



WASC Accreditation  
Educational Effectiveness Review

**Bachelor's in Software Engineering.  
The program is currently offered in the following Campi:  
Ensenada.**

## Last Program Review: November 2007

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## **1. Introduction.**

The Mission of the Bachelor's in Software Engineering Program is to generate highly qualified professionals whose apply knowledge in the areas of software development and information technology such that provide efficient solutions to industry needs with tailor made software systems, using a process based on high quality standard and accepted by the software industry.

The Vision of the Bachelor's in Software Engineering Program is be the primary source in the region for all organizations that need professionals with the abilities involved in software development using high quality standards and applied to the innovation process.

The Bachelor's in Software Engineering Program was launched in the Ensenada Campus in 2007 as a response to software industry establish in that region. This program is very similar to our Bachelor in Computer Science, but with the main difference that this program is centered in software development process using high quality standard. Our current computer science program is centered in software development in selected topics of computing like, artificial intelligence, compilers, and distributed computing.

Actually there is a important government program to support with founding all persons and companies that work in software development projects, so this program try to form professionals for living in the Ensenada area with the expectative of produce software and to integrate to this industry.

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

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

- a) Software Engineering.
- b) Networks.
- c) Systems Modeling.

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 Game Design.
- b) 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. There is only a chair for the Ensenada campus because currently the program is only offered in that campus. The chair is:

- M.S. Lucía Beltrán – Ensenada 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:

- Ensenada: 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>	4	2	6
<b>3 and 4</b>			
<b>5 and 6</b>			
<b>7 and 8</b>			
<b>Total</b>	4	2	6
<b>Percentage</b>	66.6%	33.4%	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 Software Engineering are the following:

- The alumni from this program will be able to participate in an important manner in projects related to 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 Software 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 Software Engineering program will...

- SLO\_ISW1: ... build systems based on software using high quality processes accepted as a standard in industry.
- SLO\_ISW2: ... design and manage software projects.
- SLO\_ISW3: ... apply adequate computing technologies for the development and implementation of a software product.

The student of the Bachelor's in Software 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 Software 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_ISW1	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 EGEL Examination (Professional areas).
7	SLO_ISW2		
8	SLO_ISW3		
9	SLO_AVG	These outcomes have not yet been evaluated, and no evidence exists, however, the same type of rubrics developed for outcomes SLO_ISW1, SLO_ISW2 and SLO_ISW3, will be applied, and these will be developed by the Academy of Software and Computer Science Engineering.	No evidence exists.
10	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	Polo 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 Software 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	MA407	MA405				Alfredo Rodriguez David Sánchez Salvador Baltazar Susana Dominguez Jesus 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 Software Engineering	CC089	CC403	CC404	CC082	CC084	CC090	CC087	CC092	Guillermo Cheang  Dania Licea	M.S.  M.S.	System Progr. and Operating Systems  Computer Graphics and Database
				SI400	CC406	CC409	CC091	CE066			
					CC083	CC084	CE401	CC088			
Complementary Formation or Emphasis Options					Emphasis Elective I (MSC, RIA, BIO)	Emphasis Elective II (MSC, RIA, BIO)	Emphasis Elective III (MSC, RIA, BIO)	Emphasis Elective IV (MSC, RIA, BIO)	Josefina Becerra Miguel Salinas Polo Uribe Lizeth Trujillo Lucía Beltrán	M.S. M.S. M.S. M.S. M.S.	Inform. Systems Software Eng. Software Develop. Artificial Intellig. Inform. Systems
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	Matemathics
CC400	Programming Methods I
MC400	Computer Aided Draw
MA401	Differential Calculus
CC402	Programming Methods I
FI400	Phisics I
MA402	Integral Calculus
FI401	Phisics II
MA403	Numerical Methods
MA404	Probability
FI402	Phisics III
MA405	Statistics Inference
MA406	Multivariable Calculus
CC089	Introduction to software engineering
CC403	Computationals Systems and Components
CC404	Data Structures
CC082	Software Engineering I
SI400	Database Design

CODE	COURSE
CC084	Software Engineering II
CC406	Operating Systems
CC083	Programming and mobil computing
CC090	Software project management
CC409	Database Systems
CC084	Ingeniería de software III
CC087	Business Intelligence Systems
CC091	Agile Systems Development
CE401	Computer Networks
CC092	Information Technology Management
CE066	Network management and Security
CC088	Distributed Computing Technology
	Elective I
	Elective II
	Emphasis Elective I (VGA, BPA)
	Emphasis Elective II (VGA, BPA)
	Emphasis Elective III (VGA, BPA)
	Emphasis Elective IV (VGA, BPA)

## 6. Curricular mapping.

			ENGINEERING BACHELOR'S PROGRAMS STUDENT LEARNING OUTCOMES				BACHELOR'S IN SOFTWARE ENGINEERING STUDENT LEARNING OUTCOMES			EMPHASIS OPTIONS FOR BACHELOR'S IN SOFTWARE ENGINEERING STUDENT LEARNING OUTCOMES	
CURRICULAR ELEMENTS			SLO_ENG1	SLO_ENG2	SLO_ENG3	SLO_ENG4	SLO_ISW1	SLO_ISW2	SLO_ISW3	SLO_VGD	SLO_BPA
CODE	COURSE	SEMESTER	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL	LEVEL
MA400	Matemáticas for University	1	SU	SU							
CC400	Programming Methods I	1	SU	SU			SU		SU		
MC400	Computer Aided Draw	1	SU	SU							
MA401	Differential Calculus	1	SU	SU							
CC402	Programming Methods I	2	ME	SU	SU		SU		SU		
FI400	Physics I	2	SU	SU							
MA402	Integral Calculus	2	ME	SU							
FI401	Physics II	3	ME	SU							
MA403	Numerical Methods	3	ME	SU							
MA404	Probability	3	ME	SU							
FI402	Physics III	4	ME	ME	SU						
MA405	Statistics Inference	5	ME	ME	SU						
MA406	Multivariable Calculus	5	ME	SU							
CC089	Introduction to software engineering	1	SU	SU	SU		SU	SU			
CC403	Computational Systems and Components	2			SU				SU		
CC404	Data Structures	3		ME	ME		SU		ME		
CC082	Software Engineering I	4		ME	ME	SU	ME	SU			
SI400	Database Design	4		ME	ME	SU	SU	SU	ME		
CC084	Software Engineering II	5		ME	ME	SU	ME	SU			
CC406	Operating Systems	5			ME				ME		
CC083	Programming and mobil computing	5			ME				ME		
CC090	Software project management	6		SO		ME	ME	ME			
CC409	Database Systems	6			SO				SO		
CC084	Ingeniería de software III	6		SO	SO	ME	SO	ME			
CC087	Business Intelligence Systems	7		SO	SO	ME		ME	SO		
CC091	Agile Systems Development	7		SO	SO	SO	SO	SO	SO		
CE401	Computer Networks	7							ME		
CC092	Information Technology Management	8				SO		SO	ME		
CC066	Network management and Security	8							ME		
CC088	Distributed Computing Technology	8			SO		SO	SO	SO		
	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, ME, SO
	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, ME, SO
	Emphasis Elective I (MSC, RIA, BIO)	5	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	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
	Emphasis Elective III (MSC, RIA, BIO)	7	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, 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
CO-CORRICULAR ELEMENTS	SEMESTERS	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
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
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
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
Professional Practice	6,7,8	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, ME, SO	SU, 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	SU, 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	SU, 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	SU, 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:

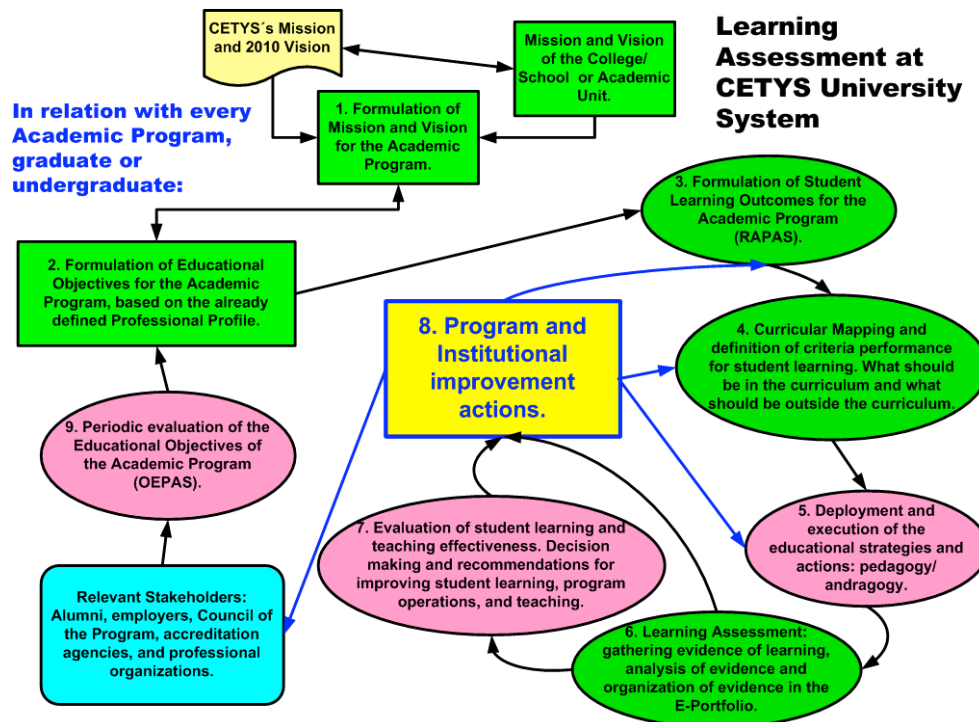
Engineering Bachelor's Programs.	Bachelor's in Software Engineering	Emphasis Options for Bachelor's in Software Engineering
The student of a CETYS University Bachelor's in Engineering Program will...	The student of the Bachelor's in Software Engineering program will...	
<b>SLO_ENG1:</b> ...correctly 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_ISW1:</b> ... build systems based on software using high quality processes accepted as a standard in industry.	The student of the Bachelor's in Software Engineering with an Emphasis in Microelectronics and Semiconductors will... <b>SLO_AVG:</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_ISW2:</b> ... design and manage software projects.	The student of the Bachelor's in Software Engineering with an Emphasis in Robotics and Industrial Automation will... <b>SLO_BPA:</b> ... integrate and implement software business applications package to business process.
<b>SLO_ENG3:</b> ... effectively use software tools and technologies to build solutions to engineering problems.	<b>SLO_ISW3:</b> ... apply adequate computing technologies for the development and implementation of a software product.	
<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 Software 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.