



WASC Accreditation  
Educational Effectiveness Review

**Bachelor's in Computer Science Engineering.  
The program is currently offered in the following Campi:  
Mexicali, Tijuana.**

## Last Program Review: November 2007

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## 1. Introduction.

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.

The Bachelor's in Computer Science Engineering Program was launched in the Mexicali Campus in 1975, in the Tijuana Campus in 1980. Since 1975, it has undergone 7 major reviews, being the last one in 2007.

The total number of alumni for the program, for the Mexicali Campus is around 270, for the Tijuana Campus is around 170.

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

Mexicali:

- The program received the accreditation by CACEI in 2007.
- The first professionals in the area of software were graduated from the program in 1979.
- 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.

Tijuana:

- 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).

## 2. Denomination and description of the academic program.

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

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

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

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

The program has chairs by campus, who are full time faculty that are in charge of the program, and are involved in enrollment and promotional activities, student guidance and alumni follow up, program review, accreditation projects, etc. The program has chairs in the Mexicali Campus and Tijuana Campus, and none in the Ensenada Campus. The chairs are:

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

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

- M.S. Guillermo Cheang – Mexicali Campus.
- M.S. Dania Licea – Mexicali Campus.
- M.S. Josefina Becerra – Mexicali Campus.
- M.S. Miguel Salinas – Mexicali Campus.
- M.S. Polo Uribe – Tijuana Campus.
- M.S. Lizeth Trujillo – Tijuana Campus.
- M.S. Lucía Beltrán – Ensenada Campus.

The students of the program are full time, primarily male and most of the students receive some sort of financial aid, the primary one being the Pro-Engineering scholarship.

The program currently has the following laboratories by campus:

- Mexicali: Physics, Advanced Computing and Electronics, Networks and Operating Systems.
- Tijuana: Physics, General Electronics, Advanced Computing, Networks and Operating Systems.

<b>Student population - Mexicali</b>			
<b>Semesters</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>1 and 2</b>	10	0	10
<b>3 and 4</b>	9	3	12
<b>5 and 6</b>	8	0	8
<b>7 and 8</b>	7	1	8
<b>Total</b>	34	4	38
<b>Percentage</b>	89.5%	10.5%	100%

<b>Student population - Tijuana</b>			
<b>Semesters</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>1 and 2</b>	24	0	24
<b>3 and 4</b>	7	2	9
<b>5 and 6</b>	5	0	5
<b>7 and 8</b>	12	1	13
<b>Total</b>	48	3	51
<b>Percentage</b>	94.1%	5.9%	100%

August – December 2007 (SIA-CETYS)

### **3. Educational Objectives of the academic program.**

The Educational Objectives that the Academy of Software and Computer Science Engineering have established for the Bachelor's in Computer Science Engineering are the following:

- The alumni from this program will be able to participate 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.

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

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

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

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

- SLO\_ENG1: ...correctly apply to engineering, the tools provided by the basic sciences, such as physics, calculus, probability, statistics and programming to the solution of diverse problems.
- SLO\_ENG2: ...design analytic and functional models, quantitatively and qualitatively, for the analysis and improvement of systems for diverse applications.
- SLO\_ENG3: ... effectively use software tools and technologies to build solutions to engineering problems.
- SLO\_ENG4: ... effectively design and manage projects.
- SLO\_ENG5: ... (Clear and effective communication in English) ... be able to express his ideas clearly and with an appropriate language, in a verbal, written, and visual way in English.

The Learning Outcomes that the Academy of Software and Computer Science Engineering have established for the Bachelor's in Computer Science Engineering are grouped into 3 that correspond to the Professional Formation Lines and 1 for each of the 3 Complementary Formation Lines or Emphasis options of the program. These are:

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 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.

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

#	Student Learning Outcomes	Metrics to evaluate student performance	Evidence of achieved learning
1	SLO_ENG1	Currently the system that is in place to evaluate student performance is a scale of 0 to 100, where a grade above 70 is considered as "passing" and below as "failing". Rubrics for the Engineer College are being developed to evaluate these learning outcomes. The rubrics are being developed by the Academy of Basic Sciences in conjunction with the other Academies of the Engineering College.	Student Work and Final Projects from selected courses (i.e. Physics II and III, Statistical Inference, Programming Methods II, Numerical Methods). EGEL Examination (Basic Sciences areas).
2	SLO_ENG2		
3	SLO_ENG3		
4	SLO_ENG4		
5	SLO_ENG5	This learning outcome is measured by the English Language Center (ELC) using appropriate performance standards for the study of ESL.	Student work follow up administrated by ELC.
6	SLO_ICC1	Currently the system that is in place to evaluate student performance is a scale of 0 to 100, where a grade above 70 is considered as "passing" and below as "failing". Rubrics to evaluate these learning outcomes are being developed by the Academy of Software and Computer Science Engineering.	Student Work and Final Projects from selected courses. EGEL Examination (Professional areas).
7	SLO_ICC2		
8	SLO_ICC3		
9	SLO_VGD	These outcomes have not yet been evaluated, and no evidence exists, however, the same type of rubrics developed for outcomes SLO_ICC1, SLO_ICC2 and SLO_ICC3, will be applied, and these will be developed by the Academy of Software and Computer Science Engineering.	No evidence exists.
10	SLO_SWD		
11	SLO_BPA		

The Academy of Software and Computer Science Engineering has the following members:

Name of the Academy or Faculty Coop: <b>Academy of Software and Computer Science Engineering.</b>				
#	Name	Degree	Area of knowledge	Campus
1	Guillermo Cheang	Master's in Science	System Programming and Operating Systems	Mexicali
2	Dania Licea	Master's in Science	Computer Graphic and Database	Mexicali
3	Josefina Becerra	Master's in Science	Information Systems	Mexicali
4	Miguel Salinas	Master's in Science	Software Engineering	Mexicali
5	Leopoldo Uribe	Master's in Science	Software Development	Tijuana
6	Lizeth Trujillo	Master's in Science	Artificial Intelligence	Tijuana
7	Lucía Beltrán	Master's in Science	Information Systems	Ensenada



## 5. Curriculum and faculty resources.

Bachelor's in Computer Science Engineering											
Semester	1	2	3	4	5	6	7	8	Full time faculty		
									Name	Degree	Area
Fundamentals for Bachelor's in Engineering	MA400	MA401	MA402	MA404	MA405				Alfredo Rodriguez David Sánchez Salvador Baltazar Susana Dominguez Jesús Sánchez Isaac Azuz	M.A. B.E. M.S. M.S. B.E. Dr.	Math, Stat Math, Phis Mah, Phis Math, Phis Math Math, Stat
	CC400	CC402	MA403		MA406						
		FI400	FI401	FI402							
		MC400									
Professional Formation in Computer Science Engineering	CC401	CC403	CC404	CC405	CE400	CC408	SI401	CC412	Guillermo Cheang  Dania Licea  Josefina Becerra Miguel Salinas  Polo Uribe Lizeth Trujillo Lucía Beltrán	M.S.  M.S. M.S. M.S.  M.S. M.S. M.S.	System Prog. and Operating Systems  Computer Graphic and Database  Inform. Systems  Software Eng. Software Dev. Artif. Intellig. Inform. Systems
				SI400	CC406	CC409	CC411	CE402			
					CC407	CC410	CE401	CC413			
							Elective I	Elective II			
Complementary Formation or Emphasis Options					Emphasis Elective I (VGD, SWD, BPA)	Emphasis Elective II (VGD, SWD, BPA)	Emphasis Elective III (VGD, SWD, BPA)	Emphasis Elective IV (VGD, SWD, BPA)			
General and signature courses	CS401		CS400		ID400	CS402			Professors from Social Science Department.		
	EC400	CS403	CS404			HU4001	HU400	HU402			

Legend for courses:

CODE	COURSE
MA400	Mathematics for University
CC400	Programming Methods I
MC400	Computer Aided Drawing
MA401	Differential Calculus
CC402	Programming Methods II
FI400	Physics I
MA402	Integral Calculus
FI401	Physics II
MA403	Numerical Methods
MA404	Probability
FI402	Physics III
MA405	Statistical Inference
MA406	Multivariable Calculus
CC401	Introduction to Computer Sciences
CC403	Computer Systems and Components
CC404	Data Structures
CC405	Analysis and Design of Algorithms
SI400	Database Design

CODE	COURSE
CE400	Computer Control
CC406	Operating Systems
CC407	Advanced Programming
CC408	Analysis and Design of Information Systems
CC409	Database Systems
CC410	Automata Theory
SI401	Software Development Processes
CC411	Compiler Design
CE401	Computer Networks
CC412	Topics in Distributed Systems
CE402	Computer Networks Applications
CC413	Artificial Intelligence
	Elective I
	Elective II
	Emphasis Elective I (VGA, SWD, BPA)
	Emphasis Elective II (VGA, SWD, BPA)
	Emphasis Elective III (VGA, SWD, BPA)
	Emphasis Elective IV (VGA, SWD, BPA)

## 6. Curricular mapping.

			ENGINEERING BACHELOR'S PROGRAMS STUDENT LEARNING OUTCOMES				BACHELOR'S IN COMPUTER SCIENCE ENGINEERING STUDENT LEARNING OUTCOMES			EMPHASIS OPTIONS FOR BACHELOR'S IN COMPUTER SCIENCE ENGINEERING STUDENT LEARNING OUTCOMES		
CURRICULAR ELEMENTS			SLO_ENG1	SLO_ENG2	SLO_ENG3	SLO_ENG4	SLO_ICC1	SLO_ICC2	SLO_ICC3	SLO_VGD	SLO_SWD	SLO_BPA
CODE	COURSE	SEMESTER	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL
MA400	Mathematics for University	1	SU	SU								
CC400	Programming Methods I	1	SU	SU	SU		SU			SU	SU	SU
MC400	Computer Aided Drawing	1	SU	SU	SU							
MA401	Differential Calculus	1	SU	SU								
CC402	Programming Methods II	2	ME	SU	SU	SU	SU			SU	SU	SU
FI400	Physics I	2	SU	SU	SU							
MA402	Integral Calculus	2	ME	SU								
FI401	Physics II	3	ME	SU	SU							
MA403	Numerical Methods	3	ME	SU	ME							
MA404	Probability	4	ME	SU								
FI402	Physics III	4	ME	ME	SU	SU						
MA405	Statistical Inference	5	ME	ME	ME	SU						
MA406	Multivariable Calculus	5	ME	SU								
CC401	Introduction to Computer Sciences	1	SU	SU	SU	SU	SU	SU		SU	SU	SU
CC403	Computer Systems and Components	2			SU	SU		SU				
CC404	Data Structures	3		ME	ME	SU	SU			ME	ME	SU
CC405	Analysis and Design of Algorithms	4	ME	ME	ME	SU	SU			ME	ME	
SI400	Database Design	4		ME	ME	ME	ME	SU		SU		ME
CE400	Computer Control	5	ME	ME	SU		ME					
CC406	Operating Systems	5		ME	ME		ME	SU	ME			
CC407	Advanced Programming	5		ME	SO		ME			ME	ME	SU
CC408	Analysis and Design of Information Systems	6		ME	ME	ME	ME	SU			ME	ME
CC409	Database Systems	6		ME	SO		ME		SO			ME
CC410	Automata Theory	6	ME									
SI401	Software Development Processes	7		SO	ME	SO	SO			ME	ME	SU
CC411	Compiler Design	7		ME	ME	SO	ME					
CE401	Computer Networks	7		ME	ME	ME	SO	SU				
CC412	Topics in Distributed Systems	8		SO	SO	ME	SO	ME	ME		ME	SU
CE402	Computer Networks Applications	8		SO	SO	SO	SO	SO	ME			
CC413	Artificial Intelligence	8		ME	ME	ME	SO				SU	SU
	Elective I	7	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU	SU
	Elective II	8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU	SU
	Emphasis Elective I (MSC, RIA, BIO)	5	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME	ME	ME	ME	ME	ME
	Emphasis Elective II (MSC, RIA, BIO)	6	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME	ME	ME	ME	ME	ME
	Emphasis Elective III (MSC, RIA, BIO)	7	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SO	SO	SO	SO	SO	SO
	Emphasis Elective IV (MSC, RIA, BIO)	8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SO	SO	SO	SO	SO	SO
CO-CORRICULAR ELEMENTS	SEMESTERS	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL
CETYS University College of Engineering Projects Expos in each Campus	2,4,6,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO
CETYS University College of Engineering Simposiums in each Campus	1,3,5,7	SU	SU	SU	SU, ME, SO	SU	SU	SU	SU	SU	SU	SU
Scholarships awarded by external institutions	1,2,3,4,5,6,7,8	SU	SU	SU	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO
External engineering competitions	1,2,3,4,5,6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO
Professional Practice	6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO
Social Service	6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO
Student Exchange	6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO
CENEVAL EGEL Examination	8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO	ME, SO

Legend for levels used for curricular mapping:

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

Legend for Student Learning Outcomes:

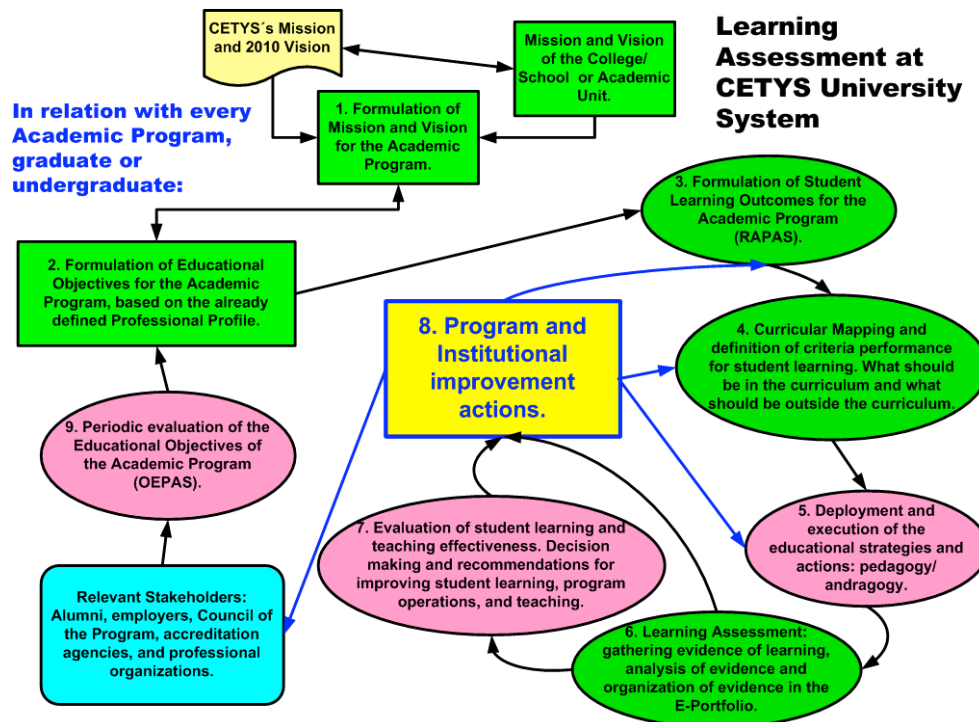
Engineering Bachelor's Programs. The student of a CETYS University Bachelor's in Engineering Program will...	Bachelor's in Computer Science Engineering The student of the Bachelor's in Computer Science Engineering program will...	Emphasis Options for Bachelor's in Computer Science Engineering
<b>SLO_ENG1:</b> ...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.	<b>SLO_ICC1:</b> ... design and build software-base systems for a generality of problems and situations and using distributed computing environments when they apply.	The student of the Bachelor's in Computer Science Engineering with an Emphasis in Animation and Video Game Design will... <b>SLO_VGD:</b> ... design and build graphics and animated software such that it can be applied to videogames design.
<b>SLO_ENG2:</b> ...design analytic and functional models, quantitatively and qualitatively, for the analysis and improvement of systems for diverse applications.	<b>SLO_ICC2:</b> ... design and implement computer networks using the convenient operating systems for creating distributed environments for software systems applications.	The student of the Bachelor's in Computer Science Engineering with an Emphasis in Software Development will... <b>SLO_SWD:</b> ... design and build software architectures for several corporative applications and problems using standard software technologies and platforms.
<b>SLO_ENG3:</b> ... effectively use software tools and technologies to build solutions to engineering problems.	<b>SLO_ICC3:</b> ... install, monitor and tune the operating systems and database systems such that he can solve problems in computing environments.	The student of the Bachelor's in Computer Science Engineering with an Emphasis in Business Processes and Applications will... <b>SLO_BPA:</b> ... integrate and implement software business applications package to business process.
<b>SLO_ENG4:</b> ... 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.

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

## 7. Assessment plan.

Based on the Assessment Plan for CETYS University System:



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

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

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

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