

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
SCHOOL OF ENGINEERING
DEPARTMENT OF STRUCTURAL AND GEOTECHNICAL ENGINEERING
ABET COURSE SYLLABI

ICE2114 STRUCTURAL ANALYSIS I

Credits and contact hours: 10 UC credits/ 10 hours (3h Lecture; 3 h Assistantship; 4 h Independent Learning Experiences).

Instructor's name: Daniel Hurtado

Course coordinator's name Diego López-García

Textbook:

- Kassimali, A. (2001) Análisis estructural. 2da ed. Thomson, México DF.
- Leet, K.; Uang, C.; Gilbert, A. (2008) Fundamentals of structural analysis. 3rd edition. McGraw Hill, New York, USA.

Course Description: **Catalog** Knowing, understanding and applying current tools for the structural analysis, strain determination, distortions and displacements on linear, elastic structures under the effect of static forces.

Prerequisite Courses: ICE-2313 Mechanics of solids y ICE2005 Structural mechanics

Co-requisite Courses: None

Status in the Curriculum: Required

Course Outcomes: **Learning**

1. Understanding and applying the Principle of Virtual Work for distortion and displacement determination.
2. Analyzing statically undetermined structures by the Flexibility Method.
3. Analyzing statically undetermined structures by the Rigidity Method.
4. Implementing computer matrix methods for structural analysis.
5. Tracing strain and distortion lines of influence and determining envelopes.
6. Estimating strain and distortions on complex undetermined structures using the fundamental principles of structural analysis in order to make hypothesis and simplifications.
7. Understand the scope and limitations of current tools for structural analysis.

Relation of Course to ABET Criteria:

- a. Knowledge of mathematics, science and engineering
- c. Design a system, component, or process

Topics covered:

1. Fundamental concepts: determination of reactions and strain on isostatic bar structures, bidimensional and tridimensional frames, determination of distortions, local coordinate systems, strain-

distortion relations.

2. Virtual Work Principle: internal and external work, complementary work, virtual work principle, theorems, complementary virtual work principle.
3. Distortions calculation: determination of displacements on beams and frame structures.
4. Matrix analysis of structures: discretization, degrees of freedom, interpolation functions, Rigidity method, Flexibility method, global matrix, matrix equation of equilibrium, implementation using software MATLAB.
5. Manual methods for undetermined structures: Flexibility method, Rigidity Method. Calculating reactions, strain and distortions caused by temperature on frame structures.
6. Matrix analysis of structures:
 - a. Direct Rigidity Method.
 - b. Flexibility Method.
7. Influence lines: moving load, reactions and strain, defining influence lines, bridge structures, envelopes.