PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
SCHOOL OF ENGINERING
DEPARTMENT OF INDUSTRIAL AND SYSTEM ENGINEERING
ABET COURSE SYLLABI

ICS1113 OPTIMIZATION

Credits and contact hours:	10 UC credits / 10 hours (2:40 hours lectures; 1:20 hours recitation and 6 hours individual work hours per week)
Instructor's name:	Alvarez Pamela, Larraín Homero, Vera Jorge, Cataldo Alejandro, Carrillo Pamela, Lüer Armin, Giesen Ricardo
Course coordinator's name	Vera Jorge
Textbook:	Ferrer, J.C. y Muñoz, J.C. "Apuntes de Optimización." Marzo 2006. Ortiz, C.; Varas, S.; Vera, J. (2000) "Optimización y Modelos para la Gestión." Dolmen ediciones. Hillier, F.; G. Lieberman. (1995) "Introduction to Operations Research." Sexta edición. McGraw-Hill. (Spanish versión, "Introducción a la Investigación de Operaciones".)
Course Catalog Description:	This course is an introduction to the major topics in Optimization. The student will be introduced to the analysis of engineering problems which can be solved using optimization techniques, and to model formulation, presenting in this way the first elements of the Operations Research discipline. The student will be exposed to the basic theory regarding characterization of solutions to deterministic problems as well as to the main solution techniques, including algorithms for linear and nonlinear problems. Students w develop a project during the semester to apply modeling skills and solution techniques.
Prerequisite Courses:	MAT1620 Calculus II and MAT1203 Linear Algebra
Co-requisite Courses:	None
Status in the Curriculum:	Required
Course Learning Outcomes:	1) Formulate optimization models in various decisions making situations, being able to identify decisions, constraints and objectives. 2) Understand the mathematical properties of Optimization Problems and apply them to identify solutions and its properties. 3) To understand and apply the SIMPLEX method for Linear Programming and other algorithms for nonlinear, integer and network problems. 4) Be familiar with the available software tools to solve optimization problems.

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Relation of Course to ABET Criteria:	b. Design and conduct experiments: analyze and interpret data d. Multidisciplinary teams e. Identify, formulate, and solve engineering problems f. Professional and ethical responsibility
Topics covered:	PART I: Motivation and preliminaries: introduction to Operations Research, model construction, basic concepts of minima and equivalent constructions. PART II: Linear Programming: standard form and the geometry of LP, the SIMPLEX method, sensitivity analysis and duality theory. PART III: Extensions to LP: Network Flow problems, Integer Programming and Dynamic Programming. PART IV: Nonlinear Optimization: unconstrained optimality conditions for minima and maxima, gradient and Newton method. Lagrange method and Karush-Kuhn-Tuker conditions. Methods for constrained problems.

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