WASC Accreditation
Educational Effectiveness Review

Bachelor's in Industrial Engineering.
The program is currently offered in the following Campuses: Mexicali, Tijuana and Ensenada.

Last Program Review: November 2007

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1. **Introduction.**

The Mission of the Bachelor's in Industrial Engineering Program is the creation, assimilation, integration and dissemination of the knowledge pertaining to Industrial Engineering via the development of full time students with high potential, to acquire and update their abilities to position themselves as engineering leaders.

The Vision of the Bachelor's in Industrial Engineering Program is be the primary source in the region for professionals that use and expand the knowledge of industrial engineering focused on the operation, improvement and innovation of processes for acquiring, producing, selling and delivering of product of services.

The Bachelor's in Industrial Engineering Program was launched in the Mexicali Campus in 1962, in the Tijuana Campus in 1980, and in the Ensenada Campus in 1981. Since 1962, it has undergone around 10 major reviews, the most important ones being in 1992, 2000, 2004, and 2007.

The total number of alumni for the program, for the Mexicali Campus is around 840, for the Tijuana Campus around 200, and for the Ensenada Campus around 200.

Some significant achievements relating to the Bachelor's in Industrial Engineering Program are:

- The program received the accreditation by CACEI in October of 2005.
- The program was the first engineering program that was launched by CETYS University.
- The first graduate with a Bachelor's Degree in the state of Baja California is an Industrial Engineer from CETYS University (1966).
- The program has the most number of alumni.
- The program has had a strong linkage with Industry throughout its existence, with students doing their professional practice in local companies such as Kenworth, Zahori, Emermex, Honeywell, Ascotech to name a few, and companies abroad like CoastCast.
- The program has alumni working in high level job positions in local companies like Kenworth, Zahori, Emermex, Honeywell, Ascotech to name a few.
- The program has had alumni working in high level job positions in government and the public sector, as well as Chambers of Entrepreneurs.
- The second book published by the CETYS University Editorial Project is "*Simulación de Evento Discreto*" ("Discrete Event Simulation") by full-time faculty M.S. Héctor Vargas.

2. Denomination and description of the academic program.

The Bachelor's in Industrial Engineering Program is focused on the following Primary Areas of Knowledge, also called Professional Formation Lines:

a) Materials and Manufacturing Processes.
b) Supply Chain Management.
c) Quality and Economics Engineering.
d) Optimization and Engineering of Human Activity Systems.

Also, as part of the 2007 program review, the following Complementary Areas of Knowledge have been added, also known as Complementary Formation Lines, or the Emphasis options of the program:

a) Logistics and Operations.
b) Strategic Management of Manufacturing.

To obtain the degree, a student must complete the following requirements:

- Accreditation of 42 courses (totaling 328 credits) for the 2004 programs and 42 courses plus 4 additional Complementary Formation Line courses (totaling 360 credits) for the 2007 programs.
- Completing 400 hours of professional practice.
- Completing 500 hours of social service.
- Completing the corresponding EGEL examination administered by CENEVAL.
- Completing any of the degree obtainment requirements established by CETYS University.

The program has chairs by campus, who are full time faculty that are in charge of the program, and are involved in enrollment and promotional activities, student guidance and alumni follow up, program review, accreditation projects, etc.:

- M.S. César Barraza – Mexicali Campus.
- M.S. Enrique Fitch – Tijuana Campus.
- M.S. Carlos González– Ensenada Campus.

The Faculty that are associated with the program, and who are members of the Academy of Industrial Engineering are:

- M.S. Mauro Chávez – Mexicali Campus
- M.S. Ezequiel Rodríguez – Mexicali Campus
- M.S. Héctor Vargas – Mexicali Campus
- M.S. Enrique Fitch – Tijuana Campus
- M.S. Salvador Chiu – Tijuana Campus
- M.S. Carlos González – Ensenada Campus
- M.S. Socorro Lomelí – Ensenada Campus

The students of the program are full time, primarily male and the proportion of local to out of state students is about 3 to 1 and most of the students receive some sort of financial aid, the primary one being the Pro-Engineering scholarship.

The program currently has the following laboratories by campus:

- Mexicali: Physics, Industrial Engineering Computer Laboratory, Chemistry, Machine Shop, Production Systems, Processes Laboratory.
- Tijuana: Physics, General Electronics, Production Systems, Industrial Computer labs.
- Ensenada: Physics, General Electronics, Physics, General Electronics, Production Systems, Industrial Computer labs.

Student population - Mexicali			
Semesters	**Male**	**Female**	**Total**
1 and 2	33	16	49
3 and 4	17	8	25
5 and 6	16	13	29
7 and 8	34	14	48
Total	100	51	151
Percentage	66.2%	32.8%	100%

Student population – Tijuana			
Semesters	**Male**	**Female**	**Total**
1 and 2	20	4	24
3 and 4	11	14	25
5 and 6	16	2	18
7 and 8	16	11	27
Total	63	31	94
Percentage	67.0%	33.0%	100%

Student population - Ensenada			
Semesters	**Male**	**Female**	**Total**
1 and 2	9	4	13
3 and 4	9	2	11
5 and 6	6	1	7
7 and 8	12	4	16
Total	36	11	47
Percentage	76.5%	23.5%	100%

August – December 2007 (SIA-CETYS)

3. Educational Objectives of the academic program.

The Educational Objectives that the Academy of Industrial Engineering have established for the Bachelor's in Industrial Engineering are the following:

- The alumni of this program will work in projects involving the areas of knowledge of industrial engineering for applications in local industry.
- The alumni of this program will be a project leader for projects involving the areas of knowledge of industrial engineering for applications in local industry.
- The alumni from this program will be able to do consulting projects in the areas of knowledge of industrial engineering for applications in local industry.
- The alumni from this program will be able to pursue graduate studies with success.
- The alumni from this program will be able to find a professional job within 6 months after graduation.
- The graduate from this program will be able to start his/her own business.
- The graduate from this program will be able to fill middle or top manager positions with in 3 years after graduation.

These Educational Objectives will be the primary focus for alumni studies and follow up, which will be used for various purposes during the assessment cycle, as well as program review.

4. Learning outcomes of the program and metrics for assessment.

There are 5 Learning Outcomes for all Engineering Bachelor's Programs that have been established by the Academies of the Engineering College, that describe knowledge, abilities and attitudes that every engineering student must achieve by the end of the academic program. These are:

The student of a CETYS University Bachelor's in Engineering Program will…

- SLO_ENG1: …correctly apply to engineering, the tools provided by the basic sciences, such as physics, calculus, probability, statistics and programming to the solution of diverse problems.
- SLO_ENG2: …design analytic and functional models, quantitatively and qualitatively, for the analysis and improvement of systems for diverse applications.
- SLO_ENG3: … effectively use software tools and technologies to build solutions to engineering problems.
- SLO_ENG4: … effectively design and manage projects.
- SLO_ENG5: … (Clear and effective communication in English) … be able to express his ideas clearly and with an appropriate language, in a verbal, written, and visual way in English.

The Learning Outcomes that the Academy of Industrial Engineering have established for the Bachelor's in Industrial Engineering are grouped into 4 that correspond to the Professional Formation Lines and 1 for each of the 2 Complementary Formation Lines or Emphasis options of the program. These are:

The student of the Bachelor's in Industrial Engineering program will…

- SLO_II1: … select materials and processes that respond to the requirements of a sustainable society.
- SLO_II2: … develop and manage quality management systems with focus on continuous improvement, in to generate competitive processes pertaining to the generation of products and services.
- SLO_II3: … develop and manage the supply chain with an integral vision, beginning with the needs of the client, and ending with the delivering of the product or service.
- SLO_II4: … apply models of optimization to design, manage and improve systems that respond to global strategies to make an organization competitive in the production of products and services.

The student of the Bachelor's in Industrial Engineering with an Emphasis in Logistics and Operations will…

- SLO_LOP: … analyze and improve practices related to the supply of materials to guarantee the operational objectives of the organization.

The student of the Bachelor's in Industrial Engineering with an Emphasis in Strategic Management of Manufacturing will…

- SLO_AEM: … develop and establish strategic processes of the operations that contribute to the competitive positioning of an organization.

The above student learning outcomes are a work in progress and are a part of the assessment cycle and program review, however we are just beginning to understand and develop tools to measure them.

#	Student Learning Outcomes	Metrics to evaluate student performance	Evidence of achieved learning
1	SLO_ENG1	Currently the system that is in place to evaluate student performance is a scale of 0 to 100, where a grade above 70 is considered as "passing" and below as "failing". Rubrics for the Engineer College are being developed to evaluate these learning outcomes. The rubrics are being developed by the Academy of Basic Sciences in conjunction with the other Academies of the Engineering College.	Student Work and Final Projects from selected courses (i.e. Physics II and III, Statistical Inference, Programming Methods II, Numerical Methods). EGEL Examination (Basic Sciences areas).
2	SLO_ENG2		
3	SLO_ENG3		
4	SLO_ENG4		
5	SLO_ENG5	This learning outcome is measured by the English Language Center (ELC) using appropriate performance standards for the study of ESL.	Student work follow up administrated by ELC.
6	SLO_II1	Currently the system that is in place to evaluate student performance is a scale of 0 to 100, where a grade above 70 is considered as "passing" and below as "failing". Rubrics to evaluate these learning outcomes are being developed by the Academy of Industrial Engineering.	Student Work and Final Projects from selected courses. EGEL Examination (Professional areas).
7	SLO_II2		
8	SLO_II3		
9	SLO_II4		
10	SLO_LOP	These outcomes have not yet been evaluated, and no evidence exists, however, the same type of rubrics developed for outcomes SLO_II1, SLO_II2, SLO_II3 and SLO_II4, will be applied, and these will be developed by the Academy of Industrial Engineering.	No evidence exists.
11	SLO_AEM		

The Academy of Industrial Engineering has the following members:

Name of the Academy or Faculty Coop: Academy of Industrial Engineering.				
#	**Name**	**Degree**	**Area of knowledge**	**Campus**
1	César Barraza	Master's in Science		Mexicali
2	Mauro Chávez	Master's in Science		Mexicali
3	Ezequiel Rodríguez	Master's in Science		Mexicali
4	Héctor Vargas	Master's in Science		Mexicali
5	Enrique Fitch	Master's in Science		Tijuana
6	Salvador Chiu	Master's in Science		Tijuana
7	Carlos González	Master's in Science		Ensenada
8	Socorro Lomelí	Master's in Science		Ensenada

5. Curriculum and faculty resources.

Bachelor's in Industrial Engineering											
Semester	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Full time faculty**		
									Name	**Degree**	**Area**
Fundamentals for Bachelor's in Engineering	MA400	MA401	MA402	MA407	MA406				Alfredo Rodriguez	M.A.	Math, Stat
	CC400	CC402	MA403	MA404	MA405				David Sánchez	B.E.	Math, Phis
		FI400	FI401	FI402					Salvador Baltazar	M.S.	Mah, Phis
									Susana Dominguez	M.S.	Math, Phis
		MC400							Jesús Sánchez	B.E.	Math
									Isaac Azuz	Dr.	Math, Stat
Professional Formation in Industrial Engineering	II400	MF400	MF401	II401	II403	II405	II408	II411	César Barraza	M.S.	
									Mauro Chávez	M.S.	
				II402	II404	II406	II409	II412	Ezequiel Rodríguez	M.S.	
									Héctor Vargas	M.S.	
						II407	II410	II413	Enrique Fitch	M.S.	
									Salvador Chiu	M.S.	
							Elective I	Elective II	Carlos González	M.S	
Complementary Formation or Emphasis Options					Emphasis Elective I (LOP, AEM)	Emphasis Elective II (LOP, AEM)	Emphasis Elective III (LOP, AEM)	Emphasis Elective IV (LOP, AEM)	Socorro Lomelí	M.S	
General and signature courses	CS401		CS400		ID400	CS402					
	EC400	CS403	CS404			HU4001	HU400	HU402			

Legend for courses:

CODE	COURSE
MA400	Mathematics for University
CC400	Programming Methods I
MC400	Computer Aided Drawing
MA401	Differential Calculus
CC402	Programming Methods II
FI400	Physics I
MA402	Integral Calculus
FI401	Physics II
MA403	Numerical Methods
MA404	Probability
MA407	Differential Equations
FI402	Physics III
MA405	Statistical Inference
MA406	Multivariable Calculus
II400	Introduction to Industrial Engineering
MF400	Materials Properties
MF401	Materials Manufacturing
II401	Industrial Chemistry

CODE	COURSE
II402	Industrial Management
II403	Industrial Electronics
II404	Methods Enginnering
II405	Production Systems Engineering I
II406	Quality Engineering
II407	Operations Research Models I
II408	Production Systems Engineering II
II409	Design of Experiments
II410	Operations Research Models II
II411	Production Systems Engineering III
II412	Economics Engineering
II413	Simulation Systems
	Elective I
	Elective II
	Emphasis Elective I (LOP, AEM)
	Emphasis Elective II (LOP, AEM)
	Emphasis Elective III (LOP, AEM)
	Emphasis Elective IV (LOP, AEM)

6. Curricular mapping.

			ENGINEERING BACHELOR'S PROGRAMS STUDENT LEARNING OUTCOMES				BACHELOR'S IN INDUSTRIAL ENGINEERING STUDENT LEARNING OUTCOMES				EMPHASIS OPTIONS FOR BACHELOR'S IN INDUSTRIAL ENGINEERING STUDENT LEARNING OUTCOMES	
CURRICULAR ELEMENTS			SLO_ENG1	SLO_ENG2	SLO_ENG3	SLO_ENG4	SLO_II1	SLO_II2	SLO_II3	SLO_II4	SLO_LOP	SLO_AEM
CODE	COURSE	SEMESTER	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL		LEVEL	LEVEL	LEVEL
MA400	Mathematics for University	1	SU	SU								
CC400	Programming Methods I	1	SU	SU	SU							
MC400	Computer Aided Drawing	1	SU	SU	SU							
MA401	Differential Calculus	1	SU	SU								
CC402	Programming Methods II	2	ME	ME	SU	SU						
FI400	Physics I	2	SU	SU								
MA402	Integral Calculus	2	ME	ME								
FI401	Physics II	3	ME	ME								
MA403	Numerical Methods	3	ME	ME	ME							
MA404	Probability	3	ME	ME								
MA407	Differential Equations	4	ME	ME								
FI402	Physics III	4	ME	ME	SU	SU						
MA405	Statistical Inference	5	ME	ME	ME							
MA406	Multivariable Calculus	5	ME	ME								
II400	Introduction to Industrial Engineering	1	SU	SU			SU					
MF400	Materials Properties	2					SO		ME		ME	
MF401	Materials Manufacturing	3					SO	ME	ME		ME	
II401	Industrial Chemistry	4	SU	SU			SO	ME	ME		ME	
II402	Industrial Management	4						SU		SO	SU	SO
II403	Industrial Electronics	5					ME	SU	SU		SU	
II404	Methods Enginnering	5				ME	SO	SU	SU	SO		SO
II405	Production Systems Engineering I	6		ME	SU	SU	SU	SU	ME	SO	SO	SO
II406	Quality Engineering	6		ME	ME		ME	SO	SO	SO	ME	SU
II407	Operations Research Models I	6			SO		SU	SU	SO	SO	SO	ME
II408	Production Systems Engineering II	7		ME	ME	SU	ME	SU	SO	SO	SO	SO
II409	Design of Experiments	7			SO		ME	SO	SO	SO	SO	SO
II410	Operations Research Models II	7		ME	SO				SU	SO	SO	SO
II411	Production Systems Engineering III	8					SU	SU	SO	SO	SO	
II412	Economics Engineering	8			SU	ME	SO	SO	SO	SO	SO	SO
II413	Simulation Systems	8		ME	SO		ME	SO	SO	SO	SO	SO
	Elective I	7	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO		SU, ME, SO	SU	SU
	Elective II	8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO		SU, ME, SO	SU	SU
	Emphasis Elective I (MSC, RIA, BIO)	5	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME	ME		ME	ME	ME
	Emphasis Elective II (MSC, RIA, BIO)	6	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME	ME		ME	ME	ME
	Emphasis Elective III (MSC, RIA, BIO)	7	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SO	SO		SO	SO	SO
	Emphasis Elective IV (MSC, RIA, BIO)	8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SO	SO		SO	SO	SO
CO-CORRICULAR ELEMENTS		SEMESTERS	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL		LEVEL	LEVEL	LEVEL
CETYS University College of Engineering Projects Expos in each Campus		2,4,6,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO		SU, ME, SO	SU, ME, SO	SU, ME, SO
CETYS University College of Enginerering Simposiums in each Campus		1,3,5,7	SU	SU	SU	SU, ME, SO	SU	SU		SU	SU	SU
Scholarships awarded by external institutions		1,2,3,4,5,6,7,8	SU	SU	SU	SU, ME, SO	SU, ME, SO	SU, ME, SO		SU, ME, SO	SU, ME, SO	SU, ME, SO
External engineering competitions		1,2,3,4,5,6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO		SU, ME, SO	SU, ME, SO	SU, ME, SO
Professional Practice		6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO		ME, SO	ME, SO	ME, SO
Social Sevice		6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO		ME, SO	ME, SO	ME, SO
Student Exchange		6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO		ME, SO	ME, SO	ME, SO
CENEVAL EGEL Examination		8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO		ME, SO	ME, SO	ME, SO

Legend for levels used for curricular mapping:

SU ("*SUFICIENTE*") = SUFFICIENT.
ME ("*MEJORABLE*") = IMPROVABLE.
SO ("*SOBRASALIENTE*") = OUTSTANDING.

Legend for Student Learning Outcomes:

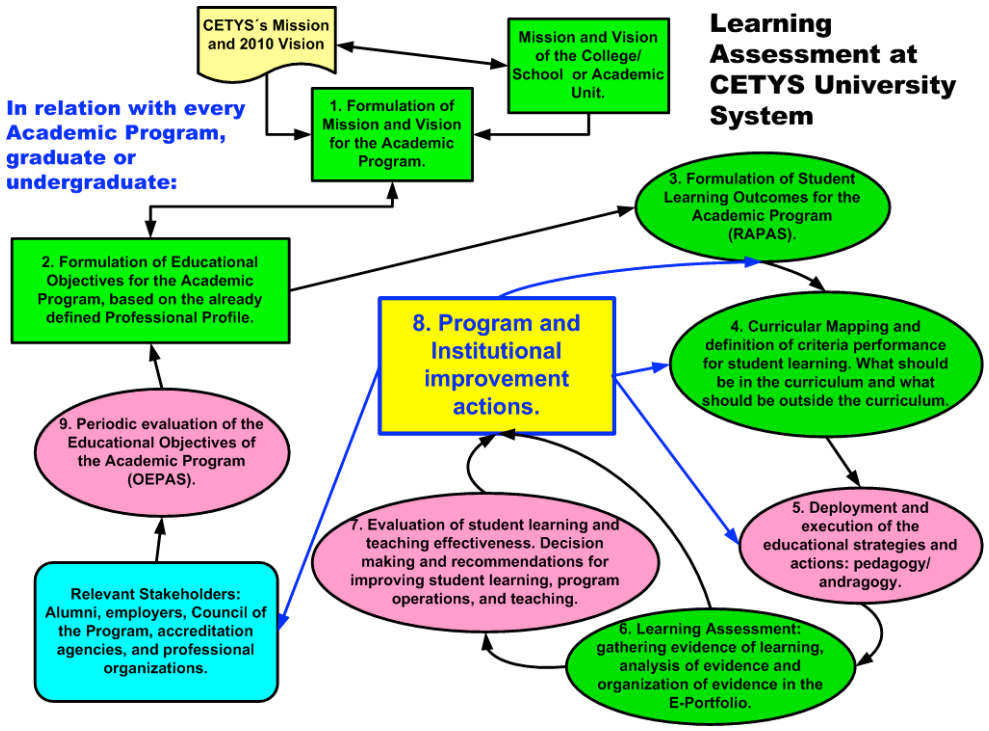
Engineering Bachelor's Programs. The student of a CETYS University Bachelor's in Engineering Program will…	**Bachelor's in Industrial Engineering** The student of the Bachelor's in Industrial Engineering program will…	**Emphasis Options for Bachelor's in Industrial Engineering**
SLO_ENG1: …correctly apply to engineering, the tools provided by the basic sciences, such as physics, calculus, probability, statistics and programming to the solution of diverse problems.	**SLO_II1**: … select materials and processes that respond to the requirements of a sustainable society.	The student of the Bachelor's in Industrial Engineering with an Logistics and Operations will… **SLO_LOP**: … analyze and improve practices related to the supply of materials to guarantee the operational objectives of the organization.
SLO_ENG2: …design analytic and functional models, quantitatively and qualitatively, for the analysis and improvement of systems for diverse applications.	**SLO_II2**: … develop and manage quality management systems with focus on continuous improvement, in to generate competitive processes pertaining to the generation of products and services.	The student of the Bachelor's in Industrial Engineering with an Emphasis in Strategic Management of Manufacturing will… **SLO_AEM**: … develop and establish strategic processes of the operations that contribute to the competitive positioning of an organization.
SLO_ENG3: … effectively use software tools and technologies to build solutions to engineering problems.	**SLO_II3**: … develop and manage the supply chain with an integral vision, beginning with the needs of the client, and ending with the delivering of the product or service.	
SLO_ENG4: … effectively design and manage projects.	**SLO_II4**: … apply models of optimization to design, manage and improve systems that respond to global strategies to make an organization competitive in the production of products and services.	

SLO_ENG5: … (Clear and effective communication in English) … be able to express his ideas clearly and with an appropriate language, in a verbal, written, and visual way in English.

This learning outcome is developed primarily via the co-curricular ESL program that all students must go through, and which is managed by the English Language Center. Some curricular courses contribute to the improvement of this learning outcome, like Advance Communication in English and selected courses from 5th semester onward.

7. Assessment plan.

Based on the Assessment Plan for CETYS University System:



Currently, the following actions have been done, with regards to the Bachelor's in Industrial Engineering Program, with the participation of faculty members from the Academy of Industrial Engineering:

1) Formulation of the Mission and Vision.
2) Formulation of the Educational Objectives.
3) Formulation of Student Learning Outcomes.
4) Curricular Mapping.

The assessment components that are currently in the process of being defined, but have not yet been developed and therefore have not been implemented are:

a) Definition of assessment tools for student learning to be used in the assessment of the Student Learning Outcomes.
b) Identification of key courses where evidence of student learning can be gathered.
c) Systematic gathering of evidence of learning and the analysis and organization of the evidence.