



**NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING
MECHATRONICS ENGINEERING PROGRAM**

MS213 – ENGINEERING ECONOMICS AND FINANCE

I. GENERAL INFORMATION

CODE	: MS213 Engineering Economics and Finance
SEMESTER	: 9
CREDITS	: 2
HOURS PER WEEK	: 4 (Theory – Practice)
PREREQUISITES	: 90 credits
CONDITION	: Compulsory

II. COURSE DESCRIPTION

This course is theoretical and practical and its general objective is to provide students with the conceptual and practical framework regarding the analysis and solutions approach to technical-economic problems in the Mechanical Engineering field. It deals with financial mathematics, cost-benefit analysis, economic and financial assessment of mechanical engineering projects.

III. COURSE OUTCOMES

1. Identify and analyze technical-economic problems in businesses and projects belonging to the civil engineering field.
2. Apply financial mathematics and the principles of the cost-benefit analysis in the technical-economic assessment of the alternatives of solution in engineering surveys.
3. Develop creativity, rationality, effectiveness and economy in the analysis and assessment of the engineering solutions, seeking environmental quality and preservation.
4. Apply the cost-benefit analysis principles and procedures to guide and assess projects of basic applied research.
5. Analyze the possible the project operation conditions assessing its advantages and disadvantages.
6. Assess the feasibility of private investment projects and understand the importance of the social assessment of the public projects.

IV. LEARNING UNITS

1. TECHNICAL-ECONOMIC PROBLEMS AND PREINVESTMENT STUDIES / 4 HOURS

Mechanical Engineering sphere / Types of technical-economic problems, variables involved. Rational process of problem solving. Problem tree and solution tree. Investment projects. General process of project development. Preinvestment studies importance, objectives and characteristics. Contents of the study.

2. FINANCIAL MATHEMATICS / 4 HOURS

Economic value of time. Financial formulas and deductions. Nominal interest rate and effective interest rate. Inflation effect. Interest rate.

3. GENERAL THEORY OF PROJECTS ASSESSMENT / 28 HOURS

Costs in the execution and operation of projects. Investment costs and operation costs. Schedule of Investments and operation costs budget. Projects benefits and income. Project assessment. Cost-benefit principle. Project viability levels. Project assessment indexes. Types of indexes. Cost-benefit temporal flow. Cost-benefit temporal graph. Net current value. Index concept, calculation and application. Application

cases. Internal rate of return. Index concept, calculation and application. Application cases. Opportunity cost of capital. Shares in Peru. Relationship between Net current value and Internal rate of return. Application of the net current value for assets assessment. Annual equivalent cost, application cases. Present value of costs.

4. BUSINESS ASSESSMENT AND PROJECTS FINANCING / 16 HOURS

Economic assessment of projects: Project economic flow, business profitability before and after taxes. Civil engineering projects financing. Types of financing. Financing structure. Loan characteristics. Project financing management. Financing quantitative aspects. Application of the internal rate of return in the financing alternatives assessment. Credit effective interest. Leasing financing. Real state project promotion. Market study. Product definition. Technical and economic aspects of the promotion. Schedule. Financing alternatives. Project cash flow. Concession system.

5. PROJECT SOCIAL ASSESSMENT / 8 HOURS

Project social assessment: Similarities and differences regarding business assessment. Externalities and social prices. Social profitability of public projects. Cost effectiveness. National investment system. System phases. Minimal content of Preinvestment studies.

6. UNCERTAINTY ANALYSIS IN PROJECTS ASSESSMENT / 4 HOURS

Project risk and uncertainty: Sensitivity analysis and other methods. Montecarlo's method.

V. CONTINUOUS EVALUATION

Quiz 1: Project definition. Market identification.

Quiz 2: Demand and offer projections. Technical optimization.

Quiz 3: Economical and financial evaluation. Social evaluation.

Quiz 4: Sensibility and risks analysis.

VI. METHODOLOGY

An active method in the learning-teaching process is used in this course. Students participate in this method every class either individually or in work groups. The instructor exposes and gives examples to complement the students' activity, using the available audiovisual aids. Cases are analyzed through debate and dialogs, apart from reflexive readings. Classroom work, with the help of the computers, is complemented with homework given by the instructor which students should expose.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

$$PF = 0.5 PP + 0.5 TE$$

PP: Average of five quizzes

TE: Average of three reports

VIII. BIBLIOGRAPHY

1. SAPAG CHAIN NASSIR

Investment projects, Formulation and Assessment
Pearson-Prentice Hall Editorial, Mexico, 2007