



NATIONAL UNIVERSITY OF ENGINEERING COLLEGE OF CIVIL ENGINEERING

CIVIL ENGINEERING PROGRAM

SYLLABUS - ECONOMICS ENGINEERING

I. GENERAL INFORMATION

CODE	: EP820
SEMESTER	: 10
CREDITS	: 4
HOURS PER WEEK	: 5 (Theory – Practice)
PREREQUISITES	: PA814 Business Technology Management
CONDITION	: Elective
DEPARTMENT	: Construction
INSTRUCTOR	: Alberto Ramirez
INSTRUCTOR E-MAIL	: are@yahoo.es

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 Civil Engineering field. It deals with financial mathematics, cost-benefit analysis, economic and financial assessment of civil 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

Civil 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

IX. COURSE CONTRIBUTIONS TO STUDENT OUTCOMES ATTAINMENT

Course contributions to Student Outcomes are shown in the following table:

K = Key

R = Related

Empty box = Does not apply

	Outcome	Contribution
Engineering Design	Design civil works satisfying requirements and needs as well as given constraints and limitations.	
Problem solving	Identify, formulate and solve engineering problems properly using the methods, techniques and tools of civil engineering.	K
Sciences Application	Apply the knowledge and skills of mathematics, sciences and engineering to solve civil engineering problems.	K
Experimentation	Conceive and conduct experiments, analyze data and interpret results	
Modern Engineering	Use and apply techniques, methods and tools of modern engineering necessary for the practice of civil engineering.	R
Engineering Impact	Understand the impact of engineering solutions on people and society in local and global contexts.	R
Project Management	Plan and manage civil engineering projects taking into account efficiency and productivity criteria.	K
Environmental Appraisal	Takes into account the importance of preserving and improving the environment in the development of their personal and professional activities.	K
Lifelong Learning	Recognize the need to keep their knowledge and skills up to date according to advances of civil engineering and engage in lifelong learning.	R
Contemporary Issues	Know and analyze relevant contemporary issues in local, national and global contexts.	R
Ethics and Professional Responsibility	Evaluate their decisions and actions from a moral perspective and assume responsibility for the executed projects.	R
Communication	Communicate clearly and effectively in oral, written and graphical formats, interacting with different types of audiences.	K
Teamworking	Appraise the importance of teamworking and participate actively and effectively in multidisciplinary teams.	K