Institutional information

As an independent and autonomous institution of higher learning, the community of the University of Costa Rica is made up of faculty, students and administrative staff dedicated to teaching, research, social action, and dissemination of knowledge.

There is a variety of conceptions regarding the mission of the university. For the University of Costa Rica, the primary activity must aim to promote the advance of knowledge and respond effectively to the integral development of society.

From this perspective, the permanent production enables the university to reach a level of excellence in the training of professionals, which in turn act as diffusers and change agents in the community.

Mission: *The rationale for the institution responds to the following statement:*

"The University of Costa Rica is a state institution of higher education, constitutionally autonomous and democratic, which promotes critical, humanistic and cultural training. It consists of a community of students, faculty and administrative officials, which contribute with the changes that society needs to achieve the common good by developing activities of teaching, research and social action based on an institutional policy to achieve social justice, equity, integral development, freedom, and full and complete independence of our society."

Vision: *The vision of the University of Costa Rica, for the five years period 2013-2017 is as follows:*

"Strengthen academic excellence through the development and ongoing exercise of a culture of quality, through close coordination between teaching, social work and research and through updating curriculums in undergraduate and graduate in all its University Venues, the generation of innovative careers, continuous improvement and high-level training of the academic and administrative staff in order to attend in a pertinent manner the needs of Costa Rican society and strengthen its leadership in the development of national education "

"Enhance the generation of scientific, technological, sociocultural and innovative knowledge in all units of the university, amongst disciplines, as well as joining international academic networks, based on mutual recognition, the respect and the shared benefits, to strengthen the academic culture"

"Promote integration, partnerships, social commitment, cooperation, solidarity relationship, dissemination of the university life and innovation, and forge new spaces, in order to transfer and share the knowledge generated between the University and the society"

"Promote the democratization of access to higher education through programs that promote equity and social inclusion, and simultaneously encourage initiatives that strengthen the support services to the student population in order to facilitate the permanence and successful culmination of their studies at the institution"

"Promote international solidarity by developing academic networks and mobility of teachers, students and administrative staff"

"Update the mechanisms and platforms for university management ensuring environmental sustainability, technological leadership and up-to-date physical infrastructure, to enhance the relevance, efficiency and accountability"

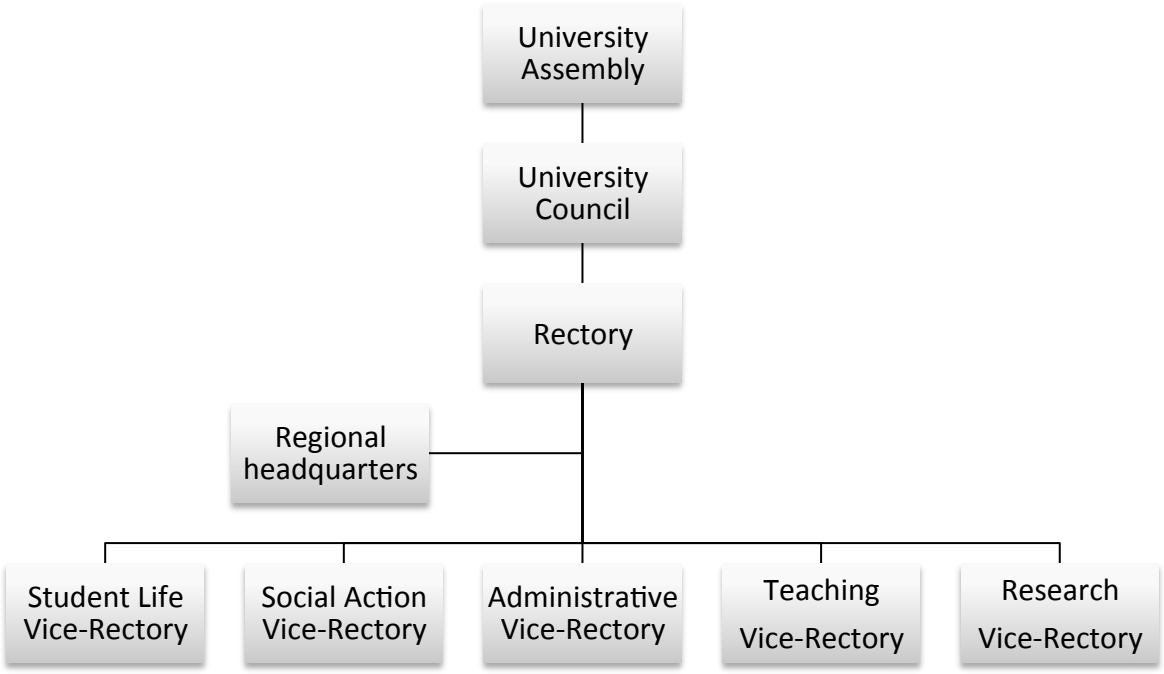
History

The origins of the University of Costa Rica date back to 1814, known as the House of Teaching of Santo Tomás, and converted in 1843 to the University of Santo Tomás.

Structure

The organizational structure of the University of Costa Rica integrates diverse areas into its work in pursuit of democratic participation in decision making by representing the university community in the governance and administration.

Organizational structure of the University of Costa Rica:



Source:http://www.ucr.ac.cr/organizacion/estructura-de-la-universidad-de-costa-rica.html

Academic Areas

The conformation of the academic system of the University of Costa Rica consists of six major areas of knowledge:

- Arts and Humanities
- Basic Sciences
- Agriculture science
- Social Science
- Health
- Engineering

Each of the academic areas encompasses one or more Faculties, which are responsible for coordinating the academic activities, chaired by the dean and the Faculty Assembly.
In most cases, Faculties are composed of Schools, which are units that implement education, research and social action.

UCR in numbers

Facts and figures show why the University of Costa Rica, throughout its 70 year history, is the leading institution of higher education in the country and in Latin American, internationally recognized for the quality of its education.

Creation Date: August 26, 1940.

Total Area: 83,613,938.95 m^2 of land, 474,616.55 m^2 of built area.

INFRASTRUCTURE	
External	
Regional headquarters	7 569 259,59 m^2
Campuses	6
Libraries	12
Documentation centers	12
Internal	
Total building area	345 503,6 m^2
Area of sidewals, parking lots and others	214 239,3 m^2
Total number of classrooms	585
Auditoriums	77
Total number of laboratories	957

Source: Sistema de Información Geográfico (SIG-OPLAU)

FACULTIES, SCHOOLS, RESEARCH CENTERS AND INSTITUES	
Faculties	13
Schools	47
Research Units (30 centers, 12 instituts)	40
Planetary	1
Special Units	5
Museums	3
Stations, estates and land reserves	12

Source: Sistema de Información Geográfico (SIG-OPLAU)

ACADEMIC AREA	
Undergraduate and graduate	
Teaching degrees	15
Diplomados	7
Bachelors	136
Licenciaturas	82
Graduate	
Specialization	71
Professional Masters	87
Academic Masters	78
Dcotorates	10

Source: Vicerrectoría de Docencia

ACCREDITED CAREERS	
By SINAES	24

Source: Vicerrectoría de Docencia

UNDERGRADUATE STUDENTS	
New students admitted 2014	7.839
Regular students enrolled (I semester 2014)	36.495
Coursed offered	4.368
Teachers (I semester 2014)	7.651
Appointments (I semestre 2014)	5.044 (1.638 tenure y 3.985 tenure-track)

Source: Oficina de Registro e Información, Centro de Evaluación Académica, Vicerrectoría de Docencia

GRADUATE STUDENTS	
Total undergraduate awarded	5.696
-Rodrigo Facio Campus	4.604
- Regional Campuses	1.092
- Graduate diplomas	812

Source: Unidad de Expedientes y Graduaciones. Oficina de Registro e Información

SOCIAL ACTION	
Cultural outreach projects	109
Students in the comprehensive program for the third age	2.845
Faculty outreach projects	483
Community service project (TCU)	148
Hours served for the community	791.700
Students who completed their TCU	2.670

Source: Vicerrectoría de Acción Social

INTERNATIONAL COOPERATION	
International agreements	257
Fellows in graduate studies abroad	243(214 doctorates, 28 masters, 1 specialty)
Visiting scholars	202
International students	244

Source: Oficina de Asuntos Internacionales y Cooperación Externa

RESEARCH AREA	
Projects, programs and current research activities	1.723
Resarchers in charge of projects	1.451
Publications of researchers (1972-2011)	3.193
Research units	98

Fuente: Vicerrectoría de Investigación

COPYRIGHT	
Trademarks	239
Brands in registration process	5
Registered patents	3
Patents in registration process	16
Discharges	5
Copyright registered	10
Industrial design in registration process	3
Industrial designs in registration process	2
Registration of plant variety	1

Source: Oficina de Divulgación e Información, Vicerrectoría de Investigación

Location of UCR campuses

Development of chemical engineering in Costa Rica

Background:

The need for a program in Chemical Engineering came from the national industry environment, which needed staff with capacity to oversee the industrial development happening because of the implementation of new economic policies in the sixties.

One of the first demonstrations of support to create such a carrer was given by the Rector of the Monterrey Institute of Technology in Mexico and the Dean of the Faculty of Engineering of the University of Houston in 1962, proposing the idea that Latin America should make urgent efforts to scale up economic development.

In 1963, the University Council agreed to study the needs of the present and future markets regarding chemical engineers. They also agreed to analyze the laboratories available and the teaching experience in the School of Chemistry.

Chemical Engineering, Mechanical Engineering and Electrical Engineering emerge in the early sixties in a response to an environment characterized by a development model where the state plays a predominant role in the economic orientation of the country. Here RECOPE (Costa Rican Oil Refinery) played a big role in the design of national development, as an autonomous institution to ensure that energy independence and security for the economic progress of the country.

In session Nº 1321, the University Council approved the creation of a degree in Chemical Engineering for 1964; this would be directed by the Department of Chemistry.

The school of Chemical Engineering has 50 years of existence, and has graduated 960 professionals with an average of at least 40 graduates per year. In 2012 the first class of students began the degree program in the province of Limón, evidence of the maturity reached at Rodrigo Facio, giving us the ability to expand to other campuses.

Curriculum

The first curricula presented were based on the curriculum of the University of Houston and of the Technological Institute of Monterrey. The first curriculum was comprised of 168 credits. The current plan has 174 credits. The curriculum has undergone changes through the years, however, while in the coordination of the Department of Chemistry (1964-1974), these were minimal.

Starting in 1989, a new systematic approach to updating and monitoring the degree plan was implemented.This allowed several reforms were made until 2012, in response to industrial and academic needs. A detail of the changes made to the curriculum is presented next.

YEAR	RESOLUTION	MODIFICATIONS
1966		First Curriculum approved by the University council
1978	231-77	Rearrangement of the Solid Mechanics course (moved to the seventh cycle), electrical engineering (eigth cycle) Production I (ninth cycle) and Production II (tenth cycle)
1983	1405-83	Semester system began. Compulsory course included (Design laboratory in Chemical Engineering). Substitution of courses (Analysis of Chemical Engineering Systems II for Applied Mathematics to Chemical Engineering)
1985	1894-85	New courses available (Elementary Math, Math I, Math II, Math III, and Math IV)
1985	1896-85	Equivalence authorization for courses (Math I, Math III, and Math IV)
1985	1899-85	New courses available (Physics I, Physics II, Physics III, and Physics IV)
1985	1921-85	Replacement courses (Physics I for Basic Physics / Physics I. Physics II for General Physics / Physics II A. Physics IV for General Physics II Laboratory / General Physics IV /General Physics III)
1985	1906-85	Changes to equivalencies for math courses (Differencial Calculus I Differencial Calculus II, Differencial Calculus III)
1988	4190-88	New curriculum
1990	4699-90	New elective courses in Environmental Impact
1991	5204-91	New elective courses (Thermal Process Design in Food iIndustry, Quality Control II, Bioengineering II and Industrial Hygiene II)
1991	5225-91	Changes in course requirements (Production Planning and Production Control)
1992	5388-92	New elective course (Quantitative Methods for Decisión Making I)
1993	5572-93	New elective course (Quantitative Methods for Decisión Making II)
1995	5887-95	Modifications in the area of Mathematics Courses
1995	5976-95	Opening of the Project Seminar For Graduation course, replacement of mathematics courses, transfering the Directed Research course, changes in the prerequirements of Mass Balance, Process Modelling, Mechanics I and Equilibrium Thermodynamics
1995	6014-95	Creation of Physics courses.
1996	6136-96	Replacing courses (Graphic drawing and design, Basic Physics courses. Correction in the structure of Applied Basic Biochemistry)
2001	7054-2001	New elective course (Integral Management of Solid Waste: Ordinary and Special)
2001	7073-2001	Elmininations of courses (Applied Basic Biochemistry and laboratory) Information and profesional guidance, Course prerequisite modification (Processes and Integrated Operations, Differential Equations, Physical Chemistry for Chemical Engineering) Course requirements updated (General Physics I, Genreal Physics II, General Physics II and Principles of Computing)Modification of the total numer of credits of the degree to 169
2003	7289-2003	Elimination of courses (Mass Balance, Process modeling, Thermodynamics and Equilibrium Thermodynamics) Creation of new courses (Process analysis I and II, Thermodyanics I and II) Prerequisite changes in course (Quantitative Analytical Chemistry) Updated courses (Mecahnics I, Operations of fluid and heat transfer, Integral Management of Solid Waste) New requirements in courses (General Chemistry Laboratory II and Quantitative Analytical Chemistry Laboratory)
2007	8040-2007	New requirements (General Physics Laboratory I, II and III) Including new courses (Reading Strategies in English)
2010	8539-2010	Changes in the prerequisites of the following courses (IQ-0200, IQ-0312,

		IQ-0334, IQ-0313, IQ-0330, IQ-0331, IQ-0335, IQ-0415, IQ-0423, IQ-0424, IQ-0432, IQ-0433, IQ-0525, IQ-0534, IQ-0451, IQ-0452 and IQ-0590) structure changes in the courses (IQ-0559 e IQ-0569)
2011	8679-2011	Descentralization of the career in the Limón Regional Headquarters (now Headquarters of the Caribbean)
2011	8702-2011	New elective course (Polymer Technology)
2012	8807-2012	New elective course (Polymer Technology II) Prerequisite changes (Graduation Project Seminar)
2012	8846-2012	New elective course (Asphalt Technology)

First Curriculum approved by the University council

UNIVERSIDAD DE COSTA RICA
FACULTAD DE CIENCIAS Y LETRAS
DEPARTAMENTO DE QUIMICA

PLAN DE ESTUDIOS. INGENIERIA QUIMICA

1961 proyecto propuesto por el Dr. Wilson Brown.

PRIMER AÑO

I Semestre		Créd.	II Semestre		Créd.
C-11	Instituciones Costarricenses	4	C-12	Instituciones Costarricenses	4
C-21	Ciencias físicas	3	C-22	Ciencias físicas	3
C-31	Castellano	4	C-31	Castellano	4
C-41	Lógica práctica	3	MS106	Matemáticas fundamentales	4
MS105	Matemáticas fundament.	4			
		18			15

SEGUNDO AÑO

III Semestre			IV Semestre		
C-51	Humanidades	4	C-52	Humanidades	4
CY217	Química General y Anal. Cualitativos	4	EGR182	Geometría Descriptiva	3
ECR181	Dibujo para Ingen.	3	MS354	Cálculo Integral	4
MS353	Cálculo Diferencial	4	CY218	Química General y Análisis Cualitativos	4
		15			15

TERCER AÑO

V Semestre		VI Semestre		
CG347	Estequiometría	3	CG348	Estequiometría	4
CY331	Anal. Cuantitativo	4	EM365	Estadística	3
MS420	Ecuaciones Diferencial	3	PS206	Física General	3
PS205	Física General	3	PS208	Laboratorio de Física	1
PS207	Laboratorio Física	1	CY302	Química Orgánica	4
CY301	Química Orgánica Gral.	4			15
		18			

CUARTO AÑO

VII Semestre			VIII Semestre		
CG355	Principios de Ing. Química I	3	CG365	Principios de Ing. Química II	3
CG364	Termodinámica (Ing. Química)	3	CY402-6	Físico-Química (con lab.)	4
CY401-5	Físico-Química (con lab.)	4	CY481	Literatura Química	1
PS320	Física Moderna	3	E1343	Elementos de Ing.Elec.	3
	Optativas	3	EM369	Resistencia de Materiales	3
		16		Optativas	3
					17

- 2 -

QUINTO AÑO

IX Semestre		Créd.	X Semestre		Créd.
CG442	Seminario	1	CG444	Lab. de Ing. Química	2
CG443	Lab. de Ing. Química	2	CG472	Cinética para Ing. Quím.	4
CG451	Economía para Ing.Quím.	3	CG474	Proyectos de Ing. Quím. (Procesos)	2
CG465	Termodinámica para Ing. Químicos	3	IG451	Control de Calidad	3
CG401	Control de Procesos (con instrumentos)	3		Optativas	3
CG457	Princ. de IngeoQuím. III	3			14
		15			

Total 158 créditos

Nota: Los cursos optativos deben ser materias no-técnicas es decir, cursos como historia, filosofía, lenguas u otros de carácter científico pero no técnico. En todos los casos estas deben ser aprobadas por el profesor consejero de cada alumno.

LISTA GENERAL DE LOS CURSOS SEMESTRALES PROPUESTOS EN EL PLAN.

C-11 y 12	Un estudio de los problemas de las instituciones Americanas (en Costa Rica sería de las instituciones costarricenses).
C-21 y 22	Estudio general de las ciencias físicas.
C-31 y 32	Estudio de Ingles (castellano en Costa Rica)
C-41	Pensamiento efectivo.
MS105-106	Matemáticas fundamentales.
C-51 y 52	Cultura pasada y presente.
CY-217-218	Principios de química.
EGR-181	Dibujo para ingenieros.
EGR-182	Geometría descriptiva.
MS-353	Cálculo diferencial.
MS-354	Cálculo integral.
CG-347	Estequiometría industrial.
CG-348	Estequiometría industrial y combustibles.
CY-331	Análisis cuantitativo (química)
MS-420	Ecuaciones diferenciales.
PS-205-206	Física General
PS-207-208	Laboratorio de física.
CY-301-302	Química Orgánica.
EM-365	Estadística.
CG-255	Principios de Ingeniería química.
CG-364	Termodinámica para ingeniería química.
CY-401-5	Físico-Química con laboratorio.
CY-402-6	Físico-Química con laboratorio.
PS-420	Física moderna.

ANEXO 4

CG-365	Principios de Ingeniería Química II.
QY-481	Literatura Química.
El-343	Elementos de Ingeniería Eléctrica.
EM-369	Resistencia de Materiales.
CG-442	Seminario.
CG-443	Laboratorio de Ingeniería Química.
CG-444	Laboratorio de Ingeniería Química.
CG-451	Economía para Ingeniería Química.
CG-465	Termodinámica para Ingeniería Química -Avanzado.
CG-401	Control de Procesos (con instrumentos).
CG-457	Principios de Ingeniería Química III.
CG-472	Cinética de Ingeniería Química.
CG-474	Proyectos de Ingeniería Química (Procesos Químicos).
IG-451	Control de calidad.
	Optativas.

Los números de cada curso se refieren al catálogo de la Universidad de Flórida en donde se puede encontrar una descripción de cada uno.

Este plan se presenta para que sirva de meta a la cual puede llegarse poco a poco. Debe adaptarse al sistema costarricense (Ciencias y Letras en el primer año) y retocarse en todo aquello que se crea conveniente. Esto es solamente un proyecto.

Curriculum current

Semester	Code	Name	Hours/ week
1	EG-0124	Humanities I	8
	EG-0316	Artistic Activity (Literary appreciation)	3
	QU-0100	General Chemistry I	4
	QU-0101	Laboratory of General Chemistry I	3
	MA-1001	Calculus I	5
	LM-1030	Reading Strategies in English	6
2	EG-0125	Humanities II	8
	EF-7281	Sports Activity	2
	QU-0102	General Chemistry II	4
	QU-0103	Laboratory of General Chemistry II	3
	FS-0210	General Physics I	4
	FS-0211	Laboratory of General Physics I	3
	MA-1002	Calculus II	5
3	IQ-0200	Graphic Analysis	6
	QU-0200	Quantitative Analytical Chemistry	4
	QU-0201	Laboratory of Analytical Chemistry	6
	FS-0310	General Physics II	4
	FS-0311	Laboratory of General Physics II	3
	MA-1003	Calculus III	5
	MA-1004	Linear Algebra	5
4	IQ-0332	Process Analysis I	6
	QU-0260	Physical Chemistry for Chemical Engineering	4
	FS-0410	General Physics III	4
	FS-0411	Laboratory of General Physics III	3
	MA-1005	Differential Equations	5
	CI-0202	Principles of Informatics	4
5	IQ-0333	Process Analysis II	5
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5
	QU-0212	General Organic Chemistry I	4
	QU-0213	Laboratory of General Organic Chemistry I	4
	XS-0217	Probability and Statistical Inference	4
6	IQ-0313	Transport Phenomena	6
	IQ-0331	Mesurement and Experimental Data Processing	6
	IE-0303	Electrothechnics	5
	QU-0214	General Organic Chemistry II	4
	QU-0215	Laboratory of General Organic Chemistry II	4
	IQ-0335	Thermodynamic II	3
7	SR-0001	National Reality Seminar I	2
	IQ-0415	Materials Engineering	4
	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0451	Production Planning	3
	IQ-XXXX	Elective I	3
8	RP-0003	Repertorio (Foundations of sociology)	
	SR-0002	National Reality Seminar II	2

	IQ-0416	Kinetics and Chemical Reactors	3
	IQ-0424	Phase Separation Operations	4
	IQ-0433	Laboratory of Phase Separation Operations	5
	IQ-0452	Production Control	3
	IQ-0590	Seminar for Graduation Projects	2
9	IQ-0517	Process Control and Instrumentation	3
	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0553	Projects Evaluation	4
	IQ-XXXX	Elective II	4
10	IQ-0526	Process and Integration Operation	4
	IQ-0551	Chemical Process Desing	4
	IQ-0556	Industrial Administration Principles	3
	IQ-XXXX	Elective III	4
	IQ-9500 IQ-9700 IQ-9800	Graduation Project	

Electives:*IQ0330 Process Engineering I; IQ0499 Asphalt Technology; IQ0500 Petroleum Engineering; IQ0503 Food Process Enginnering; IQ0504 Alternative Sources Energy; IQ0559 Heat Process Design in the Food Industry; IQ0569 Process and Equipment Design in the Food Industry; IQ0570 Polymers Tecnology I; IQ0620 Quality Control I; IQ0640 Waste Treatment; IQ0642 Bioengineering I; IQ0660 Safety and Industrial Hygiene; IQ0661 Industrial Air Pollution; IQ0671 Environmental Impact; IQ0672 Solid Waste Management*

The School of Chemical Engineering is currently working on an analysis of the program. A permanent committee is working in collaboration with UCR's Academic Evaluation Center (CEA) personnel to find out if there are any changes needed for the program to be up to date. We expect to have the results of this analysis by the end of this year. As part of this work, regular meetings have taken place with faculty members to have their feedback.

2. Self-appraisal

Promote the democratization of access to higher education through programs that promote equity and social inclusion, and simultaneously encourage initiatives that strengthen the support services to the student population in order to facilitate the permanence and successful culmination of their studies at the institution.

Last year was the 50th anniversary of the Chemical Engineering program offered by the University of Costa Rica; this being the only higher education institution that offers a degree in Chemical Engineering in the country. Since the beginning, the fundamental values have been excellence and high-quality education, creating the link between university life and the professional needs of the country.

The contribution that chemical engineers can develop in our country ranges from oil and petroleum to food industry. It includes plastic and polymer production, paper industry, fertilizers, agriculture, metallurgy, energy, biotechnology, manufactory industry, investigation, chemical industry and the use of environmentally friendly technology in the country.

As part of its social commitment, the school of Chemical Engineering has, as a main goal, to form excellent professionals that will contribute their expertise to the country. To do this, it is important to be open to change and to encourage activities that foster a culture of innovation and continuous improvement. In 2012 the department held a workshop with the participating administrative officials, faculty, students and external consultants. As a result, the strategic plan 2012-2017 of the School of Chemical Engineering was developed. This plan reflects a process of communication and identification of critical decisions to achieve optimal organizational development.

These are the main results obtained from the Environment Analysis (SWOT):

Identification of strengths:

1. Clear definition of the normative and procedural framework.
2. Computerized enrollment process.
3. Inclusion of courses in the curriculum that enable the development of multidisciplinary perspectives and interaction among students and teachers.
4. Specialization of students through elective courses included in the curriculum.
5. A considerable percentage of teachers are in the process of obtaining graduate degrees.
6. Access to virtual services.
7. Multimedia equipment installed in most classrooms.
8. Provision to update and develop pedagogically teachers through the University Teaching courses.
9. The teaching methodology used in the program promotes a balance between the need for acquisition of theoretical knowledge and the development of own skills and abilities of a professional in Chemical Engineering.
10. Implementation of Information Management System. (SAE).

Identification of opportunities:

Moreover, we detected a series of events and elements external to the School that could eventually enhance the growth and expansion of this academic unit, namely:

1. Captive market (our school is the only academic unit that offers a degree in chemical engineering).
2. Creating strategic partnerships with industry.
3. Sales of services to the industry
4. Construction of a new oil refinery plant in Moin.
5. Encouraging linking graduates to the school.
6. Opening the career at the Caribbean Campus.
7. Creating strategic partnerships with other units of the University of Costa Rica.
8. Increasing and diversifying demand for graduates.

Identification of weaknesses:

The internal elements that have been identified and require corrections in order to enable the achievement of organizational objectives can be identified as follows:

1. Inadequate physical plant (overcrowding).
2. Outdated equipment used in the laboratory.

3. Lack of proper documentation center.
4. Lack of training programs.
5. Lack of professional practice programs for students.
6. Lack of bilingual faculty and students. Poor use of a second language.
7. New environmental needs that are not addressed in the curriculum.
8. Lack of university regulations knowledge by human resources.
9. Lack of standardization in terms of the minimum elements required in projects and practice required in different courses.
10. Lack of mechanisms for ongoing evaluation of the curriculum.
11. Absence of resources and incentives that encourage research projects.
12. Poor identification of members of the organization with the objectives established.
13. Lack of tools for assessing staff.
14. Weak communication mechanisms with graduates.
15. Lack of professional development courses for graduates.
16. Significant segment of teachers ready to qualify for retirement.

Identification of threats:

1. Existence of other careers that cover the scope of Chemical Engineering.
2. Lack of other programs in Chemical Engineering in the country to generate competition and develop a comparison parameter.
3. The changing environment requires further development in research.

Last year, a much desired goal was achieved by our School of Chemical Engineering: our program was deemed substantially equivalent by the CEAB. This achievement fills us with great satisfaction and further reinforces our commitment to service with excellence and provide high quality education. The experience of the accreditation process allowed us to become more aware of what we do, of our strengths and of the improvement opportunities shared by evaluators. Aspects such as updating laboratory equipment, increasing the number of full-time professors with graduate studies, and improving the content of some of our courses are important observations that have been already incorporated and consolidated.

3. Accreditation criteria

3.1 Graduate attributes

Graduate attibutes is a new topic for us. Some efforts have been made to learn and understand how to implement an effective Graduate Attribute evaluation procedure that drives our curriculum to continuous improvement. In this sense, we still have much to learn and are looking for help and collaboration. The Faculty of Engineering, with support from the Academic Evaluation Center (CEA), is coordinating different instruction activities. For example, next April we will have a two-day workshop with Dr. Brian Frank, the Canadian EGAD Program Director, in which we will work on the improvement of our graduate attributes program.

Next, we present some preliminary work related to graduate attributes and continual improvement.

Table 3.1.1: Summary Graduate Attribute Curriculum Map

Graduate Attribute	Semester									
	1	2	3	4	5	6	7	8	9	10
	MA-1001	MA-1002	MA-1003	MA-1005	QU-0212	IE-0303	IQ-0423	IQ-0424	IQ-0525	IQ-0570
	QU-0100	QU-0102	MA-1004	QU-0260	XS-0217	QU-0214	IQ-0432	IQ-0433	IQ-0553	
	QU-0101	QU-0103	QU-0200	FS-0410	IQ-0333	IQ-0331	IQ-0415	IQ-0452	IQ-0534	
		FS-0210	QU-0201	FS-0411	IQ.0312	IQ-0313	IQ-0642		IQ-0517	
		FS-0211	FS-0310	CI-0202	IQ-0334				IQ-0620	
Knowledge base			FS-0311	IQ-0332						
	MA-1001	MA-1002	MA-1003	MA-1005	QU-0212	QU-0214	IQ-0423	IQ-0424	IQ-0525	IQ-0526
	QU-0100	QU-0102	MA-1004	QU-0260	IQ-0333	IQ-0313	IQ-0432	IQ-0433	IQ-0553	IQ-0551
	QU-0101	QU-0103	QU-0200	FS-0410	IQ.0312	IQ-0331	IQ-0451	IQ-0452	IQ-0534	IQ-0570
		FS-0210	QU-0201	FS-0411	IQ-0334	IQ-0335	IQ-0415	IQ-0416	IQ-0517	
		FS-0211	FS-0310	IQ-0332			IQ-0642		IQ-0620	
			FS-0311							
Problem analysis			IQ-0200							
	EG-0124	EG-0125	FS-0311	FS-0411	QU-0213	QU-0215	IQ-0423	IQ-0590	IQ-0525	IQ-0551
		FS-0211			IQ-0333	IQ-0313	IQ-0432	IQ-0424	IQ-0553	IQ-0570
					IQ.0312	IQ-0331	IQ-0451	IQ-0433	IQ-0534	IQ-9500
					IQ-0334		IQ-0415	IQ-0452	IQ-0517	IQ-9800
Investigation							IQ-0642			IQ-9700
				CI-0202	IQ-0333	IQ-0313	IQ-0423	IQ-0424	IQ-0525	IQ-0551
					IQ.0312	IQ-0331	IQ-0432	IQ-0433	IQ-0553	IQ-0526
					IQ-0334	IQ-0335	IQ-0642	IQ-0452	IQ-0517	
Design								IQ-0416		
	QU-0101	MA-1002	QU-0200	FS-0411	XS-0217	IE-0303	IQ-0423	IQ-0424	IQ-0525	IQ-0526
		QU-0103	FS-0311	CI-0202	IQ-0333	IQ-0313	IQ-0432	IQ-0433	IQ-0553	IQ-0551
Use of engineering tools		FS-0211	IQ-0200		IQ.0312	IQ-0335	IQ-0642	IQ-0452	IQ-0534	
					IQ-0334			IQ-0416	IQ-0517	
	QU-0101	EF-7281	QU-0200	FS-0411	QU-0213	QU-0215	IQ-0423	IQ-0424	IQ-0525	IQ-0526
	EG-0124	QU-0103	FS-0311		IQ-0333	IQ-0313	IQ-0432	IQ-0433	IQ-0553	IQ-0556
		FS-0211	IQ-0200		IQ.0312	IQ-0331	IQ-0451	IQ-0452	IQ-0534	IQ-0551
		EG-0125			IQ-0334	IQ-0335	IQ-0415	IQ-0416	IQ-0517	
						TCU	IQ-0642		IQ-0620	
	MA-1001	EF-7281			QU-0213	QU-0214	IQ-0451	IQ-0452	IQ-0517	IQ-0556
	EG-0316				IQ.0312	QU-0215	IQ-0415	RP-0003	IQ-0620	IQ-0551
Individual and team work	LM-1030				IQ-0334		IQ-0642	IQ-0416		

Communication skills	EG-0124	EG-0125			IQ.0312		IQ-0423	IQ-0590	IQ-0525	IQ-0556
	EG-0316				IQ-0334		IQ-0432	IQ-0424	IQ-0553	IQ-0551
	LM-1030						IQ-0451	IQ-0433	IQ-0517	
							IQ-0415	IQ-0452	IQ-0620	
							IQ-0642	IQ-0416		
Professionalism	QU-0101	QU-0103	QU-0201		QU-0213	QU-0215	IQ-0451	IQ-0452	IQ-0553	IQ-0526
			IQ-0200		IQ.0312	IQ-0313	IQ-0415	IQ-0416	IQ-0534	IQ-0556
			QU-0200			IQ-0335	IQ-0642	IQ-0433	IQ-0517	IQ-0570
									IQ-0620	
Impact of engineering on society and the environment	QU-0101	QU-0103	QU-0201		QU-0213	QU-0215	SR-0001	SR-0002	IQ-0553	IQ-0551
					IQ.0312	IQ-0335	IQ-0415	IQ-0452	IQ-0534	IQ-0526
					IQ-0334	TCU	IQ-0642	IQ-0433	IQ-0517	
								IQ-0416		
Ethics and equity	EG-0124	EG-0125	QU-0201		QU-0213	QU-0215	SR-0001	SR-0002	IQ-0553	IQ-0556
					IQ.0312	IQ-0331	IQ-0451	IQ-0416	IQ-0534	IQ-0551
							IQ-0415	IQ-0452	IQ-0517	
							IQ-0642	IQ-0433	IQ-0620	
									IQ-0590	
Economics and project management							IQ-0451	IQ-0452	IQ-0553	IQ-0556
							IQ-0642		IQ-0517	IQ-0551
Life-long learning	EG-0124	EG-0125	MA-1004		QU-0212	IE-0303	SR-0001	SR-0002	IQ-0553	IQ-0526
	MA-1001	EF-7281			QU-0213	QU-0214	IQ-0451	IQ-0452	IQ-0517	IQ-0556
	EG-0316				IQ.0312	QU-0215	IQ-0415	RP-0003	IQ-0620	IQ-0551
	LM-1030				IQ-0334		IQ-0642	IQ-0416		

Table 3.1.2: Indicators and Learning Activities Assessed

Graduate Attribute	Indicator	Relative Level		
		Inroductory	Intermediate	Advanced
Knowledge base	Creates mathematical descriptions for model real-world problems	QU-0100	IE-0303	IQ-0313
		QU-0101	IQ-0312	IQ-0333
		QU-0102	IQ-0335	IQ-0334
		QU-0103	IQ-0424	IQ-0416
		QU-0201	IQ-0452	IQ-0423
		QU-0260	IQ-xxxx	IQ-0433
		FS-0210		IQ-0525
		FS-0211		IQ-0534
		FS-0310		IQ-xxxx
		FS-0410		
		FS-0311		
		FS-0411		
		CI-0202		
		MA-1001		
		MA-1002		
		MA-1003		
		MA-1004		
		MA-1005		
		XS-0217		
	Selects and describes appropriate tools and methodologies to solve mathematical problems	QU-0100	IE-0303	IQ-0313
		QU-0101	IQ-0312	IQ-0333
		QU-0102		IQ-0334
		QU-0103		IQ-0335
		QU-0201		IQ-0525
		QU-0260		IQ-0534
		FS-0210		
		FS-0211		
		FS-0310		
		FS-0410		
		FS-0311		
		FS-0411		
		CI-0202		
		MA-1001		

		MA-1002		
		MA-1003		
		MA-1004		
		MA-1005		
		XS-0217		
		IQ-0332		
	Recalls and describes fundamental concepts in chemistry	QU-0100	QU-0212	IQ-0313
		QU-0101	QU-0214	IQ-0333
		QU-0102	IQ-0525	IQ-0334
		QU-0103	IQ-xxxx	IQ-0416
		QU-0201		IQ-0423
		QU-0260		IQ-0534
		IQ-0332		IQ-xxxx
		IQ-0335		
	Recalls and describes fundamental concepts in physics	FS-0211	IE-0303	IQ-0313
		FS-0210	IQ-0312	IQ-0333
		FS-0310	IQ-0335	IQ-0416
		FS-0410	IQ-0525	
		FS-0311		
		FS-0411		
	Recalls and describes fundamental engineering concepts	FS-0211	IQ-0312	IQ-0313
		FS-0210	IQ-0335	IQ-0333
		FS-0310	IQ-0424	IQ-0334
		FS-0411	IQ-0452	IQ-0416
		IQ-xxxx	IQ-xxxx	IQ-0423
				IQ-0433
				IQ-0525
				IQ-xxxx
	Comprehends and applies fundamental engineering concepts	QU-0260	QU-0212	IQ-0313
		FS-0311	IQ-0312	IQ-0333
		FS-0410	IQ-0335	IQ-0334
		MA-1005	IQ-0424	IQ-0416
		IQ-0332	IQ-0452	IQ-0423
			IQ-xxxx	IQ-0433
				IQ-0525
				IQ-0534

				IQ-xxxx
	Comprehends and applies discipline-specific engineering concepts	QU-0201	QU-0214	IQ-0313
		QU-0260	IE-0303	IQ-0333
		CI-0202	IQ-0312	IQ-0334
		FS-0410	IQ-0335	IQ-0416
		IQ-0332	IQ-0424	IQ-0433
		XS-0217	IQ-0452	IQ-0525
			IQ-xxxx	IQ-0534
				IQ-0553
				IQ-xxxx
Problem analysis	Identifies known and unknown information, uncertainties and biases	SR-0001	SR-0002	IQ-0312
		QU-0100	QU-0212	IQ-0313
		QU-0101	QU-0214	IQ-0333
		QU-0102	IQ-0424	IQ-0334
		QU-0103	IQ-0452	IQ-0415
		QU-0201	IQ-0525	IQ-0416
		QU-0260	IQ-xxxx	IQ-0423
		FS-0210		IQ-0433
		FS-0211		IQ-0526
		FS-0310		IQ-0534
		FS-0311		IQ-xxxx
		FS-0410		
		FS-0411		
		MA-1001		
		MA-1002		
		MA-1003		
		MA-1004		
		MA-1005		
		IQ-0332		
		IQ-0335		
		IQ-xxxx		
	Creates process for solving problem including approximations and assumptions	SR-0001	QU-0212	IQ-0312
		QU-0100	QU-0214	IQ-0313
		QU-0101	IQ-0335	IQ-0333
		QU-0102	IQ-0424	IQ-0334
		QU-0103	IQ-0452	IQ-0415

		QU-0260	IQ-xxxx	IQ-0416
		FS-0210		IQ-0423
		FS-0211		IQ-0433
		FS-0310		IQ-0525
		FS-0410		IQ-0526
		FS-0311		IQ-0534
		FS-0411		IQ-xxxx
		MA-1001		
		MA-1002		
		MA-1003		
		MA-1004		
		MA-1005		
		IQ-0332		
	Selects and applies appropriate quantitative model and analysis to solve problem	SR-0001	SR-0002	IQ-0312
		QU-0100	QU-0212	IQ-0313
		QU-0101	QU-0214	IQ-0333
		QU-0102	IQ-0424	IQ-0334
		QU-0103	IQ-0452	IQ-0335
		QU-0201	IQ-0525	IQ-0415
		QU-0260	IQ-0553	IQ-0416
		FS-0210	IQ-xxxx	IQ-0423
		FS-0211		IQ-0433
		FS-0310		IQ-0551
		FS-0311		IQ-0526
		FS-0411		IQ-0534
		MA-1001		IQ-xxxx
		MA-1002		
		MA-1003		
		MA-1004		
		MA-1005		
	Evaluates validity of results, risks, errors and uncertainties	SR-0001	QU-0212	IQ-0312
		QU-0100	QU-0214	IQ-0333
		QU-0101	IQ-0424	IQ-0334
		QU-0102	IQ-0452	IQ-0415
		QU-0201		IQ-0416
		QU-0260		IQ-0423

		FS-0211		IQ-0433
		FS-0311		IQ-0551
		FS-0411		IQ-0526
		MA-1001		IQ-0534
		MA-1002		IQ-xxxx
		MA-1003		
		MA-1004		
		MA-1005		
		IQ-0313		
		IQ-0332		
		IQ-0335		
		IQ-0525		
		QU-0103		
Investigation	Generates working hypotheses	EG-0124	QU-0213	IQ-0333
		EG-0125	QU-0215	IQ-xxxx
		IQ-0312	IQ-0551	
		IQ-0313	IQ-xxxx	
		IQ-0433	IQ-0590	
	Applies and tests working hypotheses	EG-0124	QU-0213	IQ-xxxx
		EG-0125	QU-0215	
		IQ-0312	IQ-0333	
		IQ-0334	IQ-0551	
		IQ-0424	IQ-xxxx	
		IQ-0433		
	Designs investigations and/or experiments	SR-0001	QU-0213	IQ-0416
		FS-0211	QU-0215	IQ-0423
		FS-0311	IQ-0551	IQ-0452
		FS-0411	IQ-xxxx	IQ-0534
		EG-0124	IQ-0590	IQ-xxxx
		EG-0125		
		IQ-0312		
		IQ-0333		
	Synthesizes data to reach conclusions	SR-0001	QU-0213	IQ-0333
		FS-0211	QU-0215	IQ-0416
		FS-0311	IQ-0551	IQ-0423
		FS-0411	IQ-0553	IQ-0452

		EG-0124	IQ-xxxx	IQ-0534
		EG-0125	IQ-0590	IQ-xxxx
		IQ-0313		
		IQ-0334		
		IQ-0335		
		IQ-0424		
		IQ-0433		
		IQ-0525		
	Assesses validity of conclusions within limitations of data and methodologies	EG-0124	QU-0213	IQ-0416
		EG-0125	QU-0215	IQ-0423
		IQ-0313	IQ-0333	IQ-0452
		IQ-0334	IQ-0551	IQ-0534
		IQ-0424	IQ-0553	IQ-xxxx
		IQ-0433	IQ-xxxx	
		FS-0211		
		FS-0311		
		FS-0411		
Design	Identifies significance and nature of open-ended problems	CI-0202	IQ-0313	IQ-0333
		IQ-0312	IQ-0335	IQ-0333
		IQ-0334	IQ-0423	IQ-0415
		IQ-0424	IQ-0433	
		IQ-0452	IQ-0525	
			IQ-xxxx	
	Identifies problem and constraints including health and safety, environmental and societal issues	IQ-0313	IQ-0423	IQ-0416
		IQ-0334	IQ-0433	IQ-0553
		IQ-0452	IQ-xxxx	
		IQ-0525		
	Identifies customer/user/client needs	CI-0202	IQ-0424	IQ-0553
		IQ-0333	IQ-xxxx	
		IQ-0452		
	Produces multiple potential solutions to meet functional specifications	CI-0202	IQ-0423	IQ-0415
		IQ-0312	IQ-0424	IQ-0416

		IQ-0313	IQ-xxxx	IQ-0553
		IQ-0333		
		IQ-0334		
	Compares solutions against problem objective to select best concept	CI-0202	IQ-0423	IQ-0333
		IQ-0312	IQ-0424	IQ-0415
		IQ-0334		IQ-0416
		IQ-0335		IQ-0553
	Creates and tests simulations/models/prototypes	CI-0202	IQ-0335	IQ-0333
		IQ-0312	IQ-0423	IQ-0415
		IQ-0334	IQ-0424	IQ-0416
		IQ-0452	IQ-0433	
	Assesses design performance based on specification and requirements	CI-0202	IQ-0423	IQ-0415
		IQ-0312	IQ-0424	IQ-0416
		IQ-0313	IQ-0433	
		IQ-0333	IQ-xxxx	
		IQ-0334		
		IQ-0335		
		IQ-0452		
Use of engineering tools	Selects appropriate instrumentation/measurement techniques/models/simulations	QU-0101	IE-0303	IQ-0333
		QU-0103	IQ-0312	IQ-0333
		QU-0200	IQ-0334	IQ-0415
		CI-0202	IQ-0335	IQ-0416
		FS-0211	IQ-0452	IQ-0424
		FS-0311	IQ-xxxx	IQ-0433
		FS-0411		IQ-0526
		MA-1002		IQ-0534
		XS-0217		
		IQ-0313		
		IQ-0423		
	Applies appropriate instrumentation/measurement techniques/models/simulations	QU-0101	IE-0303	IQ-0415
		QU-0103	IQ-0312	IQ-0416
		CI-0202	IQ-0334	IQ-0424
		FS-0211	IQ-0335	IQ-0433
		FS-0311	IQ-xxxx	IQ-0526

		MA-1002		IQ-0534
		XS-0217		IQ-0553
		FS-0411		
		IQ-0313		
		IQ-0423		
	Analyses limitations and errors of instrumentation/measurement techniques/models/simulations	QU-0101	IE-0303	IQ-0313
		QU-0103	IQ-0312	IQ-0415
		QU-0200	IQ-0334	IQ-0416
		CI-0202	IQ-0452	IQ-0424
		FS-0211	IQ-xxxx	IQ-0526
		FS-0311		IQ-0534
		XS-0217		
		FS-0411		
		IQ-0333		
		IQ-0335		
		IQ-0423		
	Evaluates appropriateness of results from instrumentation/measurement techniques/models/simulations	QU-0101	IE-0303	IQ-0333
		QU-0103	IQ-0312	IQ-0415
		QU-0200	IQ-0313	IQ-0416
		CI-0202	IQ-0334	IQ-0424
		MA-1002	IQ-0452	IQ-0526
		FS-0211	IQ-0525	IQ-0534
		FS-0311	IQ-xxxx	IQ-0553
		FS-0411		
		IQ-0335		
		IQ-0423		
		XS-0217		
Individual and team work	Assumes responsibility for own work	SR-0001	SR-0002	IQ-0313
		EF-xxxx	QU-0213	IQ-0333
		QU-0101	IQ-0312	IQ-0416
		QU-0103	QU-0215	IQ-0551
		QU-0200	IQ-0415	IQ-0452
		IQ-0334	IQ-0423	IQ-0534
		IQ-0335	IQ-0424	
			IQ-0433	
			IQ-0525	

			IQ-0556	
			IQ-xxxx	
	Exercises initiative and contributes to team goal setting	EF-xxxx	QU-0213	IQ-0333
		QU-0101	IQ-0312	IQ-0416
		QU-0103	QU-0215	IQ-0551
		QU-0200	IQ-0335	IQ-0452
		FS-0211	IQ-0415	IQ-0534
		FS-0311	IQ-0423	
		FS-0411	IQ-0433	
		IQ-0313	IQ-0525	
		IQ-0334	IQ-xxxx	
	Recognizes a variety of learning and working preferences in a group environment	QU-0101	SR-0002	IQ-0333
		QU-0103	IQ-0335	IQ-0416
		QU-0200	IQ-0415	IQ-0551
		FS-0211	QU-0213	
		FS-0311	QU-0215	
		FS-0411	IQ-0423	
			IQ-0525	
			IQ-0553	
			IQ-0556	
			IQ-xxxx	
	Applies principles of conflict management to resolve team issues	SR-0001	IQ-0423	
		EF-xxxx	IQ-0424	
			IQ-0433	
			IQ-0525	
			IQ-xxxx	
	Demonstrates capacity for technical group/team leadership	EF-xxxx	SR-0002	IQ-0416
		FS-0211	QU-0215	IQ-0551
		FS-0311	QU-0213	IQ-0534
		FS-0411	IQ-0312	
		IQ-0334	IQ-0333	
		IQ-0335	IQ-0415	
			IQ-0423	
			IQ-0424	
			IQ-0433	
			IQ-0525	

			IQ-0553	
			IQ-xxxx	
	Evaluates team effectiveness and plans for improvement	SR-0001	QU-0213	IQ-0416
		QU-0101	IQ-0312	IQ-0452
		QU-0103	QU-0215	IQ-0551
		QU-0200	IQ-0415	IQ-0534
		IQ-0334	IQ-0423	
		EF-xxxx	IQ-0424	
			IQ-0433	
			IQ-0553	
Communication skills	Adapts format, content and tone appropriate to audience	LM-1030	IQ-0433	
		EG-xxxx	IQ-0553	
		EG-0124	IQ-0590	
		EG-0125	IQ-xxxx	
		IQ-0423		
		IQ-0452		
			IQ-0556	
	Demonstrates confidence in formal and informal presentations	SR-0001	SR-0002	
		LM-1030	IQ-0433	
		EG-xxxx	IQ-0556	
		EG-0124	IQ-0590	
		EG-0125	IQ-xxxx	
		IQ-0423		
		IQ-0452		
	Summarizes and paraphrases accurately with appropriate citations	LM-1030	IQ-0415	IQ-0551
		EG-xxxx	IQ-0416	
		EG-0124	IQ-0424	
		EG-0125	IQ-0433	
		IQ-0334	IQ-0553	
		IQ-0423	IQ-xxxx	
		IQ-0452		
	Writes documents using engineering report standards	SR-0001	IQ-0333	IQ-0551
		IQ-0312	IQ-0335	
		IQ-0334	IQ-0415	
		IQ-0423	IQ-0416	
		IQ-0452	IQ-0424	

			IQ-0433	
			IQ-0553	
			IQ-0556	
			IQ-0590	
			IQ-xxxx	
	Delivers clear and organized formal presentations with accurate use of technical vocabulary	SR-0001	SR-0002	IQ-0551
		EG-xxxx	IQ-0415	
		LM-1030	IQ-0416	
		EG-0124	IQ-0424	
		EG-0125	IQ-0433	
		IQ-0312	IQ-0553	
		IQ-0334	IQ-0556	
		IQ-0335	IQ-0590	
		IQ-0423	IQ-xxxx	
		IQ-0452		
	Creates figures, tables and drawings to engineering report standards	SR-0001	IQ-0333	IQ-0551
		IQ-0312	IQ-0335	
		IQ-0423	IQ-0415	
		IQ-0452	IQ-0416	
			IQ-0424	
			IQ-0553	
			IQ-0556	
			IQ-0590	
			IQ-xxxx	
Professionalism	Demonstrates punctuality, timeliness, responsibility and appropriate communication etiquette	SR-0001	SR-0002	IQ-0534
		QU-0101	IQ-0313	IQ-0553
		QU-0103	QU-0213	IQ-0556
		QU-0201	QU-0215	IQ-xxxx
		IQ-0335	IQ-xxxx	
	Provides accurate, comprehensive, objective technical opinions and recommendations	QU-0101	SR-0002	IQ-0313
		QU-0103	IQ-0312	IQ-0416
		QU-0201	QU-0213	IQ-0551
		IQ-0333	QU-0215	IQ-0534
		IQ-0335	IQ-0525	IQ-xxxx
		IQ-0415	IQ-xxxx	

	Identifies and discloses all relevant information in meetings	QU-0101	QU-0213	IQ-0416
		QU-0103	IQ-0312	IQ-0534
		QU-0201	QU-0215	IQ-xxxx
		IQ-0313	IQ-0452	
		IQ-0335	IQ-0525	
		IQ-0415	IQ-xxxx	
	Integrates appropriate standards, codes, legal and regulatory factors into decision making	SR-0001	IQ-0312	IQ-0416
		QU-0101	IQ-0452	IQ-0551
		QU-0103	IQ-0525	IQ-0534
		IQ-0313	IQ-xxxx	IQ-0553
		IQ-0415		IQ-xxxx
	Considers protection of the public and public interest in decision making and recommendations	QU-0101	QU-0213	IQ-0416
		QU-0103	QU-0215	IQ-0551
		IQ-0313	IQ-0452	IQ-0534
		IQ-0415	IQ-0525	IQ-0556
		QU-0201	IQ-xxxx	IQ-xxxx
Impact of engineering on society and the environment	Describes the relationship between engineering systems and the environment	QU-0103	QU-0213	IQ-0416
		QU-0101	QU-0215	IQ-xxxx
		QU-0201	IQ-0334	
		IQ-0312		
		IQ-0452		
		IQ-0525		
	Considers sustainability and life-time costs in decision making and recommendations	QU-0103	SR-0002	IQ-0416
		QU-0201	QU-0213	IQ-0534
		QU-0101	QU-0215	IQ-0553
		IQ-0312	IQ-0334	IQ-xxxx
		IQ-0452		
	Balances economic, cultural, societal and technical considerations	SR-0001	SR-0002	IQ-0416
		QU-0103	QU-0213	IQ-0534
		QU-0101	IQ-0334	IQ-xxxx
		QU-0201	QU-0215	
		IQ-0452		
	Evaluates technical, social and environmental trade-offs	QU-0103	SR-0002	IQ-0416
		QU-0101	IQ-0334	IQ-0534
		QU-0201	QU-0213	IQ-0553
			QU-0215	IQ-xxxx

Ethics and equity	Demonstrates behaviour consistent with academic integrity expectations	SR-0001	SR-0002	IQ-0551
		EG-0124	QU-0213	IQ-0534
		EG-0125	QU-0215	IQ-0553
		QU-0201	IQ-0416	IQ-0556
		IQ-0312		IQ-xxxx
		IQ-0313		
		IQ-xxxx		
	Recalls and comprehends all articles of the professional engineering code of conduct	QU-0201	QU-0213	IQ-0551
		IQ-0452	QU-0215	IQ-0534
		IQ-xxxx	IQ-0335	IQ-xxxx
			IQ-0415	
	Demonstrates behaviour with all articles of the professional engineering code of conduct	QU-0201	QU-0213	IQ-0551
		IQ-0312	QU-0215	IQ-0534
		IQ-0452	IQ-0335	IQ-xxxx
			IQ-0415	
	Comprehends and demonstrates sensitivity to cultural and gender issues	SR-0002	IQ-0416	IQ-0551
		IQ-0313		IQ-0534
		IQ-0452		IQ-0553
		IQ-xxxx		
		EG-0124		IQ-0556
		EG-0125		IQ-xxxx
Economics and project management	Recalls and comprehends the development of business plans	SR-0001	SR-0002	IQ-0551
			IQ-0556	IQ-0553
	Recalls and comprehends methodologies for the management of time and resources		SR-0002	IQ-0551
			IQ-0416	
			IQ-0452	
			IQ-0556	
			IQ-xxxx	
	Recalls and comprehends methodologies for the management of risk		SR-0002	IQ-0551
			IQ-0416	
			IQ-0452	
			IQ-xxxx	
	Creates effective business plans	SR-0001	SR-0002	IQ-0551
	Applies efficient management of time and resources	SR-0001	SR-0002	IQ-0551
			IQ-0416	IQ-0553

			IQ-0452	
			IQ-xxxx	
	Evaluates and manages risks effectively		SR-0002	IQ-0551
			IQ-0416	IQ-0553
			IQ-0452	
			IQ-xxxx	
Life-long learning	Demonstrates skills of self-education and familiarity with appropriate tools	EG-xxxx	QU-0212	IQ-0551
		EG-0124	QU-0213	IQ-0525
		EG-0125	QU-0214	IQ-0556
		MA-1001	QU-0215	IQ-xxxx
		MA-1004	IQ-0312	
		IQ-0452	IQ-0313	
			IQ-0334	
			IQ-0335	
			IQ-xxxx	
	Identifies knowledge gaps and learning needs	RP-xxxx	QU-0212	IQ-0551
		EG-xxxx	QU-0213	IQ-0525
		EG-0124	QU-0214	IQ-xxxx
		EG-0125	QU-0215	
		MA-1001	IQ-0312	
		MA-1004	IQ-0334	
		IQ-0333	IQ-0335	
		IQ-0452	IQ-xxxx	
		IQ-0525		
	Identifies appropriate sources for technical and research literature	SR-0001	SR-0002	IQ-0335
		RP-xxxx	QU-0212	IQ-0525
		EG-xxxx	QU-0213	IQ-0553
		EG-0124	QU-0214	IQ-0556
		EG-0125	QU-0215	IQ-xxxx
		MA-1001	IQ-0312	
		MA-1004	IQ-0334	
		IQ-0313	IQ-xxxx	
		IQ-0333		
		IQ-0452		
	Critically evaluates information for authority, currency and objectivity	RP-xxxx	SR-0002	IQ-0551
		EG-xxxx	QU-0212	IQ-0525

		EG-0124	QU-0213	IQ-0556
		EG-0125	QU-0214	
		IQ-0452	QU-0215	
			IQ-0334	
			IQ-0335	
			IQ-xxxx	
	Demonstrates membership of appropriate professional and technical societies	RP-xxxx	QU-0212	IQ-0525
		IQ-0452	QU-0214	IQ-0553
		EG-0124	IQ-0334	
		EG-0125		
		EG-xxxx		

Table 3.1.3 Examples of Assessment Tools

Do not have the information required to complete this table.

Table 3.1.4 Examples of Assessment Results

Do not have the information required to complete this table.

In addition to the analysis of the contribution of each of the courses to the desired attributes (Tables 3.1.1 and 3.1.2), a series of questions was developed to review the opinion of graduates in relation to the attributes under study. This allowed us to know whether they considered the education they received to be useful helping them meet the challenges of professional work. We invited graduates of the years 2007-2013 to answer the questions. This set of questions was developed in collaboration with the Center for Academic Evaluation and was sent in digital form to 229 graduates. The total number of forms completed was 39.

Next the results are shown according to the different attributes studied.

3.1.1 A knowledge base for engineering

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

Semester	Code	Name	Hours/ week
1	MA-1001	Calculus I	5
	QU-0100	General Chemistry I	4
	QU-0101	Laboratory of General Chemistry I	3
2	MA-1002	Calculus II	5
	QU-0102	General Chemistry II	4
	QU-0103	Laboratory of General Chemistry II	3
	FS-0210	General Physics I	4

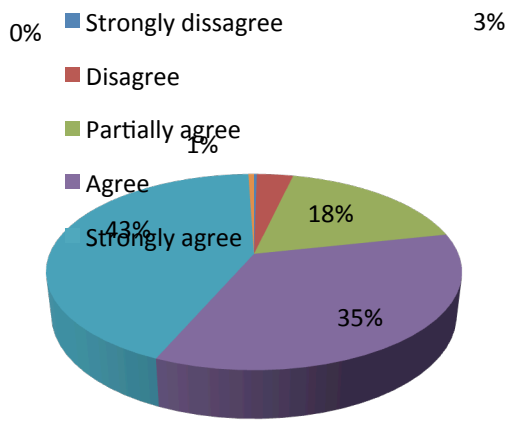
	FS-0211	Laboratory of General Physics I	3
3	MA-1003	Calculus III	5
	IQ-0200	Graphic Analysis	6
	MA-1004	Linear Algebra	5
	QU-0200	Quantitative Analytical Chemistry	4
	QU-0201	Laboratory of Analytical Chemistry	6
	FS-0310	General Physics II	4
	FS-0311	Laboratory of General Physics II	3
4	MA-1005	Differential Equation	5
	QU-0260	Physical Chemistry for Chemical Engineering	4
	FS-0410	General Physics III	4
	FS-0411	Laboratory of General Physics III	3
	CI-0202	Informatics	4
	IQ-0332	Process Analysis I	6
5	QU-0212	General Organic Chemistry I	4
	XS-0217	Probability and Statistical Inference	4
	IQ-0333	Process Analysis II	5
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5
6	IE-0303	Electrotechnics	5
	QU-0214	General Organic Chemistry II	4
	IQ-0331	Mesurement and Experimental Data Processing	6
	IQ-0313	Transport Phenomena	6
7	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	IQ-0424	Separation Operations of Phases	4
	IQ-0433	Laboratory of Phase Separation Operations	5
	IQ-0452	Production Control	3
9	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
	IQ-0620	Quality Control	4
10	IQ-0570	Polymers Technology I	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you have solid foundations of math knowledge that allowed you to develop models?
2. Did you have solid foundations in matter related to natural science (physics and chemistry)?
3. Did you have sufficient fundamental knowledge on engineering sciences (mechanics, technical drawing, thermodynamics, material sciences, electrical engineering and programing) to meet professional challenges?

78% of the graduate population answered favorably. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "knowledge base for engineering" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.2 Problem analysis

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

Semester	Code	Name	Hours/ week
1	MA-1001	Calculus I	5
	QU-0100	General Chemistry I	4
	QU-0101	Laboratory of General Chemistry I	3
2	MA-1002	Calculus II	5
	QU-0102	General Chemistry II	4
	QU-0103	Laboratory of General Chemistry II	3
	FS-0210	General Physics I	4
	FS-0211	Laboratory of General Physics I	3
3	MA-1003	Calculus III	5
	MA-1004	Linear Algebra	5
	QU-0200	Quantitative Analytical Chemistry	4
	QU-0201	Laboratory of Analytical Chemistry	6
	FS-0310	General Physics II	4
	FS-0311	Laboratory of General Physics II	3
	IQ-0200	Graphic Analysis	6
4	MA-1005	Differential Equations	5
	QU-0260	Physical Chemistry for Chemical Engineering	4
	FS-0410	General Physics III	4
	FS-0411	Laboratory of General Physics III	3
	IQ-0332	Process Analysis I	6
5	QU-0212	General Organic Chemistry I	4
	IQ-0333	Process Analysis II	5
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5

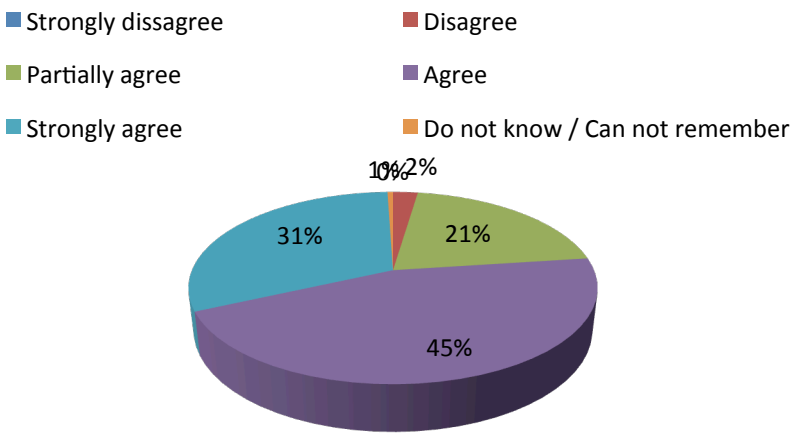
6	QU-0214	General Organic Chemistry II	4
	IQ-0313	Transport Phenomena	6
	IQ-0331	Mesurement and Experimental Data Processing	6
	IQ-0335	Thermodynamic II	3
7	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0451	Production Planning	3
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	IQ-0424	Phase Separation Operations	4
	IQ-0433	Laboratory of Phase Separation Operations	5
	IQ-0452	Production Control	3
	IQ-0416	Kinetics and Chemical Reactors	3
9	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
	IQ-0620	Quality Control	4
10	IQ-0526	Process and Integration Operation	4
	IQ-0551	Chemical Process Desing	4
	IQ-0570	Polymers Technology I	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you have skills to identify problems?
2. Did you know how to properly formulate real problems?
3. Did you have the ability to analyze results to solve the problems that have been presented?
4. Did you know how to abstract complex engineering problems and develop a model that allows solving to get conclusions?

76% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "problem analysis" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.3 Investigation

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

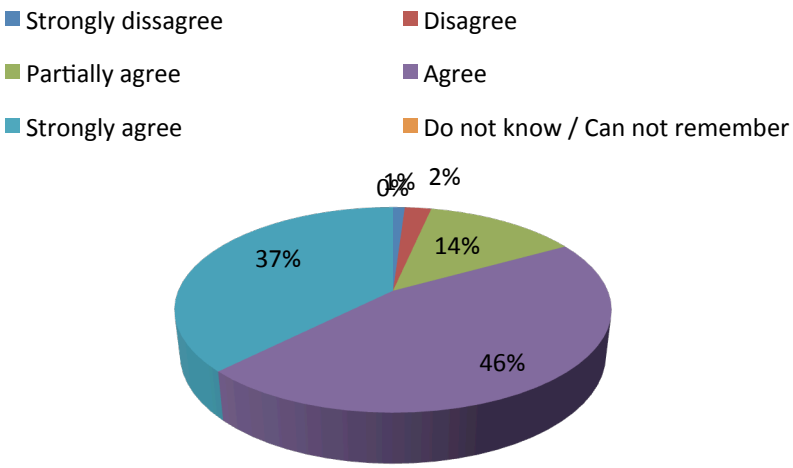
Semester	Code	Name	Hours/ week
1	EG-0124	Humanities I	8
2	EG-0125	Humanities II	8
	FS-0211	Laboratory of General Physics I	3
3	FS-0311	Laboratory of General Physics II	3
4	FS-0411	Laboratory of General Physics III	3
5	QU-0213	Laboratory of General Organic Chemistry I	4
	IQ-0333	Process Analysis II	5
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5
6	QU-0215	Laboratory of General Organic Chemistry II	4
	IQ-0331	Mesurement and Experimental Data Processing	6
	IQ-0313	Transport Phenomena	6
7	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0451	Production Planning	3
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	IQ-0424	Phase Separation Operations	4
	IQ-0433	Laboratory of Phase Separation Operations	5
	IQ-0452	Production Control	3
	IQ-0590	Seminar for Graduation Projects	2
9	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
10	IQ-0551	Chemical Process Desing	4
	IQ-0570	Polymers Technology I	4
	IQ-9500 IQ-9700 IQ-9800	Graduation Project	

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you know how to perform experiments of complex problems?
2. Were you able to analyze and interpret data obtained from experiments or modeling made by you and others?
3. Did you have the ability to summarize scientific information?
4. Could you draw valid conclusions from data interpretation and information?

83% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "investigation" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.4 Design

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

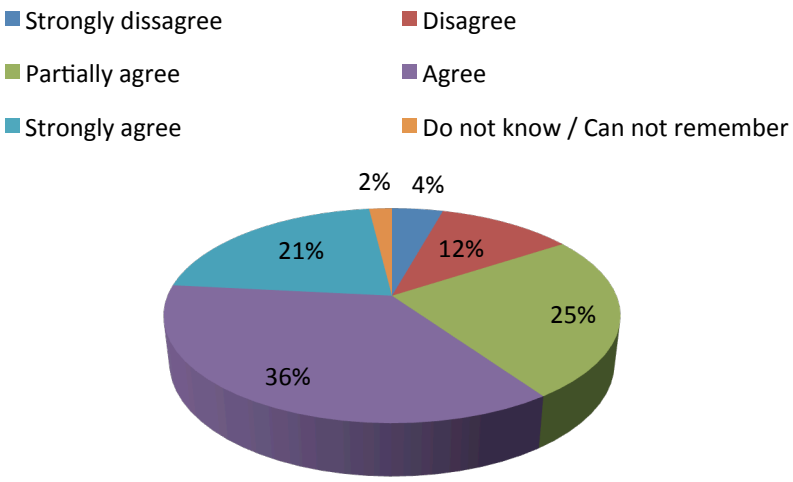
Semester	Code	Name	Hours/ week
4	CI-0202	Informatics	4
5	IQ-0333	Process Analysis II	5
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5
6	IQ-0331	Mesurement and Experimental Data Processing	6
	IQ-0313	Transport Phenomena	6
	IQ-0335	Thermodynamic II	3
7	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0642	Bioengineering	3
8	IQ-0424	Separation Operations of Phases	4
	IQ-0433	Laboratory of Separation Operations of Phases	5
	IQ-0452	Production Control	3
	IQ-0416	Kinetics and Chemical Reactors	3
9	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0553	Projects Evaluation	4
	IQ-0517	Process Control and Instrumentation	3
10	IQ-0551	Chemical Process Desing	4
	IQ-0526	Process and Integration Operation	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Could you design solutions to engineering problems?
2. Have you used the systematic approach to design (analysis of cause and effect relationships between different variables)?
3. Did you understand the components and processes associated to a problem to solve?
4. Did you recognize the risks to health and safety in specific jobs?
5. Could you apply economic criteria to the designs made?
6. Could you apply social and cultural criteria to the designs made?

57% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "design" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.5 Use of engineering tools

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

Semester	Code	Name	Hours/ week
1	QU-0101	Laboratory of General Chemistry I	3
2	MA-1002	Calculus II	5
	QU-0103	Laboratory of General Chemistry II	3
	FS-0211	Laboratory of General Physics I	3
3	FS-0311	Laboratory of General Physics II	3
	QU-0200	Quantitative Analytical Chemistry	4
	IQ-0200	Graphic Analysis	6
4	FS-0411	Laboratory of General Physics III	3
	CI-0202	Informatics	4
5	XS-0217	Probability and Statistical Inference	4
	IQ-0333	Process Analysis II	5
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5

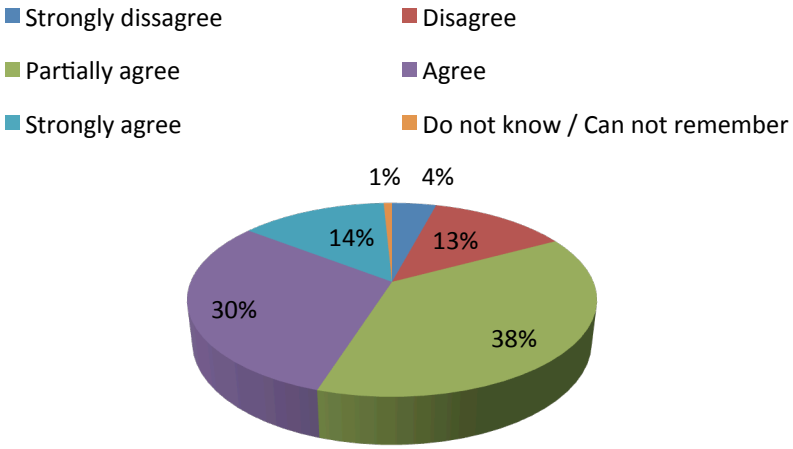
6	IE-0303	Electrotechnics	5
	IQ-0313	Transport Phenomena	6
	IQ-0335	Thermodynamic II	3
7	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0642	Bioengineering	3
8	IQ-0416	Kinetics and Chemical Reactors	3
	IQ-0424	Separation Operations of Phases	4
	IQ-0433	Laboratory of Separation Operations of Phases	5
	IQ-0452	Production Control	3
9	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
10	IQ-0526	Process and Integration Operation	4
	IQ-0551	Chemical Process Desing	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you learn to create tools, resources and techniques to help solve engineering problems?
2. Did you know how to select and apply the best tools, resources and techniques for each specific case?
3. Did you have the ability to adapt and scale the use of tools, resources and techniques learned to the engineering challenges faced?
4. Could you recognize the limitations in the use of tools, resources and techniques in specific cases?

44% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "use of engineering tools" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.6 Individual and team work

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

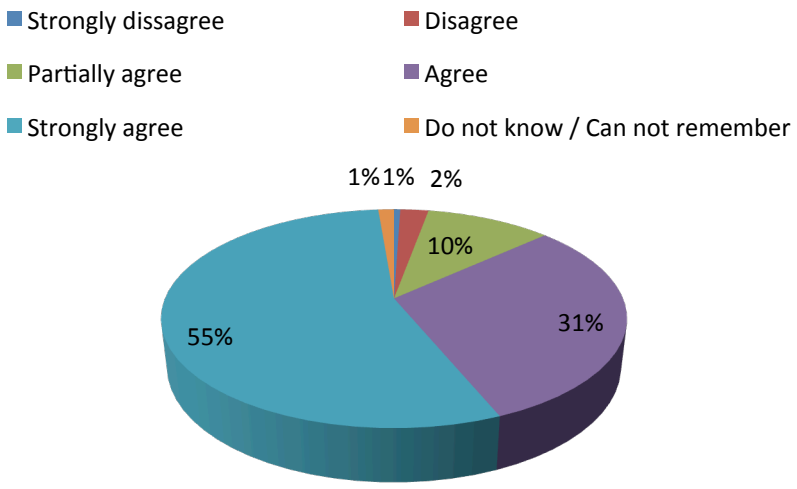
Semester	Code	Name	Hours/ week
1	EG-0124	Humanities I	8
	QU-0101	Laboratory of General Chemistry I	3
2	EG-0125	Humanities II	8
	EF-XXXX	Sport Activity	2
	QU-0103	Laboratory of General Chemistry II	3
	FS-0211	Laboratory of General Physics I	3
3	FS-0311	Laboratory of General Physics II	3
	QU-0200	Quantitative Analytical Chemistry	4
	IQ-0200	Graphic Analysis	6
4	FS-0411	Laboratory of General Physics III	3
5	QU-0213	Laboratory of General Organic Chemistry I	4
	IQ-0333	Process Analysis II	5
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5
6	QU-0215	Laboratory of General Organic Chemistry II	4
	IQ-0331	Mesurement and Experimental Data Processing	6
	IQ-0335	Thermodynamic II	3
	IQ-0313	Transport Phenomena	6
		TCU	
7	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0451	Production Planning	3
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	IQ-0424	Separation Operations of Phases	4
	IQ-0433	Laboratory of Separation Operations of Phases	5
	IQ-0452	Production Control	3
	IQ-0416	Kinetics and Chemical Reactors	3
9	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
	IQ-0620	Quality Control	4
10	IQ-0526	Process and Integration Operation	4
	IQ-0551	Chemical Process Desing	4
	IQ-0556	Industrial Administration Principles	3

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you have the ability to contribute individually to the work of a group of professionals?
2. Did you have the ability to work as a team member in a group of colleagues?
3. Did you have the ability to work as a member of a multidisciplinary team (with professionals from other disciplines)?
4. Did you have the ability to be the leader in a team?

86% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "individual and team work" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.7 Communication skills

The courses that contribute to this attribute are shown in the table below, indicating theirrespective lecture hours per week and the semester where it is taught:

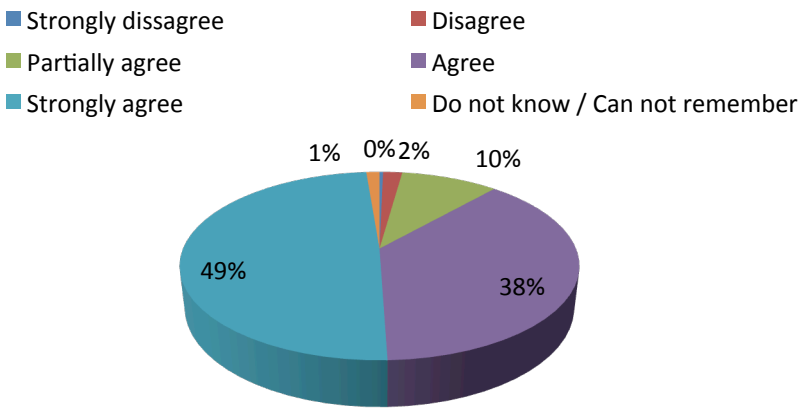
Semester	Code	Name	Hours/ week
1	EG-0124	Humanities I	8
	EG-XXXX	Artistic Activity	3
	LM-1030	Strategies of reading in English	6
2	EG-0125	Humanities II	8
5	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5
7	IQ-0423	Fluid Mechanics and Heat Transfer Operations	4
	IQ-0432	Laboratory of Fluid and Heat Transfer Operations	5
	IQ-0451	Production Planning	3
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	IQ-0424	Separation Operations of Phases	4
	IQ-0433	Laboratory of Separation Operations of Phases	5
	IQ-0452	Production Control	3
	IQ-0590	Seminar for Graduation Projects	2
	IQ-0416	Kinetics and Chemical Reactors	3
9	IQ-0525	Separation Operations by Diffusional Methods	4
	IQ-0553	Projects Evaluation	4
	IQ-0517	Process Control and Instrumentation	3
	IQ-0620	Quality Control	4
10	IQ-0556	Industrial Administration Principles	3
	IQ-0551	Chemical Process Desing	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you have the ability to communicate complex engineering concepts to colleagues?
2. Were you able to present engineering projects to people in society who are not engineers?
3. Did you perform specific, clear and effective oral presentations?
4. Could you make rigorous and effective technical written reports?
5. Could you make and understand project design documentation related to the profession (flowcharts, floor layouts, material and energy balances)?
6. Were you able to understand and follow instructions correctly?
7. Were you able to give clear instructions to colleagues and subordinates?
8. Were you able to listen respectfully to the contributions of other colleagues or other professionals?

87% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "communication skills" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.8 Professionalism

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

Semester	Code	Name	Hours/ week
1	QU-0101	Laboratory of General Chemistry I	3
2	QU-0103	Laboratory of General Chemistry II	3
3	QU-0200	Quantitative Analytical Chemistry	4
	QU-0201	Laboratory of Analytical Chemistry	6
	IQ-0200	Graphic Analysis	6
5	QU-0213	Laboratory of General Organic Chemistry I	4
	IQ-0312	Mechanics	6

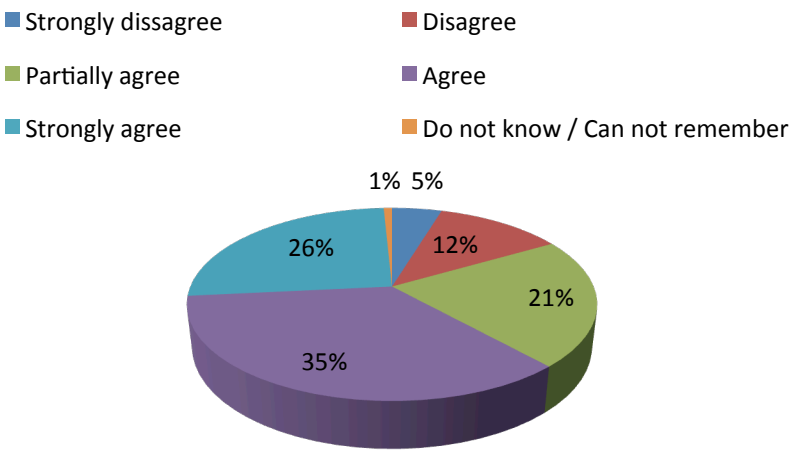
6	QU-0215	Laboratory of General Organic Chemistry II	4
	IQ-0335	Thermodynamic II	3
	IQ-0313	Transport Phenomena	6
7	IQ-0451	Production Planning	3
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	IQ-0452	Production Control	3
	IQ-0416	Kinetics and Chemical Reactors	3
	IQ-0433	Laboratory of Separation Operations of Phases	5
9	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
	IQ-0620	Quality Control	4
10	IQ-0526	Process and Integration Operation	4
	IQ-0556	Industrial Administration Principles	3
	IQ-0570	Polymers Technology I	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you understand the role you have as an engineer in Costa Rican society?
2. Did you thoroughly understand your professional responsibilities?
3. Did you know the scope and limitations of your professional practice?
4. Did you feel responsible in your role as a protector of the public interest?

81% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "professionalism" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.9 Impact of engineering on society and the environment

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

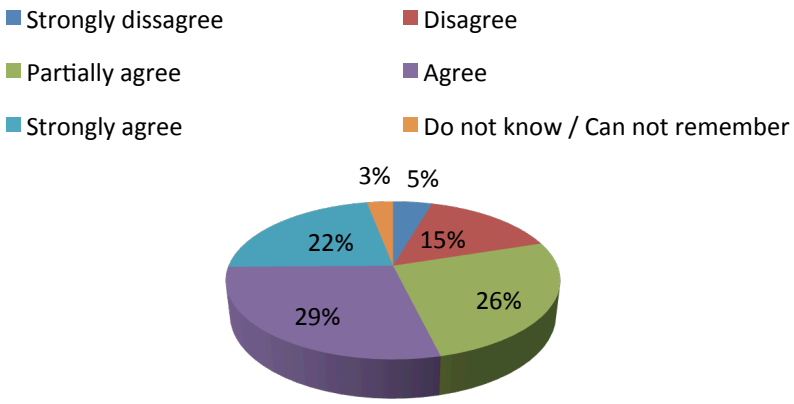
Semester	Code	Name	Hours/ week
1	QU-0101	Laboratory of General Chemistry I	3
2	QU-0103	Laboratory of General Chemistry II	3
3	QU-0201	Laboratory of Analytical Chemistry	6
5	QU-0213	Laboratory of General Organic Chemistry I	4
	IQ-0312	Mechanics	6
	IQ-0334	Thermodynamics I	5
6	QU-0215	Laboratory of General Organic Chemistry II	4
	IQ-0335	Thermodynamic II	3
		TCU	
7	SR-0001	National Reality Seminar I	2
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	SR-0002	National Reality Seminar II	2
	IQ-0416	Kinetics and Chemical Reactors	3
	IQ-0452	Production Control	3
	IQ-0433	Laboratory of Separation Operations of Phases	5
9	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
10	IQ-0551	Chemical Process Desing	4
	IQ-0526	Process and Integration Operation	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Were you able to analyze the social impacts of the engineering activities preformed?
2. Did you have the ability to analyze the environmental impacts of engineering activities performed?
3. Could you understand the interaction of engineering projects in the communities where they are performed?
4. Could you understand the economic implications of the projects and activities carried out?
5. Did you know the legal implications of your actions as a professional?
6. Did you know the requirements and implications of the project regarding health and safety of those involved?
7. Could you estimate the uncertainty associated with each potential impact of the project or activities performed?
8. Could you manage the risk associated with the potential impacts of projects or activities performed?
9. Could you understand and apply the concept of sustainability in project design for solving engineering problems?

51% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "impact of engineering on society and the environment" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.10 Ethics and equity: An ability to apply professional

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

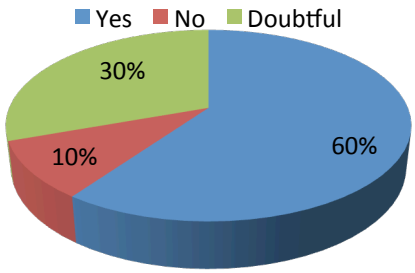
Semester	Code	Name	Hours/ week
1	EG-0124	Humanities I	8
2	EG-0125	Humanities II	8
3	QU-0201	Laboratory of Analytical Chemistry	6
5	QU-0213	Laboratory of General Organic Chemistry I	4
	IQ-0312	Mechanics	6
6	QU-0215	Laboratory of General Organic Chemistry II	4
	IQ-0331	Mesurement and Experimental Data Processing	6
7	SR-0001	National Reality Seminar I	2
	IQ-0451	Production Planning	3
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3
8	SR-0002	National Reality Seminar II	2
	IQ-0416	Kinetics and Chemical Reactors	3
	IQ-0452	Production Control	3
	IQ-0433	Laboratory of Separation Operations of Phases	5
	IQ-0590	Seminar for Graduation Projects	2
9	IQ-0553	Projects Evaluation	4
	IQ-0534	Laboratory of Separation Operations by Diffusional Methods	5
	IQ-0517	Process Control and Instrumentation	3
	IQ-0620	Quality Control	4
10	IQ-0556	Industrial Administration Principles	3
	IQ-0551	Chemical Process Desing	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Did you apply actions or practices that stimulated the development of ethical and responsible practice?
2. Was the ability to take responsibility strengthened throughout the years?
3. Did you learn to have equal treatment in all your actions?

60% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "ethics and equity" by the time of graduation.



Sourcee: Centro de Evaluación Académica, 2014

3.1.11 Economics and project management

The courses that contribute to this attribute are shown in the table below, indicating theirrespective lecture hours per week and the semester where it is taught:

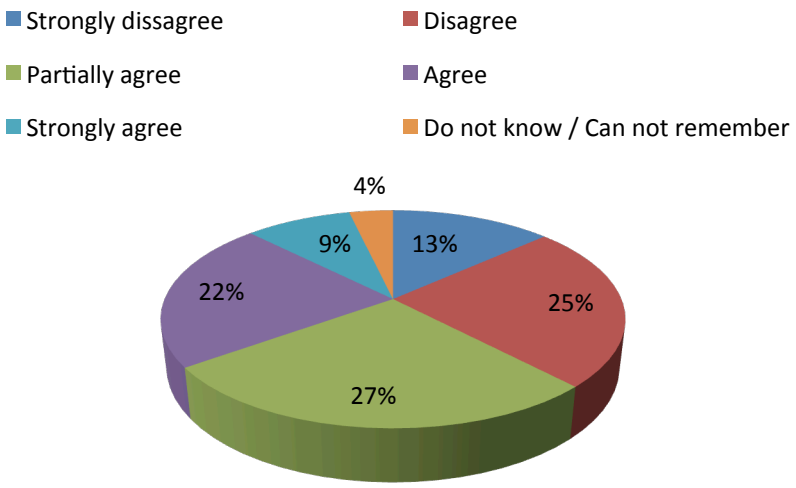
Semester	Code	Name	Hours/ week
7	IQ-0451	Production Planning	3
	IQ-0642	Bioengineering	3
8	IQ-0452	Production Control	3
9	IQ-0553	Projects Evaluation	4
	IQ-0517	Process Control and Instrumentation	3
10	IQ-0556	Industrial Administration Principles	3
	IQ-0551	Chemical Process Desing	4

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Were you able to adequately incorporate the economic variable in planning and implementation of projects?
2. Did you have the ability to manage engineering projects of any scope, applicable to your degree?
3. Could you apply the principles and good business practices to develop projects where you work?
4. Could you apply risk analysis for timely decision making?
5. Did you master the use of change management tools?
6. Did you have the ability to define the limitations and uncertainties associated with a particular project?

31% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "economics and project management" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

3.1.12 Life-long learning

The courses that contribute to this attribute are shown in the table below, indicating their respective lecture hours per week and the semester where it is taught:

Semester	Code	Name	Hours/ week
1	EG-0124	Humanities I	8
	EG-XXXX	Artistic Activity	3
	LM-1030	Strategies of reading in English	6
	MA-1001	Calculus I	5
2	EG-0125	Humanities II	8
	EF-XXXX	Sport Activity	2
3	MA-1004	Linear Algebra	5
5	IQ-0312	Mechanics	6
	QU-0212	General Organic Chemistry I	4
	QU-0213	Laboratory of General Organic Chemistry I	4
	IQ-0334	Thermodynamics I	5
6	IE-0303	Electrotechnics	5
	QU-0214	General Organic Chemistry II	4
	QU-0215	Laboratory of General Organic Chemistry II	4
7	SR-0001	National Reality Seminar I	2
	IQ-0451	Production Planning	3
	IQ-0415	Materials Engineering	4
	IQ-0642	Bioengineering	3

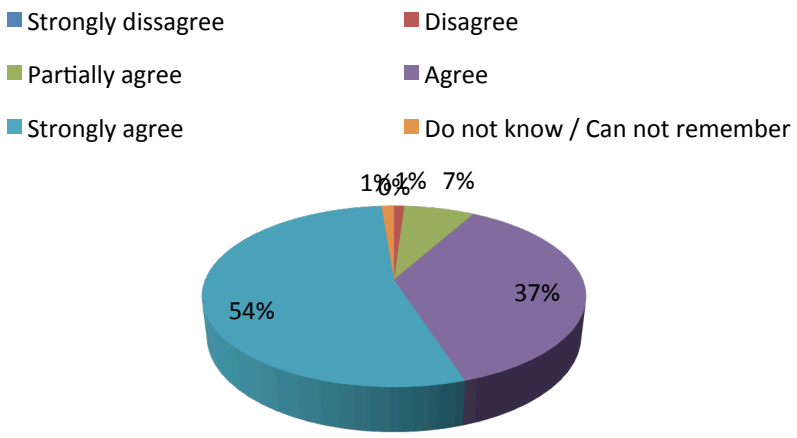
8	SR-0002	National Reality Seminar II	2
	RP-003	Repertorio (Foundations of sociology)	
	IQ-0416	Kinetics and Chemical Reactors	3
	IQ-0452	Production Control	3
9	IQ-0553	Projects Evaluation	4
	IQ-0517	Process Control and Instrumentation	3
	IQ-0620	Quality Control	4
10	IQ-0526	Process and Integration Operation	4
	IQ-0551	Chemical Process Desing	4
	IQ-0556	Industrial Administration Principles	3

To get the opinion of the graduates regarding this attribute, the following questions were asked:

1. Were you able to study independently on issues related to your career and professional practice?
2. Could you identify taining needs to meet the challenges of your job?
3. Could you cope and adapt to the changes in the discipline?
4. Could you cope and adapt to changes in the context in which you develop as a professional?
5. Did you have the ability to contribute to the advancement of knowledge in the area?

91% of the graduate population answered favorably these questions. The results obtained are presented in the following graph.

Agreement of graduates about having the attribute "life-long leaning" by the time of graduation.



Source: Centro de Evaluación Académica, 2014

In summary, around 70% of the graduates consider that the education recieved was in accordance with the attributes mentioned. These data are summarized in the following tables:

	A knowledge base for engineering	Problem analysis	Investigation	Design	Use of engineering tools	Individual and team work	Communication skills	Professionalism	Impact on society and the environment	Economics and Project management	Life-long learning	Average
Strongly dissagree	0,3	0	1	4,3	4,2	0,5	0,3	4,7	4,5	13,4	0	**3%**
Dissagree	3,4	2,3	2,3	11,5	13	2,3	1,9	12	15,5	24,5	1	**8%**
Partially agree	18	20,6	13,5	24,6	37,8	10,4	9,4	21,6	26,2	27,3	7,1	**20%**
Agree	34,9	45,3	45,6	36,3	30,5	30,5	37,9	35,2	28,6	22,4	36,9	**35%**
Strongly agree	43	31,3	37,5	21,4	13,8	54,9	49,3	25,8	22,2	8,9	53,8	**33%**
Do not know / Can not remember	0,5	0,5	0	1,9	0,8	1,3	1,3	0,8	3	3,6	1,3	**1%**
	100	100	100	100	100	100	100	100	100	100	100	**100%**

	Ethics and equity
Yes	59,9
No	9,7
Doubtful	30,5

It is noteworthy to mention that the lowest perceptions were in the following attributes:

- Design (57%)
- Use of Engineering Tools (44%)
- Impact of Engineering on Society and the Environment (51%)
- Economics and Project Management (31%)

In this regard, we consider that our Chemical Engineering Program offers the students relevant academic background and training in these areas, as it is mapped in Table 3.1.1; however, it is important to take into consideration all of the gathered reviews and comments in order make the necessary changes to improve graduates perception on these attributes.

3.2 Continual improvement

Table 3.2.1: Continual Improvement Process and Feedback

Discuss the specific results from Table 4 with respect to future program expectations. What conclusions do you draw from the specific data presented?
Summary of academic staff: in terms of equity, the participation of women faculty has increased; however, women should be further represented. Currently, women represent 30% of the faculty population. Regarding the teaching experience, 48% of the faculty staff has less than 5 years of work experience, 19% has 5 to 10 years of experience and 33% has more than 10 years of work experience. Summary of academic staff changes: It is important to note that in the last year, tree faculty members have gone into retirement. At the end of this year, 2 more faculty members could retire as well. On the other hand, there are teachers doing their graduate studies abroad and at least two more teachers that

will be starting their graduate studies abroad this year. Summary of program expenditures: This was a critical point, because the budget for laboratory equipment provided by the institution was limited. Thanks to the accreditation process, the Rector has supported with extraordinary budget for renewing in the short term our equipments.As a result, we have been able to equip our laboratories (unit operation, research, and computer labs). The faculty and the institution are aware of this need and efforts are being made. Enrolment and degree data: The necessary adjustments have been made to respond to the amount of graduates we are aware that the country requires. Changes have been made in the options available for students as graduation projects modalities. For example, the supervised professional practice modality was introduced in 2012. Supervised practice and final graduation project are the most used modalities. Also, by opening the chemical engineering program at the Caribbean Campus will increase the supply of graduates.
Who are the stakeholders consulted (or to be consulted) in the program revision process? How will the consultations take place?
The population to be consulted is compromised by teachers, students, graduates and employers. Consults would be held on the premises of the University of Costa Rica.
How are the results from data collection and analysis being used (or are planned to be used) in support of program improvement?
There are two plans for improvement of the degree. The first is an e-consultation to the graduate population, teachers, employers, faculty and administrative staff. The second is a program of visits to potential employers to better understand the demands; and to strengthen the link between the School and the industrial sector.
What specific actions have been planned or implemented as a result of the data collection and analysis with respect to expectations for and achievement of graduate attributes?
Important efforts are being made in the Faculty of Engineering in order to start working on the preparation and implementation of the graduate attributes. For example, several training courses have taken place. However, much work still needs to be done.

3.3 Students

3.3.1 Admission

To be admitted as a student of the University of Costa Rica, candidates must have their High School Diploma and pass an entrance exam. This exam tests the academic skills of the candidates and is prepared by specialized professors of the University of Costa Rica. The candidates must have a minimum score in order to be accepted at the University. Together with this exam, candidates must fulfill the requirements established in the High School Program. Completion of the High School Program and the test of their academic skills are unavoidable conditions to become a student at the University of Costa Rica. Once the candidates have been accepted as students, they can then enter the specific Engineering Program. Each School of the Engineering Faculty can accept only a limited number of students. Therefore, there is a policy to admit a limited number of students to the program. To choose among all the candidates that choose any of Engineering Programs offered by the Engineering Faculty as their first choice, the School selects those whose admission mark is the highest. The admission mark is obtained by a combination between the High School marks of the last two years and the score obtained in the academic skills test prepared by the University of Costa Rica. The process mentioned before is followed by all students, even by those who have completed courses in other institutions and can apply for credit transfer. (Credit transfer is carried out case by case by the corresponding commission created in each School for that purpose). The regulations for admission are shown in the Exhibit 2.