Piping: arbors, expansion joints, insulation, supports.
  - 3.4 Auxiliaries elements.
  - 3.5 Drawings, equipment specifications.
  - 3.6 Testing and commissioning
4. Selection of special equipment.
  - 4.1 Coilers, pumps, compressors, vacuum equipment, valves.
5. Rapid equipment design.
  - 5.1 Rapid design methods.
6. Super Pro Designer.
  - 6.1 Description of the program.
  - 6.2 Examples of use.
  - 6.3 Recommendations for use in the course.
7. Costs estimates and investments.
  - 7.1 Cost of equipment: sources of information, graphic correlations, price upgrade, size adjustments.
  - 7.2 Production costs; direct and indirect inputs, labor and depreciation.

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