College of Engineering
Academy of Master of Science in Engineering

Master of Science in Engineering
2013 Program Review

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1. Introduction.

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

- Dr. Ricardo Martinez, Tijuana campus.
- Dra. Gabriela Estrada, Mexicali campus.
- Dr. Carlos Gonzalez, Ensenada campus.
- Dr. Isaac Azuz, Ensenada campus.
- Dr. Miguel Salinas, Mexicali campus.
- Doctoral Candidate Jorge Sosa, Mexicali campus.

CETYS University's Master of Science in Engineering was created in 1992. The programs that were developed in that time were three and they were focused on the areas of: Industrial Management, Networks & Computing, and Manufacturing Systems.

The first formal review of the program was made in 1997 and basically consisted of updating the content of the three programs, and the creation of a new program focused on Optimization of Industrial Systems.

The last review was made in 2004, in which the need for integration of all the programs was identified. The programs were integrated into one core program with common courses and various emphasis areas that the graduate student could choose from according to his or her interest.

Three areas of knowledge were identified in which CETYS University has demonstrated to have the capacity to develop graduate programs, and it was around these three areas of knowledge that the emphasis areas were defined. The three areas of knowledge that were identified are: Industrial Engineering, Mechanical Engineering and Computing & Electronics.

In 2011, the Master of Science in Engineering program began its program review process, led by the Academy of Master of Science in 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 2014 versions of the academic programs.

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

- Re-structure the specialties tracks so reduce of them can found.
- To enhance the way of formal tutoring for the students.

A plan of enhancement is presented in the final section of this document where the main action activities for each of the issue listed above are proposed.

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

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

- The M.Sc. of Engineering (with three specific programs) was the first master program with professional focus in the industry in the State of Baja California in 1992.
- The program was useful for many people, from professionals of the industry to professors from other universities of the State.
- Students came from the major industries of Baja California such as Kenworth, Skyworks, Gulfstream, Bosch, Honeywell, Rockwell Collins, etc., also from institutions like the State government, CETYS, CFE, and UABC to name a few.
- Some graduates have scaled to important positions and they have also been sent to other sites abroad in the companies.
- Graduates have contributed for more than 20 years with the advancements of the industry of Baja California.
- The program received its first national accreditation of quality by CONACYT (similar to NSF at US) in 2012.

The total number of graduates of the program, for the Mexicali Campus is around 400, for the Tijuana Campus around 200 and 100 for the Ensenada Campus.

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

The Master of Science in Engineering Program is focused on the following general areas of knowledge, also called lines of applied knowledge and generation:

a) Design and Manufacturing
b) Information Technology and Multimedia Systems
c) Systems and Processes Optimization

Also, as part of the 2007 program update, the following subjects were added to the common subjects:

a) Research Methodology
b) Analysis and Improvement of Processes

The Mission and Vision of the Master of Science in Engineering Program, established as part of the previous review process, states:

The Mission of the Master of Science in Engineering Program is to generate high level specialists in select areas of engineering, who design and develop applied research projects for the improvement and innovation of local, regional and national organizations.

The Vision of the Master of Science in Engineering Program is to be the primary source in the region for high level professionals who are specialists in select areas of engineering and have the knowledge and abilities to improve and innovate organizations.

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 Master of Science in 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, so the academy changed the word "specialists" by "professionals" because 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 their 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 Master of Science in Engineering, through a process of review and analysis, has re-defined the Mission and Vision of the Master of Science in Engineering program as follows:

> *The Mission of the Master of Science in Engineering Program is to generate high level professionals in select areas of engineering, who design and develop applied research projects for the improvement and innovation of local, regional and national organizations.*

> *The Vision of the Master of Science in Engineering Program is to be the primary source in the region for high level professionals who are specialists in select areas of engineering and have the knowledge and abilities to improve and transform the organizations.*

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 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 people with the moral capacity, but looking the recognition of our graduated with high standard of specialty centered on select areas of engineering, where it refers to the following:

- Design and Manufacturing
- Information Technology and Multimedia Systems
- Optimization of Systems and Processes

The vision of the program points out in a clear way that the program should move towards skills to improve and transform organizations. 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 Educational Objectives that the Graduate College Academy has established for the Master of Science in Engineering are the following:

- Graduates of this program will be project leaders of projects involving the areas of knowledge and emphasis that they choose for application in local, regional and national organizations.
- Graduates of this program will be able to do consulting projects involving the areas of knowledge and emphasis that they choose for local, regional and national organizations.
- Graduates of this program will be able to continue their graduate studies to obtain higher degrees with success.
- Graduates of this program will be able to obtain higher level job positions in their current organization or in a new one within 6 months of the obtainment of the degree.

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

3. Revision of the program's capacity.

3.1 Structure of the program.

The Master of Science in Engineering Program is focused on the application of science and engineering, more than on research and advancement of science, and it is for this reason that, to obtain their degree, graduate students must accredit the 13 subjects that comprise the program, and also develop an application project related to their area of emphasis, in which they must generate a report of the final results. This application project is considered as a capstone subject.

The 13 subjects and the capstone subject that comprise the Master of Science in Engineering Program are classified in three sections, which are called: COMMON, EMPHASIS and APPLIED RESEARCH sections:

a) COMMON is comprised of 6 subjects that all students must take: Statistical Models, Project Management, Strategic and Competitiveness, Decision Support Systems, Analysis and Improvement of Processes, and Research Methodology. This section of the program has the objective of giving to the students a set of skills and knowledge of the main tools for managing and implementing enhancements projects in the industrial and service sectors.

b) EMPHASIS is comprised of 7 specialized subjects that all student must select from a list classified in three main areas::

- Systems and Processes Optimization: this list of subjects is subdivided into three topics:
    - Industrial Management
    - Materials and Logistics Management,
    - Quality and Productivity.

- Design and Manufacturing: this list of subjects is subdivided into two topics:
    - Manufacturing Design and Processes
    - Aerospace Engineering.

- Information Technology and Multimedia Systems: this list of subjects is subdivided into four topics:
    - Distributed Computing
    - Networks & Telecommunications
    - Control & Automation
    - Microelectronics & Semiconductors.

c) APPLIED RESEARCH is comprised of 1 capstone course that all students must take to demonstrate that they are capable of resolving a problem in the emphasis area they selected. This course is the final course for all students.

The curriculum for the Master of Science in Engineering program contains the following subjects:

CODE	Name of the subject	CRH/Q	HWH/Q	HT/Q	CRED MEX
	COMMON (6)	**144**	**240**	**576**	**36**
MA 502	Statistics Models	36	60	96	6
AD 509	Project Management	36	60	96	6
AD 510	Strategy and Competitiveness	36	60	96	6
SI 507	Decision Support Systems	36	60	96	6
CS 502	Research Methodology	36	60	96	6
II 517	Analysis and Improvement of Processes	36	60	96	6
	EMPHASIS (7 courses) according with the three areas: 1. Systems and Processes Optimization. 2. Design and Manufacturing 3. Information Technology and Multimedia Systems	**252**	**420**	**672**	**42**
	Elective specialty I	36	60	96	6
	Elective specialty II	36	60	96	6
	Elective specialty III	36	60	96	6
	Elective specialty IV	36	60	96	6
	Elective specialty V	36	60	96	6
	Elective specialty VI	36	60	96	6
	Elective specialty VII	36	60	96	6
	APPLIED RESEARCH (1)				
CS 501	Application Project	36	60	96	6
	Totals	**504**	**840**	**1344**	**84**

Nomenclature:
CRH/Q: Quantity of hours dedicated for teaching in classroom and labs per quarter.
HWH/Q: Quantity of hours dedicated for homework per quarter.
HT/Q: Quantity of total hours per course per quarter.
CRED MEX: credits per subject according with the Mexican Normativity.

The list of specific subjects per emphasis area of specialization is presented below.

3.2 Program and Institutional Learning Outcomes.

The Student Learning Outcomes for all academic programs at CETYS is divided into two 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 specific academy of the program.

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

This section will focus on the analysis and review process for the Program Level Learning Outcomes done by Academy of Master of Science in Engineering.

The Program Level Learning Outcomes that apply to the Master of Science in Engineering, are defined in the document made for the WASC accreditation process in 2008, (included in Evidence #35 of the Capacity Report for the WASC Initial Accreditation).

Initially the definitions of the Program Learning Outcomes for the Master of Science in Engineering were defined as follows:

Two Learning Outcomes were defined for all Master's Programs that describe knowledge, abilities and attitudes that every graduate student must achieve by the end of the academic program. They were defined by the Academy of Graduate Programs (a multidisciplinary group of faculty). These are:

The student of a CETYS University Master's program will…

MPLO1: … develop applied research projects using the correct quantitative and qualitative methodologies, as well as information technologies, primarily data bases and information systems, for the solution of problems related to their area of specialization.

MPLO2: … develop personal and professional competencies with a focus on specialization, for direct application in their work.

Additional to the general student outcomes defined above for all Master programs, one Learning Outcome was defined for the Master of Science in Engineering Program by the Academy of Master of Science in Engineering. It describes the knowledge, skills and attitudes that every graduate of the Master of Science in

Engineering Program must achieve by the end of the academic program. The Learning Outcome is:

Graduates of CETYS University's Master of Science in Engineering program will…

MCIPLO: … solve problems related to the improvement and innovation of products and processes in organizations, applying knowledge and skills using the techniques and tools from Statistics, Project Management, Strategic Vision and Information Technologies.

However for emphasizing the student outcomes for each elective area of the Master of Science in Engineering program, the Academy of the program established for each one of the 9 emphasis areas of the program, one more specific learning outcome describing the knowledge, skills and attitudes that every graduate student from a Master of Science in Engineering Program with a specific area of emphasis must achieve by the end of the academic program. These are:

SYSTEMS AND PROCESSES IMPROVEMENT

Graduates of the Master of Science in Engineering with Emphasis in Industrial Management will…

EAILO1: … analyze and solve problems in the context of industrial plant management, with an executive vision focused on decision making using modern manufacturing systems methodologies, and integrating tools relating to operations management, human resources, marketing and finance.

Graduates of the Master of Science in Engineering with Emphasis in Materials and Logistics Management will…

EAMLLO1: … analyze and solve problems in the context of supply chain management , with a focus on production systems with operative and processes vision using methods and tools of inventory management, planning and forecasting, master planning, floor production control and lean manufacturing.

Graduates of the Master of Science in Engineering with Emphasis in Quality and Productivity will…

ECPLO1: … analyze and solve problems in the context of work systems' improvement, that are immersed in production processes using quality management and productivity tools applying a quantitative and optimization approach

DESIGN AND MANUFACTURING

Graduates of the Master of Science in Engineering with Emphasis in Manufacturing Design and Processes will…

EDPMLO1: … analyze and solve manufacturing design and processes problems with a focus on materials analysis, and product engineering using mathematical computer modeling for design, and modern manufacturing techniques.

Graduates of the Master of Science in Engineering with Emphasis in Aerospace Engineering will…

EIALO1: … analyze and solve problems in the context of aerospace and aeronautics engineering in two areas: (1) materials & structures, and (2) energy and propulsion, using mathematical models, shuttle conceptual design, materials for design and manufacturing and turbine theory.

INFORMATION TECHNOLOGY AND MULTIMEDIA SYSTEMS

Graduates of the Master of Science in Engineering with Emphasis in Distributed Computing will…

ESCDLO1: … analyze and solve problems in the context of distributed computing with a focus on software development, using software architecture, advanced object programming, networks & operating systems, distributed system design and mobile computing.

The student at the finish of its studies at Master of Science in Engineering with Emphasis in Networks & Telecommunications will…

ERTLO1: … analyze and solve problems in the context of networks & telecommunications with a focus on computer based communication systems, using specialized connectivity equipment, internet protocols, high performance network standards and equipment, cryptography techniques and data coding.

Graduates of the Master of Science in Engineering with Emphasis in Control & Automation will…

EACLO1: … analyze and solve problems in the context of industrial automation systems, using automatic control theory, programmable controllers' technology, intelligent control systems and robotics.

Graduates of the Master of Science in Engineering with Emphasis in Microelectronics & Semiconductors will…

EMSLO1: … analyze and solve problems in the context of microelectronics and semiconductors, with a focus on integrated circuit processing, using solid state physics theory, integrated circuit fabrication techniques, materials properties and integrated circuit design.

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

Also, a set of metrics and mechanisms for doing the assessment process was defined. The next table shows this information.

#	Student Learning Outcomes	Metrics to evaluate student performance	Evidence of achieved learning
1	MPLO1	The system that is currently in place to evaluate student performance is a scale of 0 to 10, where a grade above 8 is considered as "passing" and below as "failing". Rubrics for the Master's Programs are being developed to evaluate these learning outcomes. The rubrics are being developed by the Graduate College Academy..	Student Work and Final Projects from selected courses, as well as the Applied Research Project
2	MPLO2		
3	MCIPLO		
4	EAILO1 EAMLLO1 ECPLO1 EDPMLO1 EIALO1 ESCDLO1 ERTLO1 EACLO1 EMSLO1		

As a part of the WASC process, recommendations were made with regards to the amount of learning outcomes defined, the reason for recommendation was due to the amount of work for doing the assessment process, and thus we were suggested to review and integrate the learning outcomes already defined.

The Master of Science in Engineering Academy analyzed all original learning outcomes, those defined for Master programs and the ones defined for the Master of Science in Engineering and it came to the conclusion that was possible to redefine them into the only one Program Level Learning Outcomes that will apply to the program:

Graduates of the Master of Science in Engineering will…

- SLO_MCPLO: … develop projects using applied research that contributes to solve problems related to the innovation of products and processes in the context of the industrial and service organizations.

This re-definition allows for a more clear identification of the learning outcome expected for the Master of Science in Engineering program, 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).

The program level learning outcomes that are specific to each area of specialty of the Master program were also reviewed by the Academy of Master of Science in Engineering, and they defined three additional outcomes that depend on the area of

emphasis chosen by the students. The three new learning outcomes according to the emphasis selected by the student are the following:

Graduates of the Master of Science in Engineering with Emphasis in Optimization of Systems and Processes will…

- SLO_MCPLO_SP: … develop projects using applied research that contributes to solve problems related to the innovation of products and processes in the context of the industrial and service organizations with a combination of engineering tools of Industrial Management, Supply Chain management , Quality and Productivity Models.

Graduates of the Master of Science in Engineering with an Emphasis in Design and Manufacturing will…

- SLO_MCPLO_DM: … develop projects using applied research that contributes to solve problems related to the innovation of products and processes in the context of the industrial and service organizations with a combination of engineering tools in the lines of Design and Manufacturing Processes, and Aerospace Engineering.

Graduates of the Master of Science in Engineering with an Emphasis in Information Technology and Multimedia Systems will…

- SLO_MCPLO_IT: …develop projects using applied research that contributes to solve problems related to the innovation of products and processes in the context of the industrial and service organizations with a combination of engineering tools of Distributed Computing, Telecommunications, Networking, and Automation of Control Systems.

Finally, as a result of this revision the new set of Program Learning Outcomes consists of two for all students where one is the same for all students, independently of the area of emphasis they chose, and the other one depends on the area of emphasis they selected. It is important to note that both learning outcomes promote the same main objective in the students, this is:

"Develop projects using applied research that contributes to solving problems related to the innovation of products and processes in the context of industrial and services organization".

The difference lies in the techniques they use and the knowledge they apply, so it depends on the area of emphasis, and the course they select.

The curricular mapping for the program level learning outcomes, in their redefined versions considers the following levels of performance:

- 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 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 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 consistent with the above levels, using different nomenclature (Sufficient, Improvable, and 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 Master of Science in Engineering with Program and Institutional Learning Outcomes:

Curricular mapping										
Subject information and co-curricular efforts		Institutional Learning outcomes				Program Learning Outcomes		Elective Outcome Systems and Process Optimization	Elective Outcome Design and Manufacturing	Elective Information Technology and Multimedia
CODE	SUBJECT	ILO1	ILO2	ILO3	ILO4	SLO_ENG3	SLO_MCPLO	SLO_MCPLO_SP	SLO_MCPLO_DM	SLO_MCPLO_IT
COMMON SECTION										
MA502	Statistical Models	R	R	R	R	R	R	I	I	I
AD509	Project Management	R	R	R	R	R	R	I	I	I
AD510	Strategy and competitiveness	R	R	R	R	R	R	I	I	I
SI507	Decision Support Systems	R	R	R	R	R	R	I	I	I
	Research Methodology	R	R	R	R	R	R	I	I	I
	Analysis and Processes Improvement	R	R	R	R	R	R	I	I	I
EMPHASIS SECTION										
SYSTEM AND PROCESSES OPTIMIZATION COURSES										
	Elective Specialization I	R	R	R	R	R	R	R		
	Elective Specialization II	R	R	R	R	R	R	R		
	Elective Specialization III	R	R	R	R	R	R	R		
	Elective Specialization IV	E	E	E	E	E	E	E		
	Elective Specialization V	E	E	E	E	E	E	E		
	Elective Specialization VI	E	E	E	E	E	E	E		
	Elective Specialization VII	E	E	E	E	E	E	E		
DESIGN AND MANUFACTURING COURSES										
	Elective Specialization I	R	R	R	R	R	R		R	
	Elective Specialization II	R	R	R	R	R	R		R	
	Elective Specialization III	R	R	R	R	R	R		R	
	Elective Specialization IV	E	E	E	E	E	E		E	
	Elective Specialization V	E	E	E	E	E	E		E	
	Elective Specialization VI	E	E	E	E	E	E		E	
	Elective Specialization VII	E	E	E	E	E	E		E	
INFORMATION TECHNOLOGY AND MULTIMEDIA SYSTEMS										
	Elective Specialization I	R	R	R	R	R	R			R
	Elective Specialization II	R	R	R	R	R	R			R
	Elective Specialization III	R	R	R	R	R	R			R
	Elective Specialization IV	E	E	E	E	E	E			E
	Elective Specialization V	E	E	E	E	E	E			E
	Elective Specialization VI	E	E	E	E	E	E			E
	Elective Specialization VII	E	E	E	E	E	E			E
APPLIED RESEARCH SECTION										
	Application Project	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”), in the graduate programs do not have a specific course for teaching English. The program has as a requirement for admission that the students must manage the English language in a minimum level equivalent to 500 of TOEFL, and the strategy for helping students to improve their skills of communication in the English language consist of encouraging them to take courses offered in English by guest professors from the United States, Europe or other parts of the world.

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 is offered with a mix of professors that are associates of the institution, professors from other national and international institutions, and professionals with master’s degrees that are currently working in the local and regional industry.

The program has a statewide coordinator that is in charge of the quality of the program through the selection of the professors and close communication with them for course follow up. The program coordinator has close communication with students via personal interviews and e-mail. The program coordinator is supported by the associate professors of the institution for student academic follow up in each of the campuses.

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 graduate follow up, program review, accreditation projects, etc.:

- Dra. Gabriela Estrada – Mexicali Campus.
- Dr. Ricardo Martínez – Tijuana Campus.
- Dr. Carlos González – Ensenada Campus

The Faculty that supports the program in the **COMMON** and **EMPHASIS sections of Information Technology and Multimedia Systems** are the following:

Name	**Degree**	**Institution**	**Type**	**Campus**	**Level English**
Guillermo Cheang	Doctoral Candidate	CETYS	Full	Mexicali	100%
Dania Licea	Master of Sciences	ITESM	Full	Mexicali	70%
Miguel Salinas	Doctor of Engineering	CETYS	Aggregate	Mexicali	90%
Marco Peña	Master of Science	UTEXAS	Aggregate	Mexicali	100%
Hector Barajas	Master of Science	CETYS	Aggregate	Mexicali	95%
Cristobal Capiz	Master of Science	ASU	Full	Mexicali	85%
Ricardo Martinez	Ph. D.	UABC	Full	Tijuana	90%
Adan Hirales	Ph. D.	CICESE	Full	Tijuana	100%
Moises Sánchez	Doctor of Engineering	CETYS	Full	Tijuana	100%
Daniel Moctezuma	Master of Science	CETYS	Aggregate	Mexicali	70%
Adolfo Esquivel	Master of Science	IPN	Half	Tijuana	90%
Moises Sanchez	Doctor of Engineering	CETYS	Half	Tijuana	100%

The Faculty that supports the program in the **COMMON** and **EMPHASIS sections of Systems and Processes Optimization** are the following:

Carlos Solorio	Ph. D.	UW	Full	Mexicali	100%
Gabriela Estrada	Ph. D.	UPC	Full	Mexicali	100%
Cesar Barraza	Master of Sciences	ITESM	Full	Mexicali	80%
Alfredo Rodriguez	MBA	CETYS	Full	Mexicali	70%
Salvador Chiu	Doctor of Business Administration	CETYS	Aggregate	Tijuana	100%
Enrique Fitch	Master of Science	ITSON	Full	Tijuana	100%
Rodrigo Matus	Master of Education	CETYS	Part	Tijuana	100%
Carlos González	Doctor of Engineering	CETYS	Aggregate	Ensenada	100%
Isaac Azuz	Ph. D.	UPC	Full	Ensenada	100%
Marco Jimenez	Master of Sciences	CETYS	Industry	Mexicali	100%
Oscar Chacon	Master of Science	CETYS	industry	Tijuana	100%
Dan Shunk	Ph. D.	PURDUE	Faculty ASU		American citizen
Behrouz Aslani	Ph. D.	STANFORD	Emeritus Calpoly Pomona		American citizen

The Faculty that supports the program in the **COMMON section** and **EMPHASIS section of Design and Manufacturing** are the following:

Bernardo Valadez	Doctoral Candidate	CETYS	Full	Mexicali	80%
Jesús Corona	Master of Science	UP Madrid	Full	Mexicali	100%
Harvi Castillo	Ph. D.	U. Colombia	Full	Tijuana	80%
Ivan Pulido	Master of Science	ITESM	Industry	Mexicali	100%
Ivan Williams	Master of Science	CETYS	Industry	Mexicali	100%
George Naya	Master of Science	Calpoly SLO	Industry	Mexicali	100%

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 degree 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.

(1) **Information and Multimedia Technology.** This research line addresses the problems related to the design and 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 degree, and 4 in doctoral education). The following academic programs are in this line:

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 on this LGAC (one doctor and three in doctoral training). In this line are the following academic programs:

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

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.

Under these terms, the Master of Science Engineering is covering all the lines with their three emphasis areas; it means that the program is completely aligned with the lines of research defined by the College of Engineering.

The strategy for doing research is based on that all students must do an applied research project with the tutoring and advice of professors from CETYS in accordance with the area of emphasis they selected.

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 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.

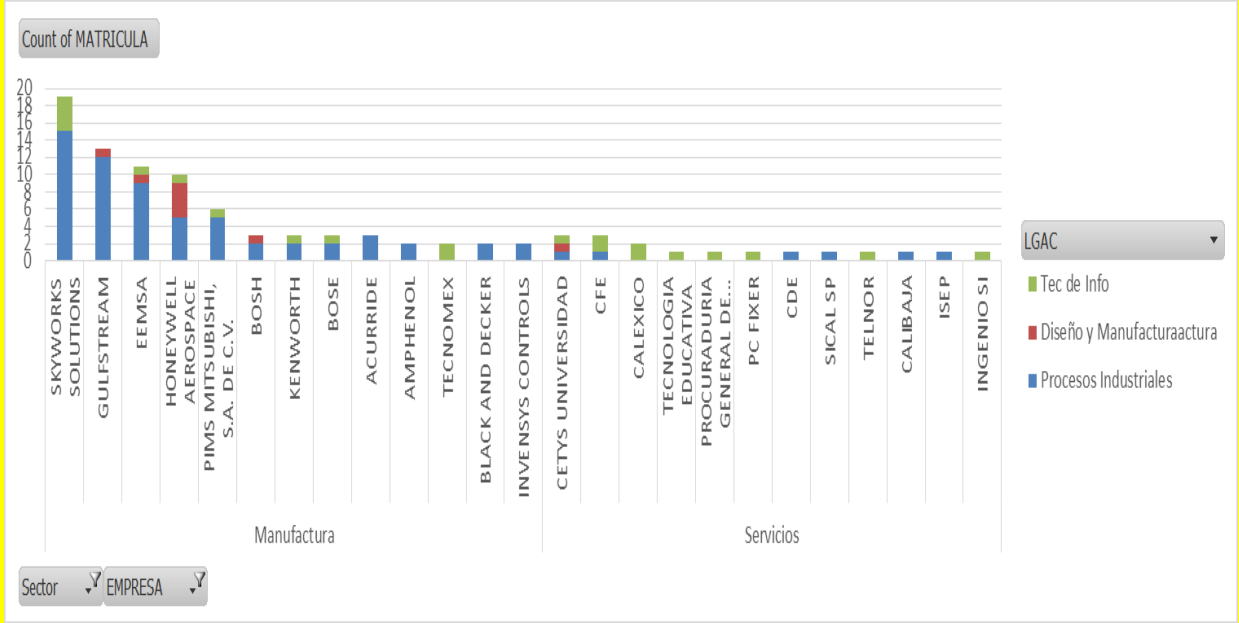
- Tijuana: Physics, General Electronics, Production Systems, Industrial Computer labs.

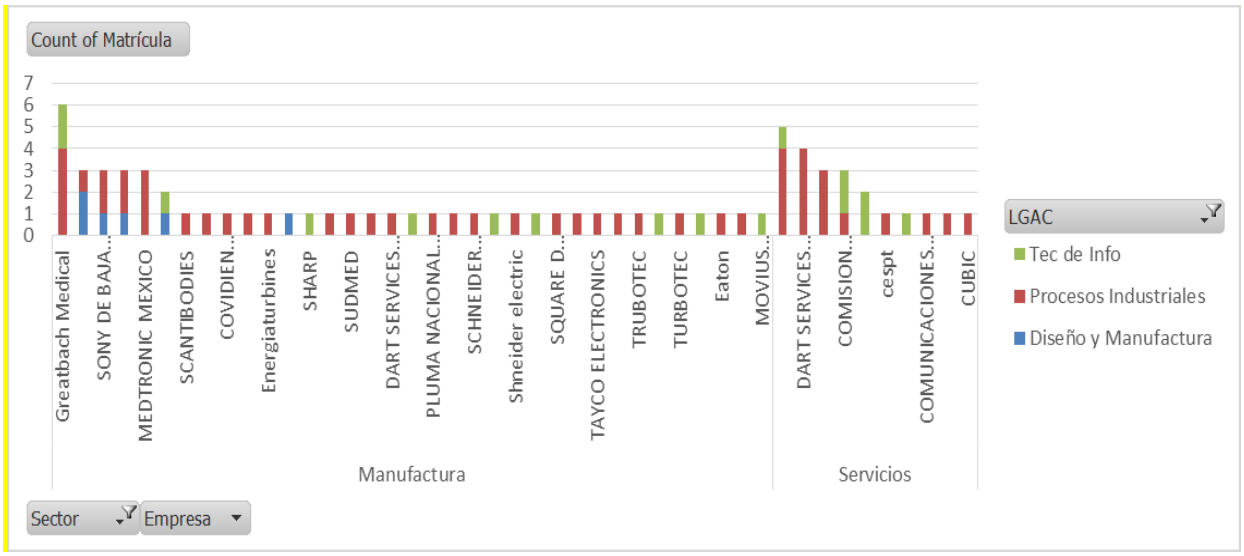
- Ensenada: Physics, General Electronics, Chemistry, Production Systems, Industrial Computer labs.

4. Revision of the program's educational effectiveness.

4.1 Graduates of the Program.

- In the three campuses, from 2009 to the first semester of 2013, 372 students have graduated from the Master of Science in Engineering.
- 186 graduates have been contacted and their data has been updated. 186 (50%) are pending to contact
- The main manufacturing sectors that are being supported state-wide are:
  - Electronics: 62 graduates (33% of the contacted graduates)
  - Aerospace: 35 graduates (19% of the contacted graduates)
  - Medical: 21 graduates (11% of the contacted graduates)




Count of Matrícula
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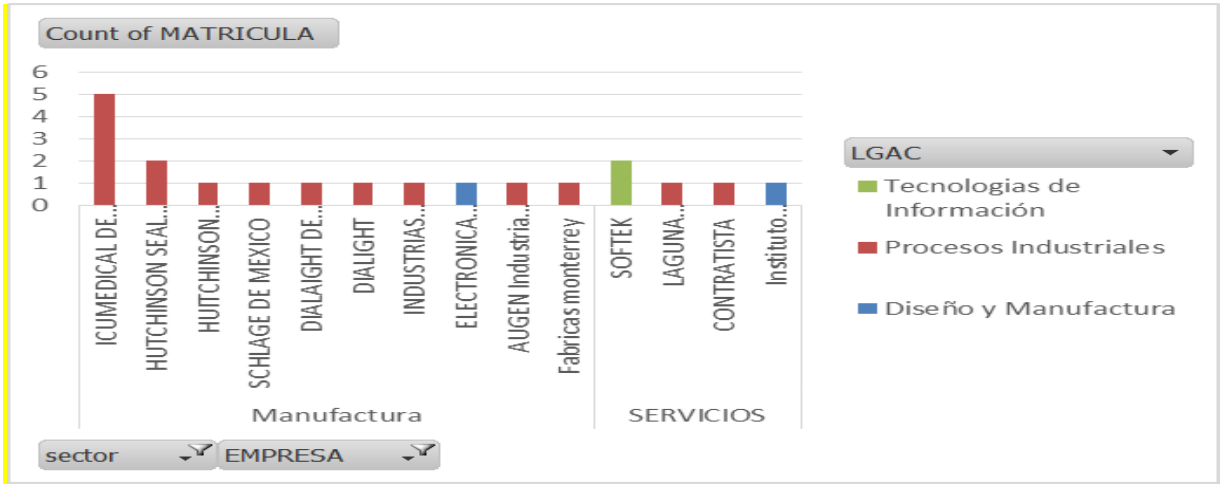
6
5
4
3
2
1
0
Greatbach Medical
SONY DE BAJA...
MEDTRONIC MEXICO
SCANTIBODIES
COVIDIEN...
Energiaturbines
SHARP
SUDMED
DART SERVICES...
PLUMA NACIONAL...
SCHNEIDER...
Shneider electric
SQUARE D...
TAYCO ELECTRONICS
TRUBOTEC
TURBOTEC
Eaton
MOVIUS...
DART SERVICES...
COMISION...
cespt
COMUNICACIONES...
CUBIC
Manufactura
Servicios
LGAC
Tec de Info
Procesos Industriales
Diseño y Manufactura
Sector
Empresa

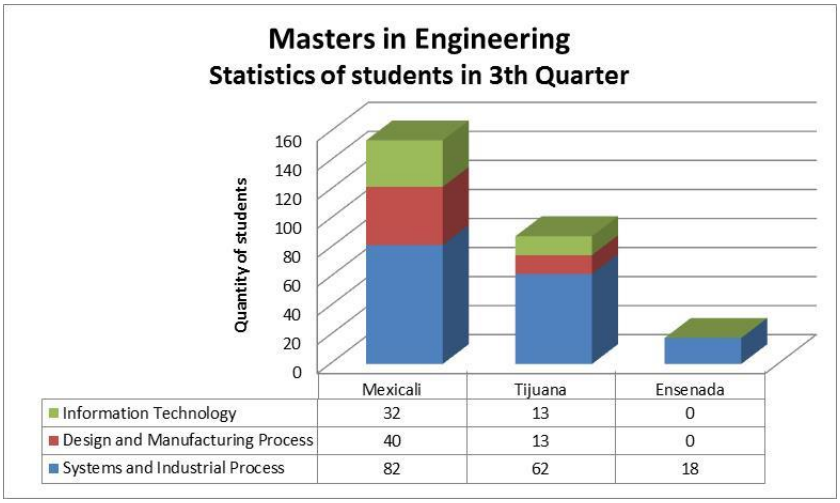

Count of MATRICULA
6
5
4
3
2
1
0
ICUMEDICAL DE...
HUTCHINSON SEAL...
HUITCHINSON...
SCHLAGE DE MEXICO
DIALAIGHT DE...
DIALIGHT
INDUSTRIAS...
ELECTRONICA...
AUGEN Industria...
Fabricas monterrey
SOFTEK
LAGUNA...
CONTRATISTA
Instituto...
Manufactura
SERVICIOS
LGAC
Tecnologias de Información
Procesos Industriales
Diseño y Manufactura
sector
EMPRESA

4.2 Student Population.

Statistics of 3th Quarter				
Masters in Engineering		**Mexicali**	**Tijuana**	**Ensenada**
Systems and Industrial Process	MCAI	21	14	0
	MCCP	10	0	0
	MCAM	18	11	0
	MCIN	33	37	18
	Subtotal	**82**	**62**	**18**
Design and Manufacturing Process	MCIA	29	2	0
	MCDP	11	11	0
	Subtotal	**40**	**13**	**0**
Information Technology	MCAC	12	5	0
	MCSC	7	1	0
	MCRT	13	7	0
	Subtotal	**32**	**13**	**0**

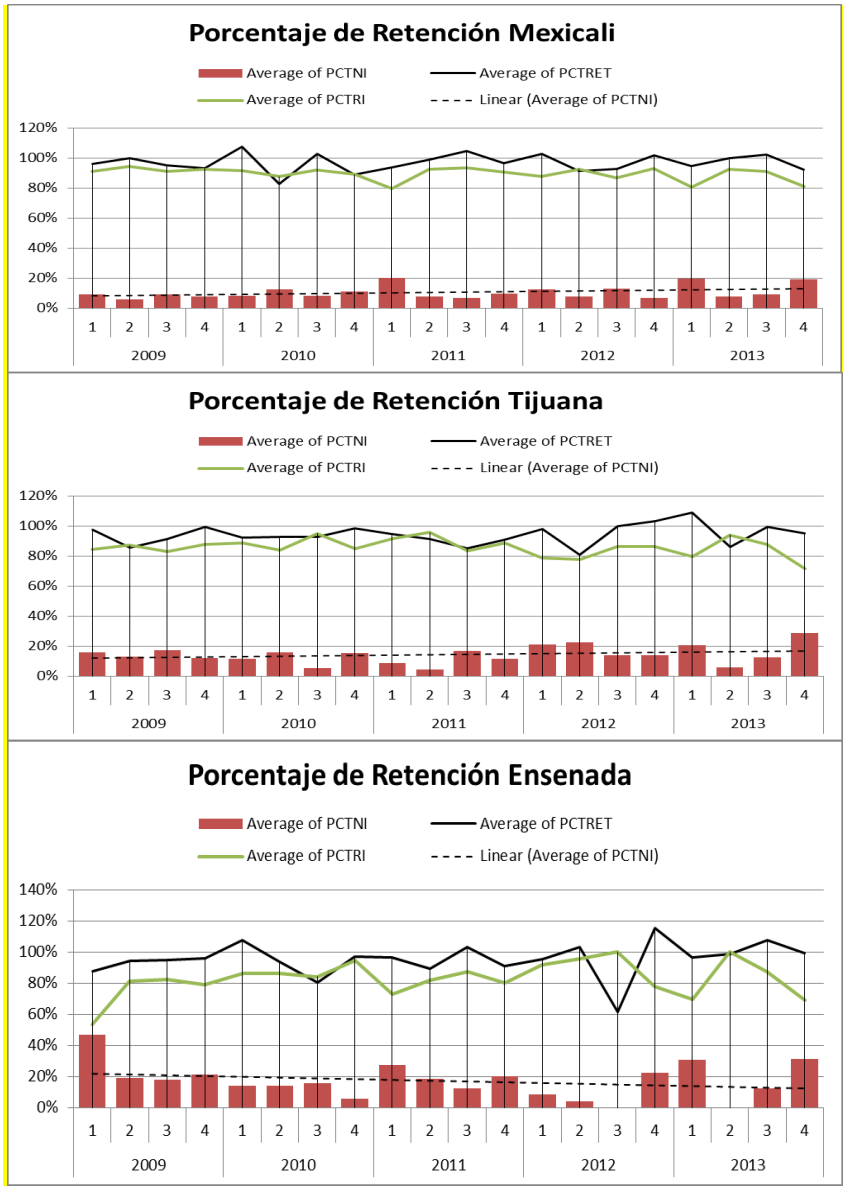
Summarize

Masters in Engineering	**Mexicali**	**Tijuana**	**Ensenada**	Total
Systems and Industrial Process	**82**	**62**	**18**	162
Design and Manufacturing Process	**40**	**13**	**-**	53
Information Technology	**32**	**13**	**-**	45
Total	**154**	**88**	**18**	260



4.3 Analysis of retention and graduation rate.

- In the three campuses, retention measured as an RI percentage of one trimester in relation with the population of the previous trimester is high (higher than 85%), except for a fall in Ensenada in 2012 TS (ICU Medical).
- New enrollment as percentage of the total is at 15% in the three campuses.
- However, Ensenada shows a decreasing tendency.



4.4 Learning Assessment Process.

This section will focus on the general description of the assessment plan developed to assess the program level learning outcomes for the Master of Science in Engineering.

Assessment at the program level is something new for the graduate programs, 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 and mainly at the bachelor levels. The result of these efforts, as well as the training of the professors it just now being used to plan and implement the proper plan for the graduate program in engineering that runs by quarters, with the support of the some faculty from the Engineering Schools in the three campuses.

This assessment plan had the goal to not only define a structure and methodology for assessment at the program level for the graduate program in engineering, but to integrate as seamlessly as possible to the academic dynamic of the courses offered at the graduate level in the engineering, 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 at the bachelor level, but builds upon it.

The process and methodology that was defined and it is still followed consists of seven key components:

1) Selection of Learning Outcomes: The Academy of Master of Science in Engineering, based upon the redefinition of the Program Level Learning Outcomes (common and electives-specific), described at the section 3.2 of this document, selected one learning outcome to assess during one year of assessment cycle, it was thinking in one year, this period of time was determined because this program runs in quarters, so this way it could be covered 4 cycles for collecting information. However, at the final of each quarter it was established an analysis of the results for taking decision for improving at the next quarter.

2) Course selection for assessment: Based upon the curriculum, and curricular mapping it was presented in previous section, it was defined in which courses the assessment process it would be implemented. It was important that the selected courses span the length of the academic program.

3) Design of Instruments for Assessment: The Academy of Master of Science in Engineering designed the instrument to assess the selected learning outcome. Example of this it can be found in the annexes of this document, it consists in a rubric.

4) Definition of learning activities and evidence of learning: Once learning outcomes and courses were defined, the learning activities and their

corresponding evidence of learning were also identified and defined. The congruency between this and the instruments defined in 3) was important. Both 3) and 4) may were done concurrently.

5) Training of faculty: With the aid of the Coordinator of graduate programs and Deans of the Schools of Engineering in each campus, faculty who would participate in assessment during the cycle were provided with 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 quarters: The learning outcomes were assessed in the selected courses, using the defined instruments for the learning activities and corresponding learning evidence. This part of the process was supervised by the Coordinators of graduate programs at each campus and the Deans of the Schools of Engineering in each Campus.

7) Analysis of results: At the end of the cycles, results were presented to the Academies and analyzed to identify areas of opportunity to be included as a part of the program review process.

For explaining the implementation and results of this plan, following it is presented how the plan is going after two cycles, 2013-1 and 2013-2. For each process it is presented the specifics that it already has been gotten.

1. Selection of Learning Outcomes:

It was selected the common program learning outcome for all tracks of the Master of Science in Engineering:

- SLO_MCPLO: … develop projects using applied research that contributes to solve problems related to the innovation of products and processes in the context of the industrial and service organizations.

This decision was taken since the academy it was beginning on this process and, they liked to work with one student outcome for a year (four quarter periods) to learn and to refine this process. Also this outcome is considered the most important result from the Master of Science program independently of the three tracks of the program.

2. Course selection for assessment:

It were selected three courses from the common courses, this considering that all students take these two in the first year of their master degree. Also in these courses the students are asked to develop a project related with master's program interests.

Common courses selected (first year):
Decision Support Systems
Project Management
Research Methodology

Also it was selected the final capstone course the master program has, where the student need to develop a project aligned with their discipline of study.

Capstone course (final of the program):
Application Project

3. Design of Instruments for Assessment:

It was defined a rubric for gathering the data from final work the student presented for each course defined, usually they present a project. This rubric can be found in the annexes of this document. It was applied the same rubric for all courses, because it was supposed that the evolution of the learning outcome should be going in better punctuation each time.

4. Definition of learning activities and evidence of learning:

As main activity was defined a final project that each course has defined, so it is not was different than others times before when the professors gave the course. For example, for the course of Decision Support System, the professor usually ask to the student analyze a problem and present the possibilities for its solution it using a data based analysis, and data visualization, but in this case the professor asked to the students to conform with a report where they show how they resolved the problem. Examples of these definitions of projects could found in the annexes of this document.

5. Training of faculty:

The faculty training consisted of presenting and making them familiar with the rubric to be used consistently in learning assessment and how to measure every aspect of it. Likewise, they were trained in the use of a software system called Institutional Electronic Portfolio (PEI for its acronym in Spanish), where professors are able to record the assessment data. The training strategy was one on one, ie, the professors involved in this process were identified and trained personally.

6. Assessment during quarters:

The assessment process is carried out in a very practical way, which was that when students openly present their projects in class, and handed it to the

professor their documents, each project was evaluated by the professor using the rubric designed, and recorded the rubric and student work on PEI.

7. Analysis of results

After complete the above process, a meeting was convened with the Academy engineering graduate, and presented the results. The meeting identified possible causes of low scores, and therefore possible improvements that could be applied in the next cycle. These agreements were communicated to all professors for their knowledge.

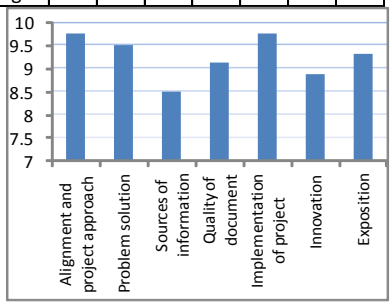
For following assessment cycles, it is expected that an assessment scheme that allows for assessment of institutional and both program level types of learning outcomes be designed, however, the bulk of workload that this would imply needs to be analyzed with detail.

4.5 Learning Assessment Outcomes

It is important in this step to perform sessions to discuss, interpret and understand the learning assessment outcomes with key members of faculty; these are Director of Engineering School, Director of Master of Engineering, Coordinators of Master in Engineering for each campus Mexicali, Tijuana and Ensenada and Professors involved in each course that was assessed.

The method proposed to share learning assessment outcomes is based on a report that concentrates key information for each course assessed, such as: name and code of the course, campus where rubric to assess the course was applied, name of professor, category for each rubric and details for each student evaluation. See next report as an example.

Table for Learning Assessment Outcomes		Student No.	Name of student	Alignment and project approach	Problem solution	Sources of information	Quality of document	Implementation of project	Innovation	Exposition	Average per student
Campus	Mexicali	1	[Name 1]	10	8	8	8	10	7	8	8.429
Course code	SI507	2	[Name 2]	10	9	8	8	10	7	8	8.571
Course name	Decision Support Systems	3	[Name 3]	10	10	8	8	10	10	10	9.429
Professor	DR. Miguel Salinas	4	[Name 4]	10	10	8	8	10	10	10	9.429
Number of students	16	5	[Name 5]	8	7	8	8	8	7	8	7.714
Type of product	Final Project	6	[Name 6]	10	10	8	10	10	10	10	9.714
Learning outcome	SLO_MCPLO	7	[Name 7]	10	10	8	10	10	9	10	9.571
Results		8	[Name 8]	8	10	8	10	10	8	9	9
Percentage of students that pass	100%	9	[Name 9]	10	10	8	10	10	9	10	9.571
	16 of 16 pass	10	[Name 10]	10	10	10	10	10	10	10	10
Opportunities areas for improvement		11	[Name 11]	10	10	10	10	10	10	10	10
Three students fail in innovation rubric		12	[Name 12]	10	10	10	10	10	10	10	10
One student fail in problem solution rubric		13	[Name 13]	10	10	10	9	10	9	9	9.571
		14	[Name 14]	10	8	8	9	8	8	8	8.429
		15	[Name 15]	10	10	8	9	10	9	10	9.429
		16	[Name 16]	10	10	8	9	10	9	9	9.286
			Average	9.75	9.5	8.5	9.13	9.75	8.88	9.31	



The use of this summary reports facilitates the discussion and generates useful interpretation to identify areas for improvement.

An assessment report is performed in this step to summarize a program's assessment activities, program decisions, and future directions. The report must be previously reviewed by the assigned Committee for Master of Engineering in CETYS Mexicali, Tijuana and Ensenada.

In order to identify how well a learning outcome was satisfied it is important to perform "Outcome reports" these reports examine each learning outcome individually. This report must describe general findings.

Once areas for improvement are identified, strategies and actions are taken to strengthen student learning. See next section "Improvement actions derived from the learning assessment".

4.6 Improvement actions derived from the learning assessment

Pending

4.7 Program accreditations and recommendations

The Master of Science in Engineering received in 2012 from CONACYT Mexico, the category of being part of PNPC, which means that the program is now included in the National List of Master Programs with the quality to receive federal funding for scholarships.

The main recommendations of peer process review were the following:

1. Strengthen research activity, where professors work in groups around the three defined LGAC.
2. Create more evidence on work in partnership with the industry.
3. Strengthen graduate follow up to know where they work and how the program helped their professional development.
4. Increase mobility of students and professors to other universities, national and international.
5. Strengthen the process of admission and selection of new students.
6. Improve the laboratories and equipment in each campus.
7. It was suggested to change the name of the program, where the word “Science” would be taken out of the name, because in Mexico this word is used for *Research oriented* no for *Professional oriented.*
8. Increase productivity of the faculty.

4.8 Follow up on the recommendations of the accrediting bodies

To follow up on all the recommendations, we have been working on defining and creating the following practices and putting them underway this year:

1. New process of admission and selection of students.
2. Integrate the letters of acceptation of application projects with the companies where the students work.
3. Using of the new Center of Excellence for Design and Innovation as a platform for increasing research productivity for the faculty.
4. Design a new process for keeping in contact with our graduates.
5. Looking for new university agreements in the United States and Europe where our students and professors can go to do internships, research or study. Some of them are: Washington State University, Eastern Washington University, Johannes Kleper at LINZ Austria, Purdue University at Calumet, California State at Chico, Polytechnic University of Cataluña at Spain, etc.

4.9 Faculty Productivity

Faculty of the College of Engineering, in addition to their work as professors, carry 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 20-20 plan of CETYS University System.

The results of these research projects are published in articles by professors in conferences, articles in journals and books.

Another important activity of the faculty is industry-related projects which most times are funded through the stimulus for innovation awarded by organizations such as CONACYT. These projects arise from innovation needs of the 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 engineering projects 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.

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

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

The faculty productivity is considered in the following aspects:

-Publications: articles in conferences, articles in journals, books

-Participation in projects in partnership with the Industry

-Certifications and trainings

-Patents

- SNI Level (National System of Researchers).

4.10 Faculty evaluation

As part of the commitment we have with students in the Master of Science in Engineering, it is important to know their opinion about the professors who teach the subjects. Therefore, professor evaluation is performed to gather information and provide feedback to professors.

The following aspects are considered in the professor evaluation.

• Knowledge: How much professors dominate the subject material.

• Course features: Explanation by professor at the beginning of the course about objectives, goals, method of evaluation and responsibilities of the student.

• Ability to communicate: Professor's ability to communicate the content in a clear and effective way, whether for discussions, explanations or other methods.

• Course Evaluation: Course evaluation process by the professor in relation to the course objectives.

• Availability: Of the professor with the students for clarification, questions and advice .

• Organization: How well professors meet the course objectives.

• Course materials: Selection and use of course materials (books, ppt).

• Dedication to students: Level of dedication given to the student by the professor.

• Treatment and respect: How well the professor treats and respects the students.

• Overall evaluation: How well the student considers the professor’s performance in general.

• Motivation: Does the professor motivate the student to visit the library to check out library materials?

• Development of the course: Do students believe that the course turned out better, the same or worse than expected?

• Recommendation of the course: Do students recommend to colleagues or friends to take the subject with that professor?

Every aspect is measured on a scale and an average is calculated at the end. This average considers the satisfaction index, where the maximum is 100. There is an example below:

DR. DAN SHUNK MANUFACTURA ESBELTA / ESTRATEGIAS DE MANUFACTURA / ANALISIS Y MEJORA DE PROCESOS	Maestro Materia
EVALUACION DOCENTE T2-2013	TOTAL
El dominio el docente del material del curso es:	5.00
Explicación de objetivos, metas, método de evaluación y responsabilidades del alumno fue:	4.79
Habilidad del docente para comunicar el contenido de una manera clara y efectiva, sea por debates, explicaciones u otros métodos fue:	4.71
En relación con los objetivos, el proceso de evaluación (examen, trabajos), fue:	4.50
La disponibilidad del docente para aclaraciones, dudas, asesorías fue:	4.67
Dada la naturaleza y los objetivos del curso, la organización del docente fue:	4.88
La selección y utilidad de los materiales del curso (libros, ppt) fueron:	4.63
El nivel de interés generado por las actividades de clase fue:	4.58
El nivel de dedicación del docente hacia el alumno fue:	4.71
El trato y respeto del docente hacia los alumnos fue:	4.92
Mi evaluación general del docente en este curso es:	4.75
PROMEDIO GENERAL	4.74
INDICE DE SATISFACCIÓN %	94.77
Total de alumnos por curso	25
No. de evaluaciones	24

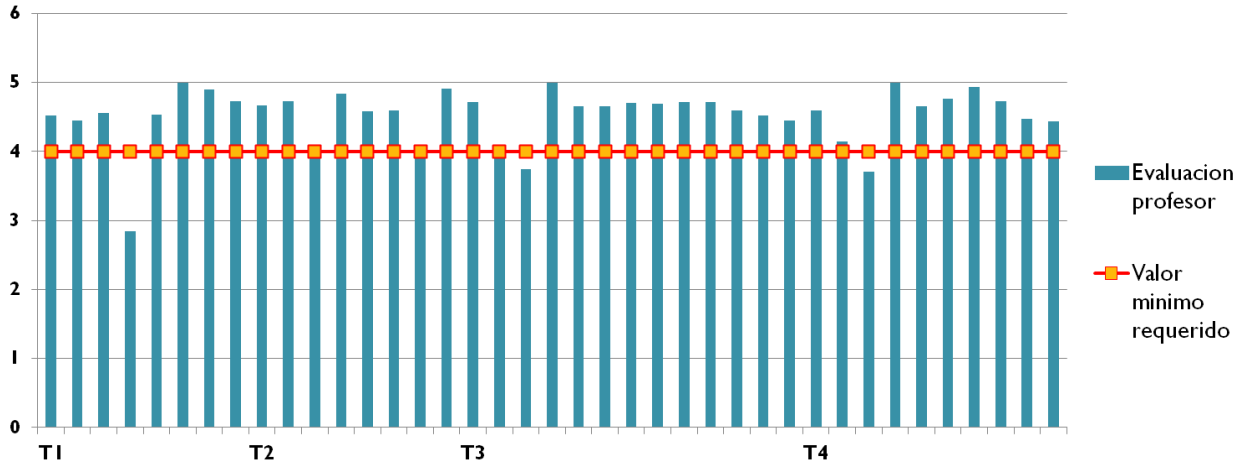
¿El maestro motivó al alumno a visitar la biblioteca para consultar material bibliográfico?	Total	%
Si	24	100.00
No	0	0.00
Total de alumnos que avaluaron	24	100

¿El desarrollo del curso resultó mejor, igual o peor a lo que esperaba?	Total	%
Mejor	18	75.00
Igual	5	20.83
Peor	1	4.17
Total de alumnos que avaluaron	24	100.00

¿Recomendarías el curso con este maestro a un colega o amigo?	Total	%
Si	23	95.83
No	1	4.17
Total de alumnos que avaluaron	24	100.00

The required minimum satisfaction index for each professor is 80 (equivalent to 4). The faculty of the Master of Science in engineering showed a satisfaction level of over 80 in 92.3% of the professors.

- Good result in professor's evaluations (92.3% complies with the minimum)
- Isolated cases (7.7%) do not comply with the minimum required.



Professor's evaluation 2012

5. External revision of the program

The program of MCIN was reviewed by Dr. Behrouz Aslani from Cal Poly University, Dr. Aslani is Professor Emeritus. The feedback provided by him is presented in two sections i) Program improvement and development and ii) General comments.

i) Program Improvement and Development

The CETYS graduate programs have a high potential for growth. CETYS campuses in Tijuana and Mexicali are located in the heart of maquiladora companies. CETYS could play a dominant role providing highly qualified professionals and engineers to fulfill the manpower needs in the region.

It is recommended that the students' final thesis address practical problems relevant to maquiladora industries. The hands-of-doing approach at CETYS coupled with problem solving for industry facing the real-world challenges will enhance the quality and reputation of CETYS as a fine Engineering program.

It should be noted that while CETYS guaranties its academic integrity, the faculty and students would become a think tank in the region. Therefore, a very aggressive "outreach' marketing plan should be designed and implemented in order to promote the program and encourage companies in the area to look into CETYS for practical solutions to their case thereby providing industry-sponsored programs for master's level thesis is highly recommended. This means that a strong tie should be developed with many maquiladora companies to identify these research needs. Partnership between CETYS and maquiladora companies could subsequently bring additional financial resources- for the university, faculty, and students- upon satisfactory accomplishments of these needs. Part of the financial rewards could also be used for renovation of the lab facilities and equipment including software and computers.

It is noted that the increase of the enrollment would be a by-product of this operation. The "outreach" would encourage those undecided students to join CETYS training for more professional development and advancement opportunities offering by CETYS.

ii) General comments

- As discussed, please delete the statement of "the alumni from this program…within six months…" on the Educational Objective.

- Since students often work in these maquiladora companies and are operating globally, then it is suggested that CETYS engineers be aware about other cultures. This knowledge would facilitate smooth operations and avoids conflicts among people with different cultural background that participate in the same project. Therefore, it is highly desirable to have some training sessions even in the form of seminars to expose engineers with multi-cultural environment.

- Though most of the CETYS students are reasonably good in English, an English language training center with focus on technical terminology related to the field of engineering is of great help.

- Promote the student Development Center to organize seminars or publish news through Website offering latest engineering findings would greatly help students to be exposed to the new findings in the field of engineering.

- Develop and implement a program that the newly graduated Engineers could become future CETYS professors. This would alleviate the challenge currently faced by the institution to recruit trained specialist to fill faculty positions.

- Working with CONACYT in order to identify ways and means such as scholarship, and grant to increase the number of financial aid would enable more students to enter CETYS's master degree program. This will reduce the actual 20% drop of the students enrollment and encourage them return to study (slide 58)

- Design/Enforce an Industry Advisory Board composed of industry leaders as traditionally done at most US universities. The Board should be in charge to make recommendations to the college of engineering in curricular matters as well as providing industry and business perspective and support. This Board would play an important role in providing key recommendations to keep the curriculum in line with the needs of the industry in the area and pointing to emerging areas of technology. Board recommendations would help CETYS Engineering faculty to be more agile and responsive to the changing engineering training needs.

- Extend university program with other national and international educational center through exchange programs in order to prepare graduates to efficiently work in an international and global setting.

- Improve books (hard copy and digital) in the Engineering library and connect with other university libraries for sharing documents (hard copy or digital).

- Design better ties with community, alumni, and local industry in order to capture more students.

- Encourage faculty to seek industry funded projects in addition to the government research oriented projects.

- Offer short and specialized training courses, e.g. Project Management for professionals for those who wish to obtain only a certificate of training on that specialized topic. Some professional do not wish to undergo through the whole Engineering curriculum. This certificate training is equivalent to the extended University in the U.S. higher education system. Therefore, participants in this short training do not need to go through to the university admission process. Collected training fee from this short training would become one of the major financial resources for the college.

- Provide financial support for faculty development including travel fund for attending conferences or additional training workshops for those highly qualified faculty to stay up-to-date in their field of interest.

- Course prerequisites should be clearly defined. Some courses such as Strategy and Competitiveness require some managerial background that lacks in many typical engineering schools. Therefore, some degree of collaboration with the school of business is encouraged to allow engineering students gain proper foundation before taking these courses.

- In the documents I received, the process of graduate admission is unclear whether master's level admission is managed at the department or at the university admission.

- Faculty performance has many indicators including: number of publications in reputed journal or conference presentations in addition to their teaching load along with student satisfaction. In order to comply with the Engineering school goal, it is suggested to develop an environment of training and research at CETYS as opposed to the mainly teaching institution as known presently. It should be noted that CETYS faculty teach on average 4 courses/quarter requiring 20 hours/week. It is anticipated that at least 20 hours is required for class preparation, homework assignments, and other course administrative task. Therefore, CETYS faculty member will not be able to undertake additional tasks such as research and new project development. It is suggested that the present policy be revised allowing faculty to carry on lower teaching load in lieu of more actively engage in the research area.

- Research lines of the program ask for faculty to engage in research in three centers of excellence (Design and Innovation, Entrepreneurial Development Center). The document does not clearly give the name of the third center. It is unclear whether my earlier suggestion in regard to the professor teaching load alleviation is part of the goals of these centers. It is also unclear to me whether is there any overlapping activities by these centers.