CETYS UNIVERSIDAD

College of Engineering
Academy of Industrial Engineering

Bachelor's in Industrial Engineering
Program Review
2010

Table of Contents.

1. Introduction.

Program review processes in CETYS University date back to the early 60s, with the first academic program being launched in 1962. Originally, program review processes were focused on maintaining pertinence in our academic programs and updating content according to regional and national tendencies and needs. Program review has been periodic, with cycles of 4 or 5 years between reviews, in concordance with the length of each program so as to have information regarding program completion and overall program efficiency. These processes were based on the design or redesign of the curriculum, as well as the definition or re-definition of the resources required to deploy the curriculum, such as faculty, infrastructure (labs, etc.), bibliography and information resources. Also, employment after completion and the impact of the academic program with regards to regional and national factors were taken into account. The results were new versions of each academic program with substantial changes that improved the curriculum and co-curriculum.

Program review processes have evolved in CETYS University, now being driven by the definition of institutional and program level learning outcome (and student achievement relating to these), as well assessment processes and an overall focus on student achievement and alumni follow-up based upon these elements. Also, the international / global component or piece is another key element in the evolution of our program review processes. The WASC accreditation process has been a leading factor in this change in paradigm.

The program review process has been re-designed, and re-tooled to allow faculty to organize in academies to analyze each academic program with a strong emphasis on the mission and vision of the program, its educational objectives, student learning outcomes, assessment and student achievement, with the final goal being to identify strengths and areas of opportunity to help in academic decision making processes and academic program improvement. Also, the addition of external reviewers provides important feedback for the work being done by the academies and the overall review process.

This new program review process was designed by the Vice-Presidency of Academic Affairs and Academic Planning and Effectiveness Offices, and deployed via the Colleges. The final result was the definition of the CETYS Periodic Academic Program Review Policy in 2008.

The CETYS Periodic Academic Program Review Policy, states that faculty should be organized in Academies, according to areas of knowledge, with the primary functions of these Academies, among other things, is to oversee the Program Review and Assessment Processes in coordination with the College of Engineering. The Academies have chairs and are comprised by Faculty of the three Campuses, and therefore work on a System wide level (for strategic processes), in addition to a Campus wide level (for operational and tactical processes).

On July 30th of 2009, the Academies of the College of Engineering were established as follows:

1. **Academy of Industrial Engineering.** This Academy is responsible for the Industrial Engineering Program (offered in the three Campuses). The chair of this Academy is M.S. Socorro Lomelí (Ensenada Campus).
2. **Academy of Computer Science and Software.** This Academy is responsible for the Computer Science Engineering Program (offered in the Mexicali and Tijuana Campuses), and the Software Engineering Program (offered in the Ensenada Campus). The chair of this Academy is M.S. Guillermo Cheang (Mexicali Campus).
3. **Academy of Cybernetics and Mechatronics.** This Academy is responsible for the Electronic Cybernetics Engineering Program and Mechatronics Engineering Programs (both are offered in the three Campuses). The chair of this Academy is M.S. Cristóbal Capiz (Mexicali Campus).
4. **Academy of Mechanical Engineering.** This Academy is responsible for the Mechanical Engineering Program (offered in the three Campuses). The chair of this Academy is M.S. Bernardo Valadez (Mexicali Campus).
5. **Academy of Digital Graphic Design Engineering.** This Academy is responsible for the Digital Graphic Design Engineering Program (offered in the three Campuses). The chair of this Academy is M.S. Fabian Bautista (Tijuana Campus).
6. **Academy de Basic Sciences**. This is the only Academy that is not responsible for an academic program, but is responsible in overseeing the Basic Sciences courses offered in all the Engineering academic programs. This Academy works with all the other Academies and is chaired by M.S. Salvador Baltazar (Mexicali Campus).

The College of Engineering began deployment of the program review processes in 2009 with all academic programs, however, the Industrial Engineering and Computer Science Engineering programs were selected to be the first two programs to be completed in the first semester of 2011.

This document presents the results generated by the Academy of Industrial Engineering for the Industrial Engineering program review process. The Academy of Industrial Engineering is comprised by the following faculty members:

- M.S. Socorro Lomelí (chair) – Ensenada Campus.
- M.S. Luisa Rosas – Ensenada Campus.
- M.S. César Barraza – Mexicali Campus.
- M.S. Ezequiel Rodríguez – Mexicali Campus.
- Dr. Carlos Solorio – Mexicali Campus.
- M.S. Mauro Chávez – Mexicali Campus.
- M.S. Enrique Fitch – Tijuana Campus.

Also, the School Director from the Ensenada Campus, Dr. Carlos González, and the Academic Director from the Mexicali Campus, M.S. Mauro Chávez, both Industrial Engineers who collaborate and are strongly involved with the Industrial Engineering program, were invited as members of the Academy of Industrial Engineering for the program review process. Also, as a policy established by the College of Engineering, any new full-time faculty member, with specialization in Industrial Engineering, will become a member of the Academy of Industrial Engineering, and such is the case of Dr. Carlos Solorio, who became a faculty member in the Mexicali Campus in the second semester of 2009. Dr. Salvador Chiu left the Academy to become Linkage Director of the Tijuana Campus in 2009.

The Industrial Engineering program was launched in 1962 in the Mexicali Campus, in 1980 in the Tijuana Campus and in 1981 in the Ensenada Campus. Since 1962 it has undergone around 20 major reviews, the latest being in 1992, 2000 and 2004. In 2007, the program underwent and upgrade in the sense that complementary specialization areas were added to the 2004 version if the program, and as such, this is not considered as a major review. In 2009, the Industrial Engineering program began the program review process, led by the Academy of Industrial Engineering, following the guidelines established by the CETYS Periodic Academic Program Review Process. Work was done via face to face workshops, as well as taking advantage of technology, such as e-mail and videoconferencing for distance interaction.

Also, a Program Review Task Force was assembled in the first semester of 2011, comprised by Academy and Team Leaders involved in program review and assessment processes, as well as the College Deans. The purpose of the Task Force was to provide a peer review team for program review processes and provide multidisciplinary and timely feedback to the Academies. In addition to the feedback provided by the Task Force, faculty from the Academies participated in various program review and assessment workshops from external consultants (Dr. Gloria Rodgers, Dr. Marilee Bresciani), and the program review documents as well as the assessment plans were reviewed by external consultants and experts (such as Dr. Marilee Bresciani) who provided observations and feedback.

The review components that are presented in this document reflect the methodology that the academy followed to undergo the review process, which begin with an analysis of the Mission and Vision of the program, as well as its educational objectives and learning outcomes, following with the curricular mapping and assessment processes, identifying indicators for student achievement, and the analysis of students, faculty and support resources. It also includes the information gathered from comparative analysis with other programs external reviewers. The areas of opportunity and recommendations identified by the academy during the process and reflected in this document are presented to the College of Engineering, who in turn will present them to the Vice-Presidency of Academic Affairs, to be considered for implementation in the 2012 versions of the academic programs.

2. Mission and Vision.

For the analysis of the Mission and Vision of the Industrial Engineering program, we begin with identifying some important historical and contextual information, as well as significant achievements of the program:

- 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 received its first accreditation by CACEI (organization in México that is equivalent to ABET in the United States) in October of 2005.
- The program has had a strong linkage with Industry throughout its existence, with students doing their professional practice in companies such as: Kenworth, Zahori, Emermex, Honeywell, Ascotech and CoastCast, to name a few.
- The program has alumni working in high level job positions in companies such as: 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 engineering book published by the CETYS University Editorial Project is "*Simulación de Evento Discreto*" ("Discrete Event Simulation") by faculty member M.S. Héctor Vargas.

Three aspects are considered in the analysis of the Mission and Vision of the Industrial Engineering Program: a) alignment with the institutional Mission and Vision, b) impact in the regional and national development and c) level of alignment of the program with the current educational objectives.

The CETYS University Industrial Engineer is a professional who contributes to maintaining the competitiveness, optimization and continuous improvement of systems having to do with the offering of goods and services in organizations within a global context. To achieve this, the CETYS University Industrial Engineer must be able to analyze and evaluate systems, as well as define optimization schemes and new system designs. These systems may be seen as process networks in which materials and resources (human and material) must interact efficiently to add value to the organization for the achievement of its goals.

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

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

In addition to the above mentioned elements, the CETYS University educational model promotes the integral development of its professionals, which includes critical thinking, global and international mindsets, information literacy, values and the contribution to social, economic and technological development and sustainability.

The Mission and Vision for the Industrial Engineering Program, established as a part of the previous review process states:

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.

As we analyze the institutional mission and the mission of the academic program, we conclude that the second complements the first one. The mission of CETYS University as well as the mission from the Bachelor's in Industrial Engineering Program point out the importance of the development of "intellectual capacity." Nonetheless, the mission of the program does not specify explicitly the importance of the "moral capacity" development in the students, but by "professionals" it means a "high standard of professional ethics, behavior and work activities while carrying out one's profession" and thus implicitly refer to the "moral capacity" as mentioned in the institutional mission.

The mission statement of CETYS University is as follows:

It is the purpose of the Centro de Enseñanza Técnica y Superior to contribute in the education of persons with the moral and intellectual capacity required to participate in an important way in the economic, social, and cultural improvement of the country. CETYS University seeks, as a result, to make indestructible those values that have traditionally been considered as basic so man can live in society in a peaceful way, and satisfy the needs that his capacity to do work allows him.

The institutional mission points out the following points regarding students:

- Moral and intellectual capacity for the economic, social, and cultural improvement of the country.
- Basic values for living in society in a peaceful way and the satisfaction of his needs that his capacity to do work allows him.

We understand as moral capacity that the students should be decent, respectful, and noble persons; regardless of the profession they choose to undertake. This would allow them to live a successful life despite of the socioeconomic level. The institutional mission points out the intellectual capacity of alumni suitable for successfully carrying out the work that his/her profession demands. In other words, the value of students as persons and as professionals should be guided towards the "economic, social, and cultural improvement of the country."

The second part of the institutional mission points out that the students must be able to satisfy their needs through their work and by living in peace with the rest of the persons. Once again, we can detect the existence of the students' ability in their profession as well as the respect to others.

Taking the above components and elements as guidelines and always with the Institutional Mission and Vision as fundamental foundation blocks, the Academy of Industrial Engineering, through a process of review and analysis, has re-defined the Mission and Vision of the Industrial Engineering program as follows:

> *The Mission of the Bachelor's in Industrial Engineering Program, seeks to contribute in the integral development of the region and the country, via the development of students with high potential using a learner centered educational model, to develop leading professionals in industrial engineering, capable of using production system resources in a rational and efficient manner, to generate quality goods and services.*
>
> *The Vision of the Bachelor's in Industrial Engineering Program is be the leader in the development of high quality professionals that integrate themselves in production systems, via an efficient academic system and an innovative teaching-learning process, always at the forefront in attending the needs of industry for regional and national sustainable development.*

3. Learning Outcomes.

The Student Learning Outcomes for an academic program are comprised by two main blocks: Institutional Learning Outcomes and Program Learning Outcomes. The Institutional Learning Outcomes are defined and reviewed by the Academy of Institutional Learning Outcomes. The Program Level Learning Outcomes are defined and reviewed by the Academies.

The Institutional Learning Outcomes are four and focus on: Verbal and Written Communication Skills, Critical Thinking, Continuous Learning/Information Literacy and Tolerance to Diversity.

The Program Level Learning Outcomes, for the programs offered by the College of Engineering are divided into two blocks: learning outcomes common to all engineering programs (with a strong emphasis on basic sciences and problem solving) and learning outcomes specific to the academic program (with a strong emphasis on the primary and complementary areas of knowledge of the program.

This document will focus on the analysis and review process for the Program Level learning outcomes done by the College of Engineering and the Academy of Industrial Engineering.

The Program Level Learning Outcomes that apply to all engineering programs, defined in the previous program review process (included in Evidence #35 of the Capacity Report for the WASC Initial Accreditation), were five and were identified as follows:

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 review of these learning outcomes took into consideration the following three general guidelines:

1. Since these learning outcomes apply to all engineering programs, all Academies should participate in the review process.
2. As a part of the WASC process, recommendations were made with regards to the amount of learning outcomes with regards to assessment implications, thus integration of learning outcomes to reduce the amount is desirable.
3. The learning outcome that has to do with "Clear and effective communication in English" must be included.

The Academies analyzed the five original learning outcomes and re-defined them into the following three Program Level Learning Outcomes that apply to all engineering programs:

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

- SLO_ENG1: …solve problems relating to the improvement of diverse systems, correctly applying the knowledge and tools provided by the basic sciences and/or software technologies.
- SLO_ENG2: … effectively design and manage projects.
- SLO_ENG3: … (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 re-definition allows for a more clear identification of the learning outcomes expected for all engineering programs, and also allows for the design of a more manageable program level assessment process and plan (which will be explained in further sections of this document).

Also as a part of the previous program review process, Program Level Learning Outcomes that apply to specific engineering programs were defined (also included in Evidence #35 of the Capacity Report for the WASC Initial Accreditation). These learning outcomes, for the Industrial Engineering program were four and were identified as follows:

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 Academy of Industrial Engineering analyzed the four original learning outcomes and re-defined them into the following three Program Level Learning Outcomes that apply specifically to the Industrial Engineering program:

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

- SLO_II1: … design and manage Quality and Continuous Improvement Systems, for the production of goods and services that are competitive in global markets, using models and methodologies of Industrial engineering, with a proactive attitude, ethical behavior and a disposition for collaborative work.
- SLO_II2: … develop and manage the Supply Chain in industries, with a systemic vision and the creative use of information technologies, working in interdisciplinary teams, following the current norms of industry with ethics and honesty, and taking into consideration sustainability factors.
- SLO_II3: … design and apply Optimization models seeking to incorporate manufacturing best practices, for the design, management and improvement of systems that contribute to the competitiveness of organizations in a global environment, working in interdisciplinary teams, following the current norms of industry with ethics and honesty, taking into account sustainability factors.

This re-definition also allows for a more clear identification of the learning outcomes expected for the industrial engineering program, and updates them, taking into account assessment considerations.

The program level learning outcomes that are specific to industrial engineering and have to do with the complementary areas of knowledge (also known as Complementary Formation Lines, or Emphasis options) remain the same:

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.

4. Curricular Mapping.

The CETYS University academic programs, at the Bachelor's level, have the following structure and degree obtainment 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. Of the 42 courses, 32 are program specific courses and 10 are humanities courses. The curricular mapping for this program review focuses on the 32 program specific courses.
- Completing 400 hours of professional practice.
- Completing 500 hours of social service.
- Completing the corresponding EGEL (undergraduate exit examination) examination administered by CENEVAL (organization in México that offers various examination services organization in México).

The curriculum for the Industrial Engineering program contains the following courses:

CODE	COURSE	SEMESTER
MA400	Mathematics for University	1
CC400	Programming Methods I	1
MC400	Computer Aided Drawing	1
MA401	Differential Calculus	1
CC402	Programming Methods II	2
FI400	Physics I	2
MA402	Integral Calculus	2
FI401	Physics II	3
MA403	Numerical Methods	3
MA404	Probability	3
MA407	Differential Equations	4
FI402	Physics III	4
MA405	Statistical Inference	5
MA406	Multivariable Calculus	5
II400	Introduction to Industrial Engineering	1
MF400	Materials Properties	2
MF401	Materials Manufacturing	3
II401	Industrial Chemistry	4
II402	Industrial Management	4
II403	Industrial Electronics	5
II404	Methods Enginnering	5
II405	Production Systems Engineering I	6
II406	Quality Engineering	6
II407	Operations Research Models I	6
II408	Production Systems Engineering II	7
II409	Design of Experiments	7
II410	Operations Research Models II	7
II411	Production Systems Engineering III	8
II412	Economics Engineering	8
II413	Simulation Systems	8
	Elective I	7
	Elective II	8
	Emphasis Elective I (LOP, AEM)	5
	Emphasis Elective II (LOP, AEM)	6
	Emphasis Elective III (LOP, AEM)	7
	Emphasis Elective IV (LOP, AEM)	8

The curricular mapping for the program level learning outcomes, in their redefined versions according to section 3 of this document, considers the following levels:

- INTRODUCTORY (I): *"At the end of the course, the students know, understand, comprehend and are familiar with the course topics".* It is expected that students have little or no knowledge of the course topics previous to the course. Knowledge and abilities acquired from previous courses may be used to develop students in the solution of problems of low to mid level complexity. New topics are introduced with a basic application level, sufficient enough for the student to comprehend implications for further applications. It is expected for the student to relate previous concepts and integrate them to his or her new base of knowledge, identifying applications via the identification and solutions of problems and cases at a basic level.

- REINFORCEMENT (R): "At the end of the course the students are able to analyze and apply course topics in various contexts, which present diverse levls of difficulty". Knowledge, skills and abilities acquired from previous courses are used to develop solutions to application problems, of mid to high level complexity, relating to the area of knowledge of the profession. It is expected that the student develop a higher level of analysis skills and learn to use in a more efficient manner the tools and methodologies relating to the area of knowledge of the profession.

- EVALUATION - (E): *"At the end of the course, the students exhibit an integrated understanding of the course topics and their application, knowing when and how to apply them".* Knowledge, skills and abilities acquired throughout previous courses are used to identify and solve problems, where the student is expected to design, integrate and evaluate tools and methodologies relating to the area of knowledge of the profession.

It is important to note that the curricular mapping of the Institutional Level Learning Outcomes for all academic programs, uses a three level scale that is congruent with the above levels, using different nomenclature (Sufficient, Improvable, Outstanding). This scale is also congruent with the program level scale of Introductory, in Development and Developed.

The following table presents the curricular mapping for the Industrial Engineering programs (Program Level Learning Outcomes):

			LEARNING OUTCOMES FOR ALL ENGINEERING PROGRAMS			LEARNING OUTCOMES FOR INDUSTRIAL ENGINEERING PROGRAM			LEARNING OUTCOMES FOR EMPHASIS OPTIONS OF THE INDUSTRIAL ENGINEERING PROGRAM	
CURRICULAR ELEMENTS			SLO_ENG1	SLO_ENG2	SLO_ENG3	SLO_II1	SLO_II2	SLO_II3	SLO_LOP	SLO_AEM
CODE	COURSE	SEMESTER	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL		LEVEL	LEVEL
MA400	Mathematics for University	1	I	I	I					
CC400	Programming Methods I	1	I	I	I					
MC400	Computer Aided Drawing	1	I	I	I					
MA401	Differential Calculus	1	I	I	I					
CC402	Programming Methods II	2	I	I	I					
FI400	Physics I	2	I	I	I					
MA402	Integral Calculus	2	I	I	I					
FI401	Physics II	3	I	I	I					
MA403	Numerical Methods	3	I	I	I					
MA404	Probability	3	I	I	I	I	I	I		
MA407	Differential Equations	4	R	R	I					
FI402	Physics III	4	R	R	I					
MA405	Statistical Inference	5	R	R	I	I	I	I		
MA406	Multivariable Calculus	5	R	R	I					
II400	Introduction to Industrial Engineering	1	I	I	I	I	I	I	I	I
MF400	Materials Properties	2	I	I	I	I	I	I	I	I
MF401	Materials Manufacturing	3	I	I	I	I	I	I	I	I
II401	Industrial Chemistry	4	R	R	I	I	I	I	I	I
II402	Industrial Management	4	R	R	I	I	I	I	I	I
II403	Industrial Electronics	5	R	R	R	I	I	I	I	I
II404	Methods Enginnering	5	R	R	R	R	R	R	I	I
II405	Production Systems Engineering I	6	R	R	R	R	R	R	R	R
II406	Quality Engineering	6	R	R	R	R	R	R	R	R
II407	Operations Research Models I	6	R	R	R	R	R	R	R	R
II408	Production Systems Engineering II	7	E	E	E	R	R	R	E	E
II409	Design of Experiments	7	E	E	E	E	E	E	E	E
II410	Operations Research Models II	7	E	E	E	E	E	E	E	E
II411	Production Systems Engineering III	8	E	E	E	E	E	E	E	E
II412	Economics Engineering	8	E	E	E	E	E	E	E	E
II413	Simulation Systems	8	E	E	E	E	E	E	E	E
	Elective I	7	E	E	E	E	E	E	E	E
	Elective II	8	E	E	E	E	E	E	E	E
	Emphasis Elective I (LOP, AEM)	5	R	R	R	R	R	R	R	R
	Emphasis Elective II (LOP, AEM)	6	R	R	R	R	R	R	R	R
	Emphasis Elective III (LOP, AEM)	7	E	E	E	E	E	E	E	E
	Emphasis Elective IV (LOP, AEM)	8	E	E	E	E	E	E	E	E

It is important to note that, in the case of SLO_ENG3 ("Clear and effective communication in English"), there are curricular elements such as the Advanced Communications in English course (5th semester), and also program level courses offered in English beginning in 5th semester. The development of clear and effective communication in English is developed primarily via the co-curricular ESL program that all students must go through, and which is managed by the English Language Center.

5. Assessment and Student Achievement.

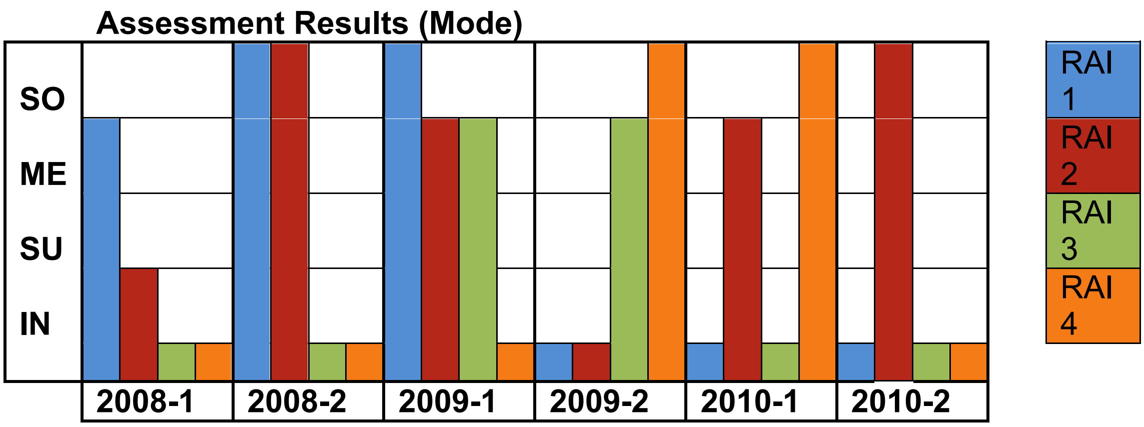
Much work has been done at the institutional level with regards to Assessment. An assessment plan and program began in 2008 with a focus on the gradual and systematic assessment of all institutional level learning outcomes for all academic programs. This has been a work in progress, in which areas of improvement have been identified and addressed, such as faculty participation and the integration and use of the electronic portfolio.

The institutional assessment process now gathers and stores information via the electronic portfolio, which is a custom design, developed by the Information Technologies Department of CETYS University.

The results of the assessment of institutional learning outcomes are delivered to the Deans of the Schools of Engineering at the end of each assessment cycle, which are by semester. The academies use this information as general input for the program review process.

INSTITUTIONAL ASSESSMENT RESULTS.

The results presented to the Academy by the CDMA (Center for Academic Development and Improvement) in the "Institutional Assessment Report Summary" are as follows:



Where: IN = Insufficient
SU = Sufficient
ME = Improvable
SO = Outstanding

RAI1 = Clear and effective communication in Spanish
RAI2 = Continuous learning
RAI3 = Critical thinking
RAI4 = Cultural diversity.

In general terms, the assessment results show a variation in learning achievement levels in each of the four institutional learning outcomes, without achieving outstanding or improvable levels consistently. This may be due to various factors that should be analyzed in conjunction with the Centers for Student Development (CEDEs) of each Campus.

Work has been done to support student development through the CEDEs of each Campus, due to the diverse academic achievement profiles of our students. This is done via workshops and student monitoring in conjunction with the academic coordinators. However, the academy identifies the importance of the course offering and content for fundamental areas relating to the four institutional learning outcomes.

Also, the Academy identifies a need to disaggregate data for each academic program to provide program specific information regarding institutional assessment for program review purposes, as well as the need for a longitudinal analysis. The Academy recommends that a set of courses for institutional assessment be defined by the Academy to be able to identify the level of development in student learning with regards to reading and writing in both Spanish and English, as well as Critical Thinking.

PROGRAM LEVEL ASSESSMENT.

The rest of this section will focus on the assessment plan and program developed to assess program level learning outcomes.

Assessment at the program level is something new, due to the fact that the focus has been on developing an infrastructure of knowledge and resources, as well as culture, to support assessment at the institutional level. The results of these efforts, as well as the information that has been generated is just now being used to obtain indicators for program review.

At the program level, the College of Engineering decided to designate an Assessment Officer to design a pilot assessment plan and program for the August-December 2010 semester for all Engineering Programs offered by the College. The responsible for this process was M.S. Jorge Sosa López, with the collaboration of the Deans of the Schools of Engineering and Chairs of each Academy.

This pilot project is divided in two stages, the first to be deployed during the second semester of 2010 focuses on program level learning outcomes common to all engineering program. The second stage focuses on program level outcomes specific to the academic program, in this case the Bachelor in Industrial Engineering, as well as external assessment data relating to the EGEL exit examination administered by CENEVAL.

This assessment plan has the goal to not only define a structure and methodology for assessment at the program level for the College of Engineering, that can be integrated as seamlessly as possible to the academic dynamic of the courses offered by the College of Engineering, but also with a strong faculty participation in the design of the assessment plan and process, providing a case study that not only integrates what has been achieved by the institutional process, but builds upon it. The complete documentation regarding the Assessment Plan for the College of Engineering may be found in the corresponding document, separate from this program review document.

The process and methodology that was defined consists of 6 key components:

1) Selection of Learning Outcomes: Each Academy, based upon the set of Program Level Learning Outcomes (common and specific) defined for the academic programs, will select at least one learning outcome to assess during each assessment cycle.

2) Course selection for assessment: Based upon the curriculum, and curricular mapping, each Academy, with the aid of the Deans of the Schools of Engineering, will define in which courses the assessment process will be implemented. It is important that the selected courses span the length of the academic program.
3) Design of Instruments for Assessment: Each Academy will design or select instruments to assess the selected learning outcomes. Examples of these may be various types of rubrics. Participation of various faculty members is not only encouraged, but strongly recommended.
4) Definition of learning activities and evidence of learning: Once learning outcomes, and courses are defined, learning activities and their corresponding evidence of learning are identified and defined. The congruency between this and the instruments defined in 3) is important. Both 3) and 4) may be done concurrently.
5) Training of faculty: With the aid of the Deans of the Schools of Engineering, faculty who will participate in assessment during the cycle are provided training regarding terminology, methodology as well as the instruments to be used. Close collaboration with faculty is key to the success of the process.
6) Assessment during semester: The learning outcomes are assessed in the selected courses, using the defined instruments for the learning activities and corresponding learning evidence. This part of the process is supervised by the Deans of the Schools of Engineering in each Campus.
7) Analysis of results: At the end of the cycle, results are presented to the Academies and analyzed to identify areas of opportunity to be included as a part of the program review process.

For the second semester of 2010 (August-December 2010):

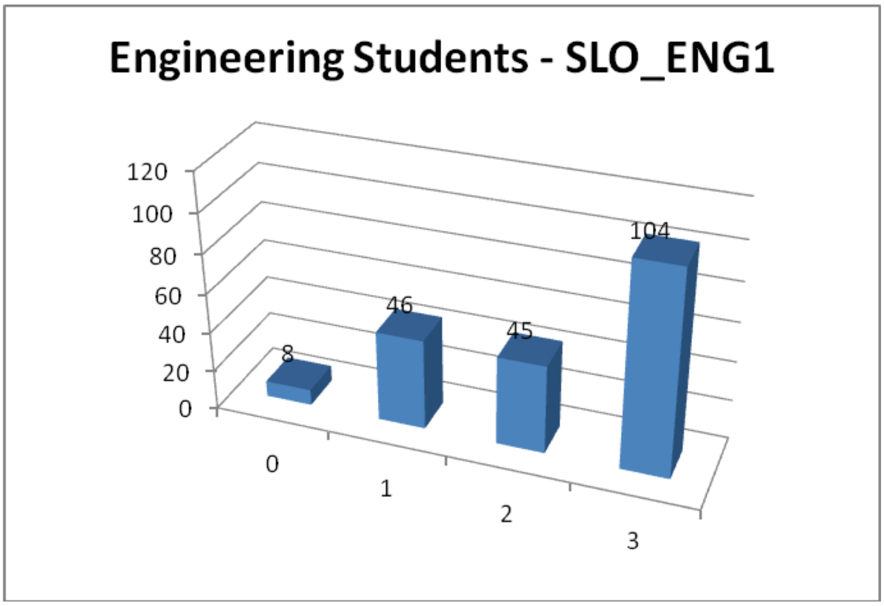
1) Selection of Learning Outcomes: The Academies decided that, for this first assessment cycle, all programs would assess the first two Program Level Learning Outcomes that are common to all Engineering Programs, meaning SLO_ENG1 and SLO_ENG2.
2) Course selection for assessment: Based upon the course offering for the August-December 2010 semester, 16 courses were selected for assessment. Since institutional learning outcomes assessment is also being done during the same semester, courses were selected with an effort to have compatibility and congruency with the institutional level assessment process, and also so as to not overburden faculty members.
3) Design of Instruments for Assessment: Each Academy made proposals for instruments to be used to assess SLO_ENG1 and SLO_ENG2, and these were analyzed and integrated, resulting in the definition of two rubrics, a holistic one for SLO_ENG1 and an analytical one for SLO_ENG2.
4) Definition of learning activities and evidence of learning: The 16 courses were divided between each Academy, according to areas of knowledge, and each Academy worked with their faculty members to identify learning activities and evidence of learning that could be used for the assessment of SLO_ENG1 and SLO_ENG2, considering the normal coursework that faculty do during a regular

semester in which the courses are offered, and also in congruency with the instruments defined in 3) Each academy delivered a learning activity and evidence of learning description document. Following the same mentality described in 2), activities were selected in which both SLO_ENG1 and SLO_ENG2 could be assessed (and if possible, also institutional learning outcomes). It is not surprising that most activities follow a project and/or problem based learning scheme.

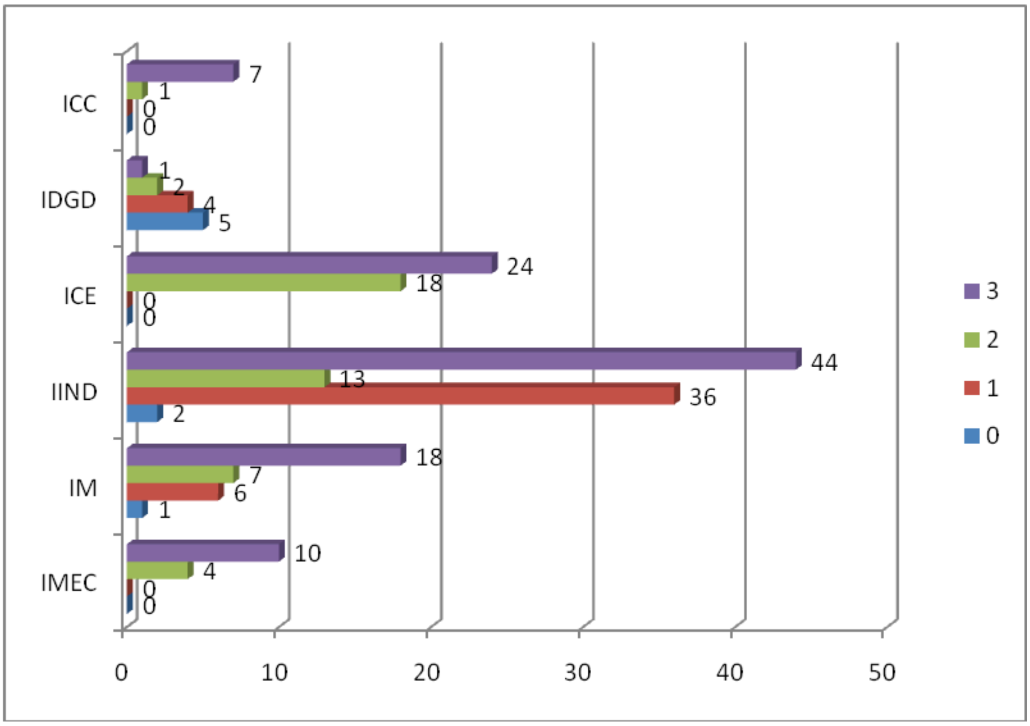
5) Training of faculty: With the aid of the Deans of the Schools of Engineering, each Campus trained the group of faculty who would teach the selected courses during the August-December 2010 semester, and therefore would participate in assessment during the cycle.
6) Assessment during semester: The assessment cycle was deployed during the August-December semester and results, including evidence of learning, were gathered by each School Director for each Campus.
7) Analysis of results: Results were analyzed by each academy during the first semester of 2011 and have been integrated into the program review documentation.

For following assessment cycles, it is expected that an assessment scheme that allows for assessment of institutional and both program level types of learning outcomes be designed, however, the bulk of workload that this would imply needs to be analyzed with detail.

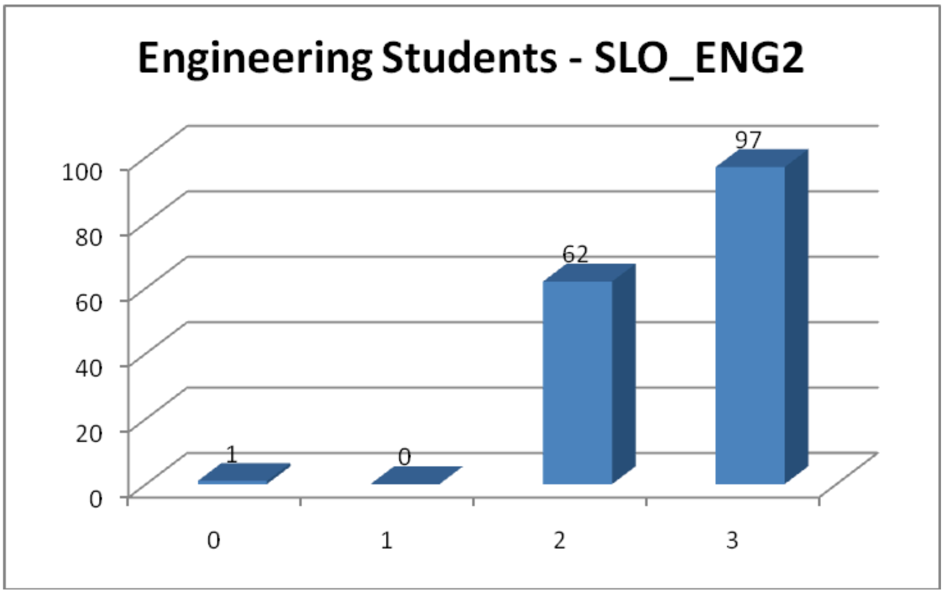
With regards to SLO_ENG1 (… problem solving…), in general, 74% of engineering students obtained learning achievement levels of 2 or 3 (Reinforcement/Improvable, Evaluation/Outstanding):



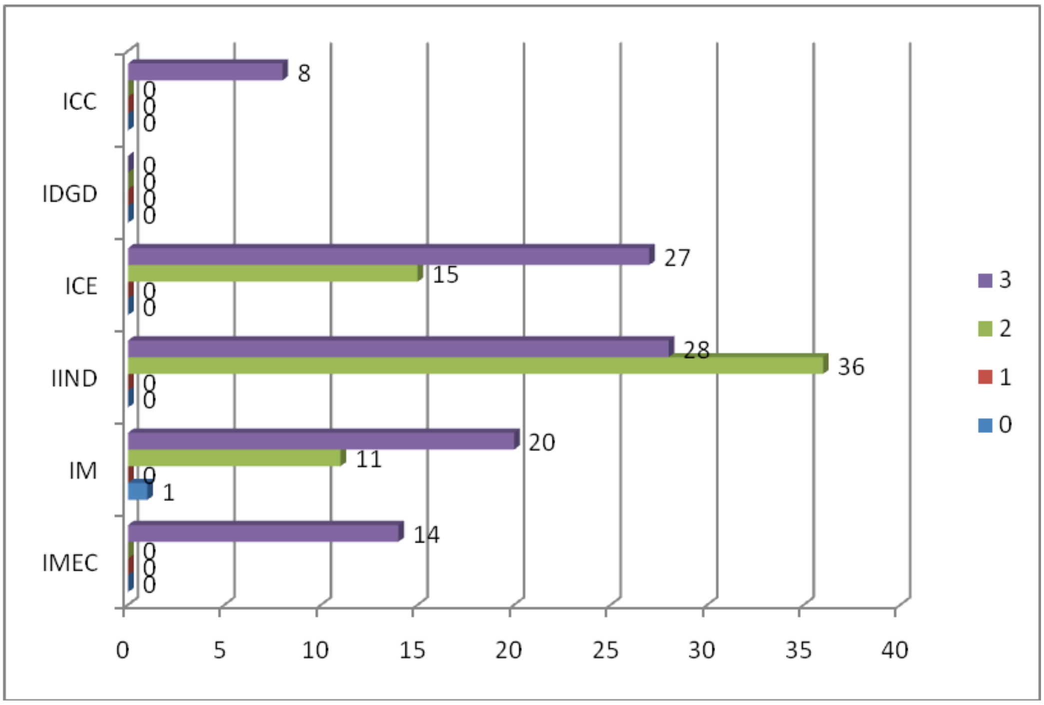
For this same learning outcome (SLO_ENG1), in the case of Industrial Engineering students, the achievement percentage drops to 60%, where the lowest achievement scores are in the courses of Physics II and Programming Methodds I, which are offered in the first three semesters of the academic program, therefore follow-up via CEDEs and tutoring programs are recommended for these courses.



With regards to SLO_ENG2 (… project management…), in general, 99.3% of engineering students obtained learning achievement levels of 2 or 3 (Reinforcement/Improvable, Evaluation/Outstanding):



For this same learning outcome (SLO_ENG2), in the case of Industrial Engineering students, the achievement percentage increases to 100%, however, a longitudinal and follow-up analysis for various cohorts is recommended to identify the consistency of these results through time.



The pertinence of the Industrial Engineering program is based upon the knowledge, skills, attitudes and values that we seek to develop in our students throughout the academic program, which in turn transcend into their professional lives. Therefore, the Academy recognizes the importance of the design and deployment of program level assessment processes for program specific learning outcomes. This is why all Academy members have participated in Institutional Assessment, and now also participate in the definition of instruments and procedures for program level assessment.

To assess the program level specific outcomes the following stages were defined:

1. Definition of rubrics.
   Faculty for each campus define a proposal of the type and format for the rubrics to be applied during the semester. These proposals are analyzed by the Academy as a group and validated for use.

2. Definition of period for assessment.
   At the beginning of each semester, the Academy will define which rubrics will be applied during the semester.

3. Identification of courses where assessment will be applied.
   Based upon the curricular mapping for the academic program, courses are selected for assessment.

4. Notification to faculty involved in assessment activities.
   Faculty is notified and trained in the use of the rubric if necessary.

5. Definition of learning activities and evidence:
   Faculty select learning activities and evidence for assessment, according to the selected course and curricular mapping.

6. Students deliver their work during the semester.
   Students do the assigned learning activity and deliver their work.

7. Faculty evaluate and provide feedback to students.
   Faculty evaluate student work using the previously designed rubrics and provide feedback to the students, as well as a general summary of assessment results.

8. Faculty generate a summary of assessment results.
   Each faculty member generates a summary of assessment results for student learning based upon the selected course and rubric.

9. The Academy analyzes the summary of assessment results.
   The Academy analyzes assessment results as a group, identifying areas of opportunity and improvement. If expected learning is not achieved, then an action plan is defined. The analysis of assessment results seeks to answer the question: what does this data mean with regards to student learning?

For the first semester of 2011 (January-June 2011):

1. Definition of rubrics.
   Faculty designed, validated and agreed upon one rubric. The rubric is a holistic rubric to assess student learning relating to the design, optimization and improvement of systems program level learning outcome (SLO_II3):

SLO_II3 – HOLISTIC RUBRIC – DESIGN AND APPLICATION OF OPTIMIZATION MODELS	
SLO_II3: The student of the Bachelor's in Industrial Engineering program will design and apply Optimization models seeking to incorporate manufacturing best practices, for the design, management and improvement of systems that contribute to the competitiveness of organizations in a global environment, working in interdisciplinary teams, following the current norms of industry with ethics and honesty, taking into account sustainability factors.	
Level	**Criteria for student learning**
0 **INSUFFICIENT (achieved if most criteria apply)**	❒ The student cannot identify the problem, opportunities and/or objectives. ❒ The student cannot describe the system or its performance measures. ❒ The formulated model does not represent the real system. ❒ No real data from the system or model is included. ❒ The model was not validated. ❒ Experimentation is done using the model but in a disorganized manner. ❒ No conclusions are obtained.
1 **INTRODUCTORY (achieved if most criteria apply)**	❒ An objective is stated but is not clear in its definition. ❒ System elements are mentioned but scarcely and without coherence. ❒ The model considers elements of the system but these are not relevant to the stated objective. ❒ El modelo considera los elementos del sistema pero no son relevantes al objetivo planteado. ❒ Real data for the system is used but the obtainment methods are not adequate. ❒ The model is only validated using the opinion of the developer of the model. ❒ Experimentation is done using the model but not according to plan or in congruence with the stated objective. ❒ The conclusions are not congruent with the stated objective.
2 **IN DEVELOPMENT (achieved if most criteria apply)**	❒ The system is described but bears little relevance to the project objective. ❒ The formulated model does too many assumptions with regards to the real system. ❒ Data recollection is adequate but statistical analysis of the data is not. ❒ The "owners of the process" participate in the validation of the model but their arguments need clarification. ❒ Experimentation is done according to plan and in congruence with the stated objective. ❒ The results analysis is lacking. ❒ Conclusions are made that are congruent with the objective, however they have little support from the experimentation results.
3 **DEVELOPED (achieved if most criteria apply)**	❒ The system is described completely: elements and relationships in congruence with the project objective. ❒ The model considers system elements relative to the objective and assumptions are justified and in adequate amount. ❒ Data recollection and statistical analysis of data are adequately done. ❒ Se hace validación estadística del modelo o bien es se muestra claramente la participación de los "dueños del proceso". ❒ Experimentation is done according to plan and results analysis is done correctly.. ❒ Conclusions are clear and precise, with solid arguments supported by experimentation results, in congruence with the stated objective.

2. Definition of period for assessment.
   The academy defined that the rubric would be applied for testing purposes during the January-June 2011 semester.

3. Identification of courses where assessment will be applied.
   Assessment would be done using the rubric for SLO_II3 in the Systems Simulation course for 8th semester students.

4. Notification to faculty involved in assessment activities.
   The corresponding faculty members in each campus were trained in the use of the rubric as well as the electronic portfolio.

5. Definition of learning activities and evidence.
   The selected faculty members defined the learning activities and evidence for assessment, in this case the final project.

6. Students deliver their work during the semester.
   Students worked on the assigned activities during the semester and delivered heir work..

7. Faculty evaluate and provide feedback to students.
   Faculty evaluated student work using the rubric for SLO_II3

8. Faculty generate a summary of assessment results.
   Each faculty member generated a summary of assessment results for student learning based upon the selected course and rubric, and these were integrated by the academy for analysis.

9. The Academy analyzes the summary of assessment results.
   The Academy analyzed the assessment results as a group and found the following results with regards to SLO_II3:

Team	# Members	0 Insufficient	1 Introductory	2 Developed	3 In Development
1	3		X	X	
2	3			X	
3	3		X		
4	3				X
5	4			X	
6	3		X		

As a result of the analysis of the global summary of assessment results, the academy came to the following conclusions and areas of opportunity:

- The academy will evaluate the possibility of modifying the rubric (using analytical rubrics instead of holistic rubrics for example), to ensure more detailed data. Assessment instruments should be calibrated and evaluated periodically by faculty.
- Notification to faculty about participation in assessment, as well as training should be done with more anticipation, to allow for faculty preparation.
- Some areas of opportunity have been identified regarding student learning, that should be addressed, such as knowledge and skills relating to methodology (data recollection and adjustment testing), results validation, etc,

ASSESSMENT DATA FROM EXTERNAL SOURCES.

It is necessary to identify additional objective metrics to include in the design and deployment of assessment plans and programs. Currently, last-year students present an undergraduate exit examination (EGEL) administered by CENEVAL (an organization in México that offers various examination services), and designed by academics from different universities all over Mexico.

The Academy analyzed the results of the EGEL examination for Industrial Engineering, as an external source for assessment information, and the results are presented as a summary in this document.

CENEVAL (National Center for Evaluation of Higher Education) in México has developed a series of instruments to evaluate basic knowledge for professionals that have concluded their academic programs. The instrument is called EGEL (Undergraduate Exit Examination) and has specific versions designed for various academic programs, using a scale that measures professional requirements established by industry and government, for new professionals.

In CETYS, graduating undergraduate students do the EGEL examination in their last semester of studies, and the results obtained are an external indicator that provides important information for program review, and specifically learning outcomes and educational objectives analysis, as well as modifications to the curriculum.

Since 2006, systematic information regarding the EGEL examination is available for analysis, and up until 2009, the EGEL examination evaluated five primary areas for Industrial Engineering:

1. Basic Sciences: Physics, Chemistry, Mathematics.
2. Fundamentals of Industrial Engineering: Methods Engineering, Quality, Operations Research, Electricity and Control, Manufacturing Engineering, Project Evaluation.
3. Industrial Engineering Applications: Industrial Management, Industrial Security, Control and Planning, Plant Engineering, Management, Commercialization.
4. Social Sciences and Humanities: Human Capital Development, Communication.

The global CENEVAL index is evaluated using three levels of achievement: ANS (Unsatisfactory Achievement), DS (Satisfactory Achievement) and DSS (Outstanding Achievement). In the year 2010, the EGEL examination was modified to evaluate knowledge and abilities for professionals of Industrial Engineering programs focusing on four areas:

1. Study of Work.
2. Operations Management and Supply Chain Management (PCP and Logistics).
3. Production Systems.
4. Industrial Management.

A detailed analysis of the EGEL results for Industrial Engineering may be found in the "2007-2010 EGEL Results Analysis for Industrial Engineering" report done by the Academy.

In the following years, program level assessment will continue with common program level learning outcomes being assessed in the odd semesters, while program specific learning outcomes will be assessed during the even semesters with correlating data from the EGEL examinations as an external assessment source.

The following assessment timeline has been defined by the Academy:

- For the August-December 2011 semester, SLO_II1 (Quality and Continuous Improvement) will be assessed in the Design of Experiments course and/or a selected specialization course.
- For the January-June 2012 semester, SLO_II2 (Supply Chain Management) will be assessed in the Production Systems courses, and SLO_II3 will continue to be assessed in the Simulation Systems course.

The program level assessment processes require the electronic portal to be expanded to include all program level learning outcomes, and also allow for report generation relating to student achievement for program review purposes.

The Academy identifies the need for an analysis of the curriculum for possible modifications to obtain better alignment for student learning and improvement of EGEL results.

6. Students.

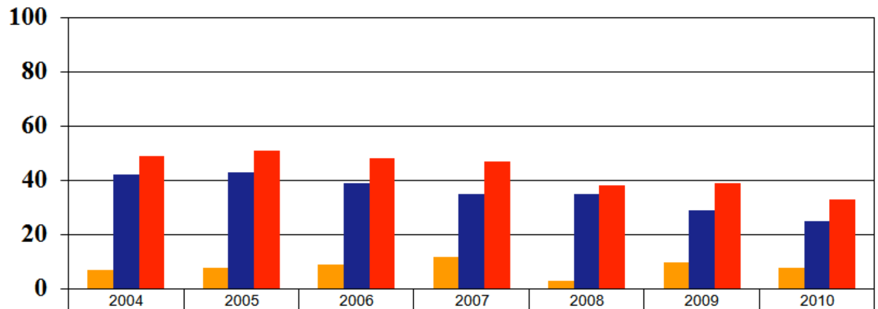
The following table presents the student population for the Industrial Engineering Program from 2004 to 2010.

Students		2004-2	2005-2	2006-2	2007-2	208-2	2009-2	2010-2	Avg 2004 2010	Diff 2004 2009
	New admissions	33	48	50	81	64	54	**71**	57.29	115.15%
	Mxl	18	27	26	47	43	32	**37**	32.86	105.56%
	Tij	8	13	15	22	18	12	**25**	16.14	212.50%
	Ens	7	8	9	12	3	10	**9**	8.29	28.57%
	Returning students	175	157	170	179	173	175	**228**	179.57	30.29%
	Mxl	120	94	101	104	106	109	**123**	108.14	2.50%
	Tij	55	63	69	75	67	66	**81**	68.00	47.27%
	Ens	0	0	0	0	0	0	**24**	3.43	NA
	Total	208	205	220	260	237	229	**299**	236.86	10.10%
	Mxl	138	121	127	151	149	141	**160**	141.00	2.17%
	Tij	63	76	84	97	85	78	**104**	83.86	23.81%
	Ens	42	43	39	35	35	29	**33**	36.57	-30.95%

As can be observed, the student population for the Mexicali and Tijuana Campuses may be considered as stable and acceptable, however this is not the case for the Ensenada Campus, which has a student population which is lower than the institutional metrics (60 students). Nonetheless, enrollment for the academic program has grown in each of the three Campuses (around 30%).

A detailed analysis of new enrollment and re-enrollment for the Ensenada Campus shows a drop in 2008, due to the city's economic situation and competition from other universities like UABC, ITE and UTT with strong promotional campaigns. Special attention should be given to strengthening communication linkages with the community to provide information regarding the benefits of studying Industrial Engineering at CETYS University.

New Enrollment Tendencies 2004-2010
Industrial Engineering (August enrollment) – Ensenada Campus



	2004	2005	2006	2007	2008	2009	2010
NI	7	8	9	12	3	10	8
RI	42	43	39	35	35	29	25
Total	49	51	48	47	38	39	33

The student profile analysis for shows certain common or specific characteristics per Campus, that provide important information for the definition of strategies with regards to enrollment and retention:

- The number of equivalency students in the Ensenada Campus has increased to 25%, with students coming in from UABC (academic quality reasons) and ITESM (security reasons).
- In the case of the Mexicali Campus, new enrollment students show a homogeneous academic preparation, due to the fact that most are from the CETYS High School, while in the case of the Tijuana and Ensenada Campuses, an increase in students coming from the CETYS High Schools is perceived along with two other High Schools.
- An increase in female students is noted: in Mexicali around 35% of the population is female, while in Ensenada the female population is around 15% and in Tijuana is around 27%. It is also noted that the female population has a better graduation rate with a lower drop-out rate.
- In the Ensenada Campus, an increase in students coming from outside Ensenada noted, with this phenomenon being less in Mexicali and Tijuana. Mexicali has tutoring and foreign student body programs for these types of students.
- The socio-economic profile of students is mid-low and low, which affects retention for economic reasons.

One of the differentiating factors of the program is student mobility. We currently have a double degree program with City University of Seattle, and national and international exchange program. The following table provides information regarding these factors:

	2006-2	2007-2	2008-2	2009-2	2010-2
Student Exchange			1	2	5
Summer Course	4				
Double Degree					1

In 2009-2 nine out of the 210 students of the program participated in the double degree program with City University of Seattle (4%), and 14 participated in an exchange program (7%). In total 23 students (11%) participated in some mobility program.

The following table, shows student participation has remained at 11%. The year with greater student participation was 2007-2 with 12%.

	2006-2	2007-2	2008-2	2009-2	2010-2
% Double degree City U	N	1%	2%	4%	4%
% Student Exchange	2%	5%	10%	7%	7%
% mobility	3%	6%	12%	11%	11%

Last year shows that the double degree program with City University of Seattle has gained popularity and it qualifies as a differentiation element; this is maybe at the expense of the exchange programs. What is also clear is that students of the 2004 plan tend to look for student mobility in greater percentage than the 2000 plan students. This is shown by observing the 2007-2 period which corresponds to the first year when the 2004 plan student were eligible to participate in double degree and exchange programs.

The Academy recommends participation of female professionals in the Induction Workshops, to help strengthen the vocational message for female students and also the establishment of cooperation linkages with the Female Professionals Club and Rotary Clubs, to develop programs that promote and support female scholarships for female students with outstanding academic achievement.

The support mechanisms for foreign students should be standardized in all three Campuses, analyzing alternatives for student housing.

Due to the socio-economic profile of students coming to our engineering programs, financial support mechanisms that are sustainable, in addition to traditional financial aid, should be analyzed. These should include alternatives regarding internships, research projects and awards for academic achievement, that provide additional financial support for students.

The Academy recommends strategies for promotional activities relating to new enrollment, that use Competitive Intelligence Marketing techniques, that allow for market positioning of the strengths of the Industrial Engineering program and Institution to be seen as a first option for new students.

7. Faculty.

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

The Academy of Industrial Engineering has the following members:

Academy of Industrial Engineering.				
#	**Name**	**Degree**	**Area of knowledge**	**Campus**
1	César Barraza	Master's in Science	Industrial Processes, Economic Engineering	Mexicali
2	Carlos Solorio Magaña	PhD	Quality and Optimization Modeling	Mexicali
3	Ezequiel Rodríguez	Master's in Science	Statistics and Quality, Operations Research	Mexicali
4	Héctor Vargas	Master's in Science	Simulation, Statistics, Operations Research.	Mexicali
5	Enrique Fitch	Master's in Science	Industrial Processes, Economic Engineering	Tijuana
6	Carlos González	Doctor´s in Engineering	Manufacturing, Simulation, Automation,	Ensenada
7	Socorro Lomelí	Master's in Science	Quality, Quantitative Models, Statistics and Economic Engineering	Ensenada

The Academy analyzed faculty from the perspective of commitment, evaluation and development, and concludes that the faculty group has a strong commitment with the institution and the program, with high student evaluations (above institutional standards), and also has low rotation.

Faculty show a good academic experience and disposition for continuous development. Also, there are Faculty members with experience in applied research for technological problem solving in companies, with company executives and experts participating in specialization courses.

However, an area of opportunity is identified in strengthening the faculty group via faculty development towards the obtainment of doctoral degrees from Universities other that CETYS for full-time and part-time faculty members, as well as a mix of bringing new faculty from other institutions, regional, national and abroad, with a focus on faculty with Doctoral degrees. The recent integration of Dr. Carlos Solorio as a full-time faculty member is an example of a step forward in these efforts.

The Academy recommends the definition of a clear strategy and timeline for current faculty development to obtain doctoral degrees, in the case of full-time and part-time faculty, as well as a hiring plan for new faculty with doctoral degrees.

Also, increased participation of faculty in applied research and publication activities is desired. The Academy recommends an analysis and re-definition of academic work-load policies, as well as faculty evaluation policies, so as to align these with the CETYS 2020 Plan expectations regarding applied research and faculty development.

8. Support Resources.

All classrooms have projector equipment and wireless Internet connection. Some classrooms have sound equipment. Faculty cubicles have computer and Internet connection.

The library has carried out considerable improvements, especially in the acquisition of electronic books and data bases.

Within the supporting programs we have departments that manage their own resources and strengthen the student's holistic education, such as:

- Student Life is a department that carries out sporting, cultural, and social activities and supports integration and the student body operation.
- Entrepreneurial Development Center promotes the student body participation in the Management and Economic Simulation Exercise program (MESE in Spanish) which strengthens the training for business decision making process through simulators. Coupled to this, the Center promotes the visits to companies and seminars in the institution.
- Student Development Center supports students since before the enrollment process through vocational guidance services, and it accompanies them throughout their undergraduate studies with tutorials, workshops, and psychological guidance.
- English Language Center supports students in the accreditation of TOEFL-equivalent test.
- Computer Services is provided by Information Services who manages computer resources in both software and hardware, as well as the necessary multimedia resources for course instruction, Blackboard platform, secure Internet access, local network connections, databases, e-mail and videoconference services.
- General Computer Laboratories provide computer resources for general hardware and software use.

In addition, the engineering programs offered by the College of Engineering have the following laboratories by campus:

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

The Academy identifies the need for a periodic plan for upgrading faculty computing equipment, in the case of full time and part time faculty, primarily hardware and software tools that are required for teaching as well as research activities.

9. Alumni.

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

- 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 within 3 years after graduation.

To evaluate the effectiveness of these educational objectives, the Academy is currently reviewing alumni studies that have been developed by the Institutional Research Offices, and complementing these with alumni surveys for the 2004 and 2005 cohorts.

The Employer Surveys (2008 and 2009) and Employment Studies that are done currently by the Institutional Research offices, identifies the employee perceptions regarding graduates of the program as positive, and in general show a preference to hire our graduates, recognizing values, initiatives, leadership an entrepreneurship as distinctive qualities in our alumni.

Around, 77% of our graduates obtain employment a month after graduation, while 15% obtain employment in 2 to 4 months after graduation. Our graduates have a 35% rotation rate due to better job offerings and around 13% work in family businesses (first to third generation).

There are three primary areas of opportunity identifies by employers that should be addressed:

1. Costs and profits background: Reinforcement of knowledge in the accounting and economic engineering fields.
2. Teamwork: Reinforcement throughout the curriculum, but primarily in the common education courses and based upon the institutional learning outcomes and goals.
3. Humbleness: Reinforcement throughout the curriculum, but primarily in the common education courses and based upon the institutional learning outcomes and goals.

These areas of opportunity reinforce the Academy's recommendation of the need for an analysis of the curriculum for possible modifications to obtain better alignment for student learning and adaptability to the changing environment.

The positive results indicate the need to continue best practices that have provided our graduates opportunities for job placement, such as professional practices and social service, and integral educational model, strong faculty leadership and participation of experts from the industrial and government sectors, as well as the program review process as a key continuous improvement piece for the program.

10. Strengths and Areas of Opportunity.

As a result of the integrated program review analysis done by the Academy, as well as information generated from accreditation processes (such as CACEI), the following strengths have been identified.

1. PERTINENCE: There is a high demand for professionals in Industrial Engineering in the region, with strong and growing Industrial development in the state of Baja California, therefore, the academic program is not only pertinent but strategic and should be seen as such by CETYS University.
2. FACULTY: Faculty with years of experience, who are committed to the Institutional Mission, which in turn has a strong impact in the way faculty work with students. Faculty are willing to be evaluated throughout the teaching and learning process and receive feedback for improvement.
3. EDUCATIONAL MODEL: Institutional guidelines clearly define the rights and obligations of students. There are diverse support structures to promote life long learning for students, incorporating internationalization and language studies.
4. PERIODIC PROGRAM REVIEW: Strong commitment to continuous improvement, with involvement and engagement by the academic community in program review, via work in the Academies.
5. TEACHING AND LEARNING PROCESSES FOCUSED ON THE STUDENT: The use of diverse pedagogical methodologies and the use of computational tools, for problem solving, are promoted and used throughout the curriculum. Assessment of student learning provides important feedback for the identification of areas of improvement.
6. INFRASTRUCTURE: Laboratories and information technologies that support student learning as well as educational technologies are a key component of the educational model.
7. GRADUATION RATES (WITH REGARDS TO NATIONAL MEAN): Retention rates are closely monitored and students follow-up via CEDES and Academic Coordinators contribute to high efficiency rates for program completion.
8. INTEGRATION OF GRADUATES INTO THE WORK FORCE: Graduates are recognized and accepted into the work force, achieving the educational objectives stated for the academic program.

The following areas of opportunity were identified by the Academy and are considered key points for improvement of the Industrial Engineering academic program of CETYS University:

1. Improvement in EGEL results.
2. Increased involvement of Faculty in applied research activities and faculty development (increase number of faculty with Doctoral degrees).
3. Low enrollment as well as a strong dependence on economic fluctuations.
4. Increased integration and use of data on assessment of student learning, as well as alumni follow-up.
5. Integration of academic information systems for decision making.
6. Curriculum modifications (integration of current knowledge and skills required for professionals).

11. Action Plan.

Category	Areas of Opportunity	Proposed actions	Proposed Timeline
1	Improvement in EGEL results	Analysis of EGEL areas of knowledge and identification of areas in the academic program that need to be strengthened. EGEL study program for students with support of faculty focused on improving results in problem areas.	Planning: August-December 2011 Deployment: January-June 2012 Responsible: Academy of Industrial Engineering
2	Increased involvement of Faculty in applied research activities and faculty development (increases number of faculty with Doctoral degrees).	Analysis and modification of academic work load policies. Hiring plan for Faculty with Doctoral degrees for the next 10 years as well as a faculty development program for current faculty with a focus on Doctoral degree obtainment.	Planning and deployment: 2011 Hiring of faculty (at least 1 per campus, a total of 3): 2012-2013 Faculty development for doctoral degrees (at least 1 per campus, a total of 3): 2012-2016 Responsible: Vice-presidency of Academic Affairs, College of Engineering
3	Low enrollment as well as a strong dependence on economic fluctuations.	Strategic plan for promotional activities relating to new enrollment, that use Competitive Intelligence Marketing techniques, that allow for market positioning of the strengths of the Industrial Engineering program and Institution to be seen as a first option for new students. Focus on high schools that feed students to CETYS University. Involvement by industry/sector experts, as well as distinguished female professionals in the fields of Industrial	Planning: August-December 2011 Deployment: 2012 Responsible: Academy of Industrial Engineering in coordination with Enrollment Offices and Promotional Department.

		Engineering is desired. Social media promotion program that links activities of the Schools and College of Engineering to social media application such as facebook and twitter.	
4	Increased integration and use of data on assessment of student learning, as well as alumni follow-up.	Continue assessment processes and periodic academy meetings, where discussion on student learning is done and documented in a systematic manner, identifying areas of opportunity. Keeping faculty involved and engaged is important. Modifications to electronic portfolio and institutional portal should be discussed. A program for alumni follow-up congruent with the program's educational objectives should be developed.	Planning: August-December 2011 Deployment: 2012 Responsible: Academy of Industrial Engineering
5	Integration of academic information systems for decision making.	Identification of required academic data and information to work with the information technologies department and the Vice-presidency of Academic Affairs to integrate current information systems to provide academic data for decision making, as well as for the assessment and program review processes.	Planning: January-June 2011 Deployment: August-December 2011 Responsible: Vice-presidency of Academic Affairs, Information Technology Department, Academy of Industrial Engineering
6	Curriculum modifications (integration of current knowledge and skills required for professionals).	Program review results and conclusions should be integrated for content modification in current courses to include topics identified as important for knowledge and skills development required by professionals in the Information Technology fields. Curricular development	Planning: 2011-2012 Deployment: 2013 Responsible: Vice-presidency of Academic Affairs, College of Engineering, Academy of Industrial Engineering

		processes for new versions of the program must include findings of this program review process, and curricular modifications must be considered (structure and quantity of courses).	