CACEI
Consejo de Acreditación de la Enseñanza de la Ingeniería, A.C.

Copaes
CONSEJO PARA LA ACREDITACIÓN DE LA EDUCACIÓN SUPERIOR, A.C.

CACEI's 2018 Reference Framework for Engineering

Criteria and Indicators

P- CACEI-DAC-03-DI03
Version 3
Valid as of January 8, 2020

Consejo de Acreditación de la Enseñanza de la Ingeniería, A.C.

CONSEJO DE ACREDITACIÓN DE LA ENSEÑANZA DE LA INGENIERÍA A.C.

CACEI's 2018 Reference Framewrok for Engineering. Criteria and Indicators.

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Valid as of January 8, 2020
In July 2021, version 3 was generated without substantial changes in criteria and indicators. For more details see Change and Revision Control section.

Index

ACRONYMS

AE	Graduate Attributes
CACEI	*Consejo de Acreditación de la Enseñanza de la Ingeniería, A.C.*
CD	Performance Criteria
CE	Evaluation Committee (Visiting Team)
CENEVAL	National Centre for Higher Education Assessment
COPAES	Council for the Accreditation of Higher Education
EGEL	General Exam for Graduates of Bachelor's Programs
EXANI-II	General Examination for Entering Bachelor's Education
GI	Stakeholders
IEA	*International Engineering Alliance*
IES	Higher Education Institution(s)
MR2018	CACEI's 2018 Reference Framework for Engineering
MR2021-TSU	CACEI's 2021 Reference Framework for TSU
OE	Educational Objectives
PE	Educational Program
PTC	Full Time Professor(s)
SIGA	*Accreditation Management and Information System*
TSU	*Técnico Superior Universitario*

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CHANGE AND REVISION CONTROL OF THE 2018 ENGINEERING REFERENCE FRAMEWORK					
VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
1	0 (20-10-2017)	NA	NA	NA	NA
1	1 (19-12-2017)	Vision, Mission Polícy, Objectives and Quality Values	(Update wording)	(Update wording)	Revision by the General Director
		Anexxes	Delete rubric	Delete rubric	The rubric is made independent as a document for easy handling
		Indicator 1.3 / Questions and evidence	Contained questions 1.3.8 and 1.3.9	Contained questions 1.3.8 and 1.3.9	These questions were either repeated or redundant with other indicators
	2 (06-12-2018)	Vision, Mission Polícy, Objectives and Quality Values	(Update wording)	(Update wording)	Revision by the General Director
		Indicator 1.3 / Questions and evidence	"Attach a comprehensive analysis of items 1.3.1 to 1.3.9 that justifies your answer."	"Attach a comprehensive analysis of items 1.3.1 to 1.3.7 that justifies your answer"	The questions have been eliminated; it is no longer necessary to mention them
		Annex 1: Minimum Contents for the Engineering Programs	The name of the PE Agronomical Engineering is modified	The name is changed to Agroindustrial Engineering.	The minimum contents described are for Agroindustrial Engineering programs, not for Agronomy
		Annex 1: Minimum Contents for the Engineering Programs	The minimum contents of Mechanical Engineering are added	(N/A)	The MR 2014 content is incorporated without a new definition for part of the TC to guide the PE
Version 2	0	Annex 2: Infrastructure,	The minimum	(N/A)	Request from the General Director

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VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
	(15-02-2019)	equipment, and facilities that must be available for the implementation of the subjects of the curriculum	contents of Chemical Engineering are added		
		Policies and guidelines for the accreditation process of undergraduate engineering programs	(N/A)	Added: "Additionally, any institution has the right to request a review of the opinion delivered for the assessed program; this will be developed through the replication process established by CACEI. For this purpose, the HEI must present and defend before the Accreditation Committee, with supporting evidence, the compliance with the standards observed for the indicators not met. The Accreditation Committee is responsible for issuing the final opinion in each case."	Update and improvement of CACEI procedures at the suggestion of the Washington Accord
		Assessment Methodology and Procedures	(N/A)	The following points and their description are added to the procedure: -Issuance of the	Update and improvement of CACEI procedures at the suggestion of the Washington Accord

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VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
				Predictamen. -Sending of the information complement. -Review of the information complement.	
		Assessment Methodology and Procedures - Figure 1	(N/A)	The process of *clarification of the committee's assessment* is incorporated into the Figure of the accreditation process	Update and improvement of CACEI procedures at the suggestion of the Washington Accord
		Vision, Mission Polícy, Objectives and Quality Values	(Update wording)	(Update wording)	Revision by the General Director
		Start of document	(N/A)	CHANGE AND REVISION CONTROL OF THE 2018 ENGINEERING REFERENCE FRAMEWORK is added	Suggestion of the Washington Accord
Version 2	1 (08-08-2019)	Annex 1: Minimum Contents for the Engineering Programs	Update of Annex 1	The following subsections are added: Description of Curriculum and curricular organization criteria and Attributes of graduation of engineering educational programs	Updating and strengthening of documents to support the accreditation process
		Annex 2: Infrastructure, equipment, and facilities that must be available to implement the curriculum subjects.	Update of Annex 2	The infrastructure and equipment requirements for electronic and biomedical engineering are added	Updating and strengthening of documents to support the accreditation process

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VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
		A. REQUIREMENTS TO CHANGE ACCREDITATION STATUS (FROM 3 TO 5 YEARS)	Adjustments to wording and figure	Adjustments to wording and figure	Updating and strengthening of documents to support the accreditation process
Version 2	2 (08-01-2020)	M. REQUIREMENTS TO CHANGE ACCREDITATION STATUS (FROM 3 TO 5 YEARS)	Information about the process	The information on the process and adjustment of figures is expanded	Updating and strengthening of documents to support the accreditation process
		N. MID-TERM REPORT	Information about the process	The information on the process and adjustment of figures is expanded	Updating and strengthening of documents to support the accreditation process
Version 3	0 (06-07-2021) What remains in this document is marked in blue	**ACKNOWLEDGEMENTS**	The entire section	ACKNOWLEDGEMENTS (Content unchanged)	On the occasion of the authorization of the new Framework of Reference 2021 for *Técnico Superior Universitario* programs (April 2021), the CACEI Board of Directors authorized the publication in a separate document of a document on "**Policies and Procedures for the Accreditation of Engineering Programs and *Técnico Superior Universitario* Associated with Engineering"** (July 2021). This action required separating the current sections related to the MR2018 indicator criteria and integrating them into another document. Several sections were
		A. INTRODUCCIÓN	The entire section	INTRODUCTION (Content unchanged)	
		B. MISSION, VISION AND OBJECTIVES	The entire section	It was transferred and updated in the new document "Policies and Procedures..."	
		C. QUALITY POLICIES AND VALUES	The entire section	It was transferred and updated in the new document "Policies and Procedures..."	
		D. GOVERNING BODIES AND COLLEGIATE BODIES	The entire section	It was transferred and updated in the new document "Policies and Procedures..."	

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VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
		E. CONCEPTUAL FRAMEWORK	The entire section	CONCEPTUAL FRAMEWORK (Content unchanged)	moved, most of them without changes in their content. The criteria and indicators remained unchanged, with only three corrections of apparent errors
		F. INTERNATIONAL ORGANIZATIONS OF WHICH CACEI IS A MEMBER OR WITH WHICH IT HAS AN AGREEMENT	The entire section	It was transferred and updated in the new document "Policies and Procedures..."	
		G. POLICIES AND GUIDELINES FOR THE ACCREDITATION PROCESS OF BACHELOR'S DEGREE PROGRAMS IN ENGINEERING	The entire section	It was transferred and updated in the new document "Policies and Procedures..."	
		H. METHODOLOGY AND ASSESSMENT PROCEDURES	The entire section	It was transferred and updated in the new document "Policies and Procedures..."	
		I. TECHNICAL DATASHEET	The entire section	It was transferred and updated in the new document "Policies and Procedures..."	
		J. SELF-ASSESSMENT CRITERIA	The entire section	Framework Criteria (Content unchanged)	
		K. SUMMARY OF INDICATORS ASSESSMENT AND	The entire section	It was transferred and updated in the new document "Policies and	

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VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
		STRENGTHS AND WEAKNESSES MATRIX		Procedures...".	
		L. REQUIREMENTS FOR PROGRAM ACCREDITATION	The entire section	Requirements for program accreditation (Content unchanged)	
		M. REQUIREMENTS TO CHANGE ACCREDITATION STATUS (FROM 3 TO 5 YEARS)	The entire section	Requirements to change accreditation status (from 3 to 5 years) It is updated as authorized in July 2021 in the new document "Policies and procedures ..."	
		N. MID-TERM REPORT	The entire section	It was transferred and updated in the new document "Policies and Procedures...".	
		O. METHODOLOGY FOR FOLLOWING UP ON RECOMMENDATIONS FOR SUBSEQUENT ACCREDITATIONS	The entire section	It was transferred and updated in the new document "Policies and Procedures...".	
		P. RECOMMENDATIONS TO THE INSTITUTIONS TO GENERATE CONDITIONS FOR ACCREDITATION.	The entire section	It was transferred and updated in the new document "Policies and Procedures...".	
		GUIDE FOR THE DEVELOPMENT OF THE SELF-ASSESSMENT	GUIDE FOR THE DEVELOPMENT OF THE SELF-	CRITERIA AND INDICATORS FOR ENGINEERING PROGRAMS	Changed the title

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CHANGE AND REVISION CONTROL OF THE 2018 ENGINEERING REFERENCE FRAMEWORK					
VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
		REPORT	ASSESSMENT REPORT		
			First paragraphs	Updated content	It is updated to refer to the new documents produced in 2020 and give it greater clarity
			Untitled, list of criteria and indicators 4.1. Achievement of program objectives. 4.2. Achievement of graduate attributes	It was left unchanged except 4.1, 4.2, and 6.4. 1. Assessment of the educational objectives of the program. 2. Assessment and achievement of the gradute attributes	Only lack of congruence in the indicators 4.1 and 4.2 was corrected; they were announced in one way and described in another
			Indicator 6.4 Is the EP supported by a sufficient and skilled set of people who facilitate the achievement of the educational objectives? Attach a description of the activities of the support areas and their impact on the achievement of the educational objectives of the PE	Indicator 6.4 Is the EP supported by a sufficient and skilled set of people that facilitate the achievement of the graduate attributes? Attach a description of the activities of the support areas and their impact on the achievement of the graduate attributes of the PE	
		Annex 1	Annex 1	ANNEX 1	

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VERSION	**REVISION**	**SECTION**	**Before**	**Now**	**Reasons for change**
				(Content unchanged)	
			Annex 1B: Graduate attributes of engineering education programs.	A complete replacement of section B was performed: CACEI's Graduate Attributes for engineering education programs and their international context	From work in 2020 by CACEI in the workshops, with professors and assessors, section B was updated with conceptual diagrams for each graduate attribute and compared with the Washington Accord of the IEA
		Annex 2	Annex 2	ANNEX 1 (Content unchanged)	
		Annex 3	Annex 1	ANNEX 3 (Content unchanged)	NA
		GLOSSARY	Glossary	GLOSSARY Some definitions were updated or eliminated (were repetitive with MR 2018 and with each other).	

ACKNOWLEDGEMENTS

The evolution of society and its institutions is a constant in humankind. As part of these, education is now advancing towards internationalization inevitably. With this in mind, the Consejo de Acreditación de la Enseñanza de la Ingeniería, A. C., (CACEI - Accreditation Council for Engineering Education, A.C.) focused its efforts to update its "*Framework for evaluation for accreditation purposes of engineering) programs*" (Accreditation criteria, namely MR2018), and will begin to apply these standards in January 2018.

This ambitious project, which we are confident will positively impact how engineers are prepared for a future that is already here, involves a concert of intelligence. It is the product of the intense work of engineering professionals who have contributed to the design and writing of this framework with their talent and experience in a disinterested and generous way. It is the result of days to which, in addition to the daily workloads, it was necessary to postpone work and personal projects, skipping hours of sleep and rest, to have enough time to generate the results that we share today with the academic community.

Sometimes, saying "thank you" is not enough to recognize the effort behind the hard work delivered to achieve a significant goal, such as the MR2018. However, due to their dedication and creativity, we acknowledge the members of the Academic Committee of the Marco de Referencia 2018 (MR2018) for their participation in this project, which they made possible:

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INTRODUCTION

The *Consejo de Acreditación de la Enseñanza de la Ingeniería, Asociación Civil* (CACEI), (Accreditation Council for Engineering Education) was formally established on July 6, 1994, as a civil association whose highest governing body is its Assembly of Associates. The associates represent higher education institutions (HEIs); professionals from engineering chapters; the federal government, represented by the General Directorate of Professions; and the productive sector, through the corresponding chambers and international organizations of engineering professionals.

CACEI is the first accrediting body established in our country. It plays a crucial role since it contributes to improving the quality of engineering education and provides timely, relevant, and objective information about it, which is of great value for educational institutions, students, professors, graduates, employers, and parents for decision making.

CACEI's objective is to support Mexican society in promoting social development based on the education of engineers who graduate from relevant educational programs of recognized quality. Its importance lies in the fact that the future of nations is associated with their insertion in the global knowledge society, and its graduates will have to fight for positions in a local, national and international context.

Accreditation is a process created to guarantee the quality and relevance of educational programs, seeking that they meet the minimum international standards recognized for good quality programs in engineering and promote in the institutions the culture of continuous improvement of educational programs, incorporating international trends for the education of engineers.

The accreditation process carried out in Mexico is voluntary. CACEI considers the criteria and standards internationally accepted by accrediting bodies similar to those of the Washington Accord. CACEI has been a provisional member since February 15, 2016, and those supervised by the Council for the Accreditation of Higher Education (Copaes).

Accreditation is carried out with the active participation of more than 2,000 peer evaluators from the academic and productive sectors throughout the country who have been trained in CACEI's evaluation methodology. Their performance is assessed on an ongoing basis.

Decisions on the quality of the evaluated educational programs are collegiate. The information provided to the institutions is used to support the decision-making process associated with their improvement. Such information gives HEIs objective and pertinent elements that lead to the generation of an improvement plan with objectives, goals, those responsible for them, strategies and programming defined to guide the implementation of the recommendations and, therefore, to the continuous improvement of the educational program.

The Framework of Reference for this 2018 version was designed collaboratively, with the support of the different collegiate bodies participating in CACEI's decision-making. The responsibility for the design was in charge of representatives of the Academic Committee formed by all the members of the Accreditation Committee, the Discipline Technical Commissions, and the Assembly of Associates and COPAES, seeking the representativeness of the engineering education institutions. The purpose of the Academic Committee was to design a Reference Framework that would incorporate the international trends and standards established by the Washington Accord and the requirements specified in the General Framework for the Accreditation Processes of Higher Level Academic Programs, 2016 of COPAES. This Framework, as well as the methodological process followed by CACEI, were in turn assessed by two internationally recognized engineering accreditation bodies: the Accreditation Board for Engineering and Technology (ABET) of the United States and the Canadian Engineers Accreditation Board (CEAB) of Canada, which issued recommendations already incorporated into the document.

CONCEPTUAL FRAMEWORK

This section aims to provide the group responsible for an institution with knowledge of the basic terminology used in the assessment and accreditation processes. The selection of the terms to be included carefully considered the language proposed in the General Framework for the Accreditation Processes of Higher Level Academic Programs 2016 of Copaes; since the objective of this proposal is to seek homogeneity of the terminology in the different accrediting bodies recognized by Copaes.

In other words, to carry out the evaluation processes for accreditation purposes, it is necessary to analyze a series of aspects related to academic programs; therefore, it is essential to have a guiding axis that allows establishing the technical-methodological guidelines for such purpose.

Several definitions used in the self-assessment and accreditation process are presented, which are fundamental for completing the instrument and preparing for the process comprehensively.

a. *External evaluation:* is the assessment of an educational program by external academics and professionals for diagnostic purposes.

b. *Accreditation:* is defined as a process to guarantee the quality of an educational program. The process is carried out by a body external to the higher education institutions, recognized for such function. Accreditation acknowledges the quality of academic programs considering the standards defined for a good quality program. It involves the assessment through standards and quality criteria previously established and disseminated by an accrediting body. The procedure includes a self-assessment of the program and an assessment by a team of external experts or faculty members. In all cases, it is a temporary accreditation for three or five years.

c. C*ACEI's object of study (target group*): engineering and higher technical university (TSU) educational programs for accreditation purposes.

d. *Criteria:* are those that share common characteristics, the reason for which the elements and indicators with common characteristics are grouped, which will be assessed by the different committees of evaluators defined by the Specialty Technical Commissions, formed by faculty members or professionals included in CACEI's Peer Evaluators List.

e. *Indicators or referents* are the statements that describe the quantitative elements (indicators) or qualitative elements (referents), or both, that are analyzed according to the previously established criteria through which the quality of specific aspects of the educational program is sought to be found. For an external evaluation for accreditation purposes, <u>all indicators are essential and must be fulfilled.</u>

f. *Specific guidelines for the evaluation:* these are the point of view to assess each criterion, indicator, or question. They are the references defined a priori, based on which will make value judgments. The most commonly used in CACEI's Reference Framework are:

   i. *Existence:* implies verifying whether the element to be assessed exists, is in force, officially authorized, known, used, and put into practice by the institution for the program. For example, the existence of the curriculum, under this criterion, is verified if the document exists, known by teachers and students, authorized by the governing bodies, registered in professions, and disseminated in the educational community.

   ii. S*ufficiency:* refers to the human and financial resources, laboratories, workshops, scientific and technological equipment, collections, computer equipment, software, and facilities that are indispensable for developing the educational program. It is assumed that these resources must be pertinent, suitable, and updated; in addition, they must exist in adequate quantity considering the potential subjects of the program and have specific characteristics of operation, availability, and accessibility for their users. For example sufficiency of computer equipment is assessed considering the number of students per computer, updated, with Internet and software required for the program.

   iii. *Relevance:* it assesses whether the curriculum, course program, learning unit, process, or element to be evaluated satisfies the needs to which it gave rise; that is, whether it is proper, adequate, congruent, or relevant under its purpose and function. For example: for the pertinence of the curriculum, assesses whether the creation of the plan was based on a study of social, economic, professional, and academic needs with the opinion of graduates and employers; an analysis of the labor field with the active participation of stakeholders, as well as professional trends and disciplinary and technological progress associated with the profession or discipline.

   iv. *Effectiveness*: assesses whether the process, program, or element complies with its objectives. For example: in the effectiveness of the admission process, it is assessed whether the process implemented leads the students who enter to meet the previously defined and disseminated admission profile required for students in the program; in the effectiveness of training, it is assessed whether, upon graduation, the student meets the minimum graduation profile using the undergraduate graduation exam (EGEL).

   v. *Efficiency:* assesses whether the process, program, or element meets the established objectives by optimizing the necessary resources.

g. *Evaluation standard:* describes the level of achievement that must reach each indicator or referent to comply with the requirements of each criterion. They are ideal or desirable values of an indicator previously established by the accrediting body, and that will serve to be contrasted with the values reached by the program.

h. *Self-assessment*: is the reflection made by the institution on the educational program considering the criteria, indicators, and standards defined by CACEI in its Reference Framework.

OVERVIEW

Reference Framework Criteria

The educational program must analyze and present information on 30 indicators distributed in six criteria during the Self-Assessment process. For each indicator, its description, the standard, self-assessment questions, and evidence required to support its compliance are indicated.

The 6 analysis criteria are:

1. Faculty. The educational program (PE) must demonstrate that the professionals who participate as faculty members are sufficient and relevant, have a good combination of academic and professional training, have an adequate distribution of substantive activities, are evaluated and supported for their improvement, and are involved in the adequacy of the curriculum. There must be processes for the selection, tenure, and retention of faculty members.

2. Students. The PE must demonstrate satisfactory and quality results in the procedures for admission, revalidation, monitoring of the student's school career, counseling, tutoring, and graduation of students within the institutional regulatory framework.

3. Curriculum. The PE must have defined and published its educational objectives, which must be congruent with the institutional mission, the needs of its stakeholders, and the CACEI criteria.

4. Assessment and Continuous Improvement. The PE must have a systematic evaluation process that considers the results of the assessment of its educational objectives, the achievement of the graduate attributes, and the school performance indexes, among others, with the representative participation of its stakeholders, which influences the continuous improvement of the PE.

5. Infrastructure and Equipment. The PE must have a systematic evaluation process that considers the results of the assessment of its educational objectives, the achievement of the graduate attributes, and the school performance indexes, among others, with the representative participation of its stakeholders, which influences the continuous improvement of the PE.

6. Institutional Support. The PE must demonstrate that the institutional support and leadership are based on efficient management processes and are adequate to ensure its quality and continuity and provide an environment in which the learning outcomes are achieved.

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Requirements for Program Accreditation

As described above, the accreditation process considers the evaluation of 30 indicators distributed into six criteria. Each indicator will be evaluated according to the following levels of compliance:

1	2	3	4
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	ACHIEVED or EXCEEDED

The accreditation process may award three possible outcomes: 1) Accredited for three years, 2) Accredited for five years, or 3) NOT accredited.

In the case of *Accreditation*, it may be granted for five or three years. The program must qualify the 30 indicators in compliance level 3 or 4 to achieve a five-year accreditation. A three-year accreditation will be granted to educational programs with four or fewer indicators assessed at compliance level 2, the remaining indicators being assessed at level 3 or 4. These cases may extend for two more years if the program demonstrates improvement of the indicators assessed at compliance level 2.

A *Non-Accreditation* decision will be issued in case the program assessed presents five indicators or more in compliance level 2; or presents one or more indicators assessed in compliance level 1.

Requirements to change accreditation status (from 3 to 5 years)

Programs achieving accreditation of three years may extend it for two more years if they demonstrate improvement in the indicators assessed at compliance level 2. For these purposes, the educational program must send CACEI a request for extension of the accreditation in not less than one year and not more than two years from the accreditation, which must be accompanied by a document that argues the improvement and evidence supports the request. The review of such documentation will be in charge of the Appeals Committee, which will review the evidence and arguments. In response to such a request, the committee will determine whether to ratify the three-year term or grant the extension for two more years. The request for extension may only be submitted once, and the evaluation of these cases may be subject to an evaluation visit to the institution to validate the improvement in the applicant program. It is essential to mention that for this request, only arguments and evidence should be presented for indicators assessed at level 2, *Partially achieved.*

Supporting policies, procedures and guidance

This document provides the institutions with guidelines and support for completing the self-assessment report, seeking to support the faculty members who will participate in the completion and discussion of each question. A description of the evidence that should support the answer provided is attached. It should be noted that the argumentation proposed for each indicator must be objective and precise.

The cédulas that must accompany the self-assessment report are described and must be completed in their entirety. Likewise, supporting documents are attached, such as the minimum contents and minimum laboratories for each engineering area and a glossary of terms to support them in the theoretical understanding of some terms that may have different conceptions in the faculty member context.

Other documents that should be consulted and are available on CACEI's website are:

- *Policies and Procedures for the Accreditation of Engineering Programs and Técnico Superior Universitarion with Engineering*.
- *Continuous Improvement Focused on Learning Outcomes. Guidelines for the Implementation of the 2018 CACEI's Reference Framework*.
- *Manual for Completing the Self-Assessment Report,* available on CACEI's website.
- *Rubric for evaluators*, which can also be helpful for educational programs.

CRITERION 1. FACULTY

The educational program (EP) must demonstrate that the professionals who participate as faculty members are sufficient and relevant, have a good combination of academic and professional training, have an adequate distribution of substantive activities, are evaluated and supported for their improvement, and are involved in the adequacy of the curriculum. There must be processes for the selection, tenure, and retention of faculty members.

Indicators

1.1. Faculty profile
1.2. Sufficiency of faculty members
1.3. Distribution of sustantive activities
1.4. Evaluation and development of the faculty members
1.5. Responsibility of the faculty members with the curriculum
1.6. Selection, tenure adn retention of faculty members

Indicador 1.1. Faculty profile

¿What is assessed?

It is assessed whether the faculty involved in delivering the program is adequate and has the necessary competencies according to the characteristics and curricular areas of the PE.

Standard

The faculty involved in delivering the program has the appropriate competencies and is committed to achieving the student's graduate attributes, considering the following factors:

- The level of academic education (background) of its members.
- Their institutional diversity of academic degrees, including the nature and scope of their professional experience.
- Their ability to communicate effectively.
- Their experience and competence in teaching, research and engineering design practice.
- Their productivity level, supported with scientific, engineering and professional publications.
- Their degree of participation in professional, scientific, engineering associations, and also programs to help society.
- Their interest in supporting the curriculum and extracurricular activities related to the PE.

Questions and evidence

Question	Evidence
1. Is the combination of factors of faculty in the program adequate for the achievement of the graduate attributes? Not adequate ☐ Some adequate ☐ Adequate ☐ Very adequate ☐	Attach *cédula 0* for each faculty member, including all relevant data concerning the following academic and professional characteristics: 1. Academic education. 2. Diversity of academic education. 3. Effective communication. 4. Experience and competence in teaching. 5. Research. 6. Practice in engineering design. 7. Productivity in research, technological development, patent or similar. 8. Participation in engineering chapters, professional associations, etc. 9. Participation in extracurricular activities of the program. 10. Participation in the analysis and updating of the program.

Question	Evidence
2. Is there a balance between faculty, regarding seniority and age? Yes☐ No☐	Attach *cédula* 1.1.1, in which the pertinent data regarding seniority and age are recorded for each member of the faculty.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 1.2. Sufficiency of faculty members

¿What is assessed?

It is assessed if the PE, according to its characteristics and enrollment, has enough faculty and they have the competencies to cover all the curricular areas of the curriculum. There should be a sufficient number of faculty to allow adequate levels of a) interaction between students and faculty, b) counseling and tutoring of students, c) service activities, d) professional development, e) interaction with representatives of industry and the profession, as well as with the students' employers.

Standard

The PE has sufficient and pertinent faculty to attend all the curricular areas of the curriculum. The faculty has the academic, professional, and didactic competencies to allow adequate levels in the performance of the substantive activities inherent to their responsibilities.

Questions and evidence

Question	Evidence
1. Does the PE have enough faculty to cover all areas of the curriculum, according to their characteristics and enrollment? Yes☐ No☐	Attach an analysis justifying the adequacy of the faculty. It is recommended to use statistics of the school population served per period and a summary table of the faculty to support such analysis.
2. Do the faculty attending the PE have the relevant competencies for their adequate academic performance?	Attach an analysis justifying the relevance of the academic staff. It is recommended to use a summary table of the academic background and

Yes☐ No☐	teaching and professional experience of the faculty that attend the PE.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐

Qualitative assessment (argumentation)

Indicator 1.3. Distribution of substantive activities

¿What is assessed?

It is assessed if the full-time professors have an adequate distribution of substantive activities in the context of the PE.

Standard

The tasks associated with academic activities are adequately distributed to full-time professors.

Questions and evidence

Question	Evidence
1. Do full-time teachers carry out a plan or program of their substantive activities for each school period or cycle? Yes☐ No☐	Attach a representative sample of the programs of substantive activities of the full-time professors, including the various areas of the curriculum (basic sciences, engineering sciences, applied engineering, design, etc.).
2. Is there a procedure that allows verifying the substantive activities performed by full-time professors and evaluating their results? Yes☐ No☐	Attach the procedure followed to verify the substantive activities performed by full-time professors and the evidence showing how the results of these activities are evaluated.
3. How do you assess the distribution of substantive activities for full-time professors participating in the program? Inadequate Some Adequate Adequate ☐ ☐ ☐	Attach a substantiated description that justifies your response.

Question	Evidence
4. How do you assess the degree (level) of interaction between students and faculty? Null Insufficient Adequate ☐ ☐ ☐	Attach a substantiated description that justifies your response.
5. How do you assess the degree (level) of counseling and mentoring of students? Null Insufficient Sdequate ☐ ☐ ☐	Attach a substantiated description that justifies your response.
6. How do you assess the degree (level) of faculty interaction with employers and practitioners in the profession? Null Insufficient Adequate ☐ ☐ ☐	Attach a substantiated description that justifies your response.
7. How do you assess, as a whole, the competence of the faculty to favor the achievement of the educational objectives of the PE? Null Insufficient Adequate ☐ ☐ ☐	Attach a comprehensive analysis of points 1.3.1 to 1.3.7 that justifies your response.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 1.4. Evaluation and development of the faculty members

¿What is assessed?

It is assessed whether a comprehensive, continuous, relevant, and efficient academic evaluation system exists and is in operation and whether it is linked to decision-making for the development of faculty.

Standard

An integral, continuous, pertinent, and efficient system for evaluating faculty exists and is in operation and is linked to decision-making for faculty development, including the participation of students, academic peers, and authorities.

Questions and evidence

Question	Evidence
1. Is there a comprehensive system for evaluating and updating faculty? Yes☐ No☐	Attach the formal document of the comprehensive faculty evaluation system, the instruments used, and an evaluation report.
2. Does the comprehensive evaluation system include the participation of: Students Yes☐ No☐ Academic peers Yes☐ No☐ Authorities Yes☐ No☐	Attach the reports of the last application to each group in the case of being considered in the system.
3. How do you assess the degree (level) of professional development of the faculty attached to the program? Null Insufficient Adequate ☐ ☐ ☐	Attach a substantiated description justifying your response.
4. How do you assess the degree (level) of pedagogical updating of the faculty participating in the program? Null Insufficient Adequate ☐ ☐ ☐	Attach a substantiated description justifying your response.
5. How do you assess the degree (level) of disciplinary updating of the faculty participating in the program? Null Insufficient Adequate ☐ ☐ ☐	Attach a substantiated description justifying your response.
6. Are the results obtained from the evaluation of the faculty included in the faculty development program? Yes☐ No☐	Attach the annual faculty development program, including an analysis of the impact of the evaluation on the development program.
7. Is the faculty given feedback after the evaluation? Yes☐ No☐	Attach at least three reports delivered to the faculty with evidence of receipt.
8. Are there policies and mechanisms aimed to the faculty associated with the results of their evaluation? Yes☐ No☐	Attach the document describing these policies or mechanisms and how they are disseminated and known by faculty.

Assessment

Quantitative assessment

NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 1.5 Responsability of the faculty members with the curriculum

¿What is assessed?

The role of the faculty is evaluated concerning: a) the creation, modification, and evaluation of courses, b) definition and revision of the educational objectives of the EP and the graduate attributes, and c) student outcomes.

Standard

There are documented and appropriate processes of the body or bodies integrated by academic personnel of the PE (council, committee, academy, or similar), in which they continuously and routinely review, analyze and make decisions, jointly with the authority, related to a) the creation, modification, and evaluation of courses, b) definition and review of the educational objectives of the PE and the graduate attributes and c) student outcomes. The results of these processes should be used systematically to contribute to the continuous improvement of the curriculum.

Questions and evidence

Question	Evidence
1. Is there an instance or instances integrated by faculty members who participate in the decision-making process of all relevant academic aspects of the curriculum? Yes☐ No☐	Attach the official document of how these faculty members are integrated, their mechanisms of functioning and operation, their periods of validity, and their levels of involvement and responsibility.
2. Is there a record of the meetings held and the matters discussed in them, of the instance(s) integrated by faculty that participate in the decision-making of all relevant academic aspects of the curriculum? Yes☐ No☐	Attach minutes of meetings held by that or those instances and the schedule (s) of the topics discussed and the agreements reached in each one of them. Consider at least the last three school periods.
3. Is there evidentiary documentation of the impact of the decisions made by the body or bodies of faculty members who participate in the	Attach a reasoned description indicating the impact of the decisions made by such body or bodies for at least the last three school terms. In

decision-making of all relevant academic aspects of the curriculum? Yes☐ No☐	particular, it is expected to provide information on a) the creation, modification, and evaluation of courses, b) definition and revision of the educational objectives of the PE and the attributes of the graduate, and c) student outcomes.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 1.6. Selection, tenure and retention of faculty members

¿What is assessed?

The existence and operation of processes for the selection and retention of faculty members are assessed, in which academic peers participate. Relevant work experience (professional, teaching, and research) and the evaluation results are considered to ensure that the faculty members respond to the profiles required by the PE.

The existence and use of mechanisms and resources to retain professors with good performance and good results in their evaluations are assessed.

Standard

The PE has a transparent institutional process for the selection and permanence of professors in which faculty members participate, and the candidates' academic background and relevant work experience are taken into consideration. The existence of mechanisms and resources for retaining professors with good performance and good results in their evaluations are also considered.

Questions and evidence

Question	Evidence
1. Is there a transparent institutional process for faculty selection? Yes☐ No☐	Attach documentation that exemplifies the process for the selection of faculty and its means of dissemination.

Question	Evidence
2. Does the faculty member selection process consider the candidate's academic background and work experience? Yes☐ No☐	Attach examples of the call for the selection of faculty that describe the profile required for the candidates.
3. Does the faculty selection process consider the performance of a competitive examination, sample class, or others with faculty members' peers? Yes☐ No☐	Attach an example of evidence, minutes of competitive examinations, sample class, or others, in which the criteria for assessing candidates are described.
4. Is there an institutional program for retaining professors with good performance and good results in their evaluations? Yes☐ No☐	Attach a description of the institutional program's mechanisms, resources, and results for the retention of qualified professors of the PE.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

CRITERION 2. STUDENTS

The PE must demonstrate satisfactory and quality results in the procedures for admission, revalidation, monitoring of the student's school career, counseling, tutoring, and graduation of students within the institutional regulatory framework.

Indicators

2.1. Admission
2.2. Revalidation, equivalency, and recognition of other studies
2.3. School trajectory (academic progress)
2.4. Counseling and tutoring
2.5. Graduation

Indicator 2.1. Admission

¿What is assessed?

The existence of an institutional process for the attraction, selection, admission, and induction of students to the PE is assessed considering the entrance profile.

Standard

The PE has a transparent process for the attraction, selection, admission, and induction of students to the PE considering the entrance profile.

Questions and evidence

Question	Evidence
1. Is there a promotional program of the PE that attracts students with the required entrance profile? Yes☐ No☐	Attach promotional documents such as brochures, posters, advertisements in newspapers and magazines. Could also provide the link to the web page where the PE is promoted. The analysis of the impact of the promotion program is attached.
2. Is there a standardized process for selecting candidates considering the entrance requirements established by the PE regulations? Yes☐ No☐	Attach the documents that indicate the requirements that the candidate to the PE must meet, adhering to the admission profile established in the regulations of the HEI. Attach the analysis of the impact of the standardized process for the selection of candidates.
3. Is there a transparent, standardized, and disseminated process for the admission of students to the PE? Yes☐ No☐	Attach a copy of the admission process for students to the PE. It must indicate the admission requirements, documents, payments, and procedures that the student must carry out and the department where they will carry them out. Attach the analysis of the impact of the transparent, standardized, and disseminated process for the admission of students.
4. Does an induction program for students accepted into the PE exist and operate? Yes☐ No☐	Attach evidence of the induction events that contemplate the institutional culture, philosophy and regulations carried out by the PE. Attach proof of the degree of satisfaction of students accepted to the PE concerning the induction program.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE	EXCEEDED

		DURATION OF THE ACCREDITATION	
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Qualitative assessment (argumentation)			

Indicator 2.2. Revalidation, equivalency, and recognition of other studies

¿What is assessed?

The processes corresponding to the institutional regulations to recognize credits obtained in other institutions, programs, or levels, credit transfer, or exchange studies are assessed.

Standard

A process exists and operates to revalidate, establish equivalency, and recognition credits obtained in other institutions, programs, or levels, transfer of credits, or exchange studies.

Questions and evidence

Question	Evidence
1. Does a process for revalidation, equivalency, and recognition of credits earned at other institutions, programs, or levels, transfer of credits, or exchange studies exist, and is it operational? Yes☐ No☐	Attach the normative documents and evidence of the process of revalidation, equivalence, and recognition of credits obtained in other institutions, programs, or levels, transfer of credits, or exchange studies.
2. Is the information of this process available to the stakeholders of the PE? Yes☐ No☐	Attach a substantiated description of the dissemination process of the normative documents of the process of revalidation, equivalency, and recognition of credits obtained in other institutions, programs, or levels, transfer of credits, or exchange studies.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 2.3. School trajectory (academic progress)

¿What is assessed?

Statistics and trends of the PE cohorts are assessed to detect areas of opportunity that may impact the establishment of improvement strategies for student performance.

Standard

The PE operates a process of monitoring progress of the cohorts that allows detecting areas of opportunity that influence the establishment of improvement strategies for the performance of students in their curriculum, as well as monitoring statistics and trends under the regulations of the PE considering indexes such as failure, lag, retention, dropout, graduation efficiency, results of comprehensive exams (EGEL or similar).

Questions and evidence

Question	Evidence
1. Is there a follow-up and analysis of statistics and trends by cohorts under the regulations of the PE that considers indexes such as failure, lag, retention, dropout, and desertion? Yes☐ No☐	Annex the analysis of the tables with failure, lag, retention, dropout, and dropout rates for at least the last three cohorts. Include the systematic strategies derived from them and the results of their implementation.
2. Are there strategies oriented to address the problems of efficiency and graduation? Yes☐ No☐	Attach evidence and analysis of the results of the strategies implemented to increase terminal and graduation efficiency, such as higher-level courses, EGEL, or similar, among others.

Assessment

Quantitative assessment			
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☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 2.4. Counseling and tutoring

¿What is assessed?

Institutional programs, services, counseling, and tutoring activities that support students in their progress in the curriculum are assessed.

Standard

The PE has institutional programs, services, counseling, and tutoring activities that support students in their progress in the curriculum to improve the retention and terminal efficiency of the PE.

Questions and evidence

Question	Evidence
1. Does a tutoring program exist and operate to support students in their progress through the curriculum to improve the program's retention and efficiency rates? Yes☐ No☐	Attach a substantiated description of the tutoring program and the analysis of its results in the retention and efficiency of the students of the PE.
2. Does an academic advising program exist and operate that supports students in their progress in the curriculum to decrease the failure rates of the PE courses? Yes☐ No☐	Include evidence that considers a representative sample of student identification or registration forms and reports of the tutoring program by generational cohort.
3. Does a medical and psychological services program exist and operate to support students in their advancement in the curriculum to improve the retention rate? Yes☐ No☐	Attach a substantiated description of the academic advising program and the analysis of its results to decrease the failure rates of the courses of the PE.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 2.5. Graduation

¿What is assessed?

The processes and policies for the graduation of students are assessed.

Standard

The PE has and operates a transparent, documented, and disseminated process of the policies established by the institution for the graduation of its students. The institution must verify that graduates have complied with the established graduation requirements.

Questions and evidence

Question	Evidence
1. Is there a transparent and disseminated process that publicizes the requirements and procedure for graduation? Yes☐ No☐	Attach the normative document of the graduation and degree process managed by the institution, the degree regulations and evidence of its dissemination, and the efficiency of its use.
2. Is there an analysis of the effectiveness of the different degree options? Yes☐ No☐	Attach the analysis of the effectiveness of the degree options.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

CRITERION 3. CURRICULUM.

The PE must have defined and published its educational objectives, which must be congruent with the institutional mission, the needs of its stakeholders, and the CACEI criteria.

Indicators

3.1. Stakeholders of the program
3.2. Relevance of the progam
3.3. Curricular organization

3.4. Congruence between the educational objectives of the PE and the mission of the institution.

3.5. Graduate attributes

3.6. Curricular flexibility

Indicator 3.1. Stakeholders of the program

¿What is assessed?

It is assessed that the PE has identified and defined the specific sectors of society (stakeholders) to which it is directed and the needs that its graduates can meet.

Standard

The PE has institutionally defined the interest groups (stakeholders) and the institution's mechanisms and strategies.

Questions and evidence

Question	Evidence
1. Have the different stakeholders, whose information is relevant, been institutionally identified and documented for the continuous improvement of the PE? Yes☐ No☐	Attach a document listing and justifying the inclusion of the stakeholders defined for the evaluation and follow-up of the PE.
2. Of the identified stakeholders, which ones have participated?	Attach a substantiated description describing the participation of the different stakeholders, supported by minutes or formal documents.
3. Do the educational objectives of the PE reflect the needs of the stakeholders? Yes☐ No☐	Attach a substantiated description justifying the congruence between the needs of the stakeholders and the educational objectives of the PE.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 3.2. Relevance of the program

¿What is assessed?

It is assessed whether the program currently responds to regional, state, or national needs, considering the analysis of the labor field, the follow-up of graduates, the opinions of employers and interest groups, professional trends, and disciplinary and technological progress. Moreover, whether it has a systematic review process in which interest groups participate to ensure its relevance and consistency with the needs, the institution's mission, and the academic unit where it operates.

Standard

The program must have a systematic review of the information from stakeholders, responding to the current training needs of the graduate, based on different studies, for example, graduate follow-up and employers' opinions, as well as its congruence with the mission of the institution and the academic unit where it operates.

Questions and evidence

Question	Evidence
1. Is there a systematic review process that incorporates relevant stakeholder feedback into the PE? Yes☐ No☐	Annex the curriculum design and evaluation methodology, including the procedure and the participation of the different stakeholders. It must include internal and external assessment, as well as the periodicity of the actions.
2. Are the educational objectives of the PE clearly defined? Yes☐ No☐	Attach a substantiated description justifying how the objectives of the PE respond to the needs detected.
3. Are the educational objectives of the PE disseminated to the public? Yes☐ No☐	Attach evidence that the educational objectives of the program are disseminated inside and outside the institution.
4. Does the PE operate a formal and systematic process that allows obtaining and periodically analyzing the opinion of graduates? Yes☐ No☐	Attach the last two analyses on the opinion of graduates.
5. Does the PE operate a formal and systematic process that allows obtaining and periodically analyzing the opinion of employers? Yes☐ No☐	Attach the last two employer opinion studies and their analysis.
6. Does the PE operate a formal and systematic process that includes studies of labor field needs to support its curricular modifications? Yes☐ No☐	Attach studies, procedures, or strategies that show that the new needs identified and validated by the stakeholders are incorporated in the improvement of the PE.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 3.3. Curricular organization

¿What is assessed?

It is assessed if the PE satisfies the specific requirements considering the following areas and their respective characteristics:

Basic sciences.- Understood as a sound education of the student. Basic sciences should provide students with knowledge and skills that address the study of concepts and theoretical solutions to problems related to basic sciences (mathematics, physics, chemistry, and biology for specific disciplines). Basic sciences develop the mathematical, logical-spatial, and reasoning tools and skills to predict and scrutinize scenarios, data analysis, and understanding of chemical and physical phenomena that allow the analysis and resolution of engineering problems. It must include a minimum of 800 hours under the guidance of a faculty member.

Engineering sciences.- Understood as the set of technical and methodological tools coming from different disciplines that allow the solution of fundamental engineering problems and that require for their achievement the adequate handling of the basic sciences and an appreciation of the essential elements of other engineering disciplines. It must include a minimum of 500 hours under the guidance of a faculty member.

Applied engineering and engineering design.- These two areas, together, must have at least 800 hours, considering the following minimums::

> **Applied engineering**.- Understood as the set of knowledge and skills involving applying mathematics and engineering sciences to practical problems of the discipline. It must include at least 250 hours under the guidance of a faculty member..
>
> **Engineering design.-** Understood as the integration of mathematics, natural sciences, engineering sciences, and complementary studies for the development of elements, systems, and processes to satisfy specific needs. This is a creative, interactive, and open process, subject to limitations governed by rules or legislation to varying degrees depending on the discipline. They may relate to economic, health, safety, environmental,

social, or other interdisciplinary aspects. It must include at least 250 hours under the guidance of a faculty member..

This means that the 300 hours to complete the 800 hours required by these two areas as a whole can be distributed among them considering the needs and emphases of the PE.

Social sciences and humanities.- Set of disciplines that seek to develop humanistic, ethical, social, and individual skills that address the study of philosophies, theories, concepts, and elementary solutions focused on analyzing social and humanistic problems of today's globalized world. It must include at least 200 hours under the guidance of a faculty member.

Economic-administrative sciences.- Set of knowledge and skills of the economic and administrative disciplines practical to understand the impact of the economic environment on engineering projects to plan, organize, manage, direct and control projects and processes and assess and interpret the results. It must include at least 200 hours under the guidance of a faculty member.

Complementary courses.- Set of knowledge and skills that contribute to engineering education. It includes languages, oral and written communication, sustainable development, the impact of technology on society, care of the environment, professional ethics, etc. It must cover at least 100 hours under the guidance of a faculty member.

The self-study guide must be integrated by establishing the points that must be evidence in the study plan: grid, course program, location in each area.

Standard

The PE considers in its curricular structure the areas and characteristics defined by CACEI.

Questions and evidence

Question	Evidence
1. Does the PE Curriculum comply with the areas, and their characteristics, defined by CACEI? Yes☐ No☐	Attach *cédulas* 3.3.1 a and 3.3.1 b and analyze the congruence with the six areas and the distribution in hours per area.
2. Is there a description of the programs of the different learning units, courses, or subjects? Yes☐ No☐	Attach official curriculum map (authorized and registered in the Dirección General de Profesiones).
3. Is there a defined curricular structure establishing the path students can follow in their training? Yes☐ No☐	Attach the 3.3.2 form for all subject programs, learning units, or courses identifying their nature (compulsory or elective) and an analysis of strengths and weaknesses placed that considers the requirements established by CACEI in the form.
4. Is there an institutional process that periodically reviews the achievement of the	Attach the curricular structure with a description of the paths that the different students can follow according to their characteristics

Question	Evidence
objectives of the courses, subjects, or learning units? Yes☐ No☐	(serialization, flexibility, among others) and the process followed for the review of compliance.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 3.4. Congruence between the educational objectives of the PE and the mission of the institution

¿What is assessed?

It is assessed whether the educational objectives of the PE are congruent with the mission of the institution.

Standard

The program's educational objectives are defined, published, assessed, and congruent with the institutional mission and the mission of the faculty member's academic unit where the program is located.

Questions and evidence

Question	Evidence
1. The educational objectives are defined and published? Yes☐ No☐	Attach evidence that the educational objectives of the EP are disseminated within and outside the institution.
2. Are the educational objectives congruent with the institutional and academic unit's mission? Yes☐ No☐	Attach a substantiated description of how the program's educational objectives are consistent with the institution's mission and the faculty member's academic unit in which it operates.

Assessment

Quantitative assessment

NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 3.5. Graduate attributes

¿What is assessed?

It is assessed whether the graduate attributes of the PE are defined, disseminated, evaluated and if they are congruent with the educational objectives. The attributes to be developed in the graduate must include or be equivalent to the following:

Capacidad de:

1. Identify, formulate and solve engineering complex problems by applying the principles of basic sciences and engineering.
2. Apply, analyze and synthesize engineering design processes that result in projects that meet the specified needs.
3. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
4. Comunicarse efectivamente con diferentes audiencias.
5. Recognize their ethical and professional responsibilities in situations relevant to engineering and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.
6. Recognize the ongoing need for additional knowledge and have the ability to locate, evaluate, integrate and apply this knowledge appropriately.
7. Effectively work on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainties.

Standard

The graduate attributes of the PE are defined, published, and their achievement is evidenced, which must be congruent with the educational objectives and include or be equivalent to the graduate attributes established by CACEI (see Annex 1).

Questions and evidence

Question	Evidence
1. Are the graduate attributes defined and published, and known to students and faculty? Yes☐ No☐	Attach evidence that the program's graduate attributes are disseminated within and outside the institution.
2. Are the PE graduate attributes congruent with the educational objectives of the PE? Yes☐ No☐	Attach a substantiated description of how the program's graduate attributes are consistent with the program's educational objectives. Also, describe how the achievement of the graduate attributes prepares the program's graduates to fulfill the program's educational objectives. Attach *cédula* 3.5.2.
3. Do the graduate attributes of the PE include or are equivalent to the seven desirable attributes of the engineer, indicated in Indicator 3.5 of the 2018 Framework? Yes☐ No☐	Attach a reasoned description that describes how the program's graduate attributes include or are equivalent to the seven minimum attributes listed in Indicator 3.5. Attach *cédula* 3.5.3. If necessary, justify the equivalence between the attributes of the PE and those indicated in this Indicator.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 3.6. Curricular flexibility

¿What is assessed?

It is assessed that the PE incorporates and recognizes using non-conventional teaching-learning modalities. Furthermore, the PE contains elective courses, professional practice, social service, and company visits. The PE includes activities derived from student mobility, approved in other national and foreign institutions, as long as these contribute to the achievement of the graduate attributes of the PE.

Standard

The PE incorporates at least three strategies that make it flexible and responsive to the training needs of students considering the graduate attributes.

Questions and evidence

Question	Evidence
1. Does the PE integrate strategies or schemes that facilitate the incorporation of scientific and technological progress in its curricular design? Yes☐ No☐	Attach evidence of the existence of the process for the integration of different strategies defined in the curriculum to incorporate scientific and technological progress (elective courses, participation of experts from the productive sector, courses in the productive sector, among others).
2. Does the PE allow non-conventional modalities to develop the different courses, subjects, or learning units? Yes☐ No☐	Attach evidence that in its operation, the PE uses non-conventional learning modalities that support students in their training process (tutorials, online, distance, summer courses, among others).
3. In its design, does the PE incorporate the professional practices in a curricular or co-curricular manner or stays in the productive sector of incidence? Yes☐ No☐	Attach evidence of institutional recognition of training through supervised professional practice in the productive sector.
4. Does the PE have institutional policies that facilitate its flexibility? Yes☐ No☐	Attach evidence of the regulated process where the recognition of the different strategies used to give flexibility to the PE is identified.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

CRITERION 4. ASSESSMENT AND CONTINUOUS IMPROVEMENT

The PE must have a systematic evaluation process that considers the results of the assessment of its educational objectives, the achievement of the graduate attributes, and the school

performance indexes, among others, with the representative participation of its stakeholders, which influences the continuous improvement of the PE.

Indicators

4.1. Assessment of the educational objectives of the program.
4.2. Assessment and achievement of the graduate attributes.
4.3. Assessment of the school performance indexes.
4.4. Continuos improvement.

Indicator 4.1. Assessment of the school performance indexes

¿What is assessed?

It is assessed that the PE has a documented and systematic process that involves collegial groups and representatives of the PE stakeholders to periodically review the achievement of the educational objectives and ensure its relevance.

Standard

The PE operates a documented and systematic process that involves collegial groups and representatives of the PE stakeholders to periodically review the achievement of the educational objectives and ensure its relevance.

Questions and evidence

Question	Evidence
1. Is there a formal process for periodic assessment of the program's educational objectives with collegial groups and stakeholder representatives? Yes☐ No☐	Attach evidence of a systematic evaluation process of the objectives of the PE with the participation of representatives of collegiate groups and stakeholders of the same. For example, minutes of evaluation meetings, agreements, and follow-up, among others.
2. Are the conclusions or observations from the analysis of the periodic evaluation result used to make recommendations to improve the evaluation process, educational objectives, and compliance with established goals? Yes☐ No☐	Attach evidence that the agreements or conclusions of the evaluation meetings have generated specific actions to improve the program. These actions may include changes or improvements to the educational objectives, the way they are assessed, and their indicators and goals.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE	EXCEEDED

		DURATION OF THE ACCREDITATION	
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 4.2. Assessment and achievement of the graduate attributes

¿What is assessed?

It is assessed that the PE has adequate and documented processes to determine the degree of development of students' graduate attributes throughout the PE.

Standard

The PE has defined a systematic process to evaluate the development and achievement of the graduate attributes throughout the curriculum, with adequate evaluation mechanisms, indicators, and goals.

The PE periodically analyzes the assessment results together with representatives of the program's stakeholders to make recommendations to be taken into account in the continuous improvement process.

Questions and evidence

Question	Evidence
1. For each graduate attribute of the program, is it defined… The mapping in the curriculum? Yes☐ No☐ The assessment tools? Yes☐ No☐ The performance indicators? Yes☐ No☐ The results collection process? Yes☐ No☐	Attach each graduate attribute of the program, how it is mapped within the curriculum, what assessment tools or instruments are used, what indicators are defined to assess it, justifying the fulfillment of the attribute, the frequency of assessment, and the goals expected to be achieved. Attach *cédulas* 4.2.1, 4.2.1a and 4.2.1b. Note**:** the evidence should be organized by attribute.
2. Is there a systematized process to ensure the graduate attributes' continuous development, measurement, and achievement? Yes☐ No☐	Attach evidence of the mechanisms followed for the operation of the process, both for the development and measurement and achievement of the graduate's attributes. Evidence of the participation of authorities and professors in the process must be attached.
3. Are the findings or observations from the analysis of the periodic assessment result used to	Append evidence that the conclusions from the evaluation meetings have generated specific

make recommendations to improve the assessment process, the graduate attributes, and the achievement of established goals?	actions to improve the program. These measures may include changes or improvements to the graduate attributes, how they are assessed, indicators, goals, among others.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 4.3. Assessment of the school performance indexes

¿What is assessed?

It is assessed that the PE has adequate and documented processes to measure and analyze school performance indexes such as failure, lag, retention, dropout, efficiency rate, graduation rate, results of integrative exams, etc., to establish intervention actions to improve the improvement PE.

Standard

The PE has defined and in operation adequate processes to measure and analyze school performance indexes such as failure, lag, retention, dropout, efficiency rate, graduation rate, etc., to establish intervention actions for the improvement of the PE.

Efficiency should be calculated based on 1.5 times the duration of the study plan.

Questions and evidence

Question	Evidence
1. Are the school performance indices mentioned in this criterion adequately and systematically measured and analyzed? Yes☐ No☐	Attach a substantiated description and evidence that explains and shows that these performance indexes are adequately and systematically measured and analyzed for the PE. Attach *cédula* 4.3.1.
2. Are there results of comprehensive exams (national standardized tests similar to EGELs)? Yes☐ No☐	Attach a substantiated description that describes whether students in the program participate in nationally standardized comprehensive exams and the results are presented and discussed.

Question	Evidence
3. Are the results used to follow up on the program? Yes☐ No☐	Attach a substantiated description describing the monitoring and follow-up process for these indicators, including who is responsible.
4. Are the conclusions or observations of the analysis of the school performance indexes used to implement intervention actions to improve the PE? Yes☐ No☐	Attach evidence of intervention actions for the improvement of the PE.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 4.4. Continuous improvement

¿What is assessed?

It is assessed that the PE has defined a systematic evaluation process with the participation of collegiate groups and stakeholders representatives, supported by the results obtained in the assessment of educational objectives, graduate attributes, school performance indexes, and additional information.

It is assessed that the PE uses the evaluation process results to define strategies, plans, and specific actions that contribute to its continuous improvement in the achievement of its educational objectives, the achievement of the graduate attributes, the school performance indexes, and other defined indicators.

Standard

The PE has defined and operating a formal and systematic process for the periodic review of its results, considering the assessment of its educational objectives, graduate attributes, school performance indexes, and other indicators; in addition to involving collegiate groups related to the program, as well as representatives of the PE's stakeholders.

The EP has one or more clearly defined and documented improvement cycles due to the periodic assessment.

Questions and evidence

Question	Evidence
1. Is there a formal process defined for periodic assessment and continuous improvement of the PE? Yes☐ No☐	Attach evidence of the precise definition of a systematic evaluation process of the PE for its continuous improvement. Attach *cédula* 4.4.1.
2. Are the assessment results of the educational objectives and graduate attributes of the program used in this process? Yes☐ No☐	Attach a substantiated description describing whether the results of the assessment of the program's educational objectives and graduate attributes are used in the evaluation process. Explain how these results are used.
3. Does the process involve collegial groups related to the program and representatives of the program's stakeholders? Yes☐ No☐	Attach evidence of the participation of the program's collegiate groups and representatives of the program's stakeholders in the evaluation process.
4. Are the evaluation and continuous improvement process in operation? Yes☐ No☐	Attach evidence showing that the evaluation and continuous improvement process is in operation.
5. Is there at least one closed improvement cycle to visualize the complete implementation of the continuous improvement process? Yes☐ No☐	Attach evidence of results from at least one closed continuous improvement cycle, explaining how evaluation results are reflected in program improvement actions.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

CRITERION 5. INFRASTRUCTURE AND EQUIPMENT

The PE must have sufficient infrastructure and equipment, security conditions, access to computer resources and library services, available user guides and manuals, maintenance, modernization, and updating programs to meet their own needs.

Indicatores

5.1. Classrooms, laboratories, cubicles, and support offices.
5.2. Computer resources
5.3. Information center
5.4. User and safety manuals
5.5. Maintenace, modernization, and upgrading

Indicator 5.1. Classrooms, laboratories, cubicles, and support offices

¿What is assessed?

The sufficiency and state of use of the facilities are assessed, considering: a) Classrooms, laboratories, and workshops under school enrollment, area of knowledge, didactic modality, and type of subject; b) Cubicles for faculty members to work and live together; c) Spaces for support offices and the development of cultural and sports events and activities; d) Accessibility to the infrastructure for people with different abilities.

Standard

Classrooms.- The number of classrooms and their characteristics are congruent to meet the needs of the PE, considering the enrollment and the educational model, as well as the furniture in adequate quantity and condition.

Laboratories.- The laboratories and workshops that support the PE are sufficient, considering the standards established by CACEI; they have the appropriate equipment and manuals and operate with the safety and hygiene measures set by the current norms and the furniture in adequate quantity and condition.

Cubicles and other workspaces for faculty members.- Cubicles and workspaces for faculty members are sufficient and functional to allow them to carry out their substantive activities and the furniture in adequate quantity and condition.

Sports, cultural and academic facilities.- The sports, cultural and educational facilities are sufficient to meet the enrollment and support the integral formation of students and the furniture in adequate quantity and condition.

Other support and service spaces for the educational community.- Support and service facilities for the academic community are sufficient, functional, and comply with current safety, hygiene, signage, and accessibility standards, as well as furniture in adequate quantity and condition.

Questions and evidence

Question	Evidence
1. Classroom characteristics are: Sufficient Yes ☐ No☐ Lighting Adequate ☐ Inadequate☐ Ventilation Adequate ☐ Inadequate☐ Noise insulation Adequate ☐ Inadequate☐ Audiovisual equipment Adequate ☐ Inadequate☐ Furnishing Adequate ☐ Inadequate☐ Accesibility Adequate ☐ Inadequate☐ Conectivity Adequate ☐ Inadequate☐ Hygiene Adequate ☐ Inadequate☐ *Cédula 5.1.1*	Attach a justification of why assigned each of the grades in items a through i. Note: Accessibility; see the glossary. Replicate *cédula* 5.1.1 for each of the types of classrooms that affect the EP.
2. Do the laboratories and workshops that attend the PE comply with the Standards established by CACEI? Yes☐ No☐	Attach a comparative analysis of CACEI's requirement vs. what is used in the operation of the PE. Attach *cédula* 5.1.2. for each laboratory that provides services to the PE.
3. The characteristics of the laboratories and workshops are: Sufficient Yes ☐ No ☐ Funcionality Adequate ☐ Inadequate☐ Safety Adequate ☐ Inadequate☐ Noise insulation Adequate ☐ Inadequate☐ Furnishing Adequate ☐ Inadequate☐ Accesibility Adequate ☐ Inadequate☐ Conectivity Adequate ☐ Inadequate☐ Hygiene Adequate ☐ Inadequate☐ Audiovisual equipment Adequate ☐ Inadequate☐ Not Apply ☐ *Cédula 5.1.3*	Attach the justification of why each of the grades in items a to i were assigned. Note: Accessibility; see the glossary. Replicate *cédula* 5.1.3 for each one of the laboratories that affect the EP.
4. Are the cubicles and workspaces for faculty members sufficient and functional? Yes☐ No☐	Attach the description and analysis of the characteristics and general situation of the cubicles and workspaces of the faculty members participating in the program. In this analysis, it is necessary to consider furniture, availability, connectivity, accessibility, safety, and hygiene.

Question	Evidence
5. Are there relevant spaces to carry out activities that support the integral development of students? Yes☐ No☐	Attach the description and analysis of the characteristics and general situation of the spaces for academic, sports, and cultural activities for students participating in the program.
6. Are the support and service spaces for the educational community sufficient and functional? Yes☐ No☐	Attach the description and analysis of the characteristics and general situation of the support and service spaces for the educational community. This analysis must consider the cafeteria, hydro-sanitary facilities, gardens, common areas, accessibility, and others.
7. Are there actions for quality assurance and continuous improvement of classrooms, laboratories, cubicles, and support offices? Yes☐ No☐	Attach a substantiated description describing the analysis and the actions implemented for continuous improvement.

Assessment

Quantitative assessment			
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Qualitative assessment (argumentation)			

Indicator 5.2. Computer resources

¿What is assessed?

The existence and sufficiency of computer resources are assessed, including computer equipment, simultaneous access capacity, connectivity, and essential and specialized software, whether free or licensed, its updating and technical support, considering the characteristics and enrollment of the PE.

Standard

The PE has sufficient and adequate computer resources considering its characteristics and enrollment.

Questions and evidence

Question	Evidence
1. Are the IT resources sufficient and adequate to meet the characteristics and enrollment of the PE? Yes☐ No☐	Attach the current analysis between the supply of computer resources (computer equipment, simultaneous access capacity, connectivity, and essential and specialized software, whether free or licensed) and the needs demanded by the PE in its different courses, subjects, or learning units.
2. Is the computer equipment sufficient, and does it meet the needs of its users? Yes☐ No☐	Attach the formal document and the statistics that support the level of use and degree of satisfaction concerning the computer equipment.
3. Is connectivity sufficient, and does it meet the needs of its users? Yes☐ No☐	Attach the formal document and the statistics that support the level of use and degree of users' satisfaction concerning connectivity.
4. Is the essential and specialized software sufficient, up-to-date, and meets the needs of its users? Yes☐ No☐	Attach the formal document and statistics that support the educational community's level of use and degree of satisfaction concerning the software required by the PE (essential and specialized software, whether free or licensed and its update).
5. Is the technical support required by the IT resources timely, sufficient and adequate? Yes☐ No☐	Attach an analysis of the degree of satisfaction of the technical support users.
6. Are there actions in place for quality assurance and continuous improvement of IT resources? Yes☐ No☐	Attach a narrative describing the analysis and actions implemented for continuous improvement.

Assessment

Quantitative assessment			
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☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 5.3. Information center

¿What is assessed?

The existence of sufficient, adequate, and effective services of an Information Center in support of the objectives of the EP is assessed, particularly its capacity to serve users, as well as the currency and availability of information resources.

Standard

The PE has sufficient, adequate, and effective services of an Information Center to meet the needs and achieve the educational objectives of the PE. It has updated personnel and infrastructure considering technological advances to provide proper attention to the PE's faculty members.

Questions and evidence

Question	Evidence
1. Are the Information Center services, physical and remote, sufficient, adequate, and practical to meet the needs of the PE? Yes☐ No☐	Attach the analysis that considers the degree of satisfaction between the services offered by the current Information Center and the needs of the students and professors of the PE in their different courses, subjects, or learning units. This analysis should support the different surveys applied to users (room and home loans, attention to acquisition requests, response to availability, and remote access needs, among others).
2. Are there quality assurance actions and a continuous improvement plan for these services? Yes☐ No☐	Attach the catalog of the collection of information resources available in printed or electronic form. Include the capacity and schedule of attention to the students of the PE.
3. Is there use, conformity, and acceptance of library services by the students of the PE? Yes☐ No☐	Include the capacity and schedule of attention to the students of the PE.
4. Is there currency and scientific-technological currency of the information resources pertinent to the PE? Yes☐ No☐	Attach the satisfaction survey of attention to the students of the PE.

Assessment

Quantitative assessment

NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 5.4. User and safety manuals

¿What is assessed?

The existence, validity, and availability of guides and manuals for proper tools, equipment, computer resources, and available laboratories are assessed. These documents should emphasize the safety aspects of users, equipment, spaces, and contingency plans.

Standard

There are guides and manuals for the appropriate and safe use of the different tools, equipment, computer resources, and laboratories available, strategies or methods followed to provide adequate guidance to users, and contingency plans for the various facilities and equipment.

Questions and evidence

Question	Evidence
1. Do the guides and manuals for the use of tools, equipment, computer resources, and laboratories exist to meet the needs of the PE? Yes☐ No☐	Attach an analysis and a list of the guides and manuals to use tools, equipment, computer resources, and laboratories related to the program. Consider their availability and validity.
2. Do the guides and manuals include the safety aspects of users, equipment, and spaces? Yes☐ No☐	Attach samples that this is fulfilled both in the guides and in the manuals of the tools, equipment, computer resources, and laboratories related to the program.
3. Do the guides and manuals include the safety aspects of users, equipment, and spaces? Yes☐ No☐	Attach the document describing the procedure to carry out the orientation of students. Include lists of students who have been duly prepared to use tools, equipment, and laboratories.
4. Are there contingency plans in case of accidents or claims in facilities or equipment related to the program? Yes☐ No☐	Attach the contingency plans to respond to the main types of accidents and events in equipment and facilities related to the program.

Question	Evidence
5. Are contingency plans periodically made known and implemented to the faculty members? Yes☐ No☐	Attach evidence that the contingency plan is periodically made known to the faculty members and carried out drills.
6. Are there actions in place for quality assurance and continuous improvement of contingency plans? Yes☐ No☐	Attach a substantiated description that supports the analysis and actions implemented for continuous improvement.

Assessment

Quantitative assessment			
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Qualitative assessment (argumentation)			

Indicator 5.5. Maintenance, modernization and upgrading

¿What is assessed?

The existence of and compliance with a preventive and corrective maintenance program for equipment and facilities, as well as a program for updating or modernizing them, is assessed.

Standard

Existence of and compliance with a preventive and corrective maintenance program for equipment and facilities and a program to update or modernize them.

Questions and evidence

Question	Evidence
1. Does the EP have maintenance programs? Preventivo Yes☐ No☐ Correctivo Yes☐ No☐	Attach the formal document of preventive and corrective maintenance validation in the PE, signed by the corresponding authority.
2. Does the PE have programs for updating or modernization of equipment and facilities? Yes☐ No☐	Attach the formal document of validation of the updating or modernization program of equipment and facilities of the PE, signed by the corresponding authority.

Question	Evidence
3. Do the maintenance, updating, or modernization programs for equipment and facilities have scheduled dates and compliance dates? Yes☐ No☐	Attach, at least, a compliance report with the maintenance, updating, or modernization programs of equipment and facilities, with evidence of receipt of the same by the corresponding authority.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

CRITERION 6. INSTITUTIONAL SUPPORT

The PE must demonstrate that the institutional support and leadership are based on efficient management processes and are adequate to ensure its quality and continuity and provide an environment in which the learning outcomes are achieved.

Indicatores

6.1. Institutional leadership
6.2. Institutional services
6.3. Finacial resources
6.4. Support personnel

Indicator 6.1. Institutional leadership

¿What is assessed?

It is assessed that the PE has an organizational structure, rules, and institutional leadership, proving certainty to the entire administrative, faculty, and student community about the policies and regulations in operation. The PE has planning documents that allow decision-making, evaluation, and monitoring of the development and improvement of the PE.

In addition, it is assessed that the person in charge of the PE must have a profile related to it. He or she must demonstrate the ability to take the initiative, manage, convene, promote, and evaluate the PE effectively and efficiently.

Standard

The PE has an organizational structure, current regulations, and institutional leadership, which provide certainty to the entire administrative, faculty, and student community about the policies and rules in operation, as well as the planning documents that allow making decisions, assessing, and following up on the development and improvement of the PE.

Questions and evidence

Question	Evidence
1. Is there a clearly defined organizational structure that supports the effective operation of the PE? Yes☐ No☐	Attach the organizational structure and a narrative of its functioning concerning the operation of the EP.
2. Is there a regulation defining the functions for each position described in the organizational structure and the rights and obligations of the community members? Yes☐ No☐	Attach a formal document describing the functions for each position described in the organizational structure and the rights and obligations of the members of the community.
3. Do the PE, the faculty member, and the institution have articulated and coherent development plans? Yes☐ No☐	Attach the action or development plans that include the mission, values, principles, vision, policies, programs, and strategies that guide the development of the program and show evidence of their dissemination, how they are followed up and how they are assessed.
4. Does the coordinator or person in charge of the PE have an academic background or experience related to the program and have the competencies for educational management? Yes☐ No☐	Attach an extensive curriculum vitae of the coordinator or person in charge of the PE, including supporting documents.

Question	Evidence
5. Is there any systematized mechanism to know the level or degree of acceptance that the PE and its graduates have in the different sectors of the environment? Yes☐ No☐	Attach evidence of the application of the mechanism and results on the level of acceptance of the PE and its graduates in the environment.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

Indicator 6.2. Institutional services

¿What is assessed?

It is assessed whether the PE has sufficient, timely, and effective institutional, faculty member, and administrative support services to achieve its educational objectives.

Standard

There are sufficient, timely, and effective institutional, faculty member, and administrative support services for the achievement of the educational objectives of the PE.

Questions and evidence

Question	Evidence
1. Does the PE offer the student the faculty member supports such as tutoring, academic advising, guidance, and counseling? Yes☐ No☐	Attach an analysis with evidence of the operation of the faculty member support services to students and its impact on the improvement of the PE indicators.
2. Does the PE offer the student the administrative supports that facilitate their entrance, permanence, and graduation? Yes☐ No☐	Attach an analysis with evidence of the operation of administrative support services for students and their impact on improving the PE indicators. This includes school control, graduation, treasury, scholarships, social service, labor exchange, professional internships, among others.

Question	Evidence
3. Does the PE offer the student the following services: medical, integral health, and wellness? Yes☐ No☐	Attach an analysis with evidence of the operation of health and welfare services for students and their impact on improving the PE indicators.
4. Does the PE link with the different sectors using diverse strategies to strengthen the student's education? Yes☐ No☐	Attach an analysis with evidence of the different strategies to strengthen student training and their impact on the improvement of the PE indicators. Include linkage and extension services through the results of the actions derived from the agreements.
5. Does the PE have a mechanism that favors decision-making considering relevant information obtained from the various institutional support services? Yes☐ No☐	Attach an analysis and evidence of the impact of the various institutional support services.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 6.3. Financial resources

¿What is assessed?

It is assessed whether the financial resources of the PE are sufficient to achieve its objectives.

Standard

The PE has sufficient financial resources to achieve its objectives.

Questions and evidence

Question	Evidence
1. Are the available financial resources sufficient for the operation and improvement of the PE? Yes☐ No☐	Attach an analysis with evidence of the financial resources allocated for the operation and improvement of the PE that were used following the needs of the PE.

Question	Evidence
2. Are resources additional to the regular budget obtained and applied to the PE? Yes☐ No☐	Attach an analysis with evidence that the additional resources favor the development of the PE. Include patronage activities, linkage projects, extension services, fees, professional services, among others.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
☐	☐	☐	☐
Qualitative assessment (argumentation)			

Indicator 6.4. Support personnel

¿What is assessed?

It is assessed whether there is sufficient and trained support personnel to develop support activities that ensure, within the scope of their competence, the fulfillment of the objectives and goals of the PE.

Standard

The support personnel is sufficient and trained to develop support activities that ensure, within the scope of its competence, the fulfillment of the objectives and goals of the PE.

Questions and evidence

Question	Evidence
1. Is the PE supported by a good and skilled set of people who facilitate the achievement of the graduate attributes? Yes☐ No☐	Attach a description of the activities of the support areas and their impact on the achievement of the graduate attributes of the PE. This includes laboratory, workshops, consulting rooms, offices, library services, psychological support, professional orientation, medical service, school services, cultural and sports activities, among others.

Question	Evidence
2. Are there mechanisms in place to know the degree of satisfaction of the faculty members of the PE with the support services? Yes☐ No☐	Attach the analysis of the information obtained from the mechanisms to determine user satisfaction with the support services.

Assessment

Quantitative assessment			
NOT ACHIEVED	PARTIALLY ACHIEVED	ACHIEVED, BUT AT RISK OF BREACHING DURING THE DURATION OF THE ACCREDITATION	EXCEEDED
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Qualitative assessment (argumentation)			

CÉDULAS

The following is a description of the information requirements of the questionnaires that can be downloaded from the CACEI website. Before assessing, it is crucial to download the most updated version. This description should not replace the careful reading of the instructions contained in each one of them.

Criterion 1. Faculty

- *Cédula* 0, one for each faculty member. Record relevant data regarding their academic background, diversity in educational background, effective communication, experience and competence in teaching, research, design practice, engineering design practice, productivity in research, technological development, patent, or similar, participation in colleges, professional, scientific and engineering associations and programs to support society, involvement in extracurricular activities related to the PE, participation in the analysis and updating of the curriculum.
- *Cédula* 1.1.1 should record the pertinent data regarding their academic background, type of contract, seniority, teaching training, participation in professional associations, course load, and teaching assessment for each faculty member.

Criterion 3. Curriculum

- *Cédulas* 3.3.1 a, 3.3.1 b, and Summary of c*édulas* 3.3.1 a and 3.3.1 b, record the curricular organization of the courses, subjects, or learning units by area and type of hours (theoretical or practical).
- *Cédula* 3.3.2, identify and record for all subject programs, learning units, or courses: their nature (compulsory or optional) and an analysis of strengths and weaknesses identified that considers the requirements established by CACEI in the format.
- *Cédula* 3.5.2, register the mapping of the PE's graduate attributes with its educational objectives.
- *Cédula* 3.5.3, register if necessary to justify the equivalence between the attributes of the PE and those of CACEI.

Criterion 4. Assessment and Continuous Improvement

- *Cédulas* 4.2.1, 4.2.1 a and 4.2.1 b, for each graduate attribute of the program record how it is mapped within the curriculum, what assessment tools or instruments are used, what indicators are defined to assess it, the frequency of assessment and the compliance goals that are expected to be achieved.
- *Cédula* 4.3.1 records the school performance indexes by cohort.
- *Cédula* 4.4.1 records the improvement plan that includes goals, actions, expected results, deadlines for their fulfillment, and responsible parties as part of its periodic assessment and continuous improvement process.

Criterion 5. Infrastructure and Equipment

- *Cédulas* 5.1.1 record the characteristics of each of the different types of classrooms.
- *Cédulas* 5.1.2, record the equipment for each of the laboratories that provide services to the PE. Only the laboratory equipment associated with the practices, simulations, or activities performed by students and professors of the PE assessed are listed.
- *Cédulas* 5.1.3 record the characteristics of each of the different laboratories that provide service to the PE.

ANNEX 1: MINIMUM CONTENTS FOR ENGINEERING PROGRAMS.

A) DESCRIPTION OF CURRICULUM AND CURRICULAR ORGANIZATION CRITERIA

Duration of the curriculum:

The total duration of the curriculum must be specified, which in no case can be less than the equivalent in instructional time, at the university level, of 2600 hours. For activities other than exhibitions, laboratories, tutorials, or workshops, such as research projects, internships, and industry practicums, the Institution must report the equivalent in hours under the supervision of a facilitator, indicating the procedure used for such calculation.

The Accreditation Council may consider situations that deviate from this approach and methodology, provided that a convincing documented justification is presented to support them. That evidence is provided that innovation in engineering education is in progress under the Educational and Academic Model declared by the Institution.

Minimum components of the curriculum

The contents of the Learning Units or subjects of the curriculum for a bachelor's degree in engineering, taught in a national HEI, for assessment purposes are grouped into seven categories:

Basic Sciences, minimum 800 hours; Engineering Sciences: minimum 500 hours; Engineering Design: minimum 250 hours and Applied Engineering, with a minimum of 250 hours but the combination of both must not be less, to 800 hours. Social sciences and humanities, minimum 200 hours; economic and administrative sciences, to meet the needs of administration, finance, governance, among others, with a minimum of 200 hours; and complementary courses: minimum 100 hours.

Basic sciences

It includes mathematics for higher university level, physics, and chemistry with practical work in the laboratory and biology with a laboratory for bioengineering. Mathematics comprises at least the topics corresponding to linear algebra, differential and integral calculus, differential equations, probability, statistics, and numerical analysis. The minimum must be 800 hours.

Engineering sciences

Engineering sciences involve applying mathematics and natural sciences to the analysis and solution of practical problems. They involve the development of numerical or mathematical techniques and modeling, simulation, and experimental processes. These contents must be pertinent to the "state of the art" of the profession. They may include several of the following aspects, as appropriate to the nature of each discipline: resistance of materials, thermodynamics,

fluid mechanics, solid mechanics, electrical circuits, electronic systems, automatic control, environmental sciences, soil mechanics, computer sciences, transport phenomena, materials sciences, aerodynamics, and geotechnics.

The inclusion of content from other engineering professions, different from those of the program itself, should also be favored to make possible the valuation and exposure to the multidisciplinary perspective. In developing engineering science content, the program must be encouraged to be at the "state of the art" level in using relevant engineering tools. Adequate laboratory experience must be ensured as a complement to the theoretical aspects of the subjects in which instruction in safety principles, standards, and procedures must be present.

Engineering design

Engineering design integrates mathematics, natural sciences, engineering sciences, and social sciences to develop elements, systems, and processes to satisfy specific needs. It is a creative, interactive, and open-ended process, subject to the constraints imposed by standards, regulations, economic, health, safety, environmental, or societal factors, as appropriate. The curriculum must culminate in a significant relevant design experience, integrates the knowledge and skills acquired throughout the educational process, and exposes students to the concepts of teamwork and project management. This experience must be supervised by a professor qualified for the professional practice of engineering. For CACEI, the learning result must consist of the generation of a product or process, improving the same, or adapting to a different context.

Applied engineering

It integrates the application of basic sciences, engineering sciences considering the social, economic, and environmental context in the solution of engineering problems, taking care of compliance with standards, social, economic, and environmental impact, and using appropriate technological tools. The educational program in its final phase must seek that students develop a terminal project that integrates the axes of the curriculum and addresses the solution of real problems of the context in a real scenario.

Social sciences and humanities

The curriculum must be oriented to develop a social awareness of the impact of technical solutions in both design and applied engineering. In this category, problems of Mexico associated with engineering, ethics, legislation, and standards are addressed, as well as topics related to work and interpersonal relationships. The basis for analyzing the social impact of a technical engineering solution is acquired.

Economic-administrative sciences

The curriculum must have a core of learning units oriented to develop the graduate's competencies to administer, manage, assess results, plan and negotiate an engineering project, and manage personnel. It includes planning tools, administration, unit costs, marketing, financial engineering, and others that allow determining the economic viability of a project and its impact.

Complementary courses

The curriculum also includes topics and activities associated with strengthening the soft skills that are so important for an engineering professional. This category incorporates courses such as study habits and classes declared seal in some IES, creativity, entrepreneurship, etc.

B) CACEI GRADUATE ATTRIBUTES FOR ENGINEERING EDUCATION PROGRAMS AND THEIR INTERNATIONAL CONTEXT.

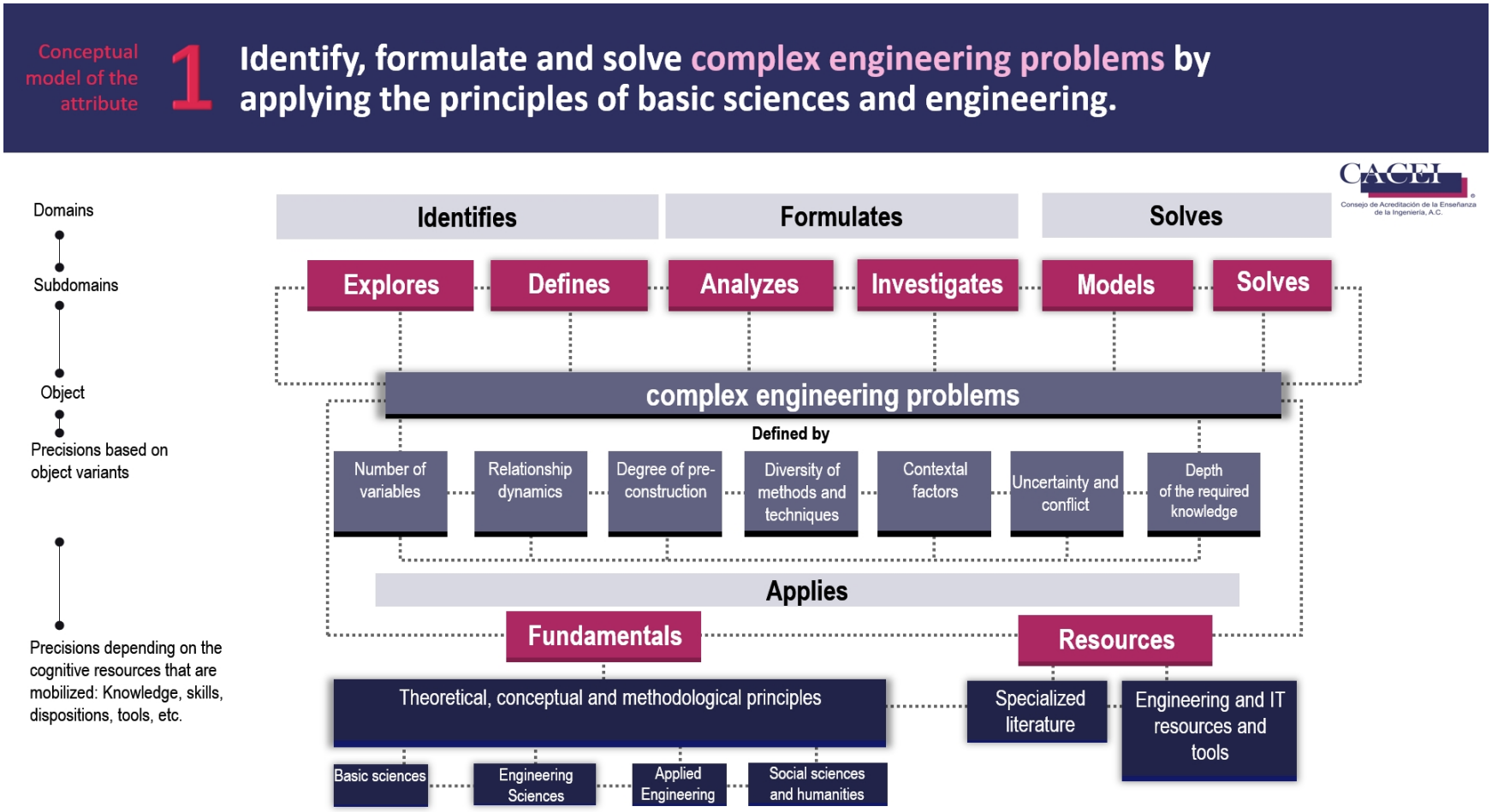
Graduate attributes are defined as: "(...) a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level" (IEA, 2013). The educational program being assessed must demonstrate the effectiveness and relevance of the policies, monitoring systems, and actions it carries out to assess and verify the achievement of the attributes in the educational process of graduates.

The following conceptual diagrams are presented for each of the graduate attributes to contribute to:

- The substantiation of the equivalence of educational programs seeking CACEI accreditation.
- The alignment of learning throughout the curricula.
- The collegial deliberative work of faculty and students.

The diagrams show domains, sub-domains, the object of work, and precisions in the function of the variants of this one. The fields of knowledge on which they are based and the tools and concepts applied in general terms are described.

Graduate attribute 1. Identify, formulate and solve engineering complex problems by applying the principles of basic sciences and engineering.



Graduate attribute 2. Apply, analyze and synthesize engineering design processes that result in projects that meet the specified needs.

Conceptual model of the attribute

2 Apply, analyze and synthesize engineering design processes that result in projects that meet specified needs.

CACEI
Consejo de Acreditación de la Enseñanza de la Ingeniería, A.C.

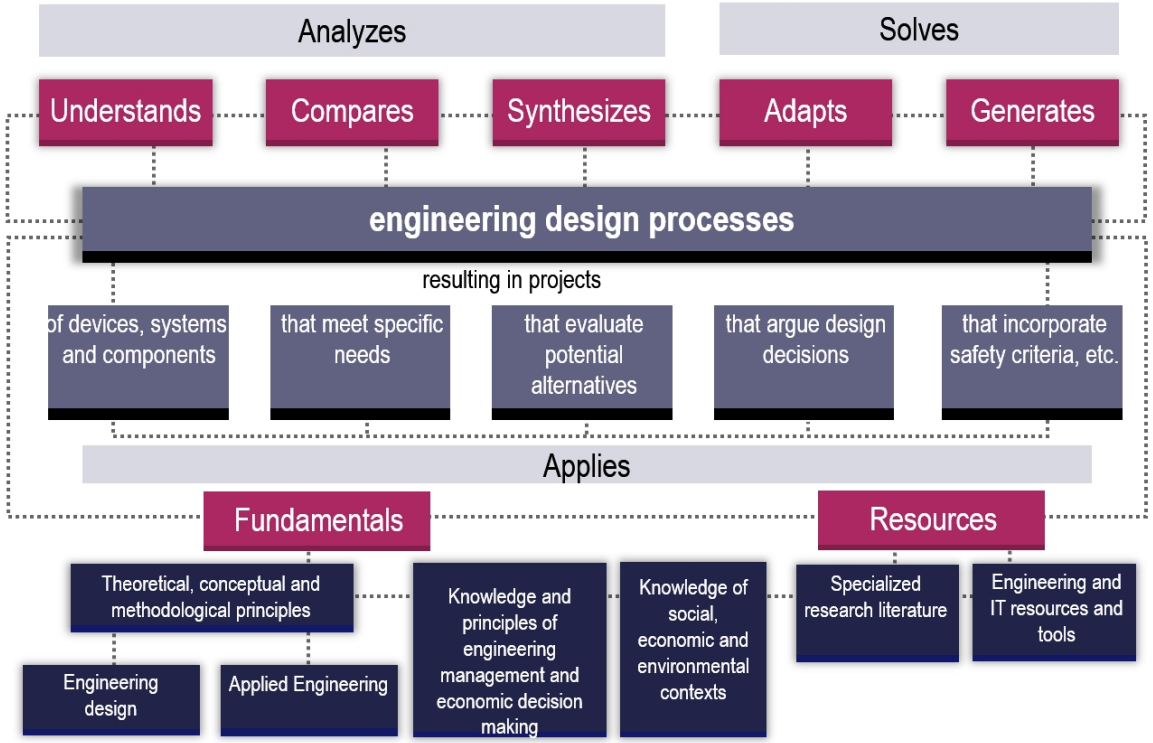
Domains

Subdomains

Object

Precision of descriptors based on object variants

Precisions depending on the cognitive resources that are mobilized: Knowledge, skills, dispositions, tools, etc.



Graduate attribute 3. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Conceptual model of the attribute

3 Develop and conduct appropriate experimentation; analyze and interpret data and use engineering judgment to draw conclusions.

CACEI
Consejo de Acreditación de la Enseñanza de la Ingeniería, A.C.

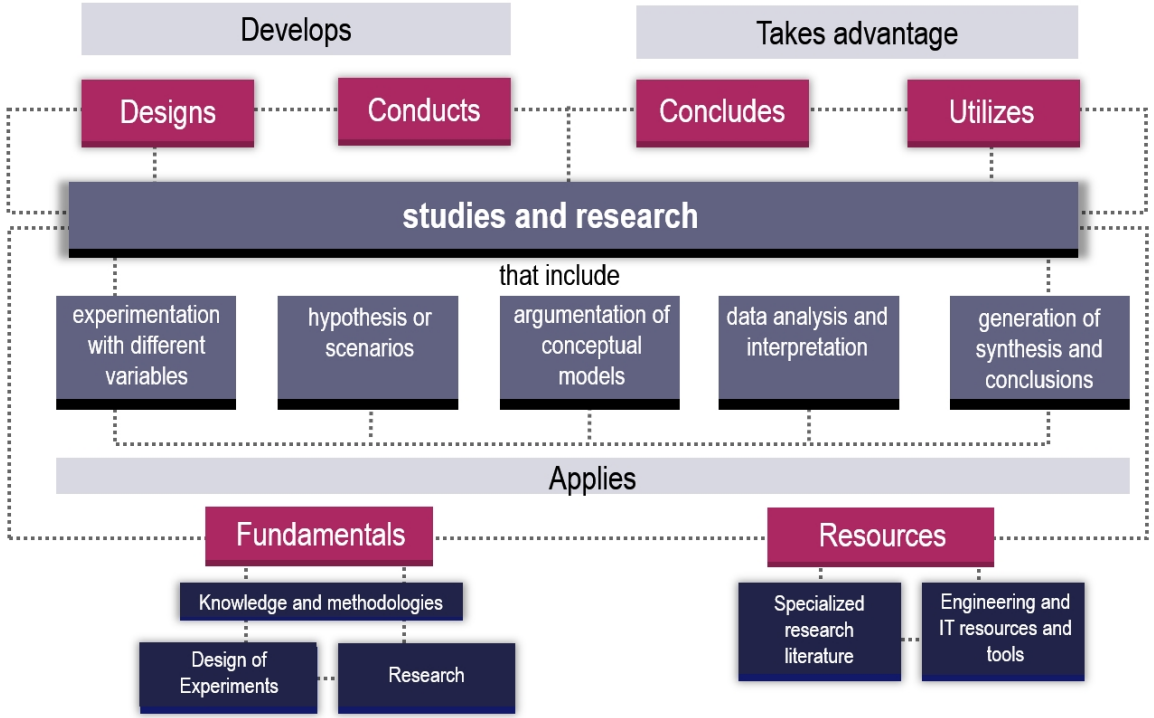
Domains

Subdomains

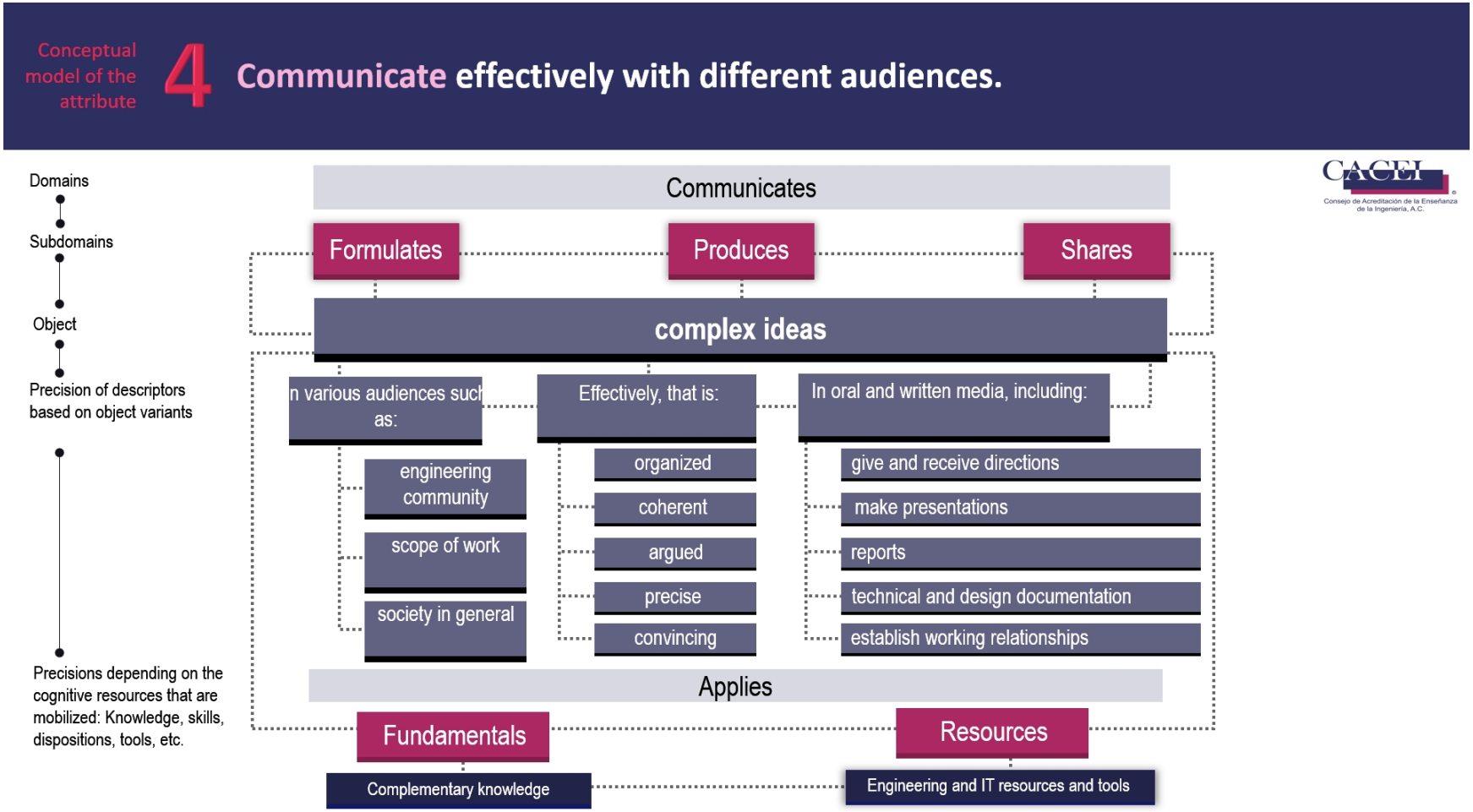
Object

Precision of descriptors based on object variants

Precisions depending on the cognitive resources that are mobilized: Knowledge, skills, dispositions, tools, etc.



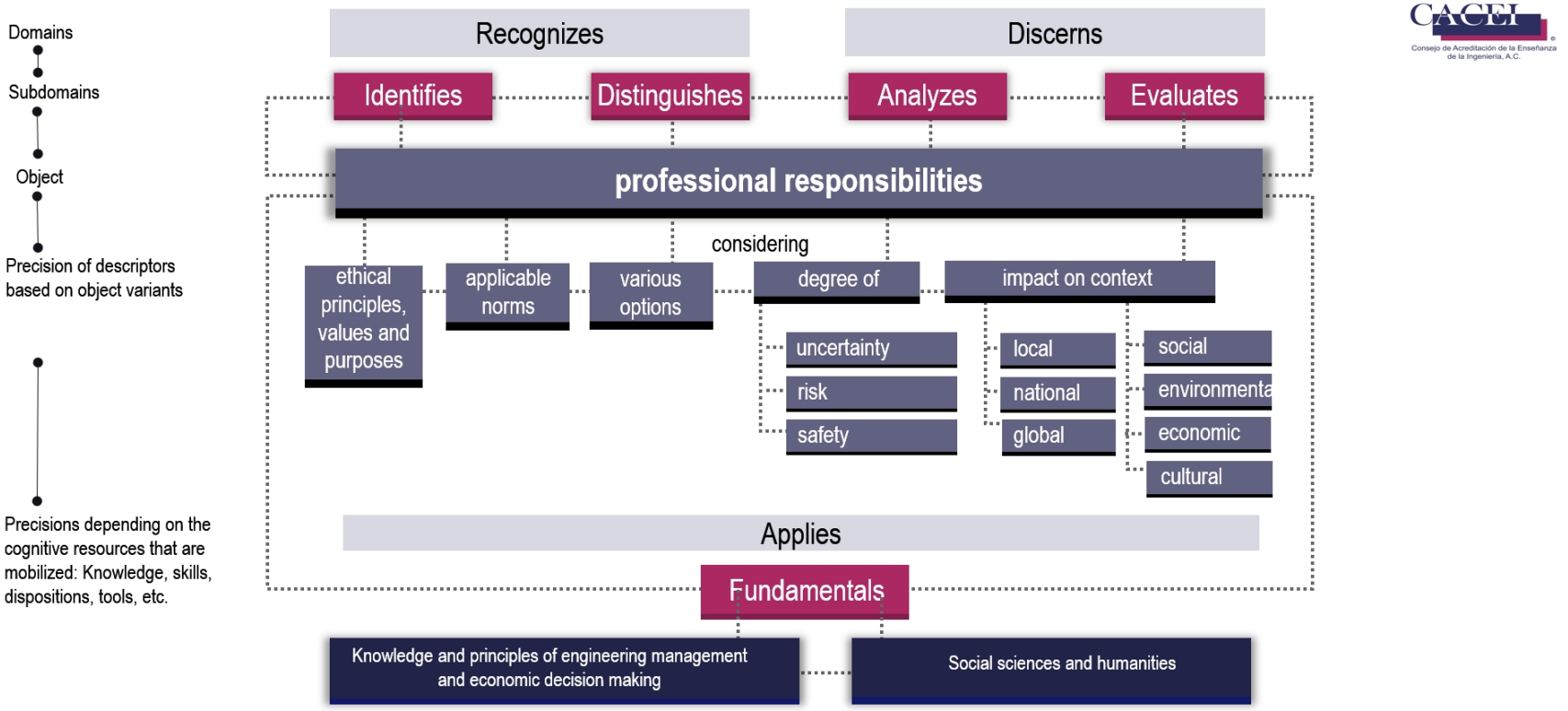
Graduate attribute 4. Communicate effectively with different audiences.



Graduate attribute 5. Recognize their ethical and professional responsibilities in situations relevant to engineering and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.

Conceptual model of the attribute **5**

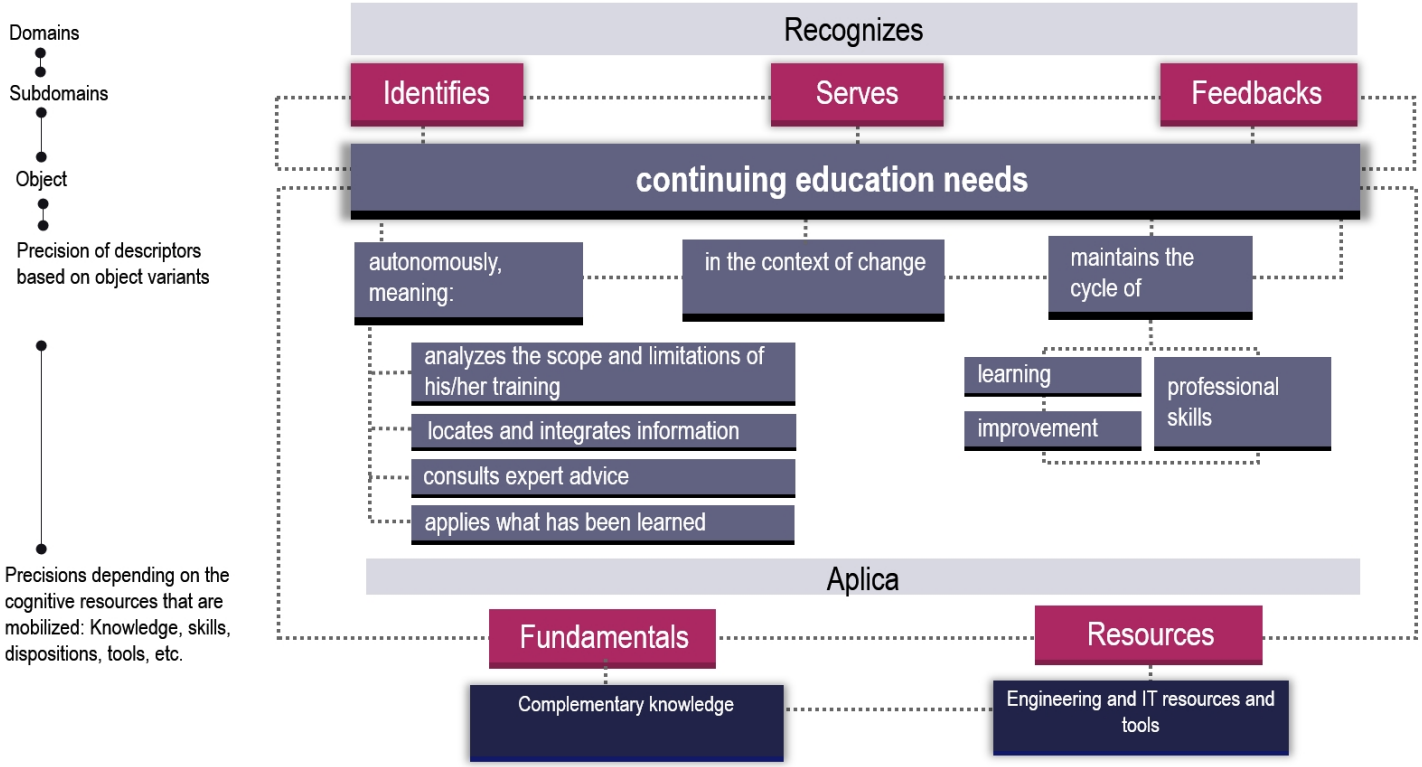
Recognize their ethical and professional responsibilities in situations relevant to engineering and make informed judgments, which consider the impact of engineering solutions in the global, economic, environmental and social contexts.



Graduate attribute 6. Recognize the ongoing need for additional knowledge and have the ability to locate, evaluate, integrate and apply this knowledge appropriately.

Conceptual model of the attribute

6 Recognize the ongoing need for additional knowledge and have the ability to locate, evaluate, integrate, and apply this knowledge appropriately.



Graduate attribute 7. Effectively work on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainties.

Comparative Analysis of CACEI and Washington Accord Graduate Attributes

Washington Accord Graduate Attributes	
Engineering Knowledge.	**WA1:** Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to the solution of complex engineering problems.
Problem Analysis: Complexity of analysis	**WA2:** Identify, formulate, research literature and analyse *complex* engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (WK1 to WK4)
Design/ development of solutions: Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified	**WA3:** Design solutions for *complex* engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (WK5)
Investigation: Breadth and depth of investigation and experimentation	**WA4:** Conduct investigations of *complex* problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
Modern Tool Usage: Level of understanding of the appropriateness of the tool	**WA5:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to *complex* engineering problems, with an understanding of the limitations. (WK6)
The Engineer and Society: Level of knowledge and responsibility	**WA6:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (WK7)

Washington Accord Graduate Attributes	
Environment and Sustainability: Type of solutions.	**WA7:** Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (WK7)
Ethics: Understanding and level of practice	**WA8:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (WK7)
Individual and Team work: Role in and diversity of team	**WA9:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
Communication: Level of communication according to type of activities performed	**WA10:** Communicate effectively on *complex* engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Project Management and Finance: Level of management required for differing types of activity	**WA11:** Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
Lifelong learning: Preparation for and depth of continuing learning.	**WA12:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Source: Graduate Attributes and Professional-Competencies. Versión 3. June 21, 2013. *International Engineering Alliance*: http://www.ieagreements.org.

Summary of the substantial equivalence of CACEI and Washington Accord graduate attributes.												
	Washington Accord Graduate Attributes											
CACEI Graduate attributes	**WA1**	**WA2**	**WA3**	**WA4**	**WA5**	**WA6**	**WA7**	**WA8**	**WA9**	**WA10**	**WA11**	**WA12**
CA1: Identify, formulate and **solve engineering complex problems** by applying the principles of basic sciences and engineering.	X	X			X							
CA2: Apply, analyze and synthesize **engineering design** processes that result in projects that meet the specified needs			X		X							
CA3: Develop and conduct **appropriate experimentation**, analyze and interpret data, and use engineering judgment to draw conclusions.				X								
CA4: Communicate effectively with different audiences.										X		
CA5: Recognize their **ethical and professional responsibilities** in situations relevant to engineering and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.						X	X	X			X	
CA6: Recognize the ongoing need for **additional knowledge** and have the ability to locate, evaluate, integrate and apply this knowledge appropriately.												X
CA7: Effectively **work on teams** that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainties.									X		X	

Washington Accord Graduate Attributes					
WA1.	Engineering knowledge.	WA5.	Appropriate techniques.	WA9.	Team and individual work.
WA2.	Complex engineering problems.	WA6.	Engineering and society.	WA10.	Communication effective.
WA3.	Desing engineerign solutions.	WA7.	Sustainability and environment.	WA11.	Engineering management
WA4.	Research of complex problems.	WA8.	Ethical principles.	WA12.	Life-long learning.

CACEI's Knowledge Areas			
Area		**Hours**	**Contents**
1. Basic sciences		**800 at least**	Understood as a sound education for the student. This should provide him/her with the set of knowledge and skills that deal with the study of concepts and theoretical solutions of problems related to basic sciences (mathematics, physics, chemistry, and biology for some specific disciplines). Basic sciences should develop in the student the tools and mathematical, logical, spatial, and reasoning skills to predict and scrutinize scenarios, data analysis, and understanding of chemical and physical phenomena that allow the analysis and resolution of engineering problems.
2. Engineering sciences		**500 at least**	Understood as the set of technical and methodological tools from several disciplines that allow the solution to problems of basic engineering and that require for its achievement the proper management of basic sciences and an appreciation of the relevant elements of other engineering disciplines.
3. Engineering Areas	**Totals, distributed in:**	**800 at least**	The areas of Applied Engineering and Engineering Design together must have at least 800 hours, considering the following minimums:
	3a. Applied engineering	250 at least	Understood as the set of knowledge and skills that involve the application of mathematics and engineering sciences to practical problems of the discipline.
	3b. Design in engineering	250 at least	Understood as the integration of mathematics, natural sciences, engineering sciences and complementary studies for the development of elements, systems, and processes to meet specific needs. The design is a creative, interactive, and open process, subject to the limitations that can be governed by norms or legislation in varying degrees depending on the discipline. They may refer to economic, health, safety, environmental, social, or other interdisciplinary factors.
	Either of the two	300	They can be distributed among themselves to complete the 800 hours, considering the needs and emphases of the PE.
4. Social sciences and humanities		**200 at least**	A set of disciplines that seek to develop humanistic, ethical, social, and individual skills that address the study of philosophies, theories, concepts, and essential solutions focused on the analysis of the social and humanistic problems of today's globalized world.
5. Economic and administrative sciences		**200 at least**	Set of knowledge and skills of the economic and administrative disciplines useful to understand the impact of the economic environment upon engineering projects to plan, organize, manage, and control projects and processes as well as evaluate and interpret results.
6. Complementary courses		**100 at least**	Set of knowledge and skills that contribute to the education of engineers. It includes languages, oral and written communication, sustainable development, the impact of technology on society, environmental care, professional ethics, etc.
TOTAL minimum		**2,600**	

Syntesis of comparison of CACEI Knowledge Areas and the Washington Accord Knowledge Profile.								
CACEI knowledge areas	**Washington Accord Knowledge Profile**							
	WK1	**WK2**	**WK3**	**WK4**	**WK5**	**WK6**	**WK7**	**WK8**
1. Basic sciences	X	X						X
2. Engineering Sciences			X	X				X
3a. Applied engineering				X		X		X
3b. Design in engineering					X		X	X
4. Social sciences and humanities							X	
5. Economic and administrative sciences							X	
6. Complemen-tary courses							X	

WA-IEA Knowledge Profile: Duration between 4 and 5 years of study normally.

WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline.	WK5	Knowledge that supports engineering design in a practice area.
WK2	Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline.	WK6	WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.	WK7	WK7: Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.	WK8	WK8: Engagement with selected knowledge in the research literature of the discipline.

CACEI's graduate attribute 1: Identify, formulate and solve engineering complex problems by applying the principles of basic sciences and engineering.			
Domains and subdomains	**Precisions based on object variants**		**Equivalence between CACEI and Washington Accord (graduate attributes and knowledge profile)**
Acción	**Object**	**Knowledge and habilities**	

Identifies (explores and defines)
 	
Formulates (analyzes and investigates)
 	
Solves (models ad solves)
 	
Applies fundamentals and resources
	Complex engineering problems, defined by:
	• the number of variables involved,
	• the magnitude and dynamics of the relationships between them,
	• the low degree of pre-structuring,
	• the diversity of theories, methods, and techniques that it requires,
	• the factors that affect it, and its possible impact on contexts:
	  ○ global, national, local.
	  ○ economic
	  ○ environmental
	  ○ cutural, and
	  ○ social.
	• as well as the degree of uncertainty, conflict, and originality that its approach implies,
	• therefore, the depth of knowledge required.
		Fundamentals:
		• Basic sciences:
		  ○ Theoretical knowledge of mathematics, physics, chemistry, and biology for certain disciplines; understanding of chemical and physical phenomena; data analysis tools.
		• Engineering sciences:
		  ○ Technical and methodological tools of engineering disciplines.
		• Applied engineering.
		• Social sciences and humanities.
		Resources:
		• Specialized research literature.
		• IT tools.
			• **WA1**: Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to the solution of complex engineering problems.
			  ○ **WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline
			  ○ **WK2:** Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline
			  ○ **WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
			  ○ **WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
			• **WA2**: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (WK1 to WK4)
			• **WA5**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations. (WK6)
			• **WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline

<table>
<tr><th colspan="4">CACEI's graduate attribute 2:
Apply, analyze and synthesize engineering design processes that result in projects that meet the specified needs.</th></tr>
<tr><th rowspan="2">Domains and subdomains</th><th colspan="2">Precisions based on object variants</th><th rowspan="2">Equivalence between CACEI and Washington Accord (graduate attributes and knowledge profile)</th></tr>
<tr><th>Object</th><th>Knowledge and habilities</th></tr>
<tr>
<td>Analyzes (understands, compare, and synthetizes)

Solves (adapts, generates)

Applies fundamentals and resources</td>
<td>Engineering design processes that result in projects:
of devices, systems, or components,
that meet specific needs,
that evaluate potential alternatives,
that argue design decisions,
and incorporate safety, economic, public health and environmental impact criteria among others that are relevant.</td>
<td>Fundamentals: Theoretical and methodological principles:
Applied engineering:
Theories, methodologies, and tools in a practical area.
Engineering design:
Integration of basic sciences, engineering, and applied engineering.
Economic and administrative sciences:
Knowledge and principles of engineering management and economic decision making.
Social and humanistic sciences:
Knowledge of the social, economic, and environmental context.
Resources:
Specialized research literature.
IT Tools.</td>
<td>WA3: Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (WK5)
WK5: Knowledge that supports engineering design in a practice area
WA5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations. (WK6)
WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline</td>
</tr>
</table>

CACEI's graduate attribute 3: Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.			
Domains and subdomains	**Precisions based on object variants**		**Equivalence between CACEI and Washington Accord (graduate attributes and knowledge profile)**
	Object	**Knowledge and habilities**	
Develops (designs and conducts) **Take advantage** (concludes and utilizes) **Applies** fundamentals and resources	Studies and research where demonstrate the engineering judgement, that is: • Experiment with different variables, • Raises hypotheses or scenarios • Argues conceptual models, • Analyze and interpret data, • Generates synthesis and informed conclusions	Fundamentals: • Knowledge about research methods and techniques, as well as experiment design. Resources: • Specialized research literature. • Engineering and IT resources and tools.	• **WA4**: Conduct investigations of complex problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. ○ **WK8:** Engagement with selected knowledge in the research literature of the discipline

CACEI's graduate attribute 4: Communicate effectively with different audiences.			
Domains and subdomains	**Precisions based on object variants**		**Equivalence between CACEI and Washington Accord (graduate attributes and knowledge profile)**
	Object	**Knowledge and habilities**	

Communicates (formulates, produces, and shares)
 	
Applies fundamentals and resources
	Complex ideas in different audiences:
	• including
	  ○ the engineering community,
	  ○ his/her scope of work, and
	  ○ society in general;
	• effectively, that is:
	  ○ organized,
	  ○ consistent,
	  ○ argued,
	  ○ accurate, and
	  ○ convincing;
	• both in oral and written media, including:
	  ○ give and receive directions,
	  ○ make presentations,
	  ○ write and undersgand reports,
	  ○ formulate and understand technical and design documentation,
	  ○ establish working relationships,
	• among others.
		Fundamentals:
		• Complementary knowledge.
		Resources:
		• Engineering and IT resources and tools.
			• **WA10:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

CACEI's graduate attribute 5: **Recognize their ethical and professional responsibilities in situations relevant to engineering and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.**			
Domains and subdomains	**Precisions based on object variants**		**Equivalence between CACEI and Washington Accord (graduate attributes and knowledge profile)**
	Object	**Knowledge and habilities**	

Recognizes (identifies and distinguishes)
 	
Discerns (analyzes and evaluates)
 	
Applies fundamentals.
	His/her professional responsibilities in the problems, activities, and engineering projects where he/she intervenes, considering:
	• the ethical principles that guide them,
	• the applicable norms and standards,
	• the potential decisions in various scenarios,
	• the level of uncertainty, risk and safety and security,
	• the factors that influence them, and its possible impact on contexts:
	  ○ global, national, local.
	  ○ economic
	  ○ environmental
	  ○ cutural, and
	  ○ social.
		Fundamentals:
		Administrative economic sciences:
		  ○ Knowledge and principles of engineering management and economic decision making.
		Social and humanistic sciences:
		  ○ Knowledge of the social, economic, and environmental context.
			• **WA6**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (WK7)
			  ○ **WK7**: Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability
			• **WA7**: Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (WK7) **WA8**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (WK7)
			• **WA8**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (WK7)
			• **WA11**: Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.

CACEI's graduate attribute 6: Recognize the ongoing need for additional knowledge and have the ability to locate, evaluate, integrate and apply this knowledge appropriately..			
Domains and subdomains	**Precisions based on object variants**		**Equivalence between CACEI and Washington Accord (graduate attributes and knowledge profile)**
	Object	**Knowledge and habilities**	

Recognizes (identifies, serves, and feedbacks)
 	
Applies fundamentals and resources
	His/her continuing education needs:
	• Autonomously, that is
	  ○ Analyze the scope and limitations of the training itself,
	  ○ Locate, evaluate, and integrate information and knowledge,
	  ○ Seek accompaniment or expert advice,
	  ○ Applies what he/she learned to his/her professional practice,
	• facing the context of constant change in the world;
	• maintains the learning cycle and constantly improves his/her professional abilities.
		Fundamentals:
		• Complementary knowledge:
		  ○ Knowledge about research methods and techniques, as well as design of experiments.
		Resources:
		• Engineering and IT resources and tools.
			• **WA12**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CACEI's graduate attribute 7: Effectively work on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainties.			
Domains and subdomains	**Precisions based on object variants**		**Equivalence between CACEI and Washington Accord (graduate attributes and knowledge profile)**
	Object	**Knowledge and habilities**	

Works (plans, organizes, leads, and evaluates)
 	
Applies fundamentals and resources
	In work teams:
	• Who manage projects,
	  ○ set goals,
	  ○ plan tasks and means,
	  ○ make decisions,
	  ○ defines roles,
	  ○ manage resources.
	• With diverse members,
	  ○ Multidisciplinary.
	  ○ Multicultural.
	• Considering:
	  ○ Conflicts.
	  ○ Interdependence.
	  ○ Equity.
	  ○ Risks and uncertainty.
	• Effectively:
	  ○ Compliance and meet deadlines.
	  ○ Evaluate results.
		Fundamentals:
		• Knowledge and principles of engineering management and economic decision making.
		Resources:
		• Engineering and IT resources and tools.
			• **WA9**: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
			• **WA11**: Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

C) CRITERIA OF THE DISCIPLINE BY PE (DISCIPLINE ATTRIBUTES)

1. Aeronautical, Aerospace Engineering and Similarly Named Programs

Aeronautical engineering programs must prepare graduates with broad and in-depth knowledge in basic sciences and engineering sciences; aerodynamics, aerospace materials, structures, propulsion, flight mechanics, telecommunications, space structures, rocket propulsion, and stability and control. They must also prepare them to develop design competencies that include integrating aeronautics topics in the design of engineering projects and the resolution of complex aeronautical engineering projects considering the social, economic, and environmental impacts of the proposed technical solution in those areas.

Aerospace engineering and other similar engineering programs that combine aeronautical engineering and astronautical engineering must prepare graduates with solid knowledge covering one of the areas of aeronautical engineering. In addition, understanding of some topics of the area is emphasized. They must also prepare them to develop design competencies that include integrating aerospace topics in the design of complex engineering projects and the resolution of aerospace engineering projects considering the social, economic, and environmental impacts of the proposed technical solution in those areas.

2. Biomedical Engineering and Similarly Named Programs

The program must prepare the graduate in a broad and deep knowledge of the specific topics of biomedical engineering and engineering sciences and the basic sciences consistent with the declared educational objectives and under the expected learning outcomes.

The curriculum must prepare graduates to:

- Apply the principles of engineering, biology, human physiology, chemistry, physical calculus, mathematics through differential equations and statistics;
- Solve complex biomedical or related engineering problems, including those topics associated with the interaction between living and non-living systems;
- Analyze, model, design, and develop devices, systems, components, and processes for biomedical engineering;
- Measure and interpret data on the behavior of living systems;
- Have design competencies that include integrating bio/biomedical topics in engineering projects and the resolution of complex biomedical engineering projects considering the social, economic, and environmental impacts of the proposed technical solution in these areas.

3. Biotechnology Engineering and Similarly Named Programs

The program must provide graduates with a broad and deep knowledge of the specific topics of engineering in biotechnology and engineering sciences and the basic sciences consistent with the declared educational objectives and following the expected learning outcomes. The curriculum must include applying engineering from these basic sciences to the design, analysis, and control of chemical, physical or biological processes, including the hazards associated with these processes.

The curriculum must prepare graduates to:

- Apply the principles of engineering, biology, molecular biology, chemistry, physical calculus, mathematics through differential equations and statistics;
- Solve complex engineering problems in biotechnology/biochemistry or related, including those topics associated with the interaction between living and non-living systems and specialty biotechnologies such as food, vegetable, marine, pharmaceutical, environmental, enzymatic, agricultural, etc.;
- Analyze, model, design, and develop devices, systems, components, and processes for instrumentation and control for biotechnology or related engineering;
- Measure and interpret data on the behavior of systems;
- Have design competencies that include integrating biotechnology/biochemistry topics in the design of engineering projects and the resolution of complex engineering projects considering the social, economic, and environmental impacts of the proposed technical solution in these areas.

Biotechnology Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Numerical methods Balances of matter and energy Thermodynamics Transport phenomena Design of experiments Molecular biology	Unit operations Bioreactors Fermentation engineering Toxicology New product development Instrumentation and control Process Engineering Genetic engineering Metabolic engineering Biotechnology** ** Specialty biotechnologies such as: food, vegetable, marine, pharmaceutical, environmental, enzymatic, agricultural, etc.

Biochemistry Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Numerical methods Balances of matter and energy Thermodynamics Transport phenomena Design of experiments	Unit operations Bioreactores Fermentation engineering Toxicology New product development Instrumentation and control Process Engineering Biotechnology** ** Specialty biotechnologies such as: food, vegetable, marine, pharmaceutical, environmental, enzymatic, agricultural, etc.

4. Chemical Engineering and Similarly Named Programs

The curriculum must provide the graduate with a solid and deep knowledge of basic sciences, including chemistry, physics, and mathematics at the university level, and engineering sciences to achieve the educational objectives and graduate attributes stated by the academic program. It must emphasize social sciences and communication and economic-administrative sciences to determine the social and economic impact of the technical engineering solution.

The educational program must include matter and energy balance; thermodynamics; transport phenomena; fluid mechanics; momentum, heat and mass transfer; material resistance; financial engineering; industrial health and safety; reactor design; chemical process control; and unitary separation operations. It must develop in the graduates the competencies to design equipment and chemical plants that include the integration of chemical engineering topics in the design of engineering projects and the resolution of complex chemical engineering projects considering the social, economic, and environmental impacts of the proposed technical solution in those areas as well as the existing standards in the country.

Chemical Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Transport phenomena Mass and energy balances Chemical thermodynamics Chemical kinetics and catalysis Thermodynamics Physical chemistry Balance of Matter and Energy Method Engineering Electrical engineering Industrial Safety	Fluid flow Heat transfer Separation processes Reactor Engineering Process Engineering Dynamics and process control Project Engineering Economic engineering

5. Civil Engineering, Construction Engineering and Similarly Named Programs

The curriculum must provide the graduate with broad and deep knowledge of basic sciences through college-level mathematics, including calculus, physics, chemistry, differential equations; probability and statistics applied to engineering and engineering sciences; analyze and solve complex problems in at least four areas of civil engineering: structures, hydraulics, environmental, roadways, construction and administration, geotechnics, among others. The student must: conduct experiments and develop projects in at least four areas defined by the program; analyze and interpret data resulting from experiments or projects; design systems, components, or processes in at least four engineering areas stated in the program; include the principles of sustainability in construction processes; develop, manage and administer civil engineering projects; have a business, public policy, and leadership skills; analyze and apply the standards defined in their professional performance; and professional ethics associated with their profession.

It must develop design competencies that include the integration of civil engineering topics in the design of engineering projects and the resolution of complex civil engineering projects considering the social, economic, and environmental impacts of the proposed technical solution in those areas as well as the established national and international technical and legal standards.

Civil Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Structures Geology Hydraulics Geotechnics Systems Engineering	Construction Structures Geotechnics Hydraulics Health Planning Transportation Systems Systems Engineering

6. Computer Science Engineering, Computer Engineering and Similarly Named Programs

The curriculum must prepare the graduate with a broad and deep knowledge of the topics of basic sciences and engineering sciences and those specific to the area that allow them to be consistent with the educational objectives and graduate attributes defined by the program. Programs in this area must include probability and statistics, differential and integral calculus, discrete mathematics, physics and chemistry with laboratory, computer science, and engineering sciences to analyze and design electrical and electronic devices for computational systems and prototypes, software, and systems containing hardware or software components. Programs must also include various programming languages; data structure; algorithms and complexity; computer security, software design; digital logic; computer architecture and organization; the

integration of theory, practice, and tools for the specification, design, implementation, testing, and maintenance of software systems; knowledge and use of a variety of programming languages to enable the design of systems, prototypes or software considering user needs and the social, economic and environmental impacts of the proposed technical solution.

Information Systems Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Programming Fundamentals Concurrency and Parallelism Data structure Discrete mathematics Computational organization Theory of computation Digital logic Software Engineering Operating Systems	Computer graphics Simulation Programming paradigms Databases WEB Programming Digital technology Artificial intelligence Computer networks Safety Software Engineering Risk Management Cloud Computing Mobile Computing Big Data Computation of science (health, biotechnology, etc.) Process analysis and modeling Integrated systems (ERP, CRM, etc.) IT Services Management IT planning Analysis, filtering, prediction and comparative analysis of data.

Hardware Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Programming Fundamentals Concurrency and Parallelism Data structure Discrete mathematics Computational organization Theory of computation Electricity and Basic Electronics Digital logic Digital electronics	Gráficos computacionales Bases de datos Control systems Application of digital systems and simulation and modeling techniques. Computer architecture; memory, central processing unit and input/output units Peripherals and interfaces, system design techniques with microprocessors and microcontrollers.

Hardware Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Signal processing Software Engineering Operating Systems	Embedded systems (recessed) Robotics Computer networks Safety Software Engineering Risk Management Cloud Computing Mobile Computing Computation of science (health, biotechnology, etc.) Internet of Things Purpose-built processors

Software Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Programming Fundamentals Concurrency and Parallelism Data structure Discrete mathematics Computational organization Theory of computation Algorithm analysis Electricity and Basic Electronics Digital logic Digital electronics Software Engineering Operating Systems	Programming paradigms Language design Databases WEB Programming Application of digital systems and simulation and modeling techniques. Computer architecture; memory, central processing unit and input/output units. Embedded (recessed) systems. Artificial intelligence Robotics Computer networks Safety Software Engineering Risk Management Computer graphics Simulation Cloud Computing Mobile Computing Video games Big Data Computation of science (health, biotechnology, etc.) Internet of Things

Software Engineering	
Engineering Sciences	**Applied engineering and engineering design**
	Analysis and modeling of processes. Integrated systems (ERP, CRM, etc.) Business Intelligence

7. Electrical Engineering, Electronic Engineering, Telecommunications Engineering and Similarly Named Programs

The curriculum must provide the graduate with a broad and deep knowledge of the specific engineering topics implied by the program title, engineering sciences, and basic sciences consistent with the stated educational objectives and under the expected learning outcomes.

The program must include topics in probability and statistics, including appropriate applications to data analysis considering the orientation of the program, differential, and integral calculus; science (including physics and chemistry with laboratory and biology being desirable); engineering science topics (including computer science) necessary to analyze and design complex electrical and electronic devices for engineering; software (for design and analysis) and systems containing hardware and software components.

For programs whose name includes the terms "electrical," "electronics," "communications," or "telecommunications," the curriculum must consist of advanced mathematics such as differential equations, linear algebra, and complex variables. Programs that include the titles "communication" and "telecommunications" must also include topics on the theory and systems of communication and, additionally, the concept of the network as the infrastructure for the establishment of virtual links and the possibility of exchanging information between different individuals considering voice, data, image and video services, taking into account the needs and the social, economic and environmental impacts of the proposed technical solution as well as the security of the information and the standards established internationally and in the country.

Electronics Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Electromagnetic theory Electrical circuits Control theory Electrical measurements Electrical machines Solid state physics Sensors and actuators Signals and systems Analog electronics Digital systems	Embedded systems Instrumentation Power electronics Communications Signal processing Communication networks

Electrical Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Electrical circuits	Plants and substations
Electrical machines	Electrical power systems
Analog electronics	Industrial facilities
Electromagnetic theory	Protection of electrical systems
Control theory	Lighting
Digital electronics	Efficient use of energy
Electrical measurements	Alternative sources of electrical energy
	Power quality

The curriculum for programs containing the name "communication(s) or telecommunication" must include communication theory and systems. For those with the name "telecommunications," the curriculum must design and operate telecommunications networks for services such as voice, data, image, and video transmission.

8. Environmental Engineering and Similarly Named Programs

The curriculum must provide the graduate with a broad and deep knowledge of the specific topics of environmental engineering and sustainability, as well as basic sciences including differential equations, differential and integral calculus, probability and statistics, applied physics with topics of calculus and laboratory, chemistry including stoichiometry, chemical equilibrium, and kinetics and have laboratory practice; earth sciences; biological sciences and fluid mechanics. It must additionally prepare the graduate to perform matter and energy balances and analyze the storage and transport of substances in different environments (air, water, and solid phases); conduct experiments in the laboratory and analyze and interpret their results, including considerations of risk to health, water, land, and the environment; design environmental engineering systems that consider risk, uncertainty, sustainability and practice through simulators, in the laboratory or real scenarios; the life cycle; the environmental impacts of technical solutions oriented to the achievement of the educational objectives stated by the program. Additionally, the curriculum must prepare the graduate to understand the norms, legislation, and considerations defined for professional practice, environmental impact projects and their implementation, and the roles and responsibilities of public and private organizations concerning environmental care and the social and economic impact of the technical solution proposed by the engineer. When the curriculum is oriented to "fire" programs, graduates must be competent in applying science and engineering to protect the health, safety, and welfare of the public against the impacts of fire. This includes the ability to use and incorporate an understanding of fire dynamics affecting the life safety of occupants and emergency personnel and the protection of property; hazards associated with building processes and designs; the design of fire protection products, systems, and equipment; human response and behavior in emergencies; and fire prevention, control, and suppression.

Environmental Engineering	
Ciencias de la ingeniería	**Ingeniería aplicada y diseño en ingeniería**
Transport phenomena Mass and energy balances Chemical thermodynamics Chemical kinetics and catalysis Thermodynamics Physical chemistry Balance of Matter and Energy Method Engineering Electrical engineering Industrial Safety	Economic engineering Environmental management Comprehensive waste management: hazardous and non-hazardous waste Water treatment Air pollution control: monitoring of sources and treatment systems Soil characterization and remediation Environmental impact and risk Design of processes for pollution control Instrumentation and process control Safety and hygiene Pollution prevention

9. Industrial Engineering, Production Engineering and Similarly Named Programs

The curriculum must provide the graduate with a broad and deep knowledge of specific topics in industrial engineering, basic sciences, and engineering sciences to design, develop, implement and improve integrated systems that include people, materials, information, infrastructure and equipment, and energy.

The curriculum must include solid learning to promote systems integration using analytical, computational, and experimental practices and systems and software. It must prepare them to be efficient and skilled in a) materials and manufacturing processes: i.e., having skills for the design of manufacturing processes that result in products that meet the requirements in the materials used and in the standards; b) production processes, storage and product engineering; the ability to design products and equipment, tools or devices and the environment necessary for their manufacture; c) manufacturing competitiveness: i.e., the ability to create a competitive advantage through manufacturing planning, strategy, quality and control; d) manufacturing systems design: the ability to analyze, synthesize and control manufacturing operations using statistical methods and; e) manufacturing laboratory simulation or facilities necessary for the processes: the ability to measure the variables associated with the manufacturing process and the development of techniques that set trends in the process itself taking into account the needs and the social, economic and environmental impacts on the proposed technical solution. It must prepare graduates to design, develop, implement, and improve integrated systems, including people, materials, information, equipment, and energy. The curriculum must consist of developing competencies for systems integration using appropriate analytical, computational, and experimental practices.

Industrial Engineering	
Engineering Sciences	**Applied engineering and engineering design**

Manufacturing processes	Production planning and control
Fundamentals of Electrical Engineering	Industrial facilities
Introduction to materials	Distribution and location of the plant
Industrial metrology	Applied computing
Occupational health and safety	Business development
Optimization of operations	Flexible manufacturing systems
Decision analysis	Method Engineering
Analysis and experimental design	Quality control and reliability
Statistical analysis	Feasibility of projects
Computer-aided drawing	System simulation
Computer programming	Supply Chain
Evaluation and project management	Human Factor Engineering
Cost Engineering	Maintenance Management
Anthropometry and biomechanics	Quality management systems
Applied Statistics	Sustainability and energy
Method Engineering	Information systems
Quality Control and Reliability	Systems modeling and analysis
Industrial Instrumentation	
Measurements in Engineering	
Operations Research	
Decision Analysis	
Systems Engineering	

10. Manufacturing Engineering and Similarly Named Programs

The curriculum must prepare graduates to be competent in:

Materials and manufacturing processes: the ability to design manufacturing processes that result in products that meet specific material and other specific requirements;

Process, assembly, and product engineering: the ability to design products and equipment, tooling, and the environment necessary for their manufacture;

Competencies to develop manufacturing competitiveness: the ability to create competitive advantage through manufacturing planning, strategy, quality, and control;

Competencies for manufacturing systems design: the ability to analyze, synthesize and control manufacturing operations using statistical methods; and

Development of competencies in manufacturing laboratory or facility experience: measuring manufacturing process variables and developing technical inferences about the process.

11. Metallurgical Engineering, Materials Engineering and Similarly Named Programs

The curriculum must provide the graduate with a broad and deep knowledge of specific advanced science topics (such as chemistry, biology, and physics), computational techniques, and engineering principles to the materials systems implicated by the program modifier (e.g.,

ceramics, metals, polymers, biomaterials, composites); to integrate an understanding of the scientific and engineering principles underlying the four major elements of the field: structure, properties, processing, and performance related to appropriate materials systems; to apply and integrate the knowledge of each of the above four elements of the field using experimental, computational, and statistical methods to solve materials problems, including selection and design, under the educational objectives of the program. The curriculum must provide the graduate with a broad and deep knowledge of specific advanced science topics (such as chemistry, biology, and physics), computational techniques, and engineering principles to the materials systems implicated by the program modifier (e.g., ceramics, metals, polymers, biomaterials, composites); to integrate an understanding of the scientific and engineering principles underlying the four major elements of the field: structure, properties, processing, and performance related to appropriate materials systems; to apply and integrate the knowledge of each of the above four elements of the field using experimental, computational, and statistical methods to solve materials problems, including selection and design, under the educational objectives of the program.

Metallurgical/ Metallurgical Materials/ Materials Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Mineralogy and crystallography	Mineral Benefit Processes
Physical geology	Metallurgical extraction processes
Thermodynamics	Metallurgical transformation process
Balance of matter and energy	Material design
Kinetics	Metallic materials
Fluid mechanics	Polymeric materials
Principles of physical metallurgy	Ceramic materials
Transport phenomena	Composite materials
Materials science and engineering	Testing and physical properties of materials
Phase transformations	
Optical microscopy	
Material Characterization	

12. Mining Engineering and Similarly Named Programs

The curriculum must prepare graduates to apply mathematics through differential equations, calculus-based physics, general chemistry, and applied probability and statistics to mining or similar engineering problems; have relevant knowledge in geological sciences, including characterization mineral deposits, physical geology, structural or engineering geology; and mineral and rock identification and properties. The graduate must be competent in statics, dynamics, the strength of materials, fluid mechanics, thermodynamics, and electrical circuits; be qualified in engineering topics related to both surface and subway mining, including mining methods, planning and design, soil control, and rock mechanics, health and safety, environmental issues and ventilation; be proficient in additional engineering topics such as rock fragmentation,

materials handling, ore or coal processing, mine surveying, and resource/reserve valuation and estimation considering educational objectives. Laboratory experience must prepare graduates to be competent in handling geological concepts, rock mechanics, and mine ventilation, among the most relevant.

Mining Engineering – Metallurgy	
Engineering Sciences	**Applied engineering and engineering design**
Mineralogy Petrology Geology Crystallography Structural geology Topography Material strength	Mineral deposits Geological engineering Engineering of mining projects and investments Mine exploration Underground mining Open pit mining Mineral Benefit Processes Metallurgical extraction processes Metallurgical transformation process

Mining Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Mineralogy Petrology Geology Crystallography Topography Material strength	Mineral deposits Geological engineering Engineering of mining projects and investments Mine exploration Underground mining Open pit mining

13. Geological Engineering and Similarly Named Programs

The curriculum must prepare graduates to have:

- The ability to apply mathematics, including differential equations, calculus-based physics, and chemistry, to complex engineering geology problems;
- Proficiency in geological science topics that emphasize geological processes and the identification of minerals and rocks;
- The ability to visualize and solve geological problems in three and four dimensions;
- Proficiency in engineering sciences, including statics, properties/strength of materials, and geomechanics;
- The ability to apply the principles of geology, elements of geophysics and geology; and
- The engineering skills to design solutions to complex engineering geology problems, including one or more of the following considerations: the distribution of physical and

chemical properties of earth materials, including surface water, groundwater (hydrogeology), and fluid hydrocarbons; the effects of natural surface and near-surface processes; the impacts of construction projects; the impacts of natural resource exploration, development, and extraction, and subsequent remediation; waste disposal; and other societal activities on these materials and processes.

Engineering in Geology, Mineralogistic Geology, Geosciences and Geophysics	
Engineering Sciences	**Applied engineering and engineering design**
Mineralogy Petrology Geology Sedimentology Stratigraphy Crystallography Cartography Palaeontology Structural geology Petrografía Topography	Mineral deposits Petroleum geology Hydrology Geotechnics Development of geological projects Exploration methods Geographic Information Systems Geological project engineering Geophysical methods

14. Mechanical Engineering and Similarly Named Programs

The program must provide the graduate with a broad and deep knowledge of specific engineering topics of study, must require students to apply engineering principles, basic sciences, and mathematics (including multivariate calculus and differential equations) and to model, analyze, design, and realize physical systems, components or processes; furthermore, it must prepare students to work professionally in thermal or mechanical systems while requiring courses in both areas.

Mechanical Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Mechanics Materials Thermodynamics Fluid Mechanics Electrical and Electronic Engineering Systems Engineering Statistics and Probability Operations Research Introduction to Electromechanical Systems Manufacturing Processes Introduction to Materials	Design Manufacturing and Materials Thermal Machines and Equipment Hydraulic and Pneumatic Machines Plants and Projects Refrigeration and Air Conditioning Environmental impact Energy Management and Saving Industrial Facilities Automation Industrial Electronics Methods Engineering and Administration

Mechatronics Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Electromagnetic theory	Automation
Electrical circuits	Embedded systems
Control Engineering	Design of mechatronic systems
Electrical engineering	Artificial intelligence
Metrology	Design of analog and digital circuits
Electrical machines	Robotics
Introduction to Mechatronics	Power electronics
Semiconductor devices	
Sensors and actuators	
Introduction to Electromechanical Systems	
Manufacturing Processes	
Introduction to Materials	

15. Naval Engineering, Naval Architecture Engineering, Marine Engineering and Similarly Named Programs

The curriculum must prepare graduates to apply probability and statistical methods to naval architecture and marine engineering problems: have a thorough basic knowledge of fluid mechanics, dynamics, structural mechanics, material properties, hydrostatics, and power/propulsion systems in the context of marine vehicles and; have competencies in the use of instrumentation appropriate to naval architecture/ or marine engineering.

16. Agricultural Engineering, Forestry and Similarly Named Programs

The curriculum must provide the graduate with a broad and deep knowledge of the specific engineering topics implied by the program name, engineering sciences, and the basic sciences consistent with the stated educational objectives and commensurate with the expected learning outcomes. The program must include topics from mathematics through differential equations and biological and engineering sciences consistent with the program's educational objectives. The curriculum must prepare graduates to apply engineering to agriculture, forestry, human or natural resources.

Forestry Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Remote sensing	Forest industries
Hydrology	Ecosystem restoration
Thermodynamics	Forest Resources Assessment
Forestry	Forest supply
Balance of matter and energy	Fire management

Physical and chemical analysis Microbiology Physical chemistry Biochemistry Anatomy of wood Edaphology Dasonomía	Forest management Geographic Information Systems Forest protection Forest nurseries Wood technology

Agroindustrial Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Thermodynamics Balance of matter and energy Physical and chemical analysis Microbiology Physical chemistry Biochemistry	Unit operations Plant Engineering Technologies for the processing and preservation of products of plant origin Technologies for the processing and preservation of products of animal origin Biotechnology Process Engineering Conservation and storage methods Industrial hygiene and safety

17. Nuclear, Radiological Engineering and Similarly Named Programs

The curriculum must prepare graduates to apply advanced mathematics, engineering sciences and sciences, including atomic and nuclear physics, and the transport and interaction of radiation with matter, to nuclear and radiological systems and processes; perform nuclear engineering design; measure nuclear and radiation techniques; work professionally in one or more fields of nuclear or radiological specialization.

18. Biological Engineering, Biological Systems, Food and Similarly Named Programs

The curriculum must include higher-level mathematics, including differential equations, a solid foundation in chemistry and biology, and a working knowledge of advanced biological sciences consistent with the program's educational objectives. The curriculum must prepare graduates to apply engineering to biological systems.

Food Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Numerical methods Balances of matter and energy	Unit operations Food analysis

Thermodynamics Transport phenomena Design of experiments Food Chemistry Food microbiology Nutrition Physicochemical properties of food	Food safety Food Processing Sensory assessment Toxicology New product development Instrumentation and control Process Engineering Biotechnology** ** Specialty biotechnologies such as: food, vegetable, marine, pharmaceutical, environmental, enzymatic, agricultural, etc.

Agroindustrial Engineering (focus on processes)	
Engineering Sciences	**Applied engineering and engineering design**
Numerical methods Balances of matter and energy Thermodynamics Transport phenomena Design of experiments Primary production Pre and post-harvest handling	Unit operations Food analysis Food safety Food Processing New product development Process Engineering Biotechnology** ** Specialty biotechnologies such as: food, vegetable, marine, pharmaceutical, environmental, enzymatic, agricultural, etc.

19. Cybersecurity Engineering, Computer Security, Cyber Operations and Similarly Named Programs

The curriculum must provide breadth and depth to the graduate in higher-level mathematics that includes probability, statistics, and cryptographic topics, including applications appropriate to achieving educational objectives. Additionally, it must provide discrete and specialized mathematics such as abstract algebra, information theory number theory, complexity theory, and finite fields; engineering topics necessary to determine cybersecurity requirements and to analyze, design, test, and protect complex devices and systems incorporating hardware, software, and human components. Also, develop competencies for the application of protection technologies and forensic techniques; the analysis and assessment of components and systems concerning security and maintenance of operations in the presence of security risks and threats as well as taking into account regulations, regulatory standards, privacy, ethics, and human behavior appropriate to the program.

The curriculum must provide breadth and depth across the range of engineering and computer science topics necessary for applying computer security principles and practices to the design, implementation, and operation of the physical, software, and human components of a system.

20. Physics Engineering or Engineering Sciences and Similarly Named Programs

The curriculum must provide breadth and depth to the graduate in higher-level mathematics and meet the general criteria for all engineering programs by strengthening competencies in electronic, computational, and research topics.

21. Photometry Engineering, Optics and Similarly Named Programs

The curriculum must provide graduates with mastery and depth in engineering subjects oriented to the program's educational objectives. It must prepare graduates to have appropriate laboratory knowledge and experience in geometrical optics, physical optics, optical materials, and optical and photonic devices and systems. It must equip graduates with the skills to apply engineering principles, basic sciences (multivariable calculus, differential equations, linear algebra, complex variables, and probability and statistics) to model, analyze, design, and realize optical devices.

Photometry Engineering, and in Optics	
Engineering Sciences	**Applied engineering and engineering design**
Geology	Hydrography
Cartography	Geographic Information Systems
Remote sensing	Global positioning systems
Geodesy	Geodesy applied to Engineering
Topography	Physical geodesy
Hydrology	Satellite geodesy
Fotogrametría	Cadastre
Astronomy	Geophysical methods
Theory of errors	

22. Petroleum Engineering and Similarly Named Programs

The curriculum must prepare graduates to master and competently use mathematics (differential equations, probability, and statistics), fluid mechanics, the strength of materials and thermodynamics; the design and analysis of systems and procedures for drilling and completing wells; the characterization and evaluation of subsurface geological formations and their resources using geoscientific and engineering methods; the design and analysis of systems for producing, injecting and handling fluids; the application of reservoir engineering principles and practices to optimize resource development and management; the use of project economics and resource valuation methods for design and decision making under conditions of risk and uncertainty.

Petroleum Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Mineralogy	Mineral deposits
Geology	Petroleum geology
Sedimentology	Hydrology
Stratigraphy	Geotechnics
Crystallography	Exploration methods
Cartography	Geographic Information Systems
Palaeontology	Project Engineering
Structural geology	Fluid reservoirs
Petrografía	Drilling Engineering
Topography	Secondary recovery
Thermodynamics	Dynamic characterization of oil wells
Geophysical methods	Deep water drilling
Petrofísica	Completion and maintenance of wells
Fluid Dynamics	Production Engineering
	Collection and management of hydrocarbon production
	Well Registration
	Industrial hygiene and safety

23. Engineering in Topography and Geomatics and Similarly Named Programs

The curriculum must prepare graduates to work competently in one or more of the following areas: boundary and land surveying, geographic and terrestrial information systems, photogrammetry, mapping, geodesy, remote sensing, and other related areas.

24. Engineering in Business Management and Similarly Named Programs

The curriculum must prepare graduates to understand the relationship between engineering and the management tasks of planning, organization, leadership, control, and the human element in production, research, and service organizations; to understand and cope with the stochastic nature of management systems. The curriculum must also prepare them to integrate management systems in several different technological environments.

Business Management Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Administration	Operations Management
Quality management	Supply Chain Management
Accounting	Production management
Economy	Strategic management
Macroeconomics	Computer science applied to business

Business Management Engineering	
Engineering Sciences	**Applied engineering and engineering design**
Finance	Process Engineering
Business management	Project Engineering
Information systems	Business Plan
Cost Engineering	Business Simulation
Logistics	Process simulation
Marketing	Quality systems
Strategic planning	
Organizational theory	

25. Ocean Engineering and Similarly Named Programs

The curriculum must prepare graduates to have the knowledge and skills to apply the principles of fluid and solid mechanics, dynamics, hydrostatics, probability and applied statistics, oceanography, water waves, and underwater acoustics to engineering problems and work in groups to perform engineering design at the systems level, integrating multiple technical areas and addressing design optimization.

ANNEX 2: INFRASTRUCTURE, EQUIPMENT AND FACILITIES THAT MUST BE AVAILABLE FOR THE IMPLEMENTATION OF THE SUBJECTS OF THE CURRICULUM.

For engineering educational programs, whatever the area of specialty, it is required to have the following laboratories:

ALL ENGINEERING PROGRAMS	
PHYSICS LABORATORY	**CHEMISTRY LABORATORY**
The objective of these laboratories will be to support the learning of the subjects corresponding to physics based on the scientific method and the theory of measurement.	The objective of these laboratories will be to support the learning of the subjects corresponding to chemistry based on the scientific method and the theory of measurement.

For the different areas of engineering, it is required to have the following infrastructure, below are some of them mentioned:

AGROINDUSTRIAL ENGINEERING		
BASIC SCIENCES LABORATORY - BIOLOGY	**ANALYSIS LABORATORY**	**FOOD LABORATORY: PRODUCTS OF ANIMAL ORIGIN (DAIRY)**
Microscopes Glassware (flasks, specimens, pipettes, glasses, etc.) Dissection case Lighters Reagents, dyes Brackets, racks Microtome Other instruments (spatulas, tweezers, etc.) Thermometers	Agitator Autoclave Scales Bain-marie Centrifuge Colony counter Glassware (flasks, specimens, pipettes, glasses, etc.) Protein Determination Equipment Spectrophotometer Greenhouse Fiber extractor Lipid extractor Incubator Microscopes Muffle Potentiometer Refractometer Refrigerator Thermometer	Autoclave Scale Blender Butirómetro Centrifuge Descremadora Cooler Packaging Greenhouse Mantequillera Molds Cheese press Refrigerator Thermometer Pasteurization and curdling tubs

AGROINDUSTRIAL ENGINEERING		
BASIC SCIENCES LABORATORY - BIOLOGY	**ANALYSIS LABORATORY**	**FOOD LABORATORY: PRODUCTS OF ANIMAL ORIGIN (DAIRY)**
	Other materials (supports, tweezers, gloves, etc.).	
FOOD LABORATORY: PRODUCTS OF ANIMAL ORIGIN (MEAT)	**FOOD LABORATORY: PRODUCTS OF VEGETABLE ORIGIN (FRUITS, VEGETABLES AND CEREALS)**	**NON-FOOD PROCESS LABORATORY**
Ahumador Scale Freezer Cutter Embutidora Greenhouse Blender Cooking pot Meat Mill Slicer Refrigerator Ham cooking tub	- Fruit and vegetables: Autoclave Scale Dryer trays Despulpadora Baler Greenhouse Juice extractor Blender Cooking pot Mill Pots, knives, spoons, strainers, trays Food Processor Refractometer Refrigerator Sealing - Cereals: Oven Trays Blender Scale Sifter	The infrastructure must be adequate and sufficient, depending on the orientation or line of work of the laboratory.

ENVIRONMENTAL ENGINEERING	
PHYSICOCHEMISTRY LABORATORY	**UNIT OPERATIONS LABORATORY**
It must have the devices and instruments that allow experiments to be carried out on the topics listed in the minimum contents.	It must have the devices and instruments that allow experiments to be carried out on the topics listed in the minimum contents.

BIOMEDICAL ENGINEERING			
INSTRUMENTATION LABORATORY	**CYBERNETICS LAB**	**TECHNOLOGICAL INNOVATION LABORATORY**	**Spaces in hospitals or Laboratory for practice with specialized equipment for clinical use.**
Design and build Analog and Digital Electronic Systems that contribute to the development of Medical Instrumentation.	Cybernetics is the science of communication, the transmission of information and the theory of automatic control either in the study of living beings or machines. Communication integrates and gives coherence to systems, information organizes and control is responsible for internal regulation and behavior in interaction with the environment and the characterization of transducers or measurement systems, the creation of graphical user interfaces for remote control of equipment, physiological signals / or digital processing of signals and images as well as equipment for the study of physiological systems by non-invasive methods.	Promote the creation, adoption, transfer and implementation of new medical technologies with high social and economic impact.	

CIVIL ENGINEERING			
TOPOGRAPHY AND GEODESY LABORATORY	**MATERIALS LABORATORY**	**SOIL AND PAVEMENT MECHANICS LABORATORY**	**HYDRAULICS LABORATORY**
Knowledge and use of Theodolite. Polygonal Lifting with Theodolite.	Knowledge of laboratory and its measuring instruments.	Index tests for soils (granulometry and plasticity).	Verificación de las propiedades de los fluidos.

CIVIL ENGINEERING			
TOPOGRAPHY AND GEODESY LABORATORY	**MATERIALS LABORATORY**	**SOIL AND PAVEMENT MECHANICS LABORATORY**	**HYDRAULICS LABORATORY**
Knowledge and use of the Total Station. Lifting of a PolygonalUsing Total Station. Knowledge and use of the automatic level. Differential leveling, profile and configuration.	Granulometric analysis in aggregates for concrete. Determination of Absorption in aggregates for concrete. Determination of density in aggregates for concrete. Sampling and density of cement. Mortar setting times. Design and Manufacture of Mortars and Concrete. Consistency Measurement. Compressive strength of concrete. Tension essays in Steel. Compressive strength of a piece of masonry.	Permeability (constant and variable load). One-dimensional consolidation. Simple compression test. Soil compaction test. Support value tests. Resistance to shear stress. Characterization of stone materials for asphalt.	Verification of the equation of quantity of motion, continuity and Bernoulli. Capacity of flows in pipes. Resistance to flow in pressure ducts. Capacity of flows in channels. Characterization of the hydraulic jump.

COMPUTER ENGINEERING / COMPUTER SCIENCE / CYBER OPERATIONS / CYBERSECURITY / COMPUTER SECURITY			
LABORATORY OF MICROCOMPUTER	**MICROPROCESSOR LABORATORY**	**DIGITAL COMMUNICATIONS LABORATORY**	**COMPUTER SECURITY AND NETWORKING LABORATORY**
Computer Equipment, Programming Languages, Database Handlers, Application Packages, CASE Tools, Prototyping Tools.	Computer Equipment, Development Kits, Power Supplies, Signal Generators, Oscilloscopes, Multimeters.	Signal Generators, Oscilloscopes, Spectrum Analyzers, Digital Frequency Meters, Power Supplies, True RSM Voltmeters, X-Y Chart, Educational equipment for simulation of digital communications	Computer Equipment, Layer 2 and Layer 3 Network Interconnection Equipment with its accessories, Packet Analysis Software. Wireless Networking Equipment,

COMPUTER ENGINEERING / COMPUTER SCIENCE / CYBER OPERATIONS / CYBERSECURITY / COMPUTER SECURITY			
LABORATORY OF MICROCOMPUTER	**MICROPROCESSOR LABORATORY**	**DIGITAL COMMUNICATIONS LABORATORY**	**COMPUTER SECURITY AND NETWORKING LABORATORY**
		systems and computer equipment.	computers with Firewall, IDS, and VPN capabilities

ELECTRICAL ENGINEERING			
ELECTRICAL CIRCUIT ANALYSIS LABORATORIES	**LABORATORY OF SYNCHRONOUS AND DIRECT CURRENT MACHINES**	**ELECTRICAL POWER SYSTEMS LABORATORY**	**LABORATORY OF TRANSFORMERS AND INDUCTION MOTORS**
First and second order electrical systems, Analysis of linear and three-phase circuits, Measurement of power, power factor, resonance, Impedance and frequency scaling, Networks and biports, Mini-laboratory of electrical systems, oscilloscopes, solenoids, wattmeters, voltmeters, ammeters, capacitor banks.	Saturation and regulation curves, Generator efficiencies, Synchronization, Voltage regulation, Voltage and current balancing, Insulation resistors, Generator coupling, Starting and speed control in motors, Efficiencies, MOTOR-generator groups AC, CD, voltmeters, ammeters, AC, synchronizing equipment, motor couplings generator, thermometers, electrodynamometers.	Characteristics and operating conditions of alternators, synchronous motors, and transmission lines, oscillations, transients, power flows. Leaks and impedances, Operation of relays and protections, Three-phase alternators, synchronous motors, three-phase, power supply modules, real and reactive power measurement and voltage measurement and direct and alternating current, strobe lamps, inertia voltage, panels, ammeters and AC and CD voltmeters.	Ohmic and insulation resistance, Transformation ratios, Polarity, Connections, losses and excitation currents, Dielectric and potential stiffness, Torque-speed curves, Single-phase motor starts, Wheastone bridges, Meguer, CD and AC voltmeters and ammeters, single-phase transformers, high voltage equipment, transformer induction motors, wattmeters.

ELECTRONIC ENGINEERING		
CONTROL ENGINEERING LABORATORY	**ANALOG ELECTRONICS LABORATORY**	**DIGITAL SYSTEMS LABORATORIES**
1. Simulation of control systems. 2. Feedback systems. 3. Proportional, integral and	1. Development of practices with active circuits. 3. Linear models. 3. Semiconductors. 4.	1. Implementation of arithmetic logical functions. 2.

ELECTRONIC ENGINEERING		
CONTROL ENGINEERING LABORATORY	**ANALOG ELECTRONICS LABORATORY**	**DIGITAL SYSTEMS LABORATORIES**
derivative control. 4. Programmable logic controllers. 5. Computer simulators, P.L.C. systems, transported belts, oscilloscopes and actuators.	Basic settings. 5. Linear integrated circuits. 6. Sources of C. D. Signal generators, multimeters, oscilloscopes, simulator of linear circuits by computer.	Controller Design. 3. Logic. 4. Microprocessors. 5. D.C. sources, signal generators, oscilloscopes, logic state analyzers, computer digital circuit simulators.

FORESTRY ENGINEERING		
BASIC SCIENCE LABORATORY - BIOLOGY	**LABORATORY OF BOTANY AND PLANT PHYSIOLOGY**	**FOREST HEALTH LABORATORY**
Microscopes Glassware (flasks, specimens, pipettes, glasses, etc.) Dissection case Lighters Reagents, dyes Brackets, racks Microtome Other instruments (spatulas, tweezers, etc.)	Autoclave Germinating chamber Collections Glassware Drying stove Incubators Microscopes Press Reagents Refrigerator	Autoclave Balance Bain-marie Centrifuge Glassware Greenhouse Incubator Inputs for culture media Forget Microscopes Other materials (dissection needles, knives, entomological pins, etc.). Projector Reagents Refrigerator
LABORATORY OF WOOD ANATOMY AND TECHNOLOGY	**NURSERY**	**FIELD EQUIPMENT**
Balance Calibrador Digital camera Glassware and reagents Greenhouse Oven Equipment and implements for wood strength tests (example: weights, deflectometer, press, universal machine) Instruments for sharpening the blades.	Containers or containers Equipment and tools (shovel, rake, pick, pruners, wheelbarrow, fumigator, etc.) Irrigation system Substrates	Altimeter Compasses Measuring tapes (meter, diametric) Clinómetro Densitómetro Personal protective equipment Forcípula GPS

FORESTRY ENGINEERING		
BASIC SCIENCE LABORATORY - BIOLOGY	**LABORATORY OF BOTANY AND PLANT PHYSIOLOGY**	**FOREST HEALTH LABORATORY**
Histological plates Humidity meter Microscopes Microtome Wood sample book Muffle Grill Projector Impregnation reactor Refrigerator Floor band saw Image Analysis Software		Various tools (magnifying glasses, shovels, scissors, machete, etc.) Luxómetro Height meter Bark Meter Distance meter Pressure and temperature gauge Micrometer Level

ENGINEERING IN BUSINESS OR BUSINESS MANAGEMENT	
METHODS AND MANUFACTURING LABORATORY	**BUSINESS MANAGEMENT LABORATORY**
Stopwatches, furnaces, molding machine. Parallel lathe, elbow brush, horizontal milling machine, universal milling machine, column drill, radial drill, saw, welding machines, die cutter, shear, bending machine, roller, grinder. Computer equipment (personal computers and/or workstations). Software for drawing, design, manufacturing and simulation of processes. Numerical control machine centers. Material handling equipment. Video recording equipment.	Computer equipment with the necessary capacity to use specialized software for the development of each of the practices. Video recording equipment. Software Features: A specific commercial name of the software is not required; derived from software with cost or free, it will always be necessary to have the licenses to use them. It is essential that the software is available to students in the development of the PE and that it is relevant to achieve the objectives described in the practices.

INDUSTRIAL ENGINEERING	
MANUFACTURING SYSTEMS LABORATORY	**METHODS ENGINEERING LABORATORY**
Furnaces, sand mills, molding machine. "Parallel lathe, elbow brush, horizontal milling machine, universal milling machine, column drill, radial drill, saw, welding machines, die cutter, shear, bending machine, roller, grinder. (Mechanical workshop) Computer equipment (personal computers and/or workstations). Software for drawing, design, manufacturing and simulation.	Tachometers, chronometers, chronographs, die cutting press, shear, disc cutter, bending machine, lathe, drill, pointer, audiovisual equipment (screen, monitors, projectors, cassettes and video cameras) and production line with variable speed.

Numerical control machine centers. Material Handling Equipment.	

MATERIALS ENGINEERING		
MATERIALS ENGINEERING LABORATORY	**METALLOGRAPHY AND HARDNESS LABORATORY OR MATERIAL ANALYSIS LABORATORY**	**STRUCTURAL CHARACTERIZATION LABORATORY**
Quebradora de rodillos Quebradora de quijadas Molino de bolas Pulverizador de discos Ro-tap Separador jig Molino para wi Mesa de rodillos para molinos Mesa concentradora wifley Balanza electrónica Celda de flotación Bomba de vacío Equipo para análisis de partícula en húmedo Separador magnético de tubo davis Estufas de secado Filtros a presión Motores agitadores Balanza analítica Parrilla eléctrica Medidor de ph Termo agitador Picnómetro Electrodos Tamices Campana de extracción	Metal cutter Polishing Macrodurometro rockwell Macrodurometro briknell Metalographic microscope Microdurómetro Bakelite assembler Metalográfic microscope Estereomicroscopio Analytical balance	UV-vis spectrophotometer The potential with Infrared spectrophotometer Analytical balance Ovens Reómetro Viscosimeter Polarized light optical microscope Reflected light optical microscope
MATERIAL DEGRADATION LABORATORY OR CORROSION LABORATORY		**HEAT TREATMENT LABORATORY**
Saline chamber Desionizador Galvanostato/potenciostato Smoke extraction hood Cells Muffles		Ultra ovens 6-2-13 Small ovens Large ovens Oven "vertical type"

MATERIALS ENGINEERING		
MATERIALS ENGINEERING LABORATORY	**METALLOGRAPHY AND HARDNESS LABORATORY OR MATERIAL ANALYSIS LABORATORY**	**STRUCTURAL CHARACTERIZATION LABORATORY**
Phmetro Analytical balances Rotary electrode Multimeter		

MECHANICAL ENGINEERING		
MATERIALS LABORATORY	**THERMOFLUIDS LABORATORY**	**MECHANICAL WORKSHOP AND METROLOGY**
Equipment for sample preparation (assemblers, polishers), Equipment for microscopic observation with camera, Equipment for mechanical essays (durometer and machine for traction, compression and fatigue testes), Furnaces for casting and heat treatments, Various chemical equipment (balance, flasks, test tubes, etc.).	Hydrostatic and fluid properties bench, Flow meter demonstration bench, Systems for the determination of load losses in pipes, Multi-pump test bench, Hydraulic turbine test bench, Subsonic wind tunnel, Steam generator, Reciprocating compressor, Internal combustion engines (petrol and diesel), Laboratory unit for air conditioning, Cooling cycle unit, Heat transformation units (conduction, convention and radiation), Laboratory heat exchanger, Laboratory unit for combustion.	Bench screw work table, Cutting belt saw, Bending machine, Bench shear, Welding equipment (electric, oxyacetylene, resistance), Emery, Conventional machine tools (lathe, milling machine, bench drill), Miscellaneous hand tools, Personal protective equipment, Lathes, milling machines and/or numerical control machining centers, Electromechanical and/or pneumatic manipulators and software for operation and control, Material handling equipment (conveyor belts, rotary tables, sensors, etc.), Equipment for electrical measurements (multimeters, oscilloscopes, sensors, etc.), Equipment for thermal measurements (thermometers, thermocouples), Equipment for pneumatic measurements (manometers, vacuometers), Equipment for mechanical measurements (rulers, flexometers, calibrators, micrometers, templates, marble, pattern blocks), Computer equipment (personal computers and/or workstations) with peripherals,

MECHANICAL ENGINEERING		
MATERIALS LABORATORY	**THERMOFLUIDS LABORATORY**	**MECHANICAL WORKSHOP AND METROLOGY**
		Software for drawing, design, manufacturing and simulation, Lathes, milling machines and/or numerical control machining centers.

PETROLEUM ENGINEERING	
FLUID MECHANICS LABORATORY	**PETROPHYSICS LABORATORY**
Bourdon pressure gauges Scales Densimeters or airmeters Rotational viscometers Electric grills	Pore-permeameter for cores 1.5" in diameter. Working pressure (up to 10,000 psi) and temperature (150 °C). Permeameter of uns consolidated media. Low pressure (120 psi) and temperature (20 °C) Interfacial/surface tension cell and contact angle for 10,000 psi and 150 °C. Continuous displacement fluid pump for high pressure (6,000 psi) Positive displacement fluid pump for high pressure (20,000 psi Direct indication viscometer Viscosímetro BROOKFIELD
RESERVOIR MODELING LABORATORY	
Workstations Servers 32-Processor Cluster	

CHEMICAL ENGINEERING		
UNIT OPERATIONS LABORATORY	**PHYSICOCHEMISTRY LABORATORY**	**CHEMISTRY LABORATORIES**
FLUID FLOW: 1.Fluids: liquid flow with determination of pressure drops of valves, fittings and flow meters. 2. Reynolds experiment or its equivalent. 3. Centrifugal pumps. HEAT TRANSFER: 1. Heat exchanger. SEPARATION PROCESSES: 1. Absorption column. 2. Distillation	1. Liquid-vapor balance. 2. Vapor pressure. 3. Liquid-liquid balance. 4. Heats of reaction. 5. Latent heat. 6. Chemical Equilibrium. GENERAL INFRASTRUCTURE: 1. Thermometers, thermocouples. 2. Pressure gauges. 3. Spectrophotometer. 4. Viscometer 5. Potentiometer	1. Identification of functional groups. 2. Melting points. 3. Organic synthesis. 4. Gravimetric analysis. 5. Volumetric analysis. GENERAL INFRASTRUCTURE: 1. Extraction hoods. 2. Safety equipment. 3. Analytical balances. 4. Spectrophotometer. 5.

CHEMICAL ENGINEERING		
UNIT OPERATIONS LABORATORY	**PHYSICOCHEMISTRY LABORATORY**	**CHEMISTRY LABORATORIES**
equipment. 3. Evaporation equipment. 4. Drying equipment. 5. Filtration equipment. REACTOR ENGINEERING: 1. Batch reactor.	for pH measurement. 6. Analytical balances. 7. Glass material. 8. Calorimeter. 9. Safety equipment. 10. Extraction hood.	Chromatograph. 6. Rotavapor. 7. Glass material.

TELECOMMUNICATIONS ENGINEERING			
ELECTROMAGNETIC THEORY LABORATORY	**LABORATORY OF LINEAR ELECTRONICS, ANALOG AND DEVICES**	**COMMUNICATIONS LABORATORY**	**POWER ELECTRONICS LABORATORY**
Radio frequency generator Civilian band radio Roe Meter Directional Wattmeter Absorption wavemeter Digital oscilloscope Vector Network Analyzer Fiber Optic Kit Transmission Line Trainer Antenna demonstrator for vhf Antenna demonstrator for uhf Field Meter Microwave trainer	Digital oscilloscopes Function Generators Power Supplies Digital multimeters TV trainers Radio frequency generators Inductance meters Linear circuit simulator	Regulated sources Radio frequency generators Oscilloscopes Random signal generators Power sensors Multimeters Computer fiber optic kit	Digital oscilloscopes Function Generators Power Supplies Power Quality Analyzers AC engines DC engines Transformers
CIRCUIT LABORATORY	**NETWORK LABORATORY**	**CONTROL LABORATORY**	**COMPUTER LAB**
Function Generators Oscilloscopes Power Supplies Power Quality Analyzers Meters R,L,C Bench multimeters Computer	Routers Computer	Programmable logic controllers p.l.c. Sensors and actuators Computer simulators Oscilloscopes	Drivers Microprocessors Digital circuit simulators Oscilloscopes Function Generators Computers

TELECOMMUNICATIONS ENGINEERING			
ELECTROMAGNETIC THEORY LABORATORY	**LABORATORY OF LINEAR ELECTRONICS, ANALOG AND DEVICES**	**COMMUNICATIONS LABORATORY**	**POWER ELECTRONICS LABORATORY**
Computer linear circuit simulator			

ANNEX 3: GLOSSARY OF TERMS

Accessibility

Characteristic of urban planning, buildings, transportation, systems, and means of communication allows any person to use the facilities or infrastructure necessary for the program regardless of their physical, mental, or sensory condition.

Admission profile

The entrance profile integrates the set of knowledge, skills, attitudes, and values or competencies that the applicant must meet and demonstrate when entering an educational program, in particular, to ensure their training at the end of their professional studies. All study programs must have an established entrance profile.

Advising

Academic advising is an activity carried out by faculty members or outstanding students to support students to improve their performance in courses or subjects, or help them develop competencies to successfully face the learning activities assigned by the professors who teach the different topics or courses of the educational program.

Approval rate

It is the number of students passing a course or grade to the total number of students enrolled.

Course or subject

In general terms, it refers to the organization of the contents foreseen in the study plan. The institutional, educational model includes modules, seminars, learning units, or whatever they are called.

Desertion

A dropout is a student who abandons their studies and leaves the level they were initially enrolled. This term is currently associated with dropping out of school and is often assumed to be similar.

Dropout rate

A dropout is considered when a cohort student leaves the educational program, although they may enroll in another program in the same or another institution. The dropout rate is calculated by adding all students leaving the program to the total number enrolled in the cohort.

TDSC = (ADS / AIS) X 100.

Where:

ADS = Number of students in the cohort who dropped out.

AIS = Number of students initially enrolled in the cohort.

Curricular flexibility

In general terms, curricular flexibility refers to diversity of educational options that aims to achieve an equitable level of academic competencies. It includes incorporating diverse educational modalities (online, open, virtual, summer courses, in-company courses, certification of acquired knowledge, etc.), different lengths of the plan (different durations), optional subjects, credit recognition, among others. It also refers to interdisciplinarity, curricular integration, linkage with the productive sector, and credit systems, among other things. Thus, flexibility poses to break the structures of time and space to acquire knowledge that transforms the social relations of learning, based on the resizing of pedagogical practices, since it is not necessary to share a physical space to share knowledge, nor to have a synchronous relationship.

In this way, curricular flexibility implies rigid opening spaces, coordinated by institutional norms and rules, to give way to professional training. The leading actor is the student and his professional interests. It includes:

- Selection, by students, of a set of courses within their training path.
- Diversification and expansion of activities, spaces, and actors in the training process.
- Promotion of student mobility processes.
- Development of training programs in different modalities with the support of TICs.
- Recognition and accreditation of competencies acquired outside the school context.
- Modification in the duration of degree programs.
- Diversification of degree options.
- Pedagogical flexibility, i.e., in teaching, learning, and assessment strategies.
- Flexibility in the different areas, spaces, and modalities of operation in the educational context represents an opportunity for innovation in training.

Egresado

An *egresado* is a person who accredits all the subjects and activities that constitute a study plan.

Employers

A person who employs others, in this case to graduates of the PE.

Enrollment

Enrollment refers to the number of students enrolled during a school year in an educational program of an educational institution or campus (Glossary, SEP 2008).

Faculty member

All faculty members who perform teaching, research, liaison, or cultural dissemination functions and systematically and specifically carry out academic activities of a technical or academic support nature in an educational program. They are professionals who participate as professors or researchers in the service of a PE. They may be full-time, part-time, or subject.

Failure rate

According to what is established in the study plans and programs, it is the percentage of students who fail to demonstrate the learning obtained in a course.

Graduate profile

It is the set of knowledge, skills, attitudes or values, competencies, or capacities that a graduate should achieve at the end of their training process.

Graduation efficiency

Refers to the proportion of students who graduate to those who entered under institutional norms. Each HEI will adjust this time according to its regulations.

ETT = (ATC / AC) X 100

Where

ATC = Number of students in the cohort who have graduated.

AC = Number of students that integrate the cohort.

When calculating this index, must take the regulations of the different HEIs into account regarding the maximum time a student has to conclude their studies.

Information centers

These are specialized centers whose primary function is to create and develop plans and programs for services that allow students and faculty members access to stored academic information. Their main objectives are to provide specialized and updated information on topics of interest for life, research and contribute to the development of research culture through disseminating research work carried out in the institutions.

Lagging rate

The percentage of students who have not progressed as planned in the curriculum for a given cohort.

Retention rate

It is the percentage of students in a cohort who remain in the educational program, thus excluding graduates and dropouts.

School cycle

The official period in which the school activities of a degree program in the National Education System are carried out. The school cycle may be four-month, semester, or annual, depending on the institutional model.

School trajectory (career path) studies

Descriptive studies that make possible to quantify school trajectory phenomena and qualitatively explain the causes or factors that determine or impact them and define actions to address them. The school trajectory must include admission, permanence, concluding credits, and academic-administrative requirements defined by the study plan and graduation.

Student cohort

Group of people who begin their studies in an educational program at the same time. In higher education institutions, it is a group of students who enter at the same time and graduate at the time contemplated in the curriculum design.

Student mobility

It consists of facilitating the stay of students of the institution of higher education in other institutions in Mexico and abroad to complete semesters, take courses and workshops, participate in research projects and receive advice to complete their undergraduate thesis work.

Support personnel (administrative, manual, and service personnel)

The group of people in charge of the operation and maintenance of a work center. It includes secretaries, heads of administrative services, coordinators of technological or academic activities, accounting assistants, doctors, support teachers, psychologists, counselors, librarians, laboratory assistants, laboratory assistants, security guards, gardeners, quartermasters, storekeepers, maintenance technicians, service assistants, and drivers, among others.

Terminal Efficiency

It is defined as the quantitative ratio of students completing the program between the total number of students enrolled in the cohort. The maximum period should consider the program's regulations, but in no case should it be greater than 1.5 times the duration of the study plan.

It is calculated through the ratio EE = (AEE / AC) X 100

Where

AEE = Number of students in the cohort that complete from the program at 1.5 years of program duration.

AC = Number of students that integrate the cohort.

Tutoring

Tutoring accompanies teachers to students in an educational program to help them make decisions about their path in the program. The tutor teaches the student to address academic weaknesses by leading them to faculty members to address problems of failure or lag through counseling or other issues to the corresponding areas (health, psychological or medical).