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

IIQ2003 TRANSPORT PHENOMENA

Credits and contact hours:	10 UC credits / 10 hours (3 h. Lectures; 1,5 h. Labs; 5,5 h. Independent learning experiences)
Instructor's name:	Vartan Ishanoglu
Course coordinator's name	To be defined
Textbook:	R.S. Brodkey & H.C. Hershey. "Transport Phenomena: A Unified Approach", Brodkey Publishing, 1988. F.P. Incropera & D.P. DeWitt. "Fundamentos de Transferencia de Calor", John Wiley & Sons, 1999.
Course Catalog Description:	In order to design, modify and predict the behavior of any chemical process, the understanding of the underlying transport mechanisms: heat, mass and momentum are crucial. In this course, analytical tools are provided to the students that will allow them to quantify analytically the most relevant transport phenomena.
Prerequisite Courses:	ICH1104 Fluid Mechanics or ICH1104 Fluid Mechanics + ICH2314 Water Quality
Co-requisite Courses:	IIQ2133 Chemical Processes
Status in the Curriculum:	Required
Course Learning Outcomes:	1. Apply the heat, mass and momentum balances equations in combination with the molecular transport equations in: steady state and transient systems; with and without generation; one-dimensional and multidimensional. 2. Model and solve steady-state and transient systems using mass, energy and momentum balances in combination with the transport equations. 3. To recognize and apply the most important dimensionless numbers in heat, mass and momentum transfer. 4. Apply correlations to estimate friction, mass and heat coefficients.
Relation of Course to ABET Criteria:	a. Knowledge of mathematics, science and engineering b. Design and conduct experiments: analyze and interpret data e. Identify, formulate, and solve engineering problems.

Topics covered:

Chapter 1. Transport Phenomena Fundamentals

The Analogy: heat, mass and momentum transfer. Heat, mass and momentum diffusivities. Fick, Fourier and Newton's Law.

Chapter 2. The General Property Balance

The balance or conservation concept. The one, two and three dimensional balance equation. Steady state with and without generation. Transport with a net convective flow

Chapter 3. Convective Transport

Natural and forced convection. Boundary Layer. Laminar pipe flow. Heat and mass transfer during turbulent flow. Transport past immersed bodies.

Chapter 4. Unsteady-state Transport

Basic equations. Analytical and graphical solution. Case studies: slab, cylinder and sphere.

Chapter 5. Radiation

Black body radiation. Stefan-Boltzmann equation. Coupled heat transfer mechanisms.

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