College of Engineering
Electronics and Mechatronics Academy

Bachelor in Electronic Cybernetics Engineering
Program Review
2013

Table of Contents

1. Introduction.

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

- M.S. Arturo Escoto (chair) - Tijuana Campus.
- M.S. Adolfo Esquivel – Tijuana Campus.
- M.S. Jorge Sosa – Mexicali Campus.
- M.S. Carlos García – Ensenada Campus.
- M.S. Cristobal Capiz – Mexicali Campus.
- Doctor Moises Sanchez – Tijuana Campus.

Also, the Dean of the College of Engineering, Dr. Miguel Salinas, who collaborates and is strongly involved with the Electronic Cybernetics Engineering program, was invited as a member of the Academy of Computer Science Engineering for the program review process. Additionally, as a policy established by the College of Engineering, any new full-time faculty member, with specialization in Electronics and/or Mechanic Engineering, will become a member of the Academy of Electronic Cybernetics Engineering.

The Bachelor's in Electronic Cybernetics Engineering Program was launched in the Mexicali Campus in 1984, in the Tijuana Campus in 2004, and in the Ensenada Campus in 1995. Since 1984, it has undergone 4 major reviews, in 1992, 2000, 2004, and 2007. The total number of graduates of the program for the Mexicali Campus is around 63, for the Tijuana Campus is around 27, and for the Ensenada Campus around 15.

- Graduates were involved in the design, integration and deployment of the technology required for the C4 Center, which manages all emergency services communications requirements for Baja California, i.e. police, firefighters, medical services, etc. The services can be used via the 066 emergency phone service (equivalent to 911 I the United States). This communications infrastructure is highly integrated and recognized nationally as the first of its kind that has been implemented in México.
- Graduates have been involved in the design, integration and deployment of network and computer systems for the government, and local industries such as Kenworth, Sony, Telcel, and Telnor, to name a few.
- Graduates have been involved in the design, integration and deployment of automated process control systems that involve robotics, programmable controllers, electronic design and virtual instrumentation, in local industries like Kenworth, Mitsubishi, Ascotech, Amphenol, Cardinal Health, and Samsung, to name a few.

- Graduates have gone abroad to study Master's and PhD's and have obtained their degrees from Higher Education Institutions in countries such as the United States, United Kingdom, Spain and Switzerland.
- Graduates whom have obtained their Master's and PhD's abroad are currently working for research institutions like the ETH in Switzerland and others in countries like the United States and Spain.
- Students have constantly achieved high scores and received merit diplomas from CENEVAL for their achievement in the EGEL test.
- Students have constantly obtained positive results in scholarship programs offered by institutions outside CETYS such as Samsung, Televisa, Kenworth, Santander to name a few.
- Students have constantly gone abroad in various Student Exchange Programs offered via CETYS University's International Exchange Program, to countries such as the United States, Germany, France and Spain and have also participated in other international programs in Australia as part of the Espacio Vanguardia Scholars Program offered by Televisa.
- Approximately 7 out of 10 students are working in a professional practice program in local industry by their 6th semester (out of 8 semesters) and approximately 9 out of 10 students are employed full time by the time they finish their studies (8th semester).
- Full time faculty of the program are actively involved in partnerships with the local industry, i.e Bose Corp. in Tijuana (M.S. Arturo Escoto), consulting and training for local companies like Honeywell, Skyworks, Sony (M.S. Cristóbal Capiz), as well as institutions abroad like ETH in Switzerland (M.S. Jorge Sosa López) to name a few.
- The first book published by the CETYS University Editorial Project is "*Sistemas de Control Secuencial y Fundamentos de PLCs*" ("Sequential Control Systems and PLC Fundamentals") by full-time faculty M.S. Jorge Sosa López.
- Graduates have participated in research projects with industry partnership programs through CONACYT initiatives such as Coordenada Movil in Tijuana.

As part of the institutional process of continuous improvement, a work team was created to review the Electronic Cybernetics Engineering program in the semester from January to June of 2013. In addition to members of the academy, the participation of pairs from other educational institutions accredited by WASC was considered as a key element for valuable feedback for the process. Considering that the program has recently changed its educational model in accordance to national guidelines to a competency-based model.

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 external reviewers from other programs. 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 2014 versions of the academic programs.

An improvement plan is presented in the final section of this paper. It includes the main activities proposed to make the necessary changes according to the results of the analysis.

2. Revision of the mission, vision and educational objectives.

For the analysis of the Mission and Vision of the Electronic Cybernetics Engineering program, we began by identifying some important historical and contextual information, as well as significant achievements of the program:

- The first professionals in the area of software graduated from the program in 2009 in Mexicali Campus and 2010 in Tijuana Campus.
- Students of the program have participated in research and technological development projects with local companies such as Argus Tecnologías.
- Students have dedicated to research through master's degree programs not only in Mexico, but also abroad.

The total number of graduates for the program, for the Mexicali Campus and Tijuana's campus is around 400 each.

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

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

a) Digital Design (Digital Electronics, Computer Architecture, Microprocessor Based Design, Interface Design): Focus on the design and integration of digital electronic systems based on computers, for solutions that require computing technology and computer interfacing with external processes and systems.
b) Automated Process Control (Control Systems, Mechatronics): Focus on the design and integration of computer systems for automated process control.
c) Networking (Operating Systems, Computer Networks): Focus on the design and integration of computer systems for networking applications.

d) Electronics (Electrical Circuits, Analog Electronics, Power Electronics): Focus on electronic circuit designs that support applications for computer interfacing, automated process control and networking.

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) Microelectronics and Semiconductors (Semiconductor Physics, Analog and Digital IC Design, etc.): Focus on IC design and manufacturing processes.
b) Robotics and Industrial Automation (Robotics, Programmable Controllers, etc.): Focus on robotics and automation for industry.
c) Bioengineering (Nanotechnology, Biomedical Instrumentation): Focus on systems for biomedical applications that involve electronics, instrumentation and computing technology.

In addition to the above mentioned elements, CETYS University's 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 Computer Science Engineering Program, established as part of the previous review process states:

The Mission of the Bachelor in Electronic Cybernetics Engineering Program is to generate highly qualified professionals whose applied knowledge in the areas of electronics, digital design and computing technology, provide innovative, sustainable and efficient solutions to industry needs, by integrating computer systems for automated process control and networking applications.

The Vision of the Bachelor's in Electronic Cybernetics Engineering Program is to be the primary source in the region for professionals that provide innovative solutions that require the use and integration of electronics, digital design and computing technology for automated process control and networking applications.

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 in Electronic Cybernetics Engineering Program points out the importance of the development of "intellectual capacity." Nonetheless, the mission of the program does not explicitly specify 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 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 socioeconomic level. The institutional mission points out the intellectual capacity of graduates 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 people. 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 Computer Science and Software Engineering, through a process of review and analysis, has re-defined the Mission and Vision of the Electronic Cybernetics Engineering program as follows:

The mission of the ECE program is to contribute to the training of professionals of excellence with the necessary scientific and technological skills in the areas of electronics, computer and information and communications technologies, to significantly participate in solving society's problems. Innovation, integrity and sustainability will be systematically promoted in their professional performance.

The vision of the ECE program is to train professionals that are the best in their field of expertise, globally competitive, and professionals who provide innovative, sustainable and profitable solutions for the engineering challenges of society.

The mission of the academic program strengthens the institutional commitment of training professionals capable of excelling in their work field, but it only implicitly state their role as a person and their commitment with society through a “successful professional life”.

While the institutional mission focuses on the development of the country, the vision of the program adopts a more local perspective. This represents an opportunity to develop Program Level Learning Outcomes, and an assessment program that responds to the proposed challenge in the vision.

The vision of the academic program reassures the institutional commitment of educating persons with the moral capacity, but it adds the following:

- Emphasizes excellence.
- Innovative and sustainable solutions.

The vision of the program points out in a clear way that the program should move towards a better deployment of its emphasis. This would have to be reflected in the curricular and co-curricular subjects, departments, and support and infrastructure centers that in one way or another impact the academic program.

The following Educational Objectives stem from the institutional mission and the academic program:

- Graduates of this program will work in projects involving design and integration of solutions involving computer systems, electronics, digital design, automated process control and networking technologies for applications in local industry.
- Graduates of this program will be project leaders for projects involving the design and integration of solutions involving computer systems, electronics, digital design, automated process control and networking technologies for applications in local industry.
- Graduates of this program will be able to do consulting projects in the areas of computer systems, electronics, digital design, automated process control and networking.
- Graduates of this program will be able to pursue graduate studies with success.
- Graduates of this program will be able to find a professional job within 6 months after graduation.
- Graduates of this program will be able to start their own business.
- Graduates of this program will be able to fill middle or top management positions within 3 years after graduation.

3. Revision of the program's capacity.

3.1 Structure of the program.

CETYS University's academic programs, at the Bachelor level, have the following structure and degree obtainment requirements:

- Accreditation of 42 subjects (totaling 328 credits) for the 2004 programs and 42 subjects plus 4 additional Complementary Formation Line subjects (totaling 360 credits) for the 2007 programs.
- Completing 400 hours of professional practice.
- Completing 500 hours of social service.
- Completing the corresponding EGEL (undergraduate exit test) examination administered by CENEVAL (organization in México that offers various examination services).

Curriculum for the Electronic Cybernetics Engineering program is comprised of the following subjects:

Semester	Code	Subjects
1	MA400	Mathematics
1	CC400	Programming methods I
1	CE403	Introduction to Electronic Cibernetics
1	CS401	Thinking skills
1	EC400	Globalization and Economic Developement
2	MC400	Computer-aided Drawing
2	MA401	Diferential Calculus
2	CC402	Programming methods II
2	FI400	Physics I
2	CE404	Digital Electronics I
2	CS403	Cultural I
3	MA402	Integral Calculus
3	FI401	Physics II
3	MA403	Numeric methods I
3	CD405	Digital Electronics II
3	CS400	Advanced communication in Spanish
3	CS404	Cultural II
4	MA404	Probability
4	MA407	Diferential Equations
4	FI402	Physics III
4	CE406	Computer Architecture
4	CE407	Electric Circuits
5	MC405	Statistical Inference
5	CC404	Data Structure
5	CC406	Operating Systems
5	CE410	Analog Electronics I
5	ID400	Advanced communication in English
6	CE409	Design with Microprocessors
6	CE410	Analog Electronics II
6	CE411	Control Systems
6	CS402	Research Methodology
6	HU400	Human Being and the Environment
7	CE412	Interfaces design
7	CE401	Computer networks
7	CE414	Power Electronics
7	HU401	Human Being, History and Society
7	OP400	Optional subject I
8	CC414	Selected Programming Topics
8	CE402	Computer Network Applications
8	CE415	Mechatronics
8	HU402	Human Being and Ethics
8	OP401	Optional subject I

3.2 Program and Institutional 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.

There are four Institutional Learning Outcomes that 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 Computer Science and Software 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 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 their 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 regarding 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 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 Electronic Cybernetics Engineering program are three and were identified as follows:

The student of the Bachelor in Electronic Cybernetics Engineering program will…

- SLO_ICE1: … design digital electronic systems, using hardware and software tools, to build solutions to engineering problems for diverse applications.
- SLO_ICE2: … solve engineering problems via the design and integration of electronics and computer systems and for automated process control applications.
- SLO_ICE3: … solve engineering problems via the design and integration of electronics and computer systems and for networking applications.

The program level learning outcomes that are specific to Electronic Cybernetics 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 in Electronic Cybernetics Engineering with an Emphasis in Microelectronics and Semiconductors will…

- SLO_MSC: … design digital and analog integrated circuits, using hardware and software tools, for diverse applications.

The student of the Bachelor in Electronic Cybernetics Engineering with an Emphasis in Robotics and Industrial Automation will…

- SLO_RIA: … design and integrate robotics and automation systems that involve electronics and computer systems for industrial applications.

The student of the Bachelor in Electronic Cybernetics Engineering with an Emphasis in Bioengineering will…

- SLO_BIO: … design and integrate systems for biomedical applications that involve electronics and computer systems.

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.

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 subject, the students know, understand, comprehend and are familiar with the subject topics".* It is expected that students have little or no knowledge of the subject topics previous to the subject. Knowledge and abilities acquired from previous subjects may be used to develop students in the solution of problems of low to medium 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 their 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 subject the students are able to analyze and apply subject topics in various contexts, which present diverse levels of difficulty". Knowledge, skills and abilities acquired from previous subjects are used to develop solutions to application problems, of medium 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 subject, the students exhibit an integrated understanding of the subject topics and their application, knowing when and how to apply them".* Knowledge, skills and abilities acquired throughout previous subjects 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 consistent with the above levels, using different nomenclature (Sufficient, Improvable, Outstanding). This scale is also consistent with the program level scale of Introductory, in Development and Developed.

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

			ENGINEERING BACHELOR'S PROGRAMS STUDENT LEARNING OUTCORS			BACHELOR'S IN ELECTRONIC CYBERNETICS ENGINEERING STUDENT LEARNING OUTCORS			EMPHASIS OPTIONS FOR BACHELOR'S IN ELECTRONIC CYBERNETICS ENGINEERING STUDENT LEARNING OUTCORS		
CURRICULAR ELERNTS			SLO_ENG1	SLO_ENG2	SLO_ENG3	SLO_ICE1	SLO_ICE2	SLO_ICE3	SLO_MSC	SLO_RIA	SLO_BIO
CODE	COURSE	SERSTER	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL
MA400	Mathematics for University	1	I	I	I		I	I			
CC400	Programming Rthods I	1	I	I	I		I	I			
MC400	Computer Aided Drawing	1	I	I	I		I	I			
MA401	Differential Calculus	1	I	I	I						
CC402	Programming Rthods II	2	I	I	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	NuRrical Rthods	3	I	I	I						
MA404	Probability	3	I	I	I						
MA407	Differential Equations	4	R	R	R						
FI402	Physics III	4	R	R	R						
MA405	Statistical Inference	5	R	R	R						
CE403	Introduction to Electronic Cybernetics	1	I	I	I		I	I			
CE404	Digital Electronics I	2	I	I	I	I	I	I			
CE405	Digital Electronics II	3	I	I	I	I	R				
CE406	Computer Architecture	4	R	R	R	R	R	R			
CE407	Electrical Circuits	4	R	R	R		I				
CC404	Data Structures	5	R	R	R			R			
CC406	Operating Systems	5	R	R	R			R			
CE408	Analog Electronics I	5	R	R	R		I				
CE409	MicroprocesEr Design	6	R	R	R	E	R				
CE410	Analog Electronics II	6	R	R	R	R	R				
CE411	Control Systems	6	R	R	R		E				
CE412	Interface Design	7	E	E	E	E	R				
CE413	Computer Networks	7	E	E	E			R			
CE414	Power Electronics	7	E	E	E		E				
CC414	Selected Topics in Programming	8	E	E	E	E	E				
CE402	Computer Network Applications	8	E	E	E			E			
CE415	Rchatronics	8	E	E	E		E				
	Elective I	7	E	E	E				E	E	E
	Elective II	8	E	E	E				E	E	E
	Emphasis Elective I (MSC, RIA, BIO)	5	R	R	R				R	R	R
	Emphasis Elective II (MSC, RIA, BIO)	6	R	R	R				R	R	R
	Emphasis Elective III (MSC, RIA, BIO)	7	E	E	E				E	E	E
	Emphasis Elective IV (MSC, RIA, BIO)	8	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 subject (5th semester), and also program level subjects 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.

Once the curricular mapping was concluded, the lessons learned during the process are as follows:

- Clarity with which each subject relates to each Learning Outcome.
- There is an important amount of involvement and engagement, as well as ownership by faculty members of the Academy that participated in the process.
- Subject content and evaluation criteria were unified.
- Discussion on how students learn and should learn throughout the academic program was achieved among faculty.
- Key moments for the assessment of student learning throughout the academic program were identified.

- Experience was obtained for further program review processes.

3.3 Faculty participating in the program.

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

- M.S. Cristobal Capiz – Mexicali Campus.
- M.S. Arturo Escoto – Tijuana Campus.

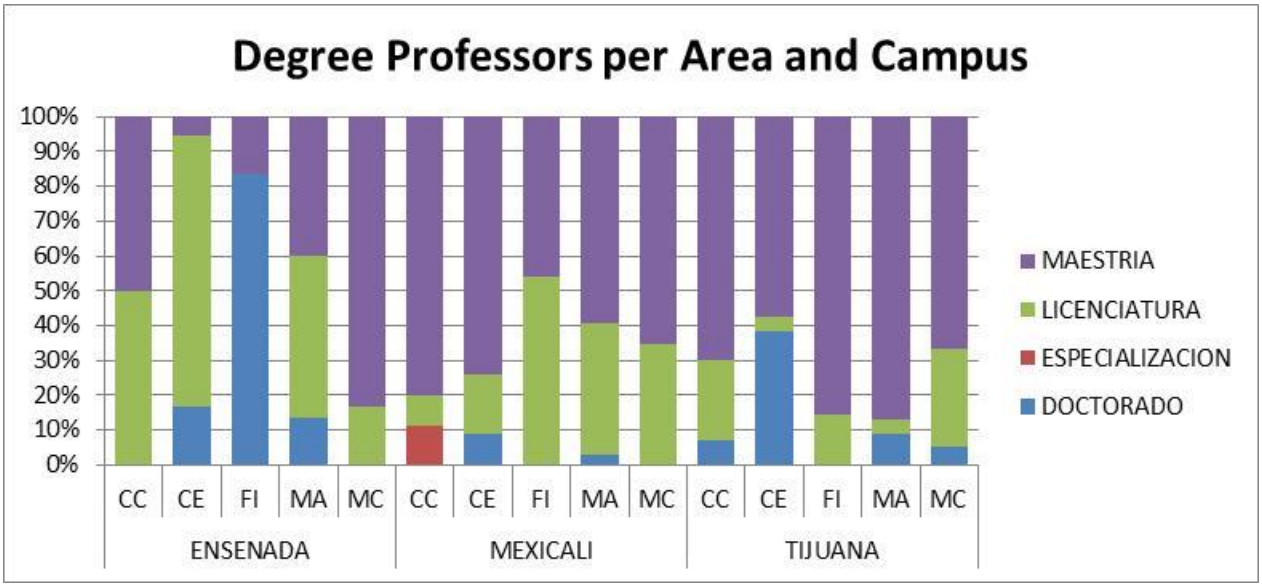
Teachers who are associated with the program, (most members of the Mechanics Engineering Academy) are:

Name	**Academic Degree**	**Knowledge Area**	**Institution**	**Type**	**Campus**
Cristobal Capiz	Master's in Science	Control Eng. Digital Systems	CETYS	Full time	Mexicali
Jorge Sosa	Master's in Science	Digital Systems, Instrumentation.	CETYS	Full time	Mexicali
Arturo Escoto	Master's in Science	Control Eng. Digital Systems, Robotics	ITESM / UABC	Associate*	Tijuana
Adolfo Esquivel	Master's in Science	Power's electronics, Microcontrollers.	IPN /CITEDI	Part time	Tijuana
Moises Sanchez	Ph. D.	Networkind, Telecommunicactions.	IPN /CITEDI / CETYS	Part time	Mexicali
Jesús Corona	Master's in Science	Aerospace design, Thermal, Fluids	Universidad de Pisa / Universidad Politecnica de Madrid	Associate*	Mexicali
Iván Pulido	Master's in Science	Mechanical design	ITESM	Adjunct	Mexicali
Nataly Medina	Master's in Science	Digital Systems	CETYS / CITEDI	Adjunct	Tijuana
Ricardo Martínez	Ph. D.	Control Eng. Artificial Intelligence.	UABC	Full time	Tijuana

The following table shows the distribution of professors on the subjects taught in the Cybernetic Electronics Program from the previous two semesters:

CODE	SUBJECT	SEMESTER	PROFESSORS		
MA400	Mathematics	1	M.S. Mauricio Odreman	M.S. Rodrigo Matus	M.S. David Dueñas
CC400	Programming methods I	1	Eng. Gerardo Del Rincon	Eng. Jose Garcia	
CE403	Introduction to Cybernetic Electronics	1	M.S. Jenifer Osuna	M.S. Natali Medina	
MC400	Computer Drawing	2	Ing. Maribel Lazcano	M.E. Ivan Cáldelas	
MA401	Differential calculus	2	Mat. Alfredo Rodriguez	M.S. Rodrigo Matus	
CC402	Programming methods II	2	Eng. Wendy Trujillo	Ing. Josefina Becerra	
FI400	Physics I	2	Eng. Talia Hernandez	Ing. Roberto Hernandez	
CE404	Digital Electronics I	2	M.S. Natali Medina		
MA402	Integral Calculus	3	Mat. Alfredo Rodríguez	Mtro. Claudio López	M.S. Rodrigo Matus
FI401	Physics II	3	Ing. Salvador Baltazar	M.S. Talia Hernandez	M.S. Jesus Camacho
MA403	Numerical Methods	3	M.S. Mauricio Odreman	Ing. Maribel Lazcano	
CE405	Digital Electronics II	3	M.S. Natali Medina	M.S. Arturo Escoto	
MA404	Probability	4	Ing. Salvador Baltazar	M.S. Rodrigo Matus	
MA407	Differential Equations	4	M.S. Mauricio Odreman		
FI402	Physics III	4	Mtro. Claudio Lopez	M.S. Jesus Camacho	

MF402	Computer Architecture	4	M.S. Natali Medina		
CE407	Electric Circuits	4	M.S. Jenifer Osuna	M.S. Natali Medina	
MA406	Multivariable Calculus	5	Dra. Gabriela Estrada	Ing. Diana Navarro	
CC404	Data Structures	5	Eng. Gustavo Nieves		
CC406	Operating Systems	5	Eng. Arturo Sevilla		
CE410	Analog Electronic I	5	M.S. Natali Medina		
CE409	Microprocessor Designs	6	M.S. Adolfo Esquivel		
CE410	Analog Electronic II	6	M.S. Jenifer Osuna		
CE411	Control Systems	6	M.S. Natali Medina		
CE412	Interface Design	7	M.S. Natali Medina		
CE401	Computer Networks	7	Ph.D. Mosises Sanchez		
CE414	Power Electronics	7	M.S. Adolfo Esquivel		
CC414	Topic on programming	8	Eng. Cesar Rico		
CE402	Computer Networks Applied	8	M.S. Daniel Moctezuma		
CE415	Mechatronics	8	M.S. Arturo Escoto		



As we can see on the chart, it is remarkable that most of the teachers in al Cetys Campuses have earned master's degrees and the Ph.D. population is growing according with the institutional development plan.

3.4 Research lines of the program.

CETYS UNIVERSITY's System, has many years of research in the fields stated on its Mission: Engineering, Administration and Social Sciences and Humanities. The research is primarily of the applied type, and with a focus on solving problems of the region of Baja California. The cases are reported in the documents that have been delivered to CONACYT to endorse the RENIECYT registration. It has also been documented in the applications and endorsements made by the Institution to belong to the National Register of Quality Postgraduate Programs.

The institution's strategic plan towards the year 2020 (CETYS 2020 PLAN) has several strategies defined in order to strengthen its faculty and research in the institution in order to ensure that this activity is an essential part of their academic functions, and in turn, take this ability to assist in the economic, social and cultural development of the region of Baja California. The three strategies are defined as follows:

(1) Strengthening its faculty through support to develop research activities in some cases, and obtaining doctoral degrees in others.
(2) Recruitment of faculty with doctoral degrees and with experience in research and publication of results.

(3) Creation of three Centers of Excellence to conduct research and technology development projects that will significantly impact on the productive, social and cultural sectors of Baja California.

To properly align all research efforts, and in turn, coexist in harmony with the teaching activities, the Institution took on the task of defining a research plan which sets out the guidelines and policies that describe the operational framework of this activity. This plan also sets targets and indicators to be achieved in the short, medium and long term. It stands as one of them, for example, that our faculty members are members of the National Researchers System of CONACYT.

Due to the ordering of research and including its graduate programs in the National Register of Quality Graduate Programs (PNPC for its acronym in Spanish), and encourage research in their careers, the Institution instructed each of its academic areas (Engineering, Business and Administration, and Social Sciences and Humanities) to define their areas of research, as well as organizing its faculty to form academic bodies in each of them. Thus the following lines were established for the area of Engineering:

(1) Information and Multimedia Technology. This research line addresses the problems related to the design and the development of computer systems applied to process automation and information management using the internet platform and associated technologies. It also addresses the problems of designing the electronic systems required in specialized processes, mainly control. Nine full-time professors are working on this LGAC (4 with Doctoral degrees, and 4 in doctoral education). In this line are the following academic programs:

1. Electronic Cybernetics Engineering
2. Computer Science Engineering
3. Digital Graphic Design Engineering
4. Software Engineering
5. Master of Science in Engineering with emphasis in Information and Multimedia Technology.

Design and manufacturing processes. This research addresses the problems related to the design and engineering of products, considering the selection of materials, structural analysis, product testing, as well as the

processes required for its manufacture. Six full-time professors are working this LGAC (1 Doctor, and 3 in doctoral training). The following academic programs can be found in this line:

1. Mechanical Engineering
2. Mechatronics Engineering
3. Master of Science in Engineering with emphasis in Design and Manufacturing.

Systems and industrial processes. This research addresses the problems related to the analysis and improvement of processes in the field of production of goods and services, using statistical techniques and operations research as well as methods for quality improvement. Nine full-time professors are working this LGAC (5 doctors and 1 in doctoral training). In this line are the following academic programs:

1. Industrial Engineering
2. Master of Science in Engineering with emphasis in Systems and Industrial Processes.

These lines were defined according to the needs found in the different sectors of the region in which the institution desires to impact with the formation of high-level human resources, and the development of research and technological development. According to the Strategic Plan's indicators, significant progress has been made in strengthening its faculty and considering these LGACs and their specific topics for hiring and doctoral training of the faculty.

Academic bodies are created for each line of research at a system-level, so that professors are integrated to develop research and teaching activities with their respective academic group in both undergraduate and graduate studies. In turn, there are collegiate bodies in the institution for reviewing and monitoring each of its academic programs, the purpose of these groups is the learning assessment, student assessment and periodic review of the academic programs.

3.5 Facilities, laboratories and book collection of the program.

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 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 subject 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. Computer Networks Laboratory, Computer Laboratory.

- Ensenada: Physics, General Electronics, Chemistry, Production Systems, Industrial Computer labs.

4. Revision of the program's educational effectiveness

4.1 Graduates of the Program

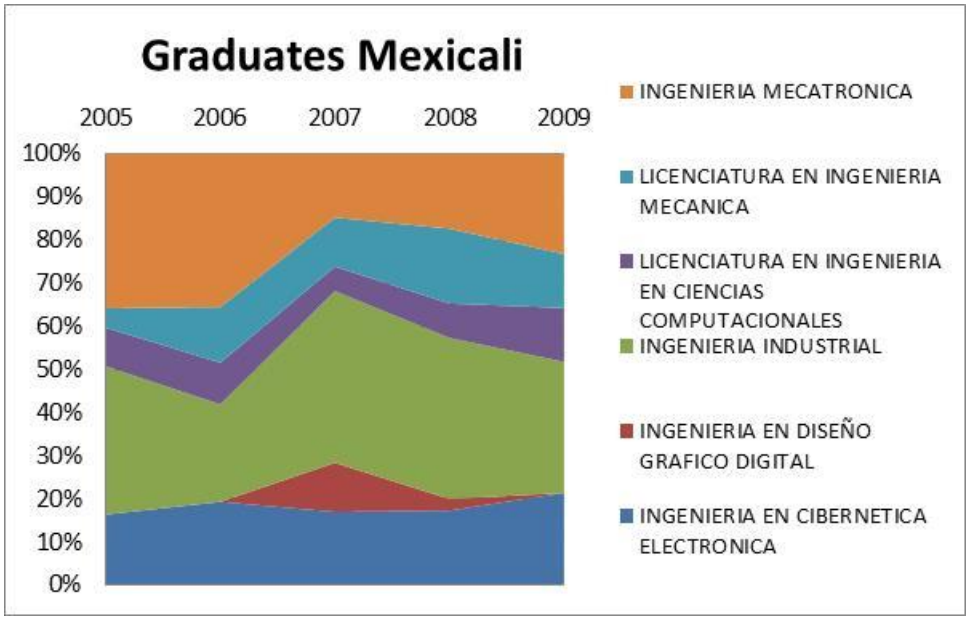


Figure 4.1

	2005	2006	2007	2008	2009	TOTAL
INGENIERIA EN CIBERNETICA ELECTRONICA	11	12	15	13	12	63
INGENIERIA EN DISEÑO GRAFICO DIGITAL			10	2		12
INGENIERIA INDUSTRIAL	23	14	35	28	17	117
INGENIERIA MECATRONICA	24	22	13	13	13	85
LICENCIATURA EN INGENIERIA EN CIENCIAS COMPUTACIONALES	6	6	5	6	7	30
LICENCIATURA EN INGENIERIA MECANICA	3	8	10	13	7	41
Escuela	67	62	88	75	56	

Table 4.1 Graduates of the Mexicali Campus

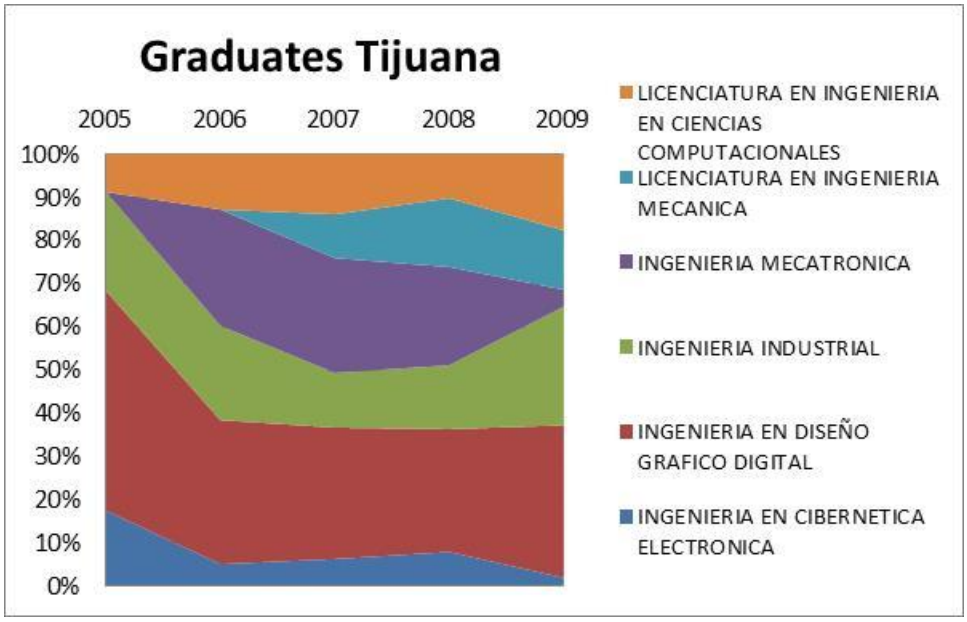


Figure 4.2

	2005	2006	2007	2008	2009	TOTAL
INGENIERIA EN CIBERNETICA ELECTRONICA	**10**	**4**	**5**	**7**	**1**	**27**
INGENIERIA EN DISEÑO GRAFICO DIGITAL	**29**	**26**	**24**	**25**	**18**	**122**
INGENIERIA INDUSTRIAL	**13**	**17**	**10**	**13**	**14**	**67**
INGENIERIA MECATRONICA	**0**	**21**	**21**	**20**	**2**	**64**
LICENCIATURA EN INGENIERIA EN CIENCIAS COMPUTACIONALES	**5**	**10**	**11**	**9**	**9**	**44**
LICENCIATURA EN INGENIERIA MECANICA	**0**	**0**	**8**	**14**	**7**	**29**
Escuela	**57**	**78**	**79**	**88**	**51**	

Table 4.2 Graduates of the Tijuana Campus

From the previous figures and tables we can see that the program in the Mexicali Campus has been steady through time for the graduate rate; however, we can also see that in Tijuana we have a special situation, where the program had a low admission rate and that caused the graduate rate to be lower than in previous periods.

4.2 Student Population

The student population trend of the Electronic Cybernetics Engineering program for the three campuses is showed in the following chart:

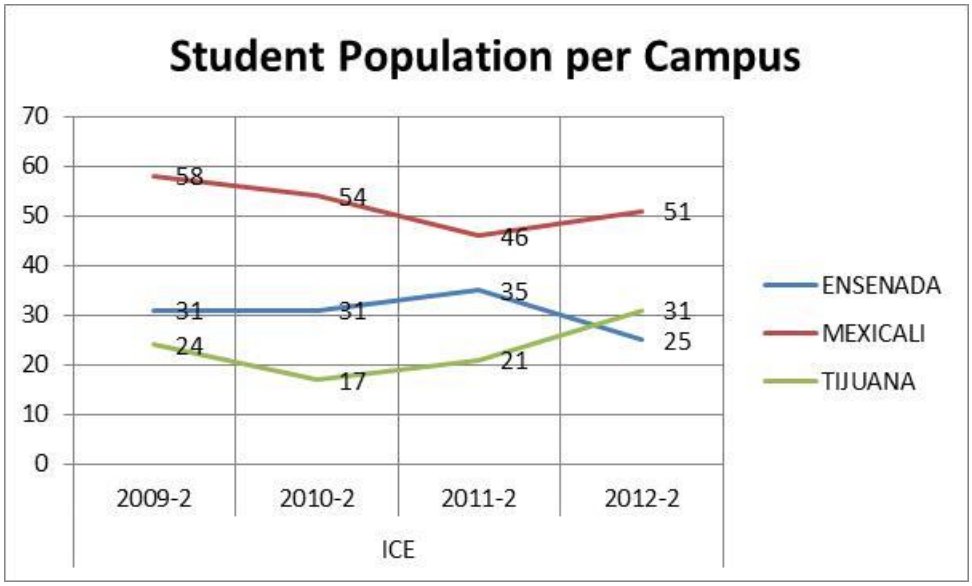


Figure 4.3

Row Labels	ENSENADA	MEXICALI	TIJUANA	Grand Total
ICE				
2009-2	31	58	24	113
2010-2	31	54	17	102
2011-2	35	46	21	102
2012-2	25	51	31	107

Table 4.3 Student Population per Campus

As is shown in figure 4.3, the student population in the Mexicali Campus has been steady through time, while in the Tijuana campus, in the 2010-2 cycle, the population decreased compared to the previous cycle. From that time on, the population regained an increasing trend and we expect to stabilize around 35 students.

The Ensenada Campus showed a reduction, although this population is still normal for that campus.

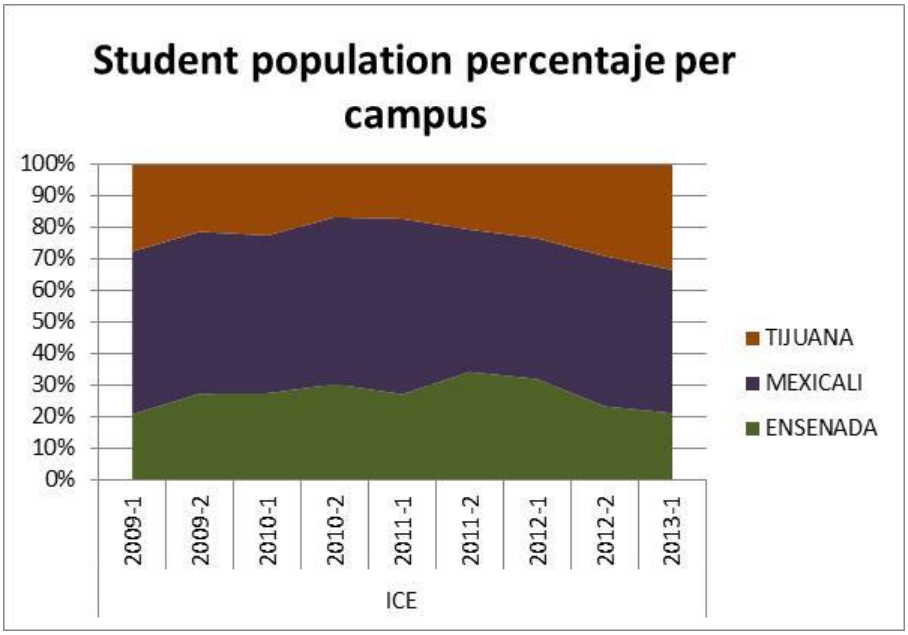


Figure 4.4

Row Labels	ENSENADA	MEXICALI	TIJUANA	Grand Total
ICE				
2009-1	25	62	33	120
2009-2	31	58	24	113
2010-1	32	58	26	116
2010-2	31	54	17	102
2011-1	27	55	17	99
2011-2	35	46	21	102
2012-1	33	46	24	103
2012-2	25	51	31	107
2013-1	21	45	33	99

Table 4.4 Student Population per Campus History

As shown in the previous chart, the most students of Electronic Cybernetics Engineering are from Mexicali Campus. Around 35% of the total population is in the Tijuana campus, and approximately 20% is in the Ensenada campus.

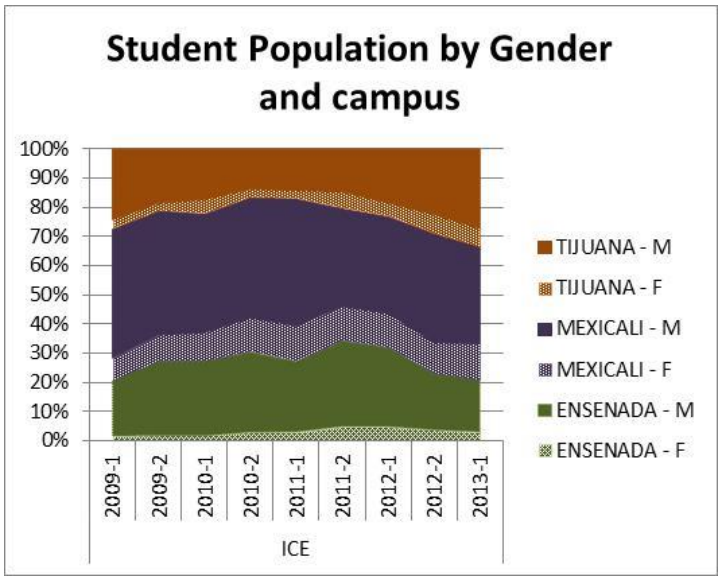


Figure 4.5

	ENSENADA		MEXICALI		TIJUANA	
Row Labels	F	M	F	M	F	M
ICE						
2009-1	2	23	9	53	4	29
2009-2	2	29	10	48	3	21
2010-1	2	30	11	47	6	20
2010-2	3	28	12	42	3	14
2011-1	3	24	12	43	3	14
2011-2	5	30	12	34	6	15
2012-1	5	28	12	34	5	19
2012-2	4	21	11	40	7	24
2013-1	3	18	12	33	6	27

Table 4.5 Student Population by Gender

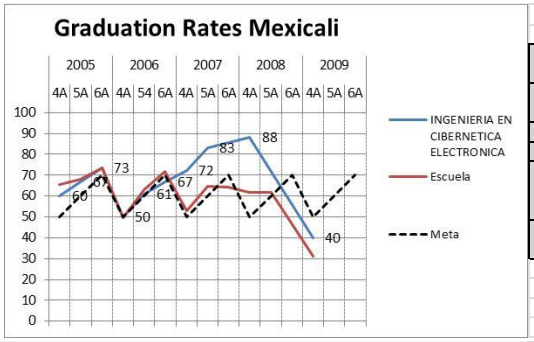
The gender behavior over time in the Mexicali and Tijuana campuses has been roughly stable. The female population represents about 10% of all students in both campuses.

In the Ensenada Campus, gender behavior over time is stable and some students are female, this trend may continue.

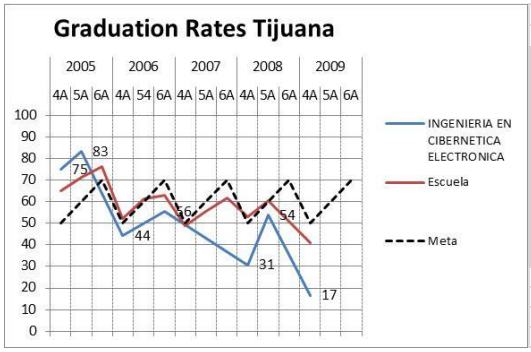
4.3 Analysis of retention and graduation rates

The retention analysis shown below for all campuses, shows that the retention rates have a normal trend for the Mexicali campus, for the period shown on the chart, there is a slightly high period in 2008 where some students had a delay in their graduation.

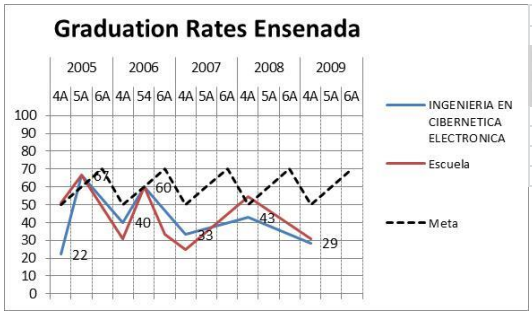
In the Tijuana campus there was a reduction on the trend because the population decreased in that period. In the Ensenada campus there is a normal trend according with the engineering school's behavior.



	2005			2006			2007			2008			2009		
	4A	5A	6A	4A	54	6A	4A	5A	6A	4A	5A	6A	4A	5A	6A
INGENIERIA EN CIBERNETICA ELECTRONICA	60	67	73	50	61	67	72	83		88			40		
INGENIERIA EN DISEÑO GRAFICO DIGITAL										35	50		18		
INGENIERIA INDUSTRIAL	70	85		44	48	52	63	71	73	62	67		55		
INGENIERIA MECATRONICA	66	75		54	73	85	67	72		63	68		30		
LICENCIATURA EN INGENIERIA EN CIENCIAS COMPUTACIONALES	31	46		33	56	67	22	44	56	60			25		
LICENCIATURA EN INGENIERIA MECANICA	100			67	78	89	42	53		62			19		
Escuela	65	68	73	50	63	72	53	65	64	62	62	###	31	##	##
Meta	50	60	70	50	60	70	50	60	70	50	60	70	50	60	70



	2005			2006			2007			2008			2009		
	4A	5A	6A	4A	54	6A	4A	5A	6A	4A	5A	6A	4A	5A	6A
INGENIERIA EN CIBERNETICA ELECTRONICA	75	83		44		56				31	54		17		
INGENIERIA EN DISEÑO GRAFICO DIGITAL	71	74	76	54	62	67	57	69		63			72		
INGENIERIA INDUSTRIAL	80	87		60	64	68	50	56		62			61		
INGENIERIA MECATRONICA				56		62	59		62	64	71		13		
LICENCIATURA EN INGENIERIA EN CIENCIAS COMPUTACIONALES	33	42		47	59		48	52		50	56		40		
LICENCIATURA EN INGENIERIA MECANICA							31	46	62	48			44		
Escuela	65	71	76	52	61	63	49	56	62	53	61	###	41	##	##
Meta	50	60	70	50	60	70	50	60	70	50	60	70	50	60	70



	2005			2006			2007			2008			2009		
	4A	5A	6A	4A	54	6A	4A	5A	6A	4A	5A	6A	4A	5A	6A
INGENIERIA EN CIBERNETICA ELECTRONICA	22	67		40	60		33			43			29		
INGENIERIA INDUSTRIAL	80			22		33	17			67			33		
Escuela	51	67	##	31	60	33	25	##	##	55	##	###	31	##	##
Meta	50	60	70	50	60	70	50	60	70	50	60	70	50	60	70

4.4 Learning Assessment Process.

The rest of this section will focus on the assessment plan and the 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 result 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 Cybernetic Electronics Engineering, as well as external assessment data relating to the EGEL exit test 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 subjects 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) Subject 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 subjects the assessment process will be

implemented. It is important that the selected subjects 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 subjects 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 a key to the success of the process.

6) Assessment during semester: The learning outcomes are assessed in the selected subjects, 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 2012 (August-December 2012):

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.

2) Subject selection for assessment: Based upon the subject offering for the August-December 2012 semester, 16 subjects were selected for assessment. Since institutional learning outcomes assessment is also being done during the same semester, subjects 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 this was analyzed and integrated, resulting in the definition of one rubric, this rubric is analytical for SLO_ENG1.

4) Definition of learning activities and evidence of learning: The 16 subjects 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, considering the normal subjectwork that faculty do during a regular semester in which the subjects 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 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 subjects during the August-December 2012 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 2013 and have been integrated into the program review documentation.

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

1. Definition of rubrics.
   Faculty for each campus will 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 subjects where assessment will be applied.
   Based upon the curricular mapping for the academic program, subjects 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 subject and curricular mapping.

6. Students upload their work to the electronic portfolio during the semester.
   Students do the assigned learning activity and upload their work to the electronic portfolio.

7. Faculty evaluate and provide feedback to students.
   Faculty will 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 will generate a summary of assessment results for student learning based upon the selected subject 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 second semester of 2013 (August – December 2013):

1. Definition of rubrics.
   Faculty for each campus defined 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. The rubrics are designed to evaluate the SLO's to be applied successfully in all the subjects.

2. Definition of period for assessment.
   The academy defined that the rubrics would be applied yearly in the January-June semesters according to the following calendar:

SLOs	**Assessment**
SLO_ICE1 SLO_ICE2	January-June 2012
SLO_ENG1	August - December 2012
SLO_ENG2 SLO_ICE3	January-June 2013

3. Identification of subjects where assessment will be applied.
   For the second rubric (SLO_ICE3 and SLO_ENG2) the following subject for the January-June 2013 semester were identified for assessment:

Code	**Group**	**Subject**	**Semester**	**Tijuana**	**Mexicali**
CE404	B2	Digital Electronics I	2	X	X
CE407	B4	Electric Circuits I	4	X	X
CE409	B6	Design with Microprocessors	6	X	X
CE415	B8	Mechatronics	8	X	X

4. Notification to faculty involved in assessment activities.
   Only one group per subject was offered in each campus, and the corresponding faculty members 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 and uploaded this information into the electronic portfolio.

6. Students upload their work to the electronic portfolio during the semester.
   Students worked on the assigned activities during the semester and uploaded their work to the electronic portfolio.

7. Faculty evaluate and provide feedback to students.
   Faculty evaluated student work using the rubric for SLO_ENG1.

8. Faculty generate a summary of assessment results.
   Each faculty member generated a summary of assessment results for student learning based upon the selected subject 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_ENG1.

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.

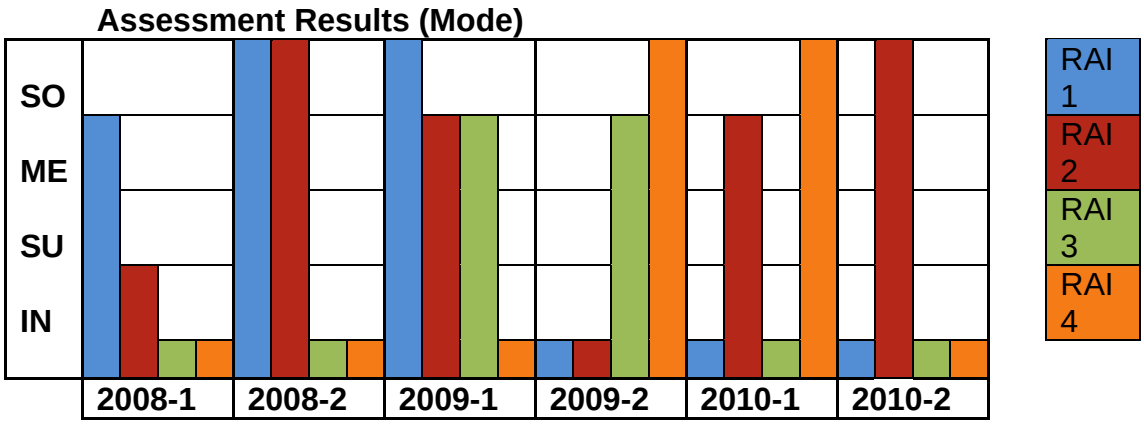
4.5 Learning Assessment Outcomes

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 subject 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.

PROGRAM ASSESSMENT RESULTS.

With regards to SLO_ENG1 for period 2012-02 (… problem solving…), in general, 61% of engineering students obtained learning achievement levels of 2 or 3 (Reinforcement/Improvable, Evaluation/Outstanding)

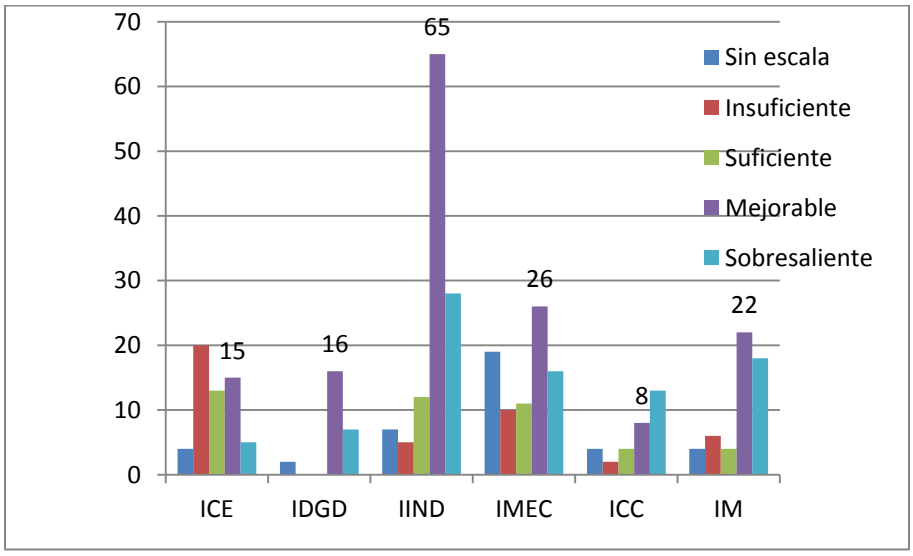
Program	Total Students	No scale	Insufficient	Sufficient	Improvable	Outstanding
ICE	131	23	30	28	32	18
IDGD	168	34	7	11	49	67
IIND	268	24	12	34	116	82
IMEC	204	40	17	32	74	41
ICC	58	7	9	6	14	22
IM	111	17	11	16	40	27
ISW	24	6	3	7	6	2
Total	964	151	89	134	331	259

Students Deployment level for SLO_ENG1 CEE Program

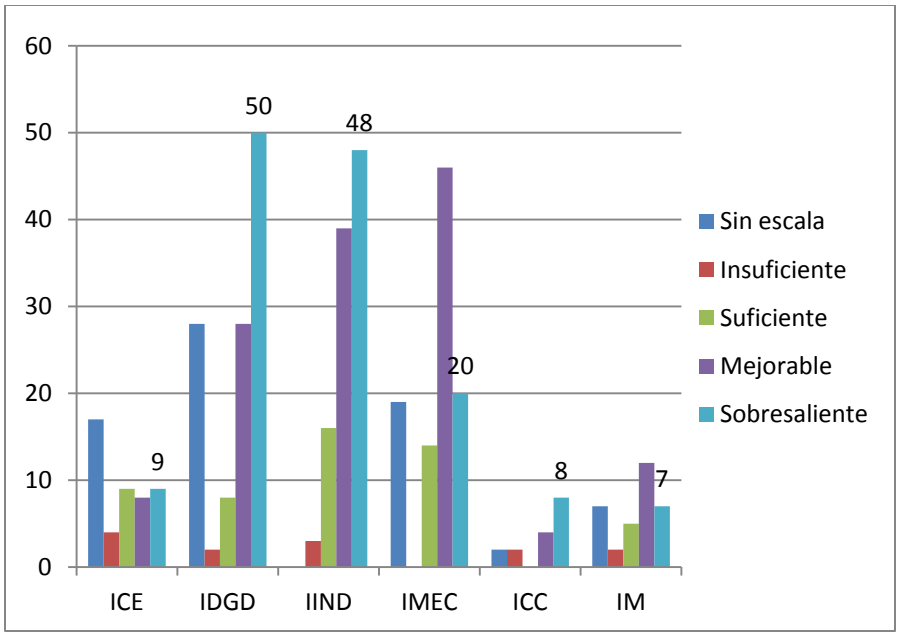
Program	Total Students	No scale	Insufficient	Sufficient	Improvable	Outstanding
ICE		18%	23%	21%	24%	14%
IDGD		20%	4%	7%	29%	40%
IIND		9%	4%	13%	43%	31%
IMEC		20%	8%	16%	36%	20%
ICC		12%	16%	10%	24%	38%
IM		15%	10%	14%	36%	24%
ISW		25%	13%	29%	25%	8%
Total		16%	9%	14%	34%	27%

Students Deployment level percentage for SLO_ENG1 CEE Program

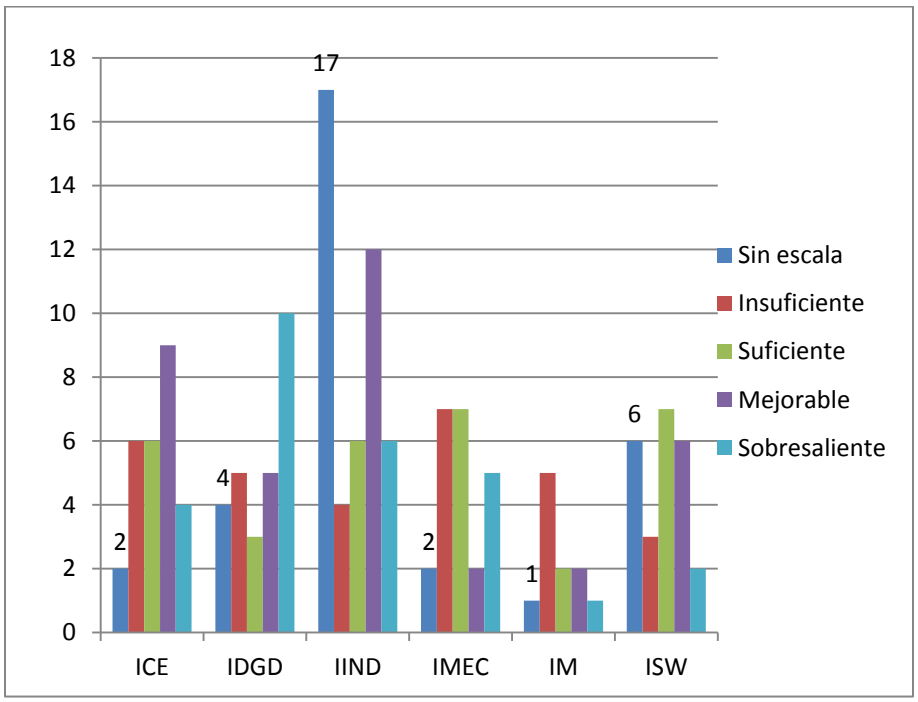
For this same learning outcome (SLO_ENG1), Cybernetic Electronics Engineering students, 38% obtained learning achievement levels of 2 or 3 (Reinforcement/Improvable, Evaluation/Outstanding):



Students Deployment level for SLO_ENG1 Mexicali's campus



Students Deployment level for SLO_ENG1 Tijuana's campus



Students Deployment level for SLO_ENG1 Ensenada's campus

For the January-June cycle of 2013, the learning measuring process focused on assessing Learning Outcome Program designated as SLO_ENG2 and SLO_ICE2, this was measured in three different subjects taught in Mexicali and Tijuana campus.

The final report for this assessment process is in analysis phase, results will be shown shortly.

4.6 Improvement actions derived from the learning assessment

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 results were consistent in both the Mexicali and Tijuana Campuses.
- The results are acceptable and are congruent with student learning expectations according to the current curricular mapping done for the academic program.
- Based on the need found, the Academy developed a learning measurement plan that will begin in August 2013.
- The action plan for measuring along all the campuses will be set as part of the regular activities and the academy agreed to use the same rubric for each period and same subjects in order to get standardized results.
- The program measurement plan will be carried out in parallel with institutional and engineering measurement plans, in order to obtain short-term feedback and to establish improvement actions.
- The improvements resulting from the learning measurement results will impact in restructuring programs, changes in infrastructure and convenient actions to achieve the learning outcomes set by the program.

4.7 Student performance in CENEVAL's EGEL

- 7 students took the test, of which none were distinguished with Outstanding Performance (0.0%), 2 with Satisfactory Performance (28.6%) and the other 5 (71.4%) did not obtain a Testimony in the Mexicali campus.
- 6 students took the test. One of them was distinguished with Outstanding Performance (16.66%), 2 with Satisfactory Performance and the other 3 did not obtain a Testimony in the Tijuana campus.
- To the date of the analysis, the data for Ensenada was not complete. The information will be attached at a later time.
- This tests consists of 4 areas: Electronic Systems Administration (ASE for its acronym in Spanish), Design and Integration of Electronic Systems (DISE for its acronym in Spanish), Creation and Implementation of Electronic Systems (CISE for its acronym in Spanish), and Operation and Maintenance of Electronic Systems (OMSE for its acronym in Spanish). The results are summarized in the following table:

AREA	STILL NOT SATISFACTORY	SATISFACTORY	OUTSTANDING
ASE	71.4 %	28.5 %	0.0 %
DISE	57.1 %	42.8 %	0.0 %
CISE	57.1 %	42.8 %	0.0 %
OMSE	42.8 %	42.8 %	14.2 %

The results shown in the table, unless there is a better opinion, suggest that all areas included in the test are critical to strengthen. This is based on the fact that we want to help our graduates to have oustanding performance in all areas. It is important to clarify that the students in this program take the test for Electronic Engineering because it is the one that goes more accordingly to their profile (this was suggeted by the Program Coordinator), since there is no specific test for this program.

4.8 Program accreditations and recommendations

Currently the program has been accredited by the WASC as part of the programs of Cetys University. However, the program has not been accredited by CACEI, the Accreditation Board of Engineering Teaching CACEI (in Spanish: “Consejo de Acreditacion de la Enseñanza de la Ingenieria”)

4.9 Follow up on the recommendations of the accrediting bodies

It is important to note that the construction activities the building of the Center of Excellence in Design and Innovation are about to begin, where both the engineering school and additional laboratories will be located.

4.10 Faculty productivity

The faculty of engineering colleges in addition to their work as teachers carries out various scientific researches related to research lines in: manufacturing, aerospace design, renewable energy, software development. These research areas have been defined as part of the needs identified in the CETYS 2020 Plan. The results of this research are published in articles by teachers in conferences, articles in journals and books.

Another important activity of the faculty is industry-related projects, that most times are funded through the stimulus for innovation awarded by organizations such as CONACYT. These projects arise from innovation needs of Industry to improve their products and / or manufacturing processes, these Companies go to CETYS asking for support in the specialty areas of the University.

The services required to the Institution are basically giving technical consultancy to develop an engineering project such as making an innovation. The results of these investments are documented as technical reports which describe that participation involved with the company, main activities and results obtained.

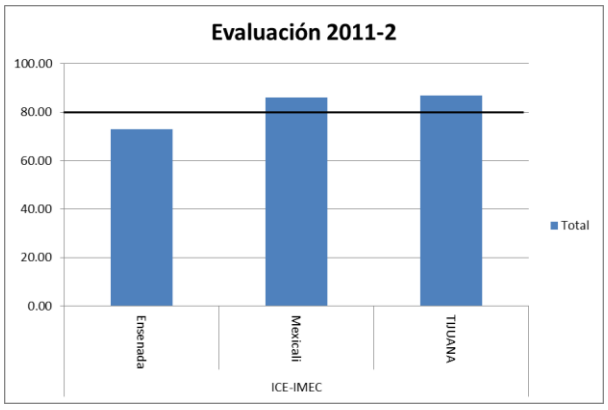
To CETYS is important that teachers are continually conducting research, publishing and participating in projects linked to the industry for this reason CETYS supports and recognizes teachers for their productivity. The help provided to teachers, who conduct research and publish, consists in give a balance in the quantity of subjects assigned, one less subject than normal quantity of subjects (four instead of three subjects); so teachers have the time to publish and conduct research.

Each year CETYS University launches a call with different categories to invite teachers to participate in the award given to those with more publications, research and outreach activities with industry.

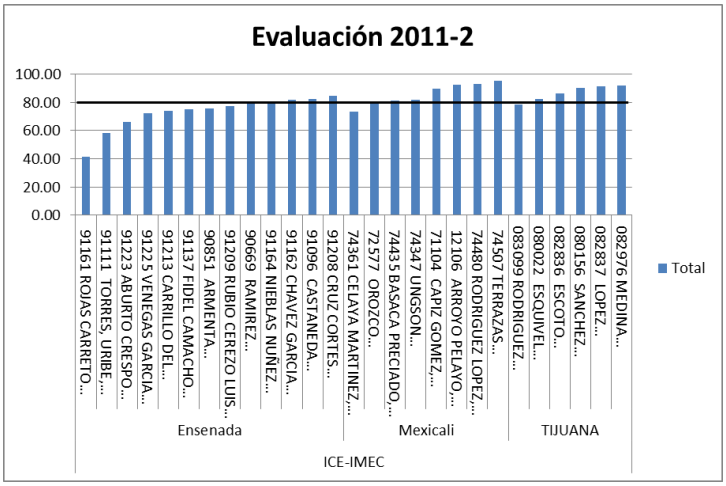
The faculty productivity is considered in the following aspects:
-Publications: articles in conferences, articles in journals, books
-Participation in projects linked to Industry
-Certifications and trainings
-Patents
-Level of SNI (National System of Researchers).

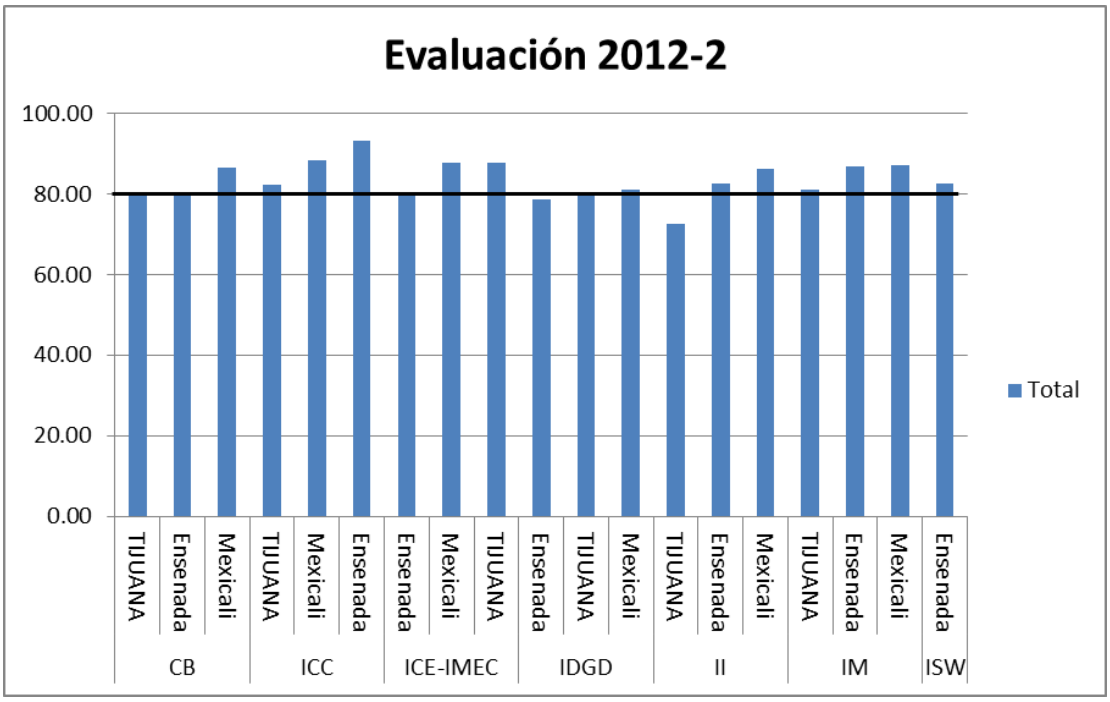
4.11 Faculty evaluation

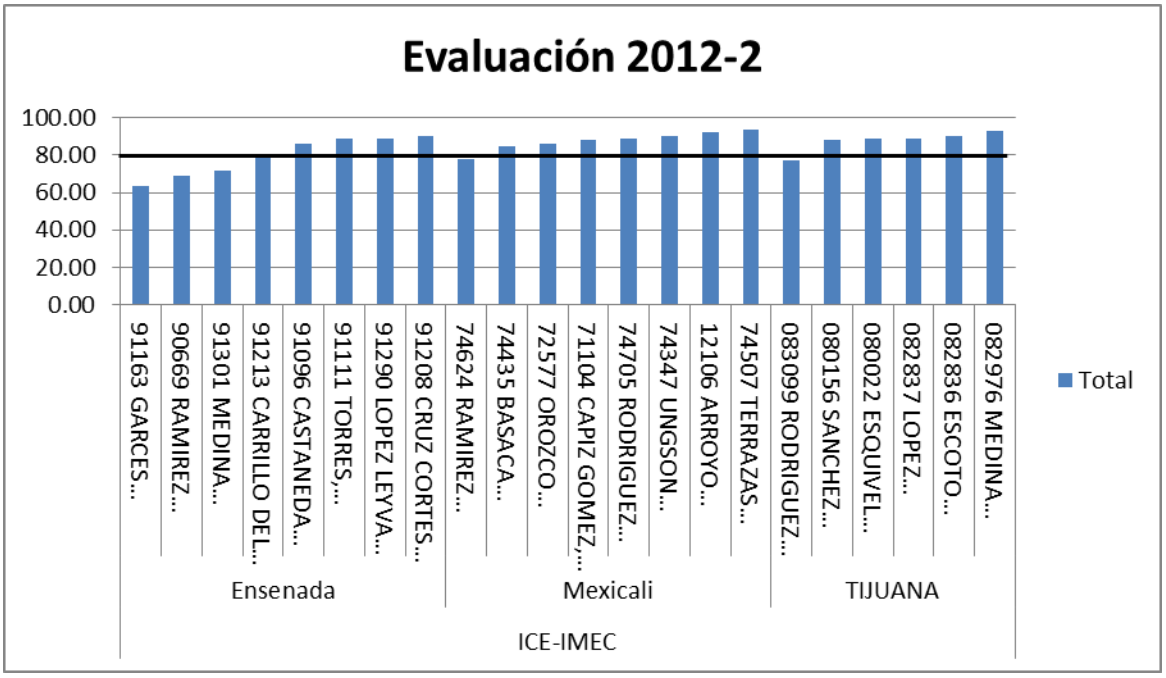
Evaluations presented are collected from the professor evaluation system, and as a sample it is displayed the last semester, from August to December, 2011 . As shown in the chart, majority obtained an evaluation of 8 out of 10 as a minimum, which is the Tijuana campus, however overall it is a good evaluation.



When analyzing teacher evaluations for the same period we can see that there are opportunities for improvement in some of members of the faculty that are below the standard, of at least 8 out of 10. To help professors who get low evaluations, there is a “Teaching Improvement Program” to which teachers are invited to attend. This program is managed by the Center of Faculty Development (Centro de Desarrollo del Profesorado in Spanish).




Evaluación 2012-2
100.00
80.00
60.00
40.00
20.00
0.00
TIJUANA
Ensenada
Mexicali
TIJUANA
Mexicali
Ensenada
Ensenada
Mexicali
TIJUANA
Ensenada
TIJUANA
Mexicali
TIJUANA
Ensenada
Mexicali
TIJUANA
Ensenada
Mexicali
Ensenada
CB
ICC
ICE-IMEC
IDGD
II
IM
ISW
Total


Evaluación 2012-2
100.00
80.00
60.00
40.00
20.00
0.00
91163 GARCES...
90669 RAMIREZ...
91301 MEDINA...
91213 CARRILLO DEL...
91096 CASTANEDA...
91111 TORRES,...
91290 LOPEZ LEYVA...
91208 CRUZ CORTES...
74624 RAMIREZ...
74435 BASACA...
72577 OROZCO...
71104 CAPIZ GOMEZ,...
74705 RODRIGUEZ...
74347 UNGSON...
12106 ARROYO...
74507 TERRAZAS...
083099 RODRIGUEZ...
080156 SANCHEZ...
080022 ESQUIVEL...
082837 LOPEZ...
082836 ESCOTO...
082976 MEDINA...
Ensenada
Mexicali
TIJUANA
ICE-IMEC
Total

4.12 Awards granted to the academic program

The program has been accredited in the Mexicali campus by CACEI in 2012 and the program will submit the auto study for the Tijuana campus in the near future.

5. External revision of the program

5.1. Academic profile of the external reviewers.

Salomón Oldak, Ph.D.
Professor
Electrical and Computer Engineering Department
Cal Poly Pomona

5.2. Recommendations of the external reviewers.

"This reviewer finds the program of studies well in sync with the industrial local needs, technologically current and although not part of this review, aligned with most of ABET requirements. The General Education as well as the Core components of the program, both in depth and breadth, are very similar to those of most other Bachelors leading to Engineering Degrees.
This program includes two features that deserve special commendation: One is the flexibility the student has of obtaining an emphasis area of their choice with the selection of elective classes in the seventh and eight semesters.
The second is the completion of 400 hours of Professional Practice requirement. This requisite gives the student invaluable practical experience and a fast path to obtain employment after graduation.
This reviewer pointed out during the visit a mild concern regarding the concurrency of students taking their first Electrical Circuits class with the Differential Equations class on the fourth semester. Consensus with CETYS faculty indicates that it would be preferable to offer the Differential Equations class previous to the delivery of Electrical Circuits. However it is recognized that rearranging these two classes is difficult, and there may not be an easy solution to solve this problem. However this is a point to be taken into consideration if significant shifts are ever considered in a future curriculum arrangement.

Recommendations:
This reviewer has basically two recommendations in regard to the program of studies:

a. Most students entering Engineering programs in México have good fundaments of pre-calculus as this is a High School requirement for graduation in the Physics-Mathematics concentration area. It seems therefore redundant to require from these students to take a class like MA400 in the first semester. For the few students that do not follow the typical path towards engineering this class could be required as a remedial subject.

   This reviewer would like to recommend to substitute this class by a "Discrete Mathematics" class, whose content doesn't seem to be currently offered in other parts of the curriculum. This class would cover logic, sets, recursion graphs and trees. This class

would better align the Cybernetics program with other similar programs which are ABET accredited.

b. A second recommendation would be the inclusion of a terminal experience Design Project (Senior Project), that could be included as part of the Professional Practice. In this reviewers personal experience this type of projects provide significant value to the student in terms of their development as engineers and individuals.

2. Faculty

Without exceptions all the faculty members this reviewer met seem to be enthusiastic, engaged and very willing to participate in the accreditation process. Everybody had a good understanding of the accreditation process and its requirements. Moreover there was a very active and productive exchange of ideas where the CETYS faculty seemed to be very receptive. The formal and informal talks showed a high degree of professionalism, competency and state of the art technical knowledge in their respective areas.

Also the campus split between Mexicali, Tijuana and Ensenada does not seem to be a significant issue. Faculty members visit on a regular basis each other campuses or coordinate meetings and solve issues electronically.

3. Students

This reviewer met alone with a class of about 30 students studying towards the B.Sc in Mechatronics Engineering. However they can be regarded as a significant sample of a CETYS Engineering group as many of their requisites are taken in conjunction with the students in the Cybernetics Electronics Engineering program.

Students were vocal, opinionated and very willing to express their thoughts.

A vast majority of students conveyed their satisfaction with the school and its programs. A huge majority indicated that they would recommend the school to others seeking Engineering degrees.

Students were particularly happy with the Professional Experience program and the way it works. Also they were very positive about the local employment opportunities, the perception that Industry has of their education, and the ease in which they may be incorporated into Industry immediately after graduation.

About 20% of the students indicated their willingness to further their education beyond graduation with graduate studies either in México, in the United States of America or in other countries.

4. Physical Installations

a. **Classrooms**

This reviewer visited some classrooms and conference halls. All of them seemed to be well equipped with multimedia equipment, Internet ready with either cabled or wireless connections. All installations are modern comfortable, and conductive to a learning environment.

b. **Laboratories**

The reviewer visited several laboratories. Labs have a combination of old and new equipment. It seemed to this reviewer that lab equipment is insufficient to handle the demand of one concurrent student section; sections have to be split either in time or equipment to accommodate demand.

Recommendation:

Given the hands on inclination of the Cybernetics Engineering program this reviewer feels that it is very important for the school to have state of the art, sufficient equipment to meet student needs. It is therefore recommended that further funding is sought to improve laboratory equipment upgrade older instruments and get sufficient equipment to be able to handle concurrently one full section of students."

6. Conclusions and long-term goals (4 years) for the program

Accreditation.

There is currently a plan under development to address the external reviewer's recommendations.

Additional to said plan, it is important to mention that the construction activities of the building for the Center of Excellence in Design and Innovation are about to begin. The School of Engineering and several additional laboratories will be located in this building.

It is also important to mention that CONACYT-EMPRESA projects are being developed with the participation of students and faculty of the program.

Subjects of the program.

The distribution by areas of study has a strengthening toward analysis and electronic design and digital integration.

The program needs to update specific content on new technologies and integrate current areas of development.

There is a deficit in laboratory hours for subjects that require it due to lack of equipment, laboratory space, and human resources.

Conclusions from the Review

SUPPORT RESOURCE	CONCLUSIONS
Book Collection	The material is obsolete for the career, with publications that have been in the collection for over ten years.
Facilities	The Institutional 2020 Development Plan is currently undergoing. This plan aims to operate a multi-campus system with the necessary infrastructure and services to support the type of education expected to be achieved in Plan 2020.
Equipment	Some of the laboratories and the equipment in them have been in use for an average of 20 years without being renewed and showing continuous failure. (Electronics, machines, tools, etc.)
Full-time Professors	Mexicali Campus: Of the 11 professors who teach the 20 subjects of the area of electronics, 1 is a full-time professor, 1 part-time (shared with other programs) and the rest of them are auxiliary. Tijuana Campus: Of the 9 professors teaching the 20 subjects of professional education, only 2 are part-time professors and the rest of them are auxiliary.
EDEC in the program	A lot of the activities covered by EDECs are done through extra-curricular activities; some of them are covered in the general education area or are not formalized within the program.

National and International Accreditation:

Propose CACEI accreditation and assign a coordinator to be in charge of the process.

Recommendations.

External reviewer:

The study plan of the Electronic Cybernetics program will greatly benefit from the inclusion of the subject Matter of Signs and Systems. SO

The program is flexible through specialties and optional subjects. It is also recommeded to add a specialty in telecommunications. SO

The program has contents typical to the area. It is recommended to update the curricular contents to technologies such as nanoelectronics, distributed and collaborative systems.

Operation of EDECs and other distinctive elements of the program: (Double grades, English courses, online courses, Professional Practice, Academic Mobility, etc.)

Establish activities that encourage the EDECs, as well as ways to evaluate them.

Offer online courses only for those subjects that do not have strong laboratory activities and/or analysis and incentive the teachers to design them.

Open opportunities for students to do their professional practice in Research Centers.

7. Attachments.

Polls, Rubrics, Accreditation Decisions, Graduate follow-up, CENEVAL's EGEL results, etc. ,

Rubric 1

Subject:

Rubric to Assess 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.				
TEAM MEMBERS:			**DATE:**	
	Unsatisfactory	**Developing**	**Satisfactory**	**Exemplary**
Problem Definition/Problem Statement	Problem not defined or stated. No objectives defined.	Problem is vaguely defined or unclear, with lack of justification. Hypothesis or scope of project or problem statement is vague or unclear.	Problem is clearly identified and stated. Elements for justification and scope of project are defined. Hypothesis or problem statement and scope of project are clearly defined.	Problem identification and definition are very clear. Justification is well developed; project objectives are very precise and measurable. Hypothesis or problem statement and scope are very precise and measurable.
Points	**0**	**8**	**15**	**20**
Application of basic science's tools	No theoretical framework presented. Did not collect meaningful data. Process description is not developed. Tools and methods were completely misapplied or absent.	Theoretical framework unclear, vaguely presented. Collected some meaningful data. Little detail on process description. Some tools and methods were applied but with significant errors or omissions.	Theoretical framework developed and clear. Collected most of the data needed. Process description is detailed. Most tools and methods were correctly applied but more could have been done.	Theoretical framework well developed and relevant. It collected all the appropriate data. Process description is detailed and used for improvement. Tools and methods were fully and correctly applied.
Points	**0**	**8**	**15**	**20**

Analysis and Interpretation of results	Little or no attempt to interpret results. No insight. Entirely missed the point of the analysis.	Interpreted some results correctly. Significant errors, omissions. Little insight. Very basic interpretation. Very vague analysis.	Analysis presented is clear, but not enough based on the tools and methods used. Interpreted most results correctly. Adequate insight. Missed some important points.	Outstanding analysis presented based on the tools and methods used. Results completely correct and appropriately interpreted. Excellent insight.	
Points	**0**	**10**	**20**	**30**	
Conclusions and recommendations.	No verification of conclusions was performed. No recommendations proposed.	Limited verification of conclusions. Very vague recommendations proposed.	Adequate verifications of conclusions, helping on improving the system.	Detailed verification of conclusions with several tools. High confidence and support of recommendations proposed for improving the system.	
Points	**0**	**5**	**10**	**15**	
Supporting documentation	No references presented. Tables, graphs and/or photos are not presented.	Only 1 reference presented is related to the project. Some of the tables, graphs and/or photos are not related to the project's objectives.	2 or 3 references presented are related to the project. Some of the tables, graphs and/or photos are related to the project's objectives.	More than 3 references presented are strongly related to the project. Several tables, graphs and/or photos strongly related to the project's objectives are presented.	
Points	**0**	**5**	**10**	**15**	
Assessment Result for SLO ENG1: UN, DE, SA, EX:				**Total Points:**	**95**

Rubric to Assess SLO_ENG2: …. Proficient design and manage of engineering projects.				
TEAM MEMBERS:			**DATE:**	
	Unsatisfactory	**Developing**	**Satisfactory**	**Exemplary**
Problem Definition/Problem Statement	Problem not defined or stated. No objectives defined.	Problem is vaguely defined or unclear, with lack of justification. Hypothesis or scope of project or problem statement is vague or unclear.	Problem is clearly identified and stated. Elements for justification and scope of project are defined. Hypothesis or problem statement and scope of project are clearly defined.	Problem identification and definition are very clear. Justification is well developed; project objectives are very precise and measurable. Hypothesis or problem statement and scope are very precise and measurable.
Points	**0**	**8**	**15**	**20**
Application of professional's tools	No theoretical framework presented. Did not collect meaningful data. Process description is not developed. Tools and methods were completely misapplied or absent.	Theoretical framework unclear, vaguely presented. Collected some meaningful data. Little detail on process description. Some tools and methods were applied but with significant errors or omissions.	Theoretical framework developed and clear. Collected most of the data needed. Process description is detailed. Most tools and methods were correctly applied but more could have been done.	Theoretical framework well developed and relevant. Collected all the appropriate data. Process description is detailed and used for improvement. Tools and methods were fully and correctly applied.
Points	**0**	**8**	**15**	**20**
Project planning and follow up.	There is no evidence of the use of any planning for the project. The tools if any are used in an appropriate way.	One management tools is used. The deployment of the activities does not match with proposal for the project.	There exist at least two project planning tools used. Gantt graphic and Bill Of Materials. The follow up sequence is inconsistent sometimes, the logs exists but are not accurate.	Project management tools are used and well deployed for the project. All responsibilities are well distributed along all team members. There is a log and report for each activity executed.
Points	**0**	**10**	**20**	**30**

Conclusions and recommendations.	No verification of conclusions was performed. No recommendations proposed.	Limited verification of conclusions. Very vague recommendations proposed.	Adequate verifications of conclusions, helping on improving the system.	Detailed verification of conclusions with several tools. High confidence and support of recommendations proposed for improving the system.
Points	**0**	**5**	**10**	**15**
Supporting documentation	No references presented. Tables, graphs and/or photos are not presented.	Only 1 reference presented is related to the project. Some of the tables, graphs and/or photos are not related to the project's objectives.	2 or 3 references presented are related to the project. Some of the tables, graphs and/or photos are related to the project's objectives.	More than 3 references presented are strongly related to the project. Several tables, graphs and/or photos strongly related to the project's objectives are presented.
Points	**0**	**5**	**10**	**15**
Assessment Result for SLO ENG2: UN, DE, SA, EX:				**Total Points:**