College of Engineering
Academy of Computer Science and Software

Bachelor's in Computer Science Engineering
Program Review
2010

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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 of 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 Computer Science and Software Engineering for the Computer Science Engineering program review process. The Academy of Computer Science and Software Engineering is comprised by the following faculty members:

- M.S. Guillermo Cheang (chair) – Mexicali Campus.
- M.S. Dania Licea – Mexicali Campus.
- M.S. Josefina Becerra – Mexicali Campus.
- M.S. Leopoldo Uribe – Tijuana Campus.
- M.S. Lucía Beltrán – Ensenada Campus.

Also, the Dean of the College of Engineering, Dr. Miguel Salinas, who collaborates and is strongly involved with the Computer Science Engineering program, was invited as a member of the Academy of Computer Science 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 Computer Science and/or Software Engineering, will become a member of the Academy of Computer Science and Software Engineering.

The Computer Science Engineering program was launched in 1975 in the Mexicali Campus and in 1980 in the Tijuana Campus. Since 1975 it has undergone around 7 major reviews, the latest being in 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 Computer Science Engineering program began the program review process, led by the Academy of Computer Science and Software 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 Computer Science Engineering program, we begin with identifying some important historical and contextual information, as well as significant achievements of the program:

- The first professionals in the area of software were graduated from the program in 1979.
- CETYS participated in 1982 as founding members of the National Association of Higher Education Institutions in Informatics (ANIEI), now known as the National Association of Higher Education Instititions in Information Technologies.
- Alumni were involved in the design, integration and deployment of systems technology for various companies in the region like Kenworth, Government, CETYS, CFE, UABC, to name a few.
- Some graduates have created important software companies for the Tijuana region (Wcubica, S.A., Arcus and PRISMA).
- Alumni have contributed for more than 25 years with IT knowledge to several companies and government (municipal and state).
- The program received its first accreditation by CACEI (organization in México that is equivalent to ABET in the United States) in 2007.

The total number of alumni for the program, for the Mexicali Campus is around 400 and for the Tijuana Campus around 400.

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

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

a) Software Development.
b) Computer Sciences.
c) Computer Networks.

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) Animation and Video Games Design.
b) Software Development.
c) Business Processes and Applications.

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 Computer Science Engineering Program, established as a part of the previous review process states:

> The Mission of the Bachelor's in Computer Science Engineering Program is to generate professionals with a profound knowledge of selected fundamentals of computing and technology, as well as a deep mastering of the software development process, that are able to develop a successful professional life within the software industry as an employee or independent professional.
>
> The Vision of the Bachelor's in Computer Science Engineering Program is be the primary source in the region for professionals for the software industry, focusing on the required abilities for specialized technical support and custom fit software development.

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 Computer Science 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 Computer Science and Software Engineering, through a process of review and analysis, has re-defined the Mission and Vision of the Computer Science Engineering program as follows:

> *The Mission of the Bachelor's in Computer Science Engineering Program is to generate professionals with a profound knowledge of selected fundamentals of computing, technology, and software development process, allowing them to develop a successful professional life.*
>
> *The Vision of the Bachelor's in Computer Science Engineering Program is to be the primary source of the region for software professionals, focusing on the solving of complex computational problems.*

The mission of the academic program strengthens the institutional commitment of training professionals capable of excelling within the work field, but it only implicitly state his/her role as a person and his/her 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:

- Software professionals
- Complex computational problems

The vision of the program points out, in a clear way, that the program should move towards software and complex problems. This would have to be reflected in the curricular and co-curricular courses, departments, and support and infrastructure centers that in one way or the other impact the academic program.

3. Student 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 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'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 Computer Science Engineering program were three and were identified as follows:

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

- SLO_ICC1: … design and build software-base systems for a generality of problems and situations and using distributed computing environments when they apply.
- SLO_ICC2: … design and implement computer networks using the convenient operating systems for creating distributed environments for software systems applications
- SLO_ICC3: … install, monitor and tune the operating systems and database systems such that he can solve problems in computing environments.

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

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

- SLO_ICC1: … analyze, design, develop and implement computer-based systems with current technology.
- SLO_ICC2: … design, configure and manage computer network in order to implement the main services and security schemes creating an environment of shared systems and shared resources in an efficient manner.
- SLO_ICC3: … install, monitor and tune system software in a modern operational environment such as database management systems, operating systems and middleware.

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

The program level learning outcomes that are specific to Computer Science 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 Computer Science Engineering with an Emphasis in Animation and Video Game Design will…

- SLO_AVG: … design and build graphics and animated software such that it can be applied to videogames design.

The student of the Bachelor's in Computer Science Engineering with an Emphasis in Software Development will…

- SLO_SWD: … design and build software architectures for several corporative applications and problems using standard software technologies and platforms.

The student of the Bachelor's in Computer Science Engineering with an Emphasis in Business Processes and Applications will…

- SLO_BPA: … integrate and implement software business applications package to business process.

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).

The curriculum for the Computer Science 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	4
FI402	Physics III	4
MA405	Statistical Inference	5
MA406	Multivariable Calculus	5
CC401	Introduction to Computer Sciences	1
CC403	Computer Systems and Components	2
CC404	Data Structures	3
CC405	Analysis and Design of Algorithms	4
SI400	Database Design	4
CE400	Computer Conteol	5
CC406	Operating Systems	5
CC407	Advanced Programming	5
CC408	Analysis and Design of Information Systems	6
CC409	Database Systems	6
CC410	Automata Theory	6
SI401	Software Development Processes	7
CC411	Compiler Design	7
CE401	Computer Networks	7
CC412	Topics in Distributed Systems	8
CE402	Computer Networks Applications	8
CC413	Artificial Intelligence	8
	Elective I	7
	Elective II	8
	Emphasis Elective I (VGD, SWD, BPA)	5
	Emphasis Elective II (VGD, SWD, BPA)	6
	Emphasis Elective III (VGD, SWD, BPA)	7
	Emphasis Elective IV (VGD, SWD, BPA)	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 levels 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 Computer Science Engineering programs (Program Level Learning Outcomes):

			LEARNING OUTCOMES FOR ALL ENGINEERING PROGRAMS			LEARNING OUTCOMES FOR COMPUTER SCIENCE ENGINEERING PROGRAM			LEARNING OUTCOMES FOR EMPHASIS OPTIONS OF THE COMPUTER SCIENCE ENGINEERING PROGRAM		
CURRICULAR ELEMENTS			SLO_ENG1	SLO_ENG2	SLO_ENG3	SLO_ICC1	SLO_ICC2	SLO_ICC3	SLO_VGD	SLO_SWD	SLO_BPA
CODE	COURSE	SEMESTER	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL
MA400	Mathematics for University	1	I	I	I						
CC400	Programming Methods I	1	I	I	I	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	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	I	I	I			
MA404	Probability	4	I	I	I						
FI402	Physics III	4	R	R	I						
MA405	Statistical Inference	5	R	R	I						
MA406	Multivariable Calculus	5	R	R	I						
CC401	Introduction to Computer Sciences	1	I	I	I	I	I	I	I	I	I
CC403	Computer Systems and Components	2	I	I	I	I	I	I	I	I	I
CC404	Data Structures	3	I	I	I	R	R	R	R	R	R
CC405	Analysis and Design of Algorithms	4	R	R	I	R	R	R	R	R	R
SI400	Database Design	4	R	R	I	R	R	R	R	R	R
CE400	Computer Conteol	5	R	R	R	R	R	R	R	R	R
CC406	Operating Systems	5	R	R	R	R	R	R	R	R	R
CC407	Advanced Programming	5	R	R	R	R	R	R	R	R	R
CC408	Analysis and Design of Information Systems	6	R	R	R	R	R	R	R	R	R
CC409	Database Systems	6	R	R	R	R	R	R	R	R	R
CC410	Automata Theory	6	R	R	R	R	R	R	R	R	R
SI401	Software Development Processes	7	E	E	E	E	E	E	E	E	E
CC411	Compiler Design	7	E	E	E	E	E	E	E	E	E
CE401	Computer Networks	7	E	E	E	E	E	E	E	E	E
CC412	Topics in Distributed Systems	8	E	E	E	E	E	E	E	E	E
CE402	Computer Networks Applications	8	E	E	E	E	E	E	E	E	E
CC413	Artificial Intelligence	8	E	E	E	E	E	E	E	E	E
	Elective I	7	E	E	E	E	E	E	E	E	E
	Elective II	8	R	R	R	E	E	E	E	E	E
	Emphasis Elective I (VGD, SWD, BPA)	5	R	R	R	R	R	R	R	R	R
	Emphasis Elective II (VGD, SWD, BPA)	6	R	R	R	R	R	R	R	R	R
	Emphasis Elective III (VGD, SWD, BPA)	7	E	E	E	E	E	E	E	E	E
	Emphasis Elective IV (VGD, SWD, BPA)	8	E	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.

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

- Clarity with which each course 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.
- Course 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.

5. Assessment and Student Achievement.

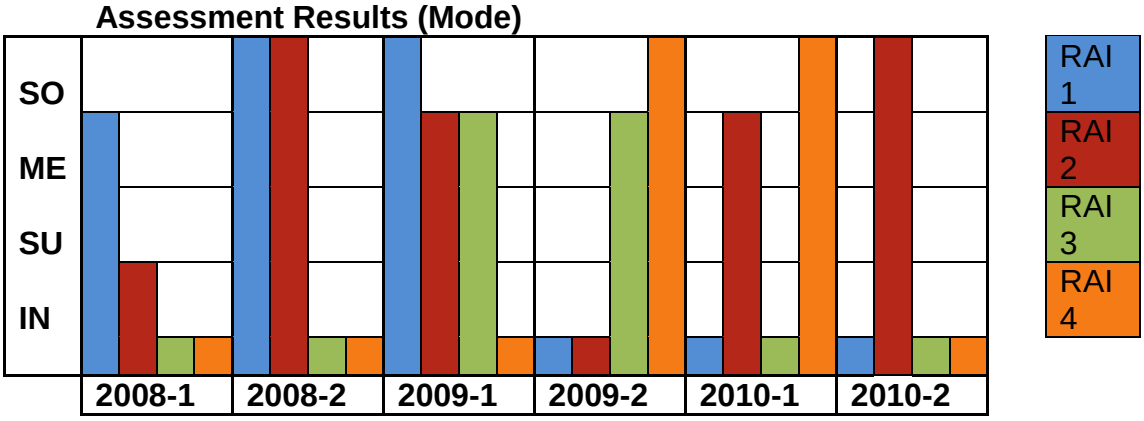
Much work has been done at the institutional level with regards to Assessment. An assessment plan and program began in 2008 with a focus on the gradual and systematic assessment of all institutional level learning outcomes for all academic programs. This has been a work in progress, in which areas of 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.

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 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 Computer Science 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 a 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):

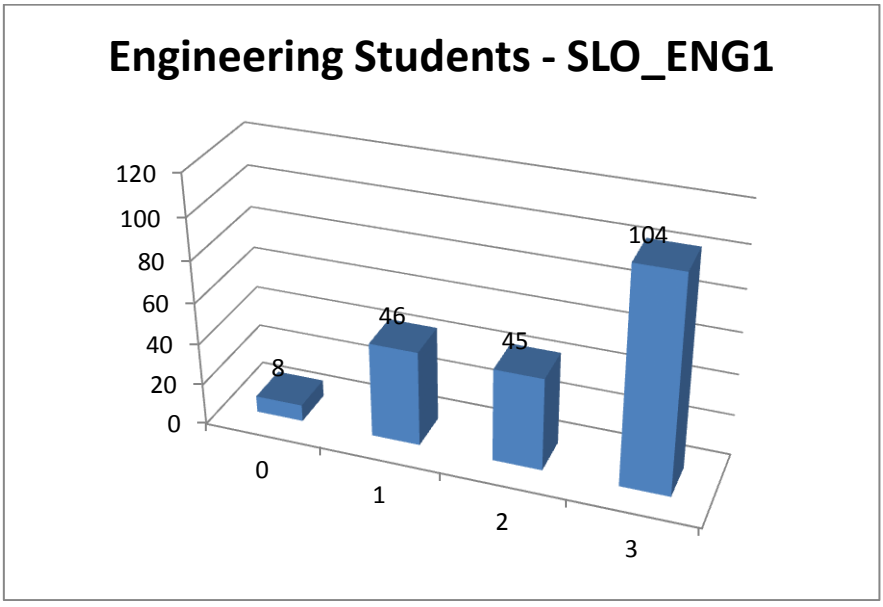
1) Selection of Learning Outcomes: The Academies decided that, for this first assessment cycle, all programs would assess the first two Program Level Learning Outcomes that are common to all Engineering Programs, meaning SLO_ENG1 and SLO_ENG2.
2) Course selection for assessment: Based upon the course 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.

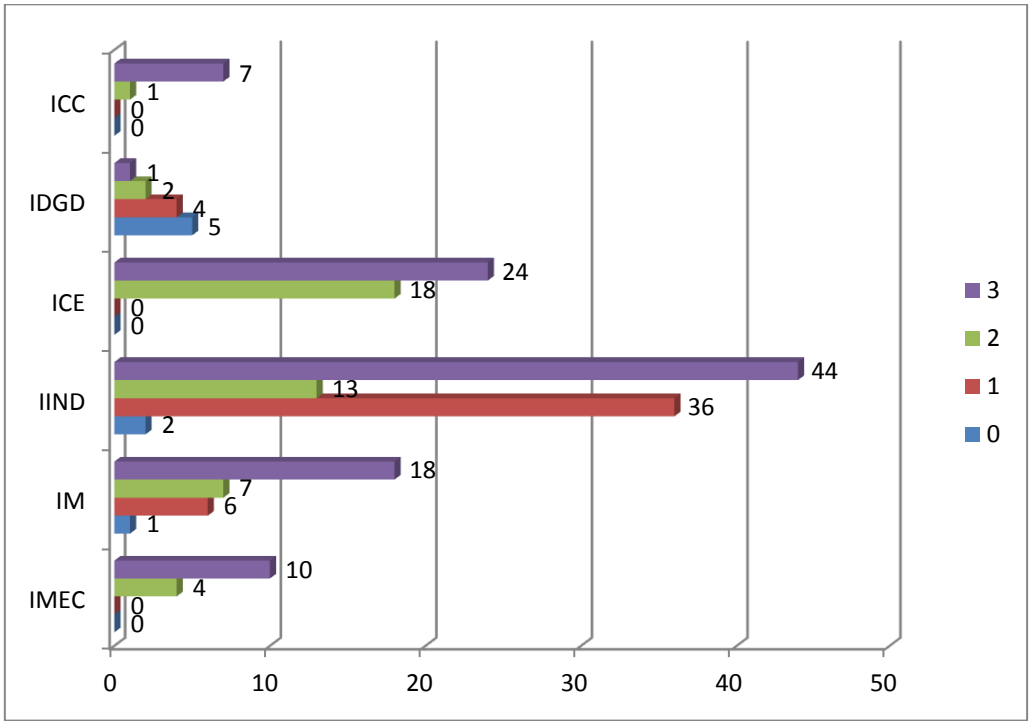
5) Training of faculty: With the aid of the Deans of the Schools of Engineering, each Campus trained the group of faculty who would teach the selected courses during the August-December 2010 semester, and therefore would participate in assessment during the cycle.
6) Assessment during semester: The assessment 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.

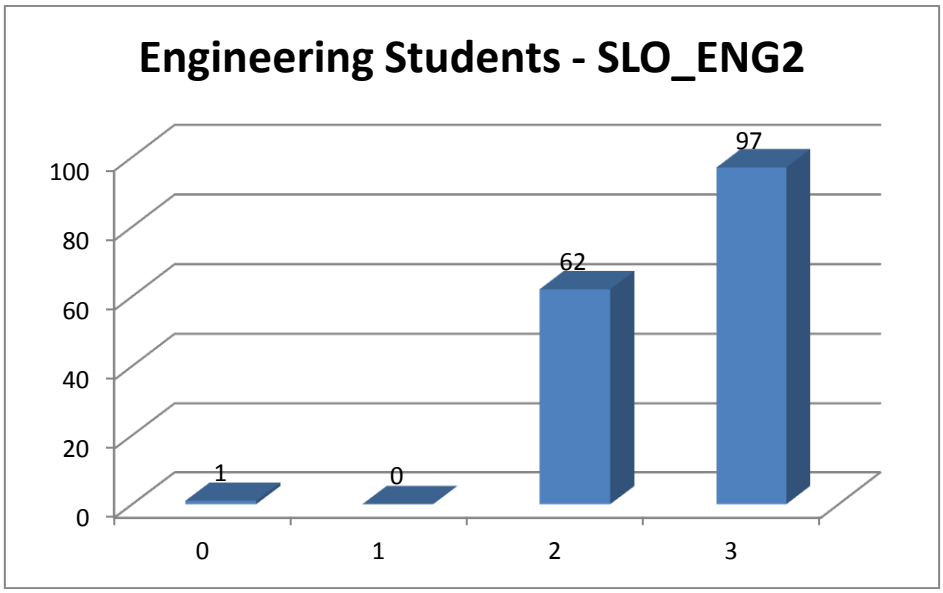
With regards to SLO_ENG1 (… problem solving…), in general, 74% of engineering students obtained learning achievement levels of 2 or 3 (Reinforcement/Improvable, Evaluation/Outstanding):



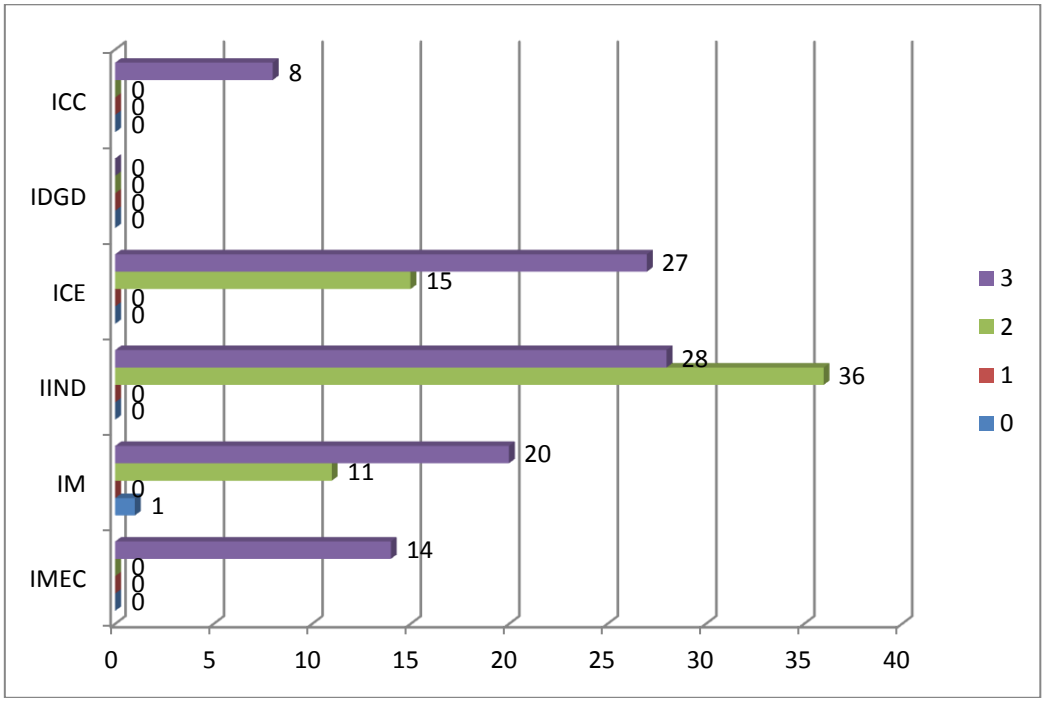
For this same learning outcome (SLO_ENG1), Computer Science Engineering students, 100% obtained learning achievement levels of 2 or 3 (Reinforcement/Improvable, Evaluation/Outstanding):



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_ENG1), Computer Science Engineering students, 100% obtained learning achievement levels of 2 or 3 (Reinforcement/Improvable, Evaluation/Outstanding):



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 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 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 two rubrics. The first rubric is a holistic rubric to assess student learning relating to the software development program level learning outcome (SLO_ICC1):

SLO_ICC1 – HOLISTIC RUBRIC – SOFTWARE DEVELOPMENT	
SLO_ICC1: The student of the Bachelor's in Computer Science Engineering program of CETYS University will analyze, design, develop and implement computer-based systems with current technology.	
Level	**Criteria for student learning**
0 **INSUFFICIENT (achieved if most criteria apply)**	The student: ❒ Cannot identify the problem, opportunities and/or objectives. ❒ Cannot determine information requirements. ❒ Cannot analyze system requirements. ❒ Cannot design the system. ❒ Cannot develop or document the system. ❒ Cannot apply testing or maintenance techniques on the system. ❒ Cannot implement or evaluate the system.
1 **INTRODUCTORY (achieved if most criteria apply)**	The student: ❒ Only partially identifies the problem, opportunities and/or objectives. ❒ Determines some of the information requirements. ❒ Analyzes some of the system requirements. ❒ Can only partially design the system. ❒ Develops the system using software and technologies and tools, however does not know how to use them efficiently. ❒ Only documents the system partially. ❒ Applies testing techniques, however these are not necessarily the most adequate or appropriate. ❒ Only implement the system partially.
2 **IN DEVELOPMENT (achieved if most criteria apply)**	The student: ❒ Correctly identifies the problem, opportunities and/or objectives. ❒ Determines the primary information requirements. ❒ Analyzes the system requirements, not necessarily using a specified tool. ❒ Designs the system, not necessarily in the most adequate manner, or using a well defined technique. ❒ Develops the system using software tools and technologies, however does not know how to use them in the most efficient manner ❒ Documents the system in an empirical manner and not using a defined technique. ❒ Applies testing and maintenance techniques to the system. ❒ Implements the system, however, not in the most adequate or efficient manner.
3 **DEVELOPED (achieved if most criteria apply)**	The student: ❒ Correctly identifies the problem, opportunities and/or objectives. ❒ Appropriately determines all system information requirements. ❒ Completely analyzes the system requirements. ❒ Correctly applies design techniques to the system. ❒ Develops the system using current technology and documents the system in a consistent and defined manner. ❒ Applies system testing and maintenance techniques in a correct and efficient manner. ❒ Implements and evaluates the system in an objective and correct manner.

The second rubric is a holistic rubric to assess student learning relating to the computer networks program level learning outcome (SLO_ICC2):

SLO_ICC2 – RÚBRICA HOLÍSTICA – REDES COMPUTACIONALES	
SLO_ICC2: The student of the Bachelor's in Computer Science Engineering program of CETYS University will design, configure and manage computer network in order to implement the main services and security schemes creating an environment of shared systems and shared resources in an efficient manner.	
Level	**Criteria for student learning**
0 **INSUFFICIENT (achieved if most criteria apply)**	The student: ❒ Cannot identify the problem. ❒ Cannot identify the necessary requirements to solve the problem (methodology, tools, system traffic, etc). ❒ Cannot do the logical or physical architecture design of the system. ❒ Cannot document the system. ❒ Cannot manage the resources of a computer network. ❒ Cannot apply testing and maintenance techniques. ❒ Cannot implement or evaluate the system.
1 **INTRODUCTORY (achieved if most criteria apply)**	The student: ❒ Only partially identifies the problem. ❒ Identifies some of the necessary requirements to solve the problem. (methodology, tools, system traffic, etc). ❒ Partially does the logical and physical architecture design of the system. ❒ Partially documents the system. ❒ Manages network resources but not in an optimal manner. ❒ Applies some testing and maintenance techniques, but not necessarily the most adequate or appropriate. ❒ Partially implements the system
2 **IN DEVELOPMENT (achieved if most criteria apply)**	The student: ❒ Correctly identifies the problem. ❒ Identifies the necessary requirements to solve the problem. (methodology, tools, system traffic, etc). ❒ Does the logical and physical architecture design, but not necessarily in the most adequate manner. ❒ Documents the system, however does not use a defined technique. ❒ Optimally manages the network resources. ❒ Applies system testing and maintenance techniques. ❒ Implements the system, however not necessarily in the most adequate or efficient manner.
3 **DEVELOPED (achieved if most criteria apply)**	The student: ❒ Correctly identifies the problem. ❒ Identifies the necessary requirements to solve the problem. (methodology, tools, system traffic, etc). ❒ Does the logic and physical architecture design in an optimal manner. ❒ Documents the system correctly using a defined techinque. ❒ Optimally manages the network resources. ❒ Applies system testing and maintenance techniques in an efficient manner. ❒ Implements and evaluates the system in a optimal manner.

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_ICC1	January-June 2011
SLO_ICC2	January-June 2012
SLO_ICC3	January-June 2013

3. Identification of courses where assessment will be applied.
   For the first rubric (SLO_ICC1) the following course for the January-June 2011 semester were identified for assessment:

Course	Semestre	Mexicali	Tijuana
Database Design	4	X	X
Analysis and Design of Information Systems	6	X	X
Topics in Distributed Systems	8	X	X

4. Notification to faculty involved in assessment activities.
   Only one group per course 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_ICC1.

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_ICC1:

Course	Assessment results
Database Design	Level 2= In development (i.e. Reinforcement)
Analysis and Design of Information Systems	Level 3 = Developed (i.e. Evaluation
Topics in Distributed Systems	Level 3 = Developed (i.e. Evaluation)

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 Campus.
- The results are acceptable and are congruent with student learning expectations according to the current curricular mapping done for the academic program.
- In the case of the Analysis and Design of Information Systems course, faculty had the opportunity to apply the rubric twice during the semester (which also helped to calibrate the instrument) and observed that students improved their learning levels. Faculty concluded that this has to do with the size of the groups (small), which allows for direct tutoring and follow-up during the semester.
- Faculty felt comfortable in the use of the rubrics and in general with the assessment process, due to the fact that they felt involved and had ownership of the process, as well as the fact that most had already participated in the institutional assessment processes and were familiar in general with the procedures.
- The academy will evaluate the possibility of modifying rubrics (using analytical rubrics instead of holistic rubrics for example), to ensure more detailed data. Assessment instruments should be calibrated and evaluated periodically by faculty.
- The program level assessment process should be done systematically, and with a broader scope (more student samples).

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 Computer Science 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 Computer Science Engineering:

1. Social environment: Social environment, organizations, information technology units, ethics, legislation.
2. Mathematics: Basic mathematics, computational and applied mathematics.
3. Hardware: Physics and electronics, Computer architecture, networks.
4. Software: Base software/operating systems, programming, software engineering.
5. Information treatment and interaction: Information treatment, human-machine interaction.

The global CENEVAL index is evaluated using three levels of achievement: ANS (Unsatisfactory Achievement), DS (Satisfactory Achievement) and DSS (Outstanding Achievement).

The EGEL results for students of the Computer Science Engineering program of CETYS University from 2006 to 2009 are as follows:

Year	City	# of Students	Average	DS	DSS	ANS	Social Environm.	Math.	HW	SW	Inform. Treatm.
2006	**Mxl**	7	940	0	0	7	1018	945	900	925	976
2007	**Mxl**	10	1053.5	5	2	3	1134	1013	1058	1038	993.5
2008	**Mxl**	1	1172	0	1	0	1202	1147	1150	1189	1020
2009	**Mxl**	4	1073.2	0	2	2	1085.75	1049	1095	1058	1010.5
		22	**1059.675**	**5**	**5**	**12**	**1109.938**	**1038.5**	**1050.75**	**1052.5**	**1000**
2006	**Tij**	**10**	925	1	0	9	934	912	932	910	971
2007	**Tij**	**7**	1015	2	1	4	1062	967	1063	1017	981
2008	**Tij**	**8**	965.6	0	0	8	1018.7	904.3	1038.1	961.5	967.12
2009	**Tij**	**6**	1041	1	1	4	1075.5	1001.8	1042.3	1045	1009.5
		31	**986.65**	**4**	**2**	**25**	**1022.55**	**946.275**	**1018.85**	**983.375**	**982.155**
		53	**1023.163**	**9**	**7**	**37**	**1066.24**	**992.38**	**1034.8**	**1017.9**	**991.07**

In the year 2010, the EGEL examination was modified to evaluate knowledge and abilities for professionals of Computer Science Engineering programs focusing n three areas:

1. Software Application Development
2. Development of System Software
3. Model Development.

The EGEL results for students of the Computer Science Engineering program of CETYS University for 2010 are as follows:

Year	City	# of Students	Average	DS	DSS	ANS	SW App. Dev.	System SW. Dev.	Model Dev.
2010	**Mxl**	6	940	1	1	4	959.66	1018.83	988.16
2010	**Tij**	9	1017.85	4	1	4	981.3	1058.1	1014.1
				5	**2**	**8**	**970.48**	**1038.465**	**1001.13**

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

- In the Mexicali campus, 42.85 % of the Computer Science Engineering students that have done the exam have obtained the Satisfactory Achievement level.
- In the Tijuana Campus, 27% of the Computer Science Engineering students that have done the exam have obtained the Satisfactory Achievement level.
- The lowest approval indices were as follows:
  - In 2006 for the Mexicali Campus, 0% of the Computer Science Engineering students that have done the exam have obtained the Satisfactory Achievement level.
  - In 2006 for the Tijuana Campus, 0% of the Computer Science Engineering students that have done the exam have obtained the Satisfactory Achievement level.
- A detailed analysis must be done of each of the evaluation areas of the EGEL examination for Computer Science Engineering, to identify areas of opportunity in the curriculum and In student learning to achieve better results. However, clear areas that should be reinforced are Mathematics and Information Treatment and Interaction.
- Students from both the Mexicali and Tijuana Campuses, who did the examination in 2008 and 2009 obtained better results.
- The results of the 2010 examinations, the areas that are given a priority are:
  - Development of base software for diverse environments.
  - Development of support models for the solution of applied research problems in various areas of knowledge.
  - Development of application software.

  In which the area of Development of Application area should be reinforced.
- It is worth mentioning that in CETYS University, the graduation requirement is to do the examination, no to obtain a satisfactory achievement level, which may influence results with regards to the motivation students have to obtain a good result versus just doing the examination to comply with the requirement regardless of the results.

Further analysis is required to include the EGEL examination as a means to obtain an external metric for assessment that is congruent with the institutional and program level assessment plans and programs.

6. Students.

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

Students		2004-2	2005-2	2006-2	2007-2	2008-2	2009-2	2010-2	Avg 2004 2010	Diff 2004 2010
	New admissions	18	25	25	31	27	24	**25**	25.00	38.89%
	Mxl	10	12	10	9	9	12	**10**	10.29	0.00%
	Tij	8	13	15	22	18	12	**15**	14.71	87.50%
	Ens	0	0	0	0	0	0	**0**	0.00	NA
	Returning students	69	64	74	58	65	69	**69**	66.86	0.00%
	Mxl	29	34	34	29	26	22	**22**	28.00	-24.14%
	Tij	40	30	40	29	39	47	**43**	38.29	7.50%
	Ens	0	0	0	0	0	0	**0**	0.00	NA
	Total students	87	89	99	89	92	93	**94**	91.86	8.05%
	Mxl	39	46	44	38	35	34	**32**	38.29	-17.95%
	Tij	48	43	55	51	57	59	**58**	53.00	20.83%
	Ens	0	0	0	0	0	0	**0**	0.00	NA

As can be observed, enrollment suffered an 18% loss in the last five years in the Mexicali Campus, while in the Tijuana Campus, the program has achieved a 7.5% increase in enrollment.

The student population is around 38 for the Mexicali Campus, and around 52 for the Tijuana Campus and may be considered as stable, however both are well below institutional metrics (60 students).

The Academy is very concerned by this behavior, and this is why, for the 2007 update of the program, the complementary emphasis areas were added to increase the level of attractiveness to the program, with the goal of incrementing enrollment while attending to current needs and tendencies of the industry.

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:

Row Labels	2006	2008	2009	2010	Grand Total
Mexicali	**4**	**1**	**1**	**4**	**10**
SUMMER COURSE	**4**				**4**
USA	4				4
STUDENT EXCHANGE		**1**	**1**	**4**	**6**
CANADA				1	1
JAPAN		1	1	2	4
HOLLAND				1	1
Tijuana			**1**	**1**	**2**
DUOBLE DEGREE (CITYU).				**1**	**1**
USA				1	1
STUDENT EXCHANGE			**1**		**1**
SPAIN			1		1
Grand Total	**4**	**1**	**2**	**5**	**12**

In 2010-2 5 participated in some international program, being the academic exchange the most attractive for them.

The following table, shows student participation as a percentage the total population. The year with greater student participation was 2010-2 with 6%.

	2006-2	2007-2	2008-2	2009-2	2010-2
% Double degree City U	N	N	N	0%	1%
% Student Exchange	4%	0%	1%	2%	4%
% Total mobility	4%	0%	1%	2%	5%

Last year shows that the student exchange 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.

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. Guillermo Cheang – Mexicali Campus.
- M.S. Leopoldo Uribe – Tijuana Campus.

The Faculty that are associated with the program, (most members of the Academy of Computer Science Engineering) are:

Name	Degree	Area of knowledge	Institution	Type	Campus	Level English
Guillermo Cheang	Master's in Science	System Programming and Operating Systems	CETYS	Full	Mexicali	100%
Dania Licea	Master's in Science	Computer Graphic and Database System	ITESM	Full	Mexicali	70%
Josefina Becerra	Master's in Science	Software Engineering	CETYS	Full	Mexicali	80%
Miguel Salinas	Doctor's in Science	Intelligence Systems	CETYS	Aggregate	Mexicali	90%
Francisco Chavez	Master's in Science	Programming Fundamentals	CETYS	Aggregate	Mexicali	85%
Marco Peña	Master's in Science	Computer Networks	UTEXAS	Aggregate	Mexicali	100%
Hector Barajas	Master's in Science	Computer Networks	CETYS	Aggregate	Mexicali	95%
Alfonso Rodriguez	Master's in Science	Architecture and Organization	CETYS	Aggregate	Mexicali	80%
Amelia Resendez	Master's in Science	Algorithms and Complexity	CETYS	Aggregate	Mexicali	85%
Margarita Solis	Master's in Science	Database Systems	CETYS	Aggregate	Mexicali	85%
Manuel Algravez	Master's in Art	Information Systems and Computer Programming	CETYS	Associate	Mexicali	70%
Roberto Gonzalez	Master's in Science	Algorithms and Complexity	ITESM	Associate	Mexicali	70%
Darianna Chavez	Master's in Art	Software Engineering	CETYS	Part	Mexicali	80%
Lucía	Master's in	Information	CETYS	Half	Ensenada	70%

Beltrán	Science	Systems				
Leopoldo Uribe	Master's in Science	Software Development	CETYS	Full	Tijuana	100%
Francisco Tovar	Master's in Science	Software Development	CETYS	Associate	Tijuana	90%
Jaime Ramos	Master's in Science	Database Systems	Inst. Tec. De Tijuana	Part	Tijuana	70%
Carol Camacho	Master's in Science	Software Development	CETYS	Part	Tijuana	100%
Arturo Sevilla	Computer Science Engineering	Software Development	CETYS	Associate	Tijuana	100%
Daniel Moctezuma	Master's in Science	Redes	CETYS	Aggregate	Tijuana	100%
Wendy Trujillo	Master's in Science	Intelligence Systems	ITT	Associate	Tijuana	70%
Enrique Fitch	Master's in Science	Mathematics	ITSON	Full	Tijuana	100%
Adolfo Esquivel	Master's in Science	Digital Systems	IPN	Half	Tijuana	90%
Moises Sanchez	Doctor's in Engineering	Redes	CETYS	Half	Tijuana	100%
Jesus Sanchez	Master's in Science	Software Development		Half	Tijuana	100%
Salvador Chiu	Doctor's in Administration	Administration	CETYS	Aggregate	Tijuana	100%
Roberto Salas	Master's in Science	Fisica	CETYS	Full	Tijuana	100%
Rodrigo Matus	Master's in Science	Mathematics	CETYS	Part	Tijuana	100%
Miriam Bautista	Master's in Science	Design	IBERO	Part	Tijuana	80%
Jose Garcia	Computer Science Engineering	Software Development	CETYS	Associate	Tijuana	100%
Arturo Escoto	Master's in Progress	Control Engineering	ITESM	Part	Tijuana	95%
Lucía Beltrán	Master's in Science	Information Systems	CETYS	Half	Ensenada	70%

The following table shows the Mexicali Campus faculty distribution with regards to the courses for the Computer Science Engineering Program:

CODE	COURSE	PROFESSOR(S)	
CC400	Programming Methods I	Francisco Chávez	Manuel Algravez
CC402	Programming Methods II	Francisco Chávez	Manuel Algravez
CC401	Introduction to Computer Sciences	Guillermo Cheang	
CC403	Computer Systems and Components	Alfonso Rodriguez	
CC404	Data Structures	Amelia Resendez	
CC405	Analysis and Design of Algorithms	Amelia Resendez	
SI400	Database Design	Dania Licea	
CE400	Computer Control	Jorge Sosa	
CC406	Operating Systems	Guillermo Cheang	Roberto Gonzalez
CC407	Advanced Programming	Luis Garcia	
CC408	Analysis and Design of Information Systems	Josefina Becerra	Manuel Algravez
CC409	Database Systems	Magarita Solis	
CC410	Automata Theory	Roberto Gonzalez	
SI401	Software Development Processes	Darianna Chavez	
CC411	Compiler Design	Guillermo Cheang	
CE401	Computer Networks	Hector Barajas	Marco Pena
CC412	Topics in Distributed Systems	Guillermo Cheang	
CE402	Computer Networks Applications	Hector Barajas	
CC413	Artificial Intelligence	Miguel Salinas	

The following table shows the Mexicali Campus faculty distribution with regards to the courses for the Computer Science Engineering Program:

CODE	COURSE	PROFESSOR(S)	
CC400	Programming Methods I	Carol Camacho Estrada	Wendy Trujillo-Lugo
CC402	Programming Methods II	Jose Garcia Gonzalez	Jaime Ramos-Gaxiola
CC401	Introduction to Computer Sciences	Jaime Ramos-Gaxiola	Wendy Trujillo-Lugo
CC403	Computer Systems and Components	Adolfo Esquivel-Martínez	
CC404	Data Structures	Carol Camacho Estrada	
CC405	Analysis and Design of Algorithms	Wendy Trujillo-Lugo	Carol Camacho Estrada
SI400	Database Design	Carol Camacho Estrada	
CE400	Computer Control	Arturo Escoto Mendez	Adolfo Esquivel-Martínez
CC406	Operating Systems	Arturo Sevilla-Covarrubias	
CC407	Advanced Programming	Leopoldo J. Uribe-Reyna	
CC408	Analysis and Design of Information Systems	Francisco Tovar Téllez	
CC409	Database Systems	Alfonso Paredes	Jesús Jaquez Rueda
CC410	Automata Theory	Leopoldo J. Uribe-Reyna	
SI401	Software Development Processes	Wendy Trujillo-Lugo	Jesús Jaquez Rueda
CC411	Compiler Design	Leopoldo J. Uribe-Reyna	
CE401	Computer Networks	Moisés Sánchez-Adame	
CC412	Topics in Distributed Systems	Alfonso Paredes	Leopoldo J. Uribe-Reyna
CE402	Computer Networks Applications	Daniel Moctezuma-Canchola	
CC413	Artificial Intelligence	Arturo Sevilla-Covarrubias	Wendy Trujillo-Lugo

The following tables show the Mexicali Campus faculty evaluation results from 2008 to 2010:

	Name	Jan-Jun 2008		Aug - Dec 2008		Jan-Jun 2009		Aug - Dec 2009		Aug - Dec 2010	
1	Algravez, Manuel	80.44%	18	84.70%	20	88.96%	10	81.83%	29	79.68%	46
2	Barajas, Hector	79.20%	22	74.74%	33	83.42%	23	85.86%	14	81.05%	42
3	Becerra, Josefina	81.10%	14	84.68%	21	88.49%	13	84.28%	21	77.16%	51
4	Chavez, Darianna							82.71%	27	84.22%	25
5	Chavez, Francisco	91.46%	1	92.37%	2	90.38%	5	92.71%	1	91.21%	4
6	Cheang, Guillermo	76.80%	25	89.50%	7	87.15%	17	85.25%	17	85.08%	22
7	Garcia, Luis			77.92%	29			84.45%	20	54.12%	54
8	Gonzalez, Roberto									83.06%	31
9	Licea, Dania	80.69%	15	84.74%	19	86.84%	19	81.55%	31	82.18%	36
10	Salinas, Miguel					62.36%	38	74.35%	40		
11	Solis, Margarita	76.72%	26			80.65%	28				
12	Resendez, Amelia	88.09%	3	83.89%	22	90.82%	3	92.65%	2	92.67%	2
	Average	**81.81%**		**84.07%**		**84.34%**		**84.56%**		**81.04%**	
	Overall average of school	**80.30%**		**84.29%**		**83.81%**		**82.89%**		**83.91%**	

The following tables show the Tijuana Campus faculty evaluation results from 2008 to 2010:

	Name	Jan-Jun 2008		Aug - Dec 2008		Jan-Jun 2009		Aug - Dec 2009		Jan - Jun 2010		Aug - Dec 2010	
1	Fitch, Enrique	82.29%		82.31%	13			94.04%		88.09%		87.12%	
2	Uribe, Leopoldo J.	78.80%		85.72%	7			91.42%		88.67%		83.30%	
3	Esquivel, Adolfo	78.65%		82.06%	15			87.43%		81.87%		69.81%	
4	Sánchez, Moisés	78.19%		86.03%	5			92.02%		83.20%		80.62%	
5	Sánchez, Jesús	0.00%		62.13%				86.33%		71.99%		74.96%	
6	Chiú, Salvador	85.54%		83.21%	10			91.89%		86.55%		85.17%	
7	Salas, Roberto	90.46%		91.58%	2					87.74%		90.62%	
8	Matus, Rodrigo	82.91%		80.42%	20			87.42%		83.38%		83.16%	
9	Bautista, Miriam	72.56%		85.38%	8	80.80%		87.58%		82.78%		82.78%	
10	Ramos, Jaime	80.26%		79.52%	21	84.21%		83.26%		89.21%		74.92%	
11	Bautista, Fabián			86.63%	4			92.28%		86.18%		83.26%	
12	Camacho, Carol									78.32%		75.87%	
13	Trujillo, Wendy							61.98%		88.70%		90.02%	
14	Paredes, Alfonso												
15	Sevilla, Arturo												
16	Moctezuma, Daniel	84.00%								85.96%		87.34%	
17	García, José											84.78%	
18	Escoto, Arturo			65.48%	40			78.81%		87.05%		85.26%	
	Average	**73.97%**		**80.87%**		**82.51%**		**86.21%**		**84.65%**		**82.44%**	
	Overall average of school			**77.23%**									

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. 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.

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.

9. Comparative Analysis.

The Academy decided to do a comparative analysis of the CETYS University Computer Science Engineering program with other academic programs from other universities in México and abroad, using the following methodology:

1. Identification of specific countries of interest besides México.
2. Definition of criteria for identification of universities and academic programs, as well as the criteria for the comparative analysis.
3. The selected academic programs will be distributed among the academy members.
4. Each academy member will compile information regarding the academic programs for analysis.
5. Definition of format for information summary.
6. A summary will be delivered by each academy member with the research results.
7. Each academy member will present the research results and conclusions to the academy for discussion and analysis.
8. The academy will elaborate a summary document with the compilation of research results.
9. Conclusions and areas of opportunity will be identified.

The research was done during the January-June 2011 semester:

1. The countries of interest are: México, United States, Canada, Europe and India.

2. Courses from selected academic programs will be compared with courses from the CETYS University Computer Science Engineering program.

3. The distribution among academy members was done as follows:

Faculty member	Country
Lucía Beltrán	México
Dania Licea	United States and Canada
Josefina Becerra	Europe
Francisco Chávez	India

4. Research was done using the internet.

5. The format for the compilation of summary results is a Powerpoint presentation.

6. Each academy member delivered a summary of results as a Powerpoint presentation.

7. Meetings were held via videoconferencing in which each academy member presented the research summary.

8. The academy created a report called the “Comparative analysis for the Computer Science Engineering Program of CETYS University with similar academic programs in the United States, Canada, Europe and India”.

9. Based upon the analysis result, three key areas of opportunity were identified:
    a. Increase in the number of courses in the Computer Science Engineering program of CETYS University to be congruent and competitive with other academic programs in México and abroad.
    b. Discrete Math topics (or possibly a course) should be integrated into the curriculum.
    c. Increase in the set of electives and specialization courses.

10. Alumni.

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

- The alumni from this program will be able to participle in an important manner in projects related with information technology and software development.
- 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 reviewed alumni studies that have been developed by the Institutional Research Offices, and complementing these with alumni surveys for the 2004 and 2005 cohorts.

The Academy administered a survey during the January-June 2011 semester to alumni from 2008 to 2010 with the following results:

- 100% of alumni are working in jobs related to their specialization area in companies that develop software, videogames, internet applications, as consultants, in both government and industry.
- Around 37.5% of alumni are finishing or in the process of beginning graduate studies, and the rest manifest an interest in graduate studies in the future.
- 100% of alumni find work in a period of 6 months or less.
- 15.62 % of alumni have their own company.

The academy identifies the need to do a follow-up study of alumni from 2008 and above to identify if alumni hold middle or top managerial jobs three years after graduation.

11. External Reviews.

The Academy held meetings with experts in various fields of knowledge relating to the Computer Science Engineering program to obtain feedback regarding the program. The following experts were consulted:

- Videogame industry/sector.
- Software development industry/sector.
- ANIEI (National Association of Higher Education Institutions in Information Technologies in México).
- CONAIC (National Council on Accreditation in Informatics and Computing in México).

VIDEOGAME INDUSTRY/SECTOR.

On September 3rd 2009, the Academy met with experts from the videogame industry/sector in Mexicali, Baja California with the following participants:

- Guillermo Cheang León, Dania Licea Verduzco, Josefina Becerra Paredes, Lucía Beltrán, Leopoldo Uribe, Miguel Salinas, Alejandro Zendejas (Academy of Computer Science Engineering).
- Jorge Morales (Inmersion).
- Francisco Casanova (Digital Chocolate).
- Jacobo Ríos (IGDA).
- Angélica Lefaspy (Playsoft).
- Adrián Jimate (Gameloft)

The purpose of this meeting was to present the Computer Science Engineering academic program to receive feedback from the videogame industry/sector experts with regards to the content and the pertinence of the curriculum, as well as software tools used for software development. The following comments were compiled during the meeting:

- Jacobo Ríos from IGDA (International Game Developers Association) mentioned the existence of student chapters of IGDA to involve students in video gaming from a development standpoint.
- The experts agree that the videogame specialization area of the academic program is designed to prepare professionals that wish to work in the video gaming industry, however much additional preparation is required for these professionals once they graduate.
- XNA is a good starting language, however training in this language should begin earlier in the academic program to allow training on more complex languages further on.
- There are two main professional profiles for video game designers:
  a. Video game art designers, with knowledge of color theory, textures, animation and modeling. These professionals need training not only in the use of software development tools, but also in modeling and texturing techniques. Modeling may be done using various materials (clay, wire, etc.).

b. Programmers for video games, with knowledge of C++, Java (mobile), computer theory, operating systems, compilers, networks, graphic programming, intelligent systems. These professionals work with graphic interfaces and graphic processors.

- Programmers may be classified in two types: those who are focused on problem solving (analysis and comprehension), and those who elaborate the project from the beginning (mathematical testing).
- Creativity and innovation should be promoted, where learning is in an entertaining and motivating environment.
- Making video games is no game, it is work in multidisciplinary teams of people.
- Sales management is an important area of opportunity, due to the fact that there are needs for professionals with this profile in the video game sector: lawyers, programmers with managerial skills, product designers, international business, etc.
- Planning for the engagement of students from the high school level, via some sort of "ad-hoc" program that promotes and generates enthusiasm for video gaming from the development standpoint.
- "Animation mentor", offers on-line courses with evaluators direct from the industry.
- There is a software called "Alice", that allows for the creation of virtual 3D, where characters may be created based on mathematics.

Another meeting was held on September 4th 2009 with the following participants:

- Guillermo Cheang León, Dania Licea Verduzco, Josefina Becerra Paredes, Lucía Beltrán Rocha, Leopoldo Uribe, Miguel Salinas, Alejandro Zendejas (Academy of Computer Science Engineering).
- Jorge Morales (Inmersion).
- Francisco Casanova (Digital Chocolate).
- Jacobo Ríos (IGDA).
- Angélica Lefaspy, Miriam Álvarez, Erick Nembil (Playsoft).
- Adrián Jimate (Gameloft)
- Héctor Psatrana (Catapulta)
- Iván Díaz de León (Digital Entertainment)
- Germán Vázquez, Ricardo Villarreal.

The purpose of this meeting was the same as the previous one. The following comments were compiled during the meeting:

- Catapulta mentions that they are seeking to create support so México has a formal and compatible development structure for the video game industry in the country, a 60 billion dollar industry in 2010 (more than the movie industry).
- Catapulta also presents a technology called "VIRTOOLS", that is developed using a platform that is for all video game platforms (multi-console, mobile, etc.), created to develop products in a short time. The student need not be an expert programmer to use it and is ideal for

casual games. They have currently developed a video game for Lorena Ochoa (Mexican golfer).
- C++ language is an important tool for video game design.

SOFTWARE DEVELOPMENT INDUSTRY/SECTOR.

On October 16th 2010, a meeting was held in Ensenada between the Academy and experts from the Software Industry in Baja California. The participants in this meeting were:

- Gabriel Fuentes, Project Manager for Softtek.
- Fernando Torres, Project Leader for Softtek.
- José López, Operations Manager for Hildebrando.
- Félix Rivera, Project Leader for Hildebrando.
- Krishna Tirunagari for Tech Mahindra.
- Antonio Silva, Consulting Services for Strategic Businesses Director for Delloite México.
- Lucía Beltrán Rocha, faculty member of the Academy of Computer Science Engineering for CETYS University
- Socorro Lomelí Sánchez, Linkage Director for CETYS University Ensenada Campus

The purpose of this meeting was to present the Computer Science Engineering academic program to receive feedback from the software development industry/sector experts with regards to the content and the pertinence of the curriculum, as well as software tools used for software development.

During the session, the background and history of the academic program was presented, as well as a study done in 2004 via the IT Baja Cluster software companies and the results obtained from this study.

The mission and vision of the academic program was also presented, and the participants were asked to answer a survey relating to the tendencies in the software industry, to gain information for further analysis.

Also, each company shared their business goals and development plans.

The following comments were compiled during the meeting:

- There is a need in the industry for professionals with Software Engineering profiles.
- Specialization areas are important to complete the profile, such as: business systems, software quality engineering and mobile computing.
- Security, quality and the internet are topics that are gaining more relevance in the industry.
- Students must study topics related to Cloud Computing.
- Students must study topics related to knowledge management (i.e. sharepoint).

- Knowledge in finance is important (budgeting and return of investment of software projects).
- Topics relating to best practices in quality are important, such as quality assurance, quality and testing, covering functional testing, volume, unitary, integral, etc.
- For requirements analysis, the use of BPMN (Business Process Management Notation) services/soa, UML, are recommended.
- With regards to the basic sciences, topics in relational and vector calculus, Boolean logic, set theory, Karnaugh maps, should be covered.

ANIEI (NATIONAL ASSOCIATION OF HIGHER EDUCATION INSTITUTIONS IN INFORMATION TECHNOLOGIES IN MÉXICO).

A request was made to the president of ANIEI (National Association of Higher Education Institutions in Information Technologies in México), María de Lourdes Sánchez Guerrero, to provide a peer review of the Computer Science Engineering academic program of CETYS University, and the following feedback was received:

- The academic program complies with the needs México has for the development of highly qualified professionals that satisfy the needs of the information technologies sector and industry in general.
- The specialization areas allow students to graduate with a specific profile that is related to an industry specific type
- The curriculum is aligned to the ANIEI Curricular Model.

CONAIC (NATIONAL COUNCIL ON ACCREDITATION IN INFORMATICS AND COMPUTING IN MÉXICO).

A request was made to the president of CONAIC (National Council on Accreditation in Informatics and Computing in México), Dr. Alma Rosa García Gaona, to provide a peer review of the Computer Science Engineering academic program of CETYS University. The feedback information has not yet been received, but will be integrated into the continuous improvement process for academic program review.

CONCLUSIONS OBTAINED FROM EXTERNAL REVIEWS.

The following elements were identified by the Academy as key points for program review and possible modifications to the curriculum:

- Relating to video game development:
  - Increase study and practice in the use of C++ programming language.
  - Focus on the interdisciplinary nature of the video game developer profile.
  - Focus on creativity and innovation.
  - Provide a broad scope of alternatives with regards to development platforms.
- Introduce Cloud Computing topics into the curriculum.
- Integrate best practices in quality as a part of the software development topics.
- Include topics in Project Management and Software Processes from the ANIEI model.

12. Strengths and Areas of Opportunity.

As a result of the integrated program review analysis done by the Academy, the following strengths have been identified.

1. PERTINENCE: There is a high demand for professionals in Computer Sciences in the region, 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. 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 Computer Science 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).

13. 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 Software and Computer Science 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 2): 2012-2013 Responsible: Vice-presidency of Academic Affairs, College of Engineering
3	Low enrollment as well as a strong dependence on economic fluctuations.	Program to promote Computer Science and Information Technologies in high schools, including workshops and motivational activities to encourage students to study in these fields. Focus on high schools that feed students to CETYS University. Involvement by industry/sector experts is desired.	Planning: August-December 2011 Deployment: 2012 Responsible: Academy of Software and Computer Science Engineering in coordination with Enrollment Offices and Promotional Department.
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	Planning: August-December 2011 Deployment: 2012 Responsible: Academy of Software and Computer Science Engineering

		discussed. A program for alumni follow-up congruent with the program's educational objectives should be developed.	
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 Software and Computer Science 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 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).	Planning: 2011-2012 Deployment: 2013 Responsible: Vice-presidency of Academic Affairs, College of Engineering, Academy of Software and Computer Science Engineering