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

ICM2223 HEAT TRANSFER

Credits and contact hours:	10 UC credits / 10 hours (3 h. Lectures / 7 h. Independent learning experiences)
Instructor's name:	Ignacio Lira
Course coordinator's name	To be defined
Textbook:	Lira, I. Elements of Heat Transfer (in Spanish). Students download these notes from the course's web page
Course Catalog Description:	Whenever there is a temperature difference between two parts of a system, energy is transferred from the hot zone to the cold area. We feel "hot" when our body has difficulties in releasing the energy produced internally by metabolism, and feel "cold" when the body activates physiological mechanisms that increase the internal energy generation and reduce its passage to the environment. The word "heat" designates the energy that passes from one place to another at a lesser temperature (its unit is the joule), while "heat transfer" designates the rate at which this phenomenon occurs (its unit is the watt, joules per second). Heat transfer is relevant for many daily activities and for several technological processes of significance in different branches of science and technology. It is thus of fundamental importance in the instruction of Mechanical Engineers.
Prerequisite Courses:	ICH1104 Fluid Mechanics
Co-requisite Courses:	None
Status in the Curriculum:	Required
Course Learning Outcomes:	1. To master the fundamental concepts of the three main mechanisms of heat transfer. 2. To apply the law of conservation of energy in mathematical model of those mechanisms. 3. To solve heat transfer problems, especially those of conduction, by means of the "five steps" methodology. 4. To understand the method of dimensional analysis for obtaining approximate solution to complex problems. 5. To be able to select and apply experimental correlations in convection phenomena. 6. To apply the concepts of surface and spatial resistances in radiation

problems.

7. To understand the main elements for designing and analyzing heat exchangers.
8. To be able to design simple heat transfer experiment.
9. To interpret the results of that experiment an present its results in a written report.

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
g. Effective communication
k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

1. Conduction
   1D steady-state conduction
   Electrical analogy
   The convection coefficient
   1D steady-state conduction + generation
   Unsteady conduction with uniform temperature
   Longitudinal conduction + transverse convection
   Finite differences
   Conduction + movement
2. Convection
   Dimensional analysis
   Dimensionless numbers in heat transfer
   Convection correlations
3. Heat exchangers
   The LMTD method
   The effectiveness method
4. Radiation
   Phenomenology
   Definitions and Kirchhoff's law
   Surface resistance
   Radiative exchange between surfaces
   Radiation intensity and solid angle
   Relation between radiation intensity and radiosity
   Vision factor and geometric resistances
   Evaluation of vision factors
   Radiation plus conduction and convection

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