

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
COLLEGE OF ENGINEERING
DEPARTMENT OF MINING ENGINEERING
ABET COURSE SYLLABI

IMM3323 MINE EQUIPMENT MANAGEMENT

Credits and contact hours: 10 UC credits / 10 hours (3 h. Lectures; 1.5h. site visit and 5.5h. Independent learning experiences)

Instructor's name: Rodrigo Pascual

Course coordinator's name Viviana Fernandez

Textbook: N. Hastings: "Physical Asset Management, Springer.", 2010
M. Rausand, A.Hoyland. "System reliability theory: models and statistical methods" New York, J. Willey, 2004
A.K.S. Jardine, A. Tsang, "Maintenance, Replacement and Reliability", Pitman Publishing, 2nd ed, 2013
R Pascual: "El arte de Mantener, apuntes de cursos", Pontificia Universidad Católica de Chile, 2012.

Course Catalog Description: The course goal is training students to analyze availability and performance in mining equipment, to specify monitoring programs of equipment conditions and to evaluate emerging automation technologies potential in mining industry. Analyzing, planning and implementing equipment maintenance policies, learning replacement strategies for capital assets and inventory strategies for critical spares.

Prerequisite Courses: IMM2063 Conminution And Metallurgical Processes: or IMM2023: Conminution processes

Co-requisite Courses: None

Status in the Curriculum: Required

Course Learning Outcomes:

1. Recognize and apply basics availability and productivity analysis in mining equipment.
2. Assess and implement maintenance policies in mining equipment.
3. Specify and implement monitoring policy programs of equipment conditions
4. Evaluate mining equipment automation.
5. Perform replacement analysis in mining equipment.

**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
- f. Professional and ethical responsibility
- g. Effective communication
- h. Broad education necessary for global, economic, environmental and societal context.
- k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

- 1. Maintenance function.
 - 1.1. Introduction: Maintenance objectives; Maintenance strategies; KPI's; Mine/Plant situation (Chilean industry)
 - 1.2. Risks in maintenance: Qualitative risk estimation: Equipment failure understanding (RID model); Quantitative risk estimation: Failure data analysis (preliminary statistics).
- 2. Reliability analysis.
 - 2.1. Probability density functions and failure rate.
 - 2.2. Weibull analysis: Weibull distribution (2 and 3 parameters); Data censoring.
- 3. Maintenance decision optimization, decision models.
 - 3.1. Failure cost understanding.
 - 3.2. Optimal preventive part replacement: Expected cost; Expected life; Optimal replacement model.
 - 3.3. Inspection interval optimization: Optimal inspection frequency; Failure finding intervals.
 - 3.4. Condition-Based Maintenance (CBM) optimization: CBM candidates; Proportional Hazards Model.
- 4. Reliability data structures.
 - 4.1. Necessary data: Basic definitions; Common problems.
 - 4.2. Information processes for reliability analysis: Information structures for reliability centered knowledge; Living RCM.