

INSTITUTO POLITÉCNICO NACIONAL
SECRETARÍA ACADÉMICA
DIRECCIÓN DE EDUCACIÓN SUPERIOR



SYNTHESIZED SCHOOL PROGRAM

ACADEMIC UNIT: Escuela Superior de Cómputo

ACADEMIC PROGRAM: Ingeniería en Sistemas Computacionales.

LEARNING UNIT: Economic Engineering

LEVEL: III

AIM OF THE LEARNING UNIT:

The student determines the specific economic evaluation method from different investment alternatives on the basis of the economic feasibility of the same.

CONTENTS:

- I. Introduction to economic engineering.
- II. Value of money over time.
- III. Assessment of economic alternatives.
- IV. Depreciation, taxes and financing in the economic evaluation.
- V. Effects of inflation on the economic assessment.

TEACHING PRINCIPLES:

This unit will be addressed from the case-based learning strategy. The teacher applies the inductive method, with these will be carried out learning activities in class. The teacher encourage students some techniques, such as: collaborative work, participatory work, brainstorming, graphic organizers, inquiry documentary, work sheets, exhibitions of complementary subjects directed discussion. It promotes self-learning and teamwork.

EVALUATION AND PASSING REQUIREMENTS:

This Learning Unit will be assessed in terms of the portfolio of evidence, which is formed by: formative evaluation, summative and headings for self-evaluation, coevaluation and heteroevaluation.

This learning unit can also be proven by:

- Proven competence, by means of evaluation theory and practice, by performing the practices of the 5 through 11.
- Official recognition by either another IPN Academic Unit of the IPN or by a national or international external academic institution besides IPN.

REFERENCES:

- Baca Urbina, Gabriel. (2007). *Ingeniería Económica*. (Cuarta Edición). México: Mc-Graw-Hill. ISBN 9701061136.
- Blank. L. T. y Tarkin. A. J. (2006). *Ingeniería Económica*. (Sexta Edición). México: Mc-Graw-Hill. ISBN 9701056086.
- Ciseell, R. y Cissell, H. (2006). *Matemáticas Financieras*. (Segunda Edición). México: Continental. ISBN 968-26-0752-3.
- Hernández Hernández, A. (2006). *Matemáticas Financieras*. México: Cengage Learning Editores. ISBN 970686475X.
- Neftci, S. (2008). *Ingeniería Financiera*. México: McGraw-Hill Interamericana. ISBN: 9701066294.



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ACADEMIC UNIT: Escuela Superior de Cómputo.

ACADEMIC PROGRAM: Ingeniería en Sistemas Computacionales

LATERAL OUTPUT: Analista Programador de Sistemas de Información.

FORMATION AREA: Professional.

MODALITY: Presence.

LEARNING UNIT: Economic Engineering.

TYPE OF LEARNING UNIT: 1) Theoretical - Practical
2) Optative.

VALIDITY: August, 2011

LEVEL: III.

CREDITS: 7.5 Tepic, 4.39 SATCA

ACADEMIC AIM

The knowledge of Economic Engineering are essential in the formation of the engineer because it in their activities must plan, negotiate, analyze, design and strategically coordinate projects in the field of computational systems.

Decisions to select all types of alternatives on investments such as: changes to existing products, innovations of technological processes and acquisition of machinery and/or equipment, introduction of methods of work, expansion of installed capacity, infrastructure works, require the completion of a solid economic analysis that improve decision-making in the selection of optimal alternatives. As well as develops strategic thinking, creative thinking, collaborative work, and participatory and assertive communication.

Also this assessment must resort to some robust method of analysis. It is precisely the Economic Engineering, includes not only the methods of evaluation of alternatives, but extends from the generation of alternatives until the prediction of its consequences; which requires theoretical and practical abilities, that used throughout their professional development and through the assessment of competences acquired in units of learning precedents: Linear Algebra, probability and Statistics, Financial Management and economic fundamentals.

This learning unit is related to the drive of collateral learning Project Management.

AIM OF THE LEARNING UNIT:

The student determines the specific economic evaluation method from different investment alternatives on the basis of the economic feasibility of the same.

CREDITS HOURS

THEORETICAL CREDITS / WEEK: 3.0

PRACTICAL CREDITS / WEEK: 1.5

THEORETICAL HOURS/SEMESTER:
54

PRACTICAL HOURS / SEMESTER: 27

AUTONOMOUS LEARNING HOURS:
54

CREDITS HOURS / SEMESTER: 81

LEARNING UNIT DESIGNED BY:
Academia de Ciencias Básicas.

REVISED BY:
Dr. Flavio Arturo Sánchez Garfias.
Subdirección Académica

APPROVED BY:
Ing. Apolinar Francisco Cruz Lázaro.
Presidente del CTCE

AUTHORIZED BY: Comisión de Programas Académicos del Consejo General Consultivo del IPN

Ing. Rodrigo de Jesús Serrano Domínguez
Secretario Técnico de la Comisión de Programas Académicos

THEMATIC UNIT: I

TITLE: Introduction economic engineering.

UNIT OF COMPETENCE

The student characterizes the main definitions, practical applications and the importance of economic engineering, in decision-making based on the analysis of their alternatives.

No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	
1.1	Definition and importance of economic engineering.	1.0		1.5		1B, 2B, 4B, 5C
1.1.1	Application.					
1.1.2	Relationship with other disciplines.					
1.2	Economic Engineering in decision-making.	0.5			1.5	
1.2.1	Approach of alternatives and factors that implies a decision.					
	Subtotals:	1.5		1.5	1.5	

TEACHING PRINCIPLES

Framing of the course and team building.

This unit will be addressed from the case-based learning strategy and the inductive method, what will allow for the consolidation of the following learning techniques: brainstorming, tab of work: inquiry documentary, directed discussion, conceptual maps, problem solving, exposure as a team of complementary subjects.

LEARNING EVALUATION

Diagnostic Test

Project Portfolio: Evidences:

Tab work	5%
Conceptual Map	5%
Exercise-solving	10%
Cooperative Presentation	10%
Report of Practicals	20%
Self-Evaluation Rubrics	5%
Cooperative Evaluation Rubric	5%
Written Learning Evidence	40%

THEMATIC UNIT: II			TITLE: Value of the money in time.			
UNIT OF COMPETENCE						
The student solves practical cases in engineering, based on the concept of the value of the money in time and the development of the formulas for compound interest.						
No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	
2.1	The value of money over time.	1.5		2.0	3.0 3.0	1B, 2B, 4B
2.2	Simple interest and compound interest.	1.5		2.5		
2.3	Nominal Rate and effective rate.	1.0		2.0		
2.4	Capitalisation continues and unobtrusive manner.	1.0		1.5		
2.5	Development of formulas.	1.5		1.0		
2.5.1	Notation of formulas.					
2.5.2	Factor of composite amount.					
2.5.3	Factor of present value.					
2.5.4	Factor in depreciation fund.					
2.5.5	Factor of composite amount uniform series.					
2.5.6	Recovery Factor capital.					
2.5.7	Factor in the gradient.					
	Subtotals:	6.5		9	6	
TEACHING PRINCIPLES						
This unit will be addressed from the case-based learning strategy and the inductive method, what will allow for the consolidation of the following learning techniques: inquiry documentary, directed discussion in the round tables, resolution of problems, exposure in computer of supplementary issues.						
LEARNING EVALUATION						
Project Portfolio:						
Discussions aimed at Round Tables		10%				
Exercise-solving		10%				
Cooperative Presentation		10%				
Reports of Practicals		20%				
Self-Evaluation Rubrics		5%				
Cooperative Evaluation Rubric		5%				
Written Learning Evidence		40%				

LEARNING UNIT::

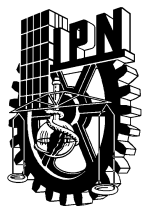
Economic Engineering

PAGE: 5 OUT OF 10

THEMATIC UNIT: III			TITLE: Assessment of economic alternatives.			
UNIT OF COMPETENCE						
The student applies the main methods of evaluation of economic alternatives on the basis of the effect on the decision-making.						
No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	
3.1	Method of the net present value (VPN).	1.5	0.5	1.5	1.0	1 B, 2B, 3C, 4B, 5C
3.2	Method of the annual cost uniform equivalent (CAUE)	1.5	0.5	1.5	1.0	
3.3	Minimum rate acceptable performance (TMAR).	1.5		1.5	1.5	
3.4	Method of the internal rate of return (TIR).	1.0		1.5	1.5	
3.5	Incremental analysis.	2.0		2.0		
3.5.1	Implementation of the CAUE and analysis incremental for the replacement of the computer.					
3.6	Cost-benefit.	1.5		1.5	1.5	
	Subtotals:	9	1	9.5	6.5	
TEACHING PRINCIPLES						
This unit will be addressed from the case-based learning strategy and the inductive method, what will allow for the consolidation of the following learning techniques: inquiry into practical cases, directed discussion, problem solving, exposure as a team of complementary subjects.						
LEARNING EVALUATION						
Project Portfolio: Inquiry into Practicals cases 10% Directed Discussion 10% Exercise-solving 10% Cooperative Presentation 10% Reports of Practicals 20% Self-Evaluation Rubrics 5% Cooperative Evaluation Rubrics 5% Written Learning Evidence 30%						

THEMATIC UNIT: IV		TITLE: Depreciation, taxes and financing in the economic evaluation.					
UNIT OF COMPETENCE							
The student relates the main definitions of economic evaluation on the basis of the theoretical tools of the inductive method of economic engineering.							
No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY	
		T	P	T	P		
4.1 4.1.1 4.1.2 4.1.3	Definition, calculation and interpretation. Depreciation. Taxes. Financing.	2.0	0.5	2.5	2.5	1 B, 2 B, 4B, 3C	
4.2 4.2.1 4.2.2 4.2.3	Economic assessment considering depreciation factors, taxes and financing. Method of the present value. Method of the internal rate of return. Replacement of equipment by paying the taxes.	2.0		1.5	3.0		
Subtotals:		4.0	0.5	4.0	5.5		
TEACHING PRINCIPLES							
This unit will be addressed from the case-based learning strategy and the inductive method, what will allow for the consolidation of the following techniques of learning: tab of work: inquiry documentary, directed discussion, conceptual maps, troubleshooting, exposure in computer of supplementary issues.							
LEARNING EVALUATION							
Project Portfolio:							
Tab work		5%					
Conceptual Map		5%					
Exercise-solving		10%					
Cooperative Presentation		10%					
Reports of practicals		20%					
Self-Evaluation Rubrics		5%					
Cooperative Evaluation Rubrics		5%					
Written Learning Evidence		40%					

THEMATIC UNIT: V		TITLE: Effects of inflation on economic assessment.					
UNIT OF COMPETENCE							
The student analyzes the effects originated by inflation in the study of economic alternatives on the basis of the effect on the decision-making.							
No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY	
		T	P	T	P		
5.1 5.1.1 5.1.2 5.1.3	Inflation. Definition. Causes. Effects.	2.0		2.5		1B, 2B, 4B, 5C	
5.2 5.2.1 5.2.2	Calculation of the VPN with inflation and financing. Method of the net present value (VPN). Method of the internal rate of return (TIR).	2.5		2.0	6.0		
	Subtotals:	4.5		4.5	6		
TEACHING PRINCIPLES							
This unit will be addressed from the case-based learning strategy and the inductive method, what will allow for the consolidation of the following techniques of learning: tab of work: inquiry documentary, directed discussion, mental maps, use cases, resolution of problems, exposure as a team of complementary subjects.							
LEARNING EVALUATION							
Project Portfolio:							
Tab work		5%					
Use Cases		5%					
Directed Discussion		5%					
Mental Maps		5%					
Exercise-solving		10%					
Cooperative Presentation		10%					
Report of Practicals		20%					
Self-Evaluation Rubrics		5%					
Cooperative Evaluation Rubrics		5%					
Written Learning Evidence		30%					



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LEARNING UNIT::

Economic Engineering.

PAGE: 8 **OUT OF** 10

RECORD OF PRACTICALS

No.	NAME OF THE PRACTICAL	THEMATIC UNITS	DURATION	ACCOMPLISHMENT LOCATION
1	Implementation of alternatives in decision-making.	I	1.5	Physics Laboratory.
2	Determination of the basic formulae Economic Engineering.	II	3.0	
3	Implementation of the basic formulae Economic Engineering in the use cases. Method.	II	3.0	
4	Implementation of the Net Present Value.	III	1.5	
5	Implementation of the method of the annual cost Uniform equivalent.	III	1.5	
6	Implementation rate minimum acceptable performance.	III	1.5	
7	Implementation of the method of the Internal Rate of Return.	III	1.5	
8	Implementation of the Incremental analysis and cost-benefit analysis.	III	1.5	
9	Implementation of the depreciation in Economic Engineering.	IV	3.0	
10	Application of the factors of economic evaluation (tax and financing).	IV	3.0	
11	Implementation of a program that solves the calculation of the VPN with inflation and financing.	V	6.0	
		TOTAL OF HOURS	27.0	
EVALUATION AND PASSING REQUIREMENTS:				
The practicals contribute 20% of the rating for each thematic unity, and 20% of the final grade. It is not requirement essential to adopt practicals to accredit the learning unit.				



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LEARNING UNIT::

Economic Engineering.

PAGE: 9 **OUT OF** 10

PERÍODO	UNIDAD	EVALUATION TERMS
1	I	Continuous evaluation 60% and written learning evidence 40%.
2	II	Continuous evaluation 60% and written learning evidence 40%.
3	III	Continuous evaluation 70% and written learning evidence 30%.
4	IV	Continuous evaluation 60% and written learning evidence 40%.
5	V	Continuous evaluation 70% and written learning evidence 30%.
<p>The learning unit I and II is 33% worth of the final score. The learning unit III is 33% worth of the final score. The learning unit IV and V is 34% worth of the final score.</p> <p>Other means to pass this Learning Unit:</p> <ul style="list-style-type: none"> Proven competence, by means of evaluation theory and practice, by performing the practices of the 5 through 11. Official recognition by either another IPN Academic Unit of the IPN or by a national or international external academic institution besides IPN. <p>If accredited by Special Assessment or a certificate of proficiency, this will be based on guidelines established by the academy on a previous meeting for this purpose.</p>		

KEY	B	C	REFERENCES:
1	X		Baca Urbina, Gabriel. (2007). <i>Ingeniería Económica</i> . (Cuarta Edición). México: Mc-Graw-Hill. ISBN 9701061136.
2	X		Blank. L. T. y Tarkin. A. J. (2006). <i>Ingeniería Económica</i> . (Sexta Edición). México: Mc-Graw-Hill. ISBN 9701056086.
3		X	Ciseell, R. y Cissell, H. (2006). <i>Matemáticas Financieras</i> . (Segunda Edición). México: Continental. ISBN 968-26-0752-3.
4	X		Hernández Hernández, A. (2006). <i>Matemáticas Financieras</i> . México: Cengage Learning Editores. ISBN 970686475X.
5		X	Neftci, S. (2008). <i>Ingeniería Financiera</i> . México: McGraw-Hill Interamericana. ISBN: 9701066294.



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TEACHER EDUCATIONAL PROFILE PER LEARNING UNIT

1. GENERAL PERFORMANCE

ACADEMIC UNIT: Escuela Superior de Cómputo

ACADEMIC PROGRAM: Ingeniería en Sistemas Computacionales NIVEL III

FORMATION AREA:

Institutional	Basic Scientific	Professional	Terminal and Integration
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ACADEMY Ciencias Básicas. LEARNING UNIT:: Economic Engineering

SPECIALTY AND ACADEMIC REQUIRED LEVEL: Masters Degree in Applied Mathematics, Industrial Engineering or related areas.

2. AIM OF THE LEARNING UNIT:

The student determines the specific economic evaluation method from different investment alternatives on the basis of the economic feasibility of the same.

3. PROFESSOR EDUCATIONAL PROFILE:

KNOWLEDGE	PROFESSIONAL EXPERIENCE	ABILITIES	APTITUDES
Knowledge of mathematical finance at the senior level. In the MEI.	<ul style="list-style-type: none">• One year of experience as a teacher at the top level in the area of basic sciences.• Two years of experience dedicated to professional activities related to some area of mathematical finance.	<ul style="list-style-type: none">• Analysis and synthesis.• Leadership.• Decision-making.• Conflict Management.• Managing groups.• Verbal fluency of ideas.• Teaching skills.• Implement the MEI.	<ul style="list-style-type: none">• Responsible.• Honest.• Respectfully.• Tolerant.• Collaborative.• Assertive.• Participatory.

DESIGNED BY

REVISED BY

AUTHORIZED BY

M. en C. Ángel Morales González
Lic. Judith Margarita Tirado Lule
Profesores colaboradores

Dr. Flavio Arturo Sánchez Garfias
Subdirector Académico

Ing. Apolinar Francisco Cruz Lázaro
Director

Date: 2011