

ACCREDITATION CRITERIA AND PROCEDURES

Engineering Programs 2018

Colegio Federado de Ingenieros y Arquitectos

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PREFACE

The Colegio Federado de Ingenieros y Arquitectos de Costa Rica (CFIA) [Federated Association of Engineers and Architects of Costa Rica], in response to the worldwide trend to establish an accreditation system for architecture and engineering education programs, started in 1993 a process to develop such an Accreditation System.

As a fundamental part of this process, with the assistance of members of Engineers Canada Accreditation Board (ECAB) who assessed the programs, several engineering programs obtained the “substantially equivalent accreditation” under internationally recognized standards and procedures.

This process allowed an important number of CFIA members to get the required know-how and experience which, in turn, has made it possible to establish our own accreditation system. This accreditation system was recognized by the International Engineering Alliance (IEA) as it granted CFIA a provisional signatory status of the Washington Accord.

Therefore, for CFIA and its affiliates (Colegio de Ingenieros Civiles, Colegio de Ingenieros Topógrafos, Colegio de Ingenieros Electricistas, Mecánicos e Industriales, and Colegio de Ingenieros Tecnólogos), as well as for its Joint Accreditation Commission, it is with great satisfaction that we present these “Accreditation Criteria and Procedures for Engineering Programs 2016.” We are sure that they will significantly contribute to the improvement of engineering education and professional practice in Costa Rica.

Thus, we believe that with the implementation of this manual CFIA is taking a vital and transcendental step in its responsibility for the promotion of the continuous improvement of engineering education programs and for ensuring the Costa Rican society that the engineering profession is practiced under the strictest, most ethical, and most efficient standards.

We would like to specially thank those who have been members of the Boards of Directors of CFIA’s Affiliates since 1993. In particular, we would like to acknowledge the effort and support of the current General Board of Directors, chaired by Engineer Fernando Ortiz, and the contribution of engineers Carlos Villalta, Carlos Bejarano, and Daniel Acuña, current presidents of CFIA’s affiliates.

We would also like to acknowledge those who participated in the Drafting Workshops for the Accreditation Criteria and the policies and parameters of the accreditation processes for engineering programs in Costa Rica for their generous contributions and professional work. We would like to thank CFIA’s Academic and Professional Evaluation

Department for its review and design of the manual. In other words, our gratitude to Max Buck, Eduardo Paniagua, Luis Mc Rae (R.I.P.), Jorge Rojas, Saúl Fernández, Rafael Oreamuno, Irene Campos, Olman Vargas, Javier Chacón, Celina Ciles, Dinia Vega, and Daniel Hernández.

Finally, our deepest gratitude to the members of the Canadian Engineering Accreditation Board (CEAB), currently Engineers Canada Accreditation Board (ECAB), who since 1999 have been providing their valuable advice for the design of the Accreditation System and the drafting of this document.

Consejo de Acreditación del Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (CACFIA) [CFIA's Accreditation Board]

San Jose, Costa Rica, March 2016

APPROVAL OF PROVISIONAL SIGNATORY STATUS

In accordance with the decision of the Washington Accord Signatories on 24 June 2015, the Accord Executive Committee is very pleased to accept Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (CFIA) as a provisional signatory of the Washington Accord. Also kindly accept my heartfelt congratulation on this major achievement of CFIA.

The Provisional Signatory status in the Washington Accord is the first step towards the full Signatory status, the highest global standard in accreditation of engineering education programs. All seventeen Signatories and the Accord Executive Committee stand ready to help CFIA towards this goal. I would request that CFIA familiarize itself with the document *International Engineering Alliance: Educational Accord* found on the IEA website on the details.

Again, heartiest congratulation!

Yours faithfully

Andrew M. Wo
Chairman, Washington Accord

Source: <http://www.ieagrements.org/Washington-Accord/signatories.cfm>

WASHINGTON ACCORD

Signatories have full rights of participation in the Accord; qualifications accredited or recognized by other signatories are recognized by each signatory as being substantially equivalent to accredited or recognized qualifications within its own jurisdiction.

Australia - Represented by Engineers Australia (1989)

- **Canada** - Represented by Engineers Canada (1989)
- **Chinese Taipei** - Represented by Institute of Engineering Education Taiwan (2007)
- **China** - Represented by China Association for Science and Technology (2016)
- **Hong Kong China** - Represented by The Hong Kong Institution of Engineers (1995)
- **India** - Represented by National Board of Accreditation (2014)
(Only applies to programs accredited by the NBA offered by education providers accepted by NBA as Tier 1 institutions)
- **Ireland** - Represented by Engineers Ireland (1989)
- **Japan** - Represented by Japan Accreditation Board for Engineering Education (2005)
- **Korea** - Represented by Accreditation Board for Engineering Education of Korea (2007)
- **Malaysia** - Represented by Board of Engineers Malaysia (2009)
- **New Zealand** - Represented by Institution of Professional Engineers NZ (1989)
- **Pakistan** - Represented by Pakistan Engineering Council (2017)
- **Russia** - Represented by Association for Engineering Education of Russia (2012)
- **Singapore** - Represented by Institution of Engineers Singapore (2006)
- **South Africa** - Represented by Engineering Council of South Africa (1999)
- **Sri Lanka** - Represented by Institution of Engineers Sri Lanka (2014)
- **Turkey** - Represented by MUDEK (2011)
- **United Kingdom** - Represented by Engineering Council UK (1989)
- **United States** - Represented by Accreditation Board for Engineering and Technology (1989)

Organizations holding provisional status have been identified as having qualification accreditation or recognition procedures that are potentially suitable for the purposes of the Accord; those organizations are further developing those procedures with the goal of achieving signatory status in due course; qualifications accredited or recognized by organizations holding provisional status are not recognized by the signatories.

- **Bangladesh** - Represented by Board of Accreditation for Engineering and Technical Education
- **Costa Rica** - Represented by Colegio Federado de Ingenieros y Arquitectos de Costa Rica
- **Mexico** - Represented by Consejo de Acreditación de la Enseñanza de la Ingeniería
- **Peru** - Represented by ICACIT
- **Philippines** - Represented by Philippine Technological Council

Fuente: <http://www.ieagreements.org/Washington-Accord/signatories.cfm>

1 Agency Description

1.1 Accreditation Process

It is an evaluation process that seeks to determine if an engineering education program meets the required quality standards. To this end, an accreditation model, criteria and procedures based on the Canadian Accreditation System of Engineering Education Programs and the good practices set by the International Engineering Alliance defined in the Washington Accord are used.

The accreditation criteria include an evaluation of graduates' qualifications, the program's ongoing improvement, its support policies and procedures for students' educational process, its academic curriculum, and its environment.

CFIA's Engineering and Architecture Program Accreditation Board is the body in charge of managing the accreditation process of engineering and architecture education programs in Costa Rica as part of the fulfillment to its goals set in paragraphs a and c of Article 4 of CFIA's Organic Law, which read as follows:

- Encourage the progress of Engineering and Architecture, as well as the sciences, arts, and occupations related to them.
- Promote the educational, social, economic, technical, artistic, and legal conditions necessary for the evolution of its members and cooperate with state and private institutions in everything related to enhancement of the country's development.

1.2 Agency's Historical Overview

On July 3, 1903, Decree No. 34 created the Facultad Técnica de la República, today's Colegio Federado de Ingenieros y Arquitectos (CFIA) (Law No. 4925, December 17, 1971).

In February 1993, under the auspices of UPADI (Unión Panamericana de Asociaciones de Ingeniería) the First Pan-American Seminar and First National Congress on the Institutional Evaluation and Accreditation of Engineering Education was held. This activity marked CFIA's first encounter with accreditation processes.

With the support of the Canadian International Development Agency (CIDA), the collaboration project entitled Accreditation of Engineering Education Programs in Latin

America was carried out between 1994 and 1997. Its goal was to “Assist in the creation of a reference framework for the accreditation engineering education programs in Latin America and promote the creation of accreditation systems...” On May 22, 1996, CFIA’s Accreditation and Authorization Committee was formally created. It immediately focused on organizing the “Workshop Seminar: Accreditation Process of Engineering and Architecture Majors” to be held from November 22 to 24 of that same year. The first proposal for an accreditation manual resulted from this activity.

CFIA’s Representative Assembly in Session No. 07-96/97G.E. held on July 28, 1997, agreed to create a Permanent Joint Commission (PJC) to be in charge of all accreditation processes for engineering and architecture majors.

Thanks to the work of the PJC, the first engineering program was accredited as “substantially equivalent” under the criteria and procedures of the Canadian Engineering Accreditation Board (CEAB) in September 1999. Thereon, every program evaluation visit involved two evaluation teams: a team from CEAB and a peer or shadow team comprised by members of the PJC.

Under this modality, more than 20 joint evaluation visits took place in three public and three private universities, ending up with the accreditation of 12 engineering programs.

On June 26, 2003, CFIA’s General Board of Directors (GBD) agreed to create the Professional Training Department (PTD) as the entity’s formal liaison with the academic sector and executor of the Joint Accreditation Board’s agreements, which formally started working in 2004.

In June 2004, CFIA’s GBD in Session No. 27-03/04-GE agreed to create the Sistema de Acreditación del Colegio Federado e Ingenieros y Arquitectos [CFIA’s Accreditation System] as a body under its control.

By Agreement No. 8 of Session 02-05/06 of CFIA’s GBD, in November 2005 Addendum No. 1 to the Cooperation Agreement between CFIA and the Sistema Nacional de Acreditación de la Educación Superior (SINAES), the country’s higher education accreditation system, was approved. Accordingly, the Agencia de Acreditación de Programas de Ingeniería y de Arquitectura (AAPIA) was created as a joint accreditation agency for architecture and engineering programs.

In Session 31-05/06 held in August 2006, CFIA’s GBD approved by means of Agreement No. 13: “(...) to delegate to the AAPIA the recommendations and technical resolutions in terms of accreditation matters.”

In 2008, a Memorandum of Understanding was subscribed between CFIA and Engineers Canada, which states that “The CEAB agrees to provide CFIA with the required technical assistance to develop and implement its own accreditation system (...)” and that “Engineers Canada commits to assist the future Costa Rican accreditation system for it to achieve its acceptance into the Washington Accord.”

In 2009, within the framework of the agreement with SINAES, a pilot plan to accredit an engineering major with the participation of CEAB observers was put in place.

In June 2015, at the general meeting of the International Engineering Alliance held in Istanbul, Turkey, CFIA was unanimously accepted as a provisional signatory of the Washington Accord. The candidacy was presented by Engineers Canada and seconded by Engineers Ireland.

1.3 Mission and Vision

1.3.1 Mission

Assist with the ongoing improvement of the education programs in engineering and architecture by implementing an accreditation process.

1.3.2 Vision

Be the guardian of the quality assurance of the education programs in engineering and architecture in Costa Rica.

1.3.3 Quality Policy:

We strive to provide accreditation services for Engineering and Architecture programs that meet the needs and expectations of higher education institutions, based on internationally recognized best practices, the principles and values of CFIA, and the commitment to continuous improvement.

1.4 Accreditation Objectives

- Assure to the national and international community that an education program meets the set of criteria to provide the pertinent education that enables graduates to get licensed to practice engineering professionally in Costa Rica.

- Encourage the constant improvement of the education programs in engineering and architecture.
- Facilitate the recognition of studies taken in other countries, within the guidelines set by the bilateral or multilateral conventions, agreements, and treaties subscribed by the country, to get licensed to practice the profession.

1.5 Policies and Values

1.5.1 Policies

The guiding strategies for CFIA's accreditation actions include:

- The conceptualization of accreditation as a dialogue-based process that seeks to understand an educational program with the goal of improving it.
- The recognition that the quality and quality assurance of education processes and their inputs, outcomes, and contexts are the primary responsibility of higher education institutions.
- A deep respect for the autonomy, identity, and integrity of higher education institutions.
- A duty to consult the various stakeholders involved in the engineering education program accreditation processes and to define accreditation criteria and procedures based on the values of responsibility, transparency, and respect.
- A desire to assist in the improvement of both the quality of education programs and their accountability to the society which they serve.

1.5.2 Values

All those involved in the accreditation process should, when performing their duties, base their actions, remarks, and decisions on the following axiological principles:

- Commitment
- Trust
- Confidentiality
- Equity
- Honesty

- Impartiality
- Independence
- Objectivity
- Respect
- Responsibility
- Transparency

1.5.3. Policy about conflicts of interest.

Those who do not have a conflict of interest or particular situation that contravenes the policies, value principles, or rules of conduct stipulated in this manual or of the instruments derived from it, will be able to participate as members of the Accreditation Council, of the technical committees, as peer evaluators or observers of accreditation processes.

1.6 Roles of CFIA's Accreditation Board

1.6.1 Main Role

Manage the accreditation process of engineering and architecture programs.

1.6.2 Specific Roles

- Define the accreditation policies, criteria, and procedures.
- Inform higher education institutions and the community at large about the accreditation policies, criteria, and procedures.
- Supervise the actions of the evaluation teams and the organization's staff.
- Train and certify competent evaluators in accreditation processes.
- Keep current in the art of education, accreditation, and practice of engineering and architecture.
- Recommend to CFIA's GBD accreditation agencies with which to enter into cooperation and/or mutual recognition agreements.
- Recommend to CFIA's GBD cooperation agreements with accreditation agencies of other disciplines.

- Appoint the evaluation teams that will visit the engineering and architecture programs undergoing an accreditation process.
- Evaluate the engineering and architecture programs in order to grant the accreditation according to the policies, criteria, and procedures established for such purpose.
- Decide the term for which accreditation is granted to each program.
- Learn and decide about the appeals for review filed by the program authorities.
- Participate in national and international forums, seminars, and congresses related to quality assurance in the academic arena.
- Collaborate with the partner organizations with which it has signed agreements in the development of mutually acceptable standards and criteria, as well as in the exchange of experiences that promote good practices in accreditation.
- Support, advise, and participate in accreditation processes outside Costa Rica.
- Advise higher education institutions that offer engineering and architecture programs on general accreditation matters.
- Report the engineering and architecture education programs that have been accredited.

2 Agency Organization

2.1 Agency Composition

2.1.1 Nature: CFIA is not a governmental organization. It is a civil society organization created by law of the republic, with legal status, patrimony and its own government.

2.1.2 Legal basis. The accreditation agency of CFIA, as an organ of this organization, is constituted under the scope of Section c, paragraph 4, chapter 2 of the Organic Law of the Colegio Federado de Ingenieros y de Arquitectos de Costa Rica, of December 17, 1971, that states: "Promote the educational, social, economic, technical, artistic and legal conditions necessary for the evolution of the professions that integrate it and cooperate with state and private institutions in everything that involves improving the development of the country."

2.1.3 Address, control and surveillance: Shall be borne by the following bodies: Assembly of representatives, General Board of Directors of the CFIA, Accreditation Board, technical committees and Executive direction of the CFIA.

2.1.4 Assembly of Representatives

This is the maximum authority at CFIA. It is in charge of approving the guidelines, policies, and annual budget of both CFIA and its Accreditation Agency.

2.1.5 General Board of Directors (GBD)

It is in charge of CFIA's general administration. It is comprised by two representatives of each of its affiliate associations. The GBD members remain in office for two years and may be reelected.

The GBD will be responsible for overseeing the roles of CFIA's Accreditation Agency. It will delegate to CFIA's Accreditation Board, without detriment of the powers conferred upon it by law, everything related to the administration of the accreditation processes. Furthermore, it will approve its extraordinary budget as provided by CFIA's Organic Law.

2.1.6 CFIA's Accreditation Board

2.1.6 CFIA's Accreditation Council: It is a permanent body of CFIA, comprised by 14 full members, all with the right of voice and vote.

Its Constitution is as follows: two representatives (one full members and one alternate) of each of the five affiliate associations of CFIA: Colegio de Ingenieros Civiles (CIC) [Association of Civil Engineers]; Colegio de Arquitectos de Costa Rica (CACR) [Association of Architects of Costa Rica]; Colegio de Ingenieros Electricistas, Mecánicos e Industriales (CIEMI) [Association of Electrical, Mechanical, and Industrial Engineers], Colegio de Ingenieros Topógrafos (CIT) [Association of Land Surveying Engineers], Colegio de Ingenieros Tecnólogos (CITEC) [Association of Technology Engineers], two representatives of the Cámara Costarricense de la Construcción (CCC) [Costa Rican Construction Chamber], and two representatives of the Cámara de Industrias de Costa Rica (CICR) [Chamber of Industries of Costa Rica]. All of CFIA's Accreditation Board members must be professional engineers or architects.

The Accreditation Council members will remain in their position for a period of 2 years, and may be re-elected for a maximum of two consecutive periods.

The president and vice-president of the Accreditation Council will remain in the position for 2 years and may be re-elected for a maximum of two consecutive periods.

2.1.7 Technical Committees

They are made up by professionals who are members of CFIA and who have experience and knowledge in program accreditation matters. The Technical Committees are coordinated by a member of CFIA's Accreditation Board. The main functions of the Technical Committees are:

- Update the manual of accreditation criteria and procedures and its related evaluation instruments.
- Participate in the training actions derived from the accreditation processes.
- Be part of the visiting teams, if so determined by CFIA's Accreditation Board.

2.1.5 CFIA's Executive Directorate

CFIA's Executive Director is in charge of the executive functions of its Accreditation Agency. The Executive Director may delegate such function to the Academic and Professional Evaluation Department. The duties of the Director or his/her delegate are:

- To adhere to the policies set by CFIA's Accreditation Board, the General Board of Directors, and the Assembly of Representatives and oversee their compliance.
- To enforce all the agreements made by CFIA's Accreditation Board.
- To plan, organize, coordinate, and perform all actions related to the operation of CFIA's Accreditation Agency based on the laws, regulations, and agreements, including its operating plan, budget, activity reports, regular and special meetings of CFIA's Accreditation Board, collaboration with other accreditation agencies, and updating of the manual of criteria and procedures.

3

Accreditation of Engineering Education Programs

3.1 Definition

Accreditation is a periodic evaluation process of an educational program that ultimately makes a value judgment about its quality and ensures that it complies with the minimum necessary conditions to provide pertinent academic training in a professional discipline.

As an evaluation process, it involves a structured and in-depth analysis of the relevant information about the program under study, which is grouped in evaluation categories or components whose ensemble and interaction represent the program. This information is interpreted in the light of a reference framework composed of criteria, indicators, and minimum referents considered adequate to assess the quality of the program.

If an educational program is accredited, this means that it is an authorized educational organization which, based on a clear set of rules and using adequate resources, complies with or exceeds the minimum requirements set to educate people in the specified field. This is certified to the public by an accrediting agency.

3.2 Accreditation Milestones

From the evaluation stakeholders' perspective, accreditation has three milestones: internal or self-evaluation, external or heteroevaluation, and, finally, a metaevaluation or synthesis.

The self-evaluation is carried out by the “university agents” themselves who are responsible for the educational program. Its immediate purposes are to ensure the program is constantly improving and to get ready for the external evaluation.

The heteroevaluation is performed by external “academic peers and professionals” who are considered to be qualified evaluators and who, according to the objectivity required by their position, are responsible for issuing an assessment report stating whether the program being evaluated complies with the criteria or not. The report is submitted to CFIA's Accreditation Board that, in turn, will determine the status, in terms of accreditation, of the program evaluated and report it to CFIA's Board of Directors.

The metaevaluation (evaluation of the evaluation) deals with the evaluation process itself in order to improve it continuously. This is under the responsibility of the accreditation agency involved in its development and is part of its quality assurance.

3.3 Purpose of the Accreditation

The overall purpose of the accreditation is to identify, according to the established criteria, the engineering education programs whose graduates have been trained in the academic contents of their particular discipline and, therefore, are eligible to be licensed to start their professional practice since they have the necessary competencies and skills as supported by their degree.

CFIA has decided that its members have to be competent in their disciplines and have to understand the impact of their professional practice on society. Therefore, the accreditation process has to indicate what programs properly train their graduates in engineering matters through their content and promote the development of the skills, competencies, and values that would allow them to be successful and adhere to the strictest ethical principles.

3.4 General Characteristics of the Process

Accreditation is voluntary and is only performed when the institution's authorities offering the engineering programs at a university level request it.

Accreditation is granted to individual engineering programs and not to departments, colleges, or universities as a whole.

The accreditation status and term for which the program is accredited are decided by CFIA's Accreditation Board based on the assessment of the information supplied by the program authorities, the report prepared by the peer reviewers, and the improvement project submitted.

The accreditation process encompasses and integrates both quantitative and qualitative criteria.

The accreditation process is characterized by being respectful of the idiosyncrasy and particularities of each program but demands compliance with the established standards.

The information submitted by the authorities of the program being evaluated must be complete, clear, accurate, objective, and relevant. The omission of any of these aspects may cause the process to be invalidated and the need to start all over.

The assessment is carried out by a team of peers that can come from both the academy and the industry.

The information submitted by the peer reviewers must be complete, clear, accurate, and objective, so that it allows for a proper assessment of the program for accreditation purposes.

All of the information provided by the authorities in charge of the program undergoing an evaluation as well as that submitted by the peer reviewers and the deliberations of CFIA's Accreditation Board are confidential. Only the names of the programs that meet the accreditation criteria and, therefore, in the opinion of CFIA's Accreditation Board will be granted the accredited status as well as their accreditation term will be made public.

Any change in the program that alters the conditions under which it was accredited must be reported to CFIA's Accreditation Board, which will decide whether it is necessary to evaluate the program again or not.

For accreditation purposes, a program is characterized by a formally approved and published academic curriculum considered as a separate entity by the institution that may evaluate independently. All of the program options are examined. Based on the principle that a program is only as strong as its "weakest link," a program is accredited if and only if all of the training options or emphases meet the accreditation criteria.

If the program is offered in different venues or campuses, either partially or totally, the assessment visit will only include the venues for which the corresponding assessment has been requested. In those cases, the accreditation criteria must be met in all the venues or campuses to be assessed.

If a program, because of its title, is subject to the content requirements of two or more engineering programs, the program must comply with the requirements of CFIA's Accreditation Board for each engineering education program referred to in its title. CFIA's Accreditation Board will not evaluate or accredit degrees, diplomas, certificates, or components thereof not related to engineering. Only engineering diplomas and degrees will be reported in the annual report of accredited programs.

CFIA's Accreditation Board must have evidence that each degree option offered by the program has a significantly different curricular content and that the option title accurately depicts the curricular content.

CFIA's Accreditation Board must receive evidence that the title of the program is adequate for all options it offers. The accreditation is granted for a limited number of years ranging from three to six years maximum. The number of years of the accreditation will be based on the value and merits demonstrated by the program based on the accreditation criteria and the sovereign decision of CFIA's Accreditation Board.

3.5 General Evaluation Categories

The program analysis is carried out by breaking it down, for evaluation purposes, in segments interacting with each other; each segment has to have inherent characteristics that differentiate it from the rest. These segments are referred to herein as categories.

The set of categories, together with their interactions, represents the program. The evaluation process has the goal to assign a “quality value” to each of the categories, and, using this as a starting point, infer the overall quality of the program.

The program must fully satisfy the entry requirements and meet at least an 80% qualification in the percentage of compliance of the accreditation criteria, to obtain the status of accredited.

3.5.1 Categories

- Curriculum
- Faculty
- Infrastructure
- Management
- Students and graduates

3.6 Initial Requirements

The institution and the program must make sure that they meet the initial requirements to be subjected to accreditation: program authorization, academic degree, title, and program graduates.

3.6.1 Authorization Agreement

Only educational programs authorized by one of the country’s competent bodies, either the Consejo Nacional de Rectores (CONARE) [National Council of Provosts] or the Consejo Nacional de Educación Superior Privada (CONESUP) [National Council of Private Higher Education], or a law of the Republic are eligible for accreditation. Therefore, the agreement number and the corresponding operation authorization date must be included in the application.

3.6.2 Academic Degree and Title

Only programs that grant the academic degree of *Licenciatura* or equivalent are accredited. Therefore, it is necessary to report the authorized title and academic degree using the degree and title nomenclature authorized for Costa Rican higher education.

If the academic offer includes “lateral exits” or interim academic degrees before the *Licenciatura* (Baccalaureate or associate degrees), they are not eligible for accreditation on their own, but only as part of the whole program which concludes with the *Licenciatura* academic degree.

3.6.3 The title of the program:

It should correspond and be coherent with its nature and explicitly state in the title of the diploma offered that it is an engineering program. The title of the program must depict the curricular content.

3.6.4 Graduate Cohort

The program being evaluated must have at least one cohort of graduates with the academic degree of *Licenciatura*, who have completed the academic process of the program under scrutiny. For new programs, the evaluation may be performed at the time their students are taking their last academic cycle, so that the accreditation decision coincides with their graduation.

4 Accreditation Criteria

1 Curriculum (Curricular Content)

As a whole, the curriculum must provide the academic content that enables to get the pertinent training in all aspects that qualify for the professional practice of the discipline at the time of entering the labor market, particularly the graduate attributes.

A. General Aspects

1.1 Commitment to Continual Improvement

The programs eligible for accreditation must be committed to their ongoing improvement. There must be improvement processes in place, expressed by means of

planning, execution, verification, and corrective actions to seek excellence in the provision of the services and the achievement of the graduate attributes.

1.2 Curriculum Orientation

The curriculum orientation must be explicit. Its mission, vision, and general objectives must be clearly formulated, be pertinent to the universal conception of the discipline, be known by the academic community, and be aligned with the institutional goals.

B. Academic - Professional Profile

The education provided by the academic curriculum should allow a broad basis for the practice of engineering.

The evaluation of the academic – professional profile focuses on the graduate attributes on which the program’s educational efforts have to be based, that must include the approach, development and assessment of the achievement of the attributes.

1.3 Graduate Attributes

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” (Washington Accord, 2015).

The program being evaluated must demonstrate the effectiveness and pertinence of policies and actions carried out for incorporation into the training process the attributes of the graduates.

At least the policy that establishes the incorporation in the training process of the focus by attributes and evidences of the commitment of the professors and academic authorities must be presented, to assume this approach. It must be reported at least the mapping in the academic curriculum of the attributes, in which it is indicated in which subject, in what academic cycle a certain attribute is developed or evaluated and the corresponding level (initial, intermediate or advanced), the tools and indicators developed to verify the achievement of each of the attributes, as well as the results obtained from its application in recent years.

- **Engineering knowledge:** Competence to apply university-level mathematics, natural sciences, engineering fundamentals, and specialized knowledge to solve complex engineering problems.

- **Problem analysis:** An ability to use appropriate knowledge and skills to identify, formulate, research literature, analyze, and solve complex engineering problems and reach substantiated conclusions by using the principles of mathematics, natural sciences and engineering sciences.
- **Solution design and development:** An ability to design solutions for complex engineering problems and to design systems, components, or processes that meet specific needs with appropriate attention to public health and safety, applicable standards, and cultural, social, economic, and environmental aspects.
- **Investigation:** An ability to conduct investigations of complex problems by means of appropriate knowledge and methods, including experiment design, data analysis and interpretation, and synthesis of information to reach valid conclusions.
- **Use of modern engineering tools:** An ability to create, select, apply, adapt, and expand appropriate techniques, resources, and modern engineering and information technology tools, including complex engineering problem prospecting and modeling, and be aware of their related limitations.
- **Engineering and society:** An ability to apply reasoning informed by a knowledge of the context, which includes an assessment of social, health, safety, legal, and cultural aspects and the corresponding responsibilities, relevant for the professional practice of engineering and the solution of complex engineering problems.
- **Environment and sustainability:** An ability to understand and evaluate sustainability and the impact of professional engineering works on the solution of complex engineering problems in social and environmental contexts.
- **Ethics and equity:** Ability to apply ethical and equity principles, committing to justice and the duty of professional practice, with the responsibilities and international standards of engineering practice
- **Individual and teamwork:** An ability to work effectively as an individual or as a member or leader in a variety of teams, preferably in a multidisciplinary setting.
- **Communication:** An ability to communicate complex engineering concepts within the profession and to the society at large. This ability includes understanding and writing effective reports and design documentation, giving

effective presentations, and effectively giving and responding to clear instructions. Communication in a second language should be encouraged.

- **Project management and finances:** An ability to appropriately incorporate management, economics and business practices, including project, risk and change management, into the practice of engineering and to understand their limitations. It is also desirable to understand the basic aspects of starting and managing technologically-based companies.
- **Life-long learning:** An ability to acknowledge the need for continuous education and to engage in an independent life-long learning process by identifying and managing their own educational needs within a technologically-changing world.

1.4 Curriculum Structure

The program curriculum map, its development themes or thematic areas, the common courses with other engineering programs (common core), and their timeline and organization must be well established. All these aspects must be pertinent to the program nature.

The program authorities and faculty must ensure that the study objectives and contents of all program development themes are relevant, pertinent, up-to-date, and sufficient to favor the achievement of the graduate attributes.

It is advisable for the curriculum to include optional or elective courses that allow catering to students' particular interests and that are pertinent to the emerging demands in the labor market.

1.5 Curriculum Compliance and Level

All students who graduate, including those who entered via recognition of previous studies or transfer of credits from other institutions or programs, whether they took such courses by attending classes or at a distance, must comply with all curricular content. This must be clearly reflected in the students' academic transcripts.

If prior university-level (post-secondary) studies in mathematics, natural sciences, or complementary courses are recognized, the corresponding criteria and procedures must be clearly explained in the institution's admission policies.

The academic level of the curriculum must be appropriate for a university-level engineering program.

1.6 Program Duration

The total duration of the curriculum must be specified and, under no circumstances, may it be inferior to the equivalent instruction time of 2250 accreditation units (AU) at a university level.

An AU is equivalent to one lecture, lesson, or teacher-student interaction activity lasting 50 minutes. An hour of laboratory work, workshops, and scheduled tutorials are weighted at 0.5 AU.

Classes of other than the nominal 50-minute duration should be reported proportionally. In assessing the time assigned to determine the AU of the various components of the curriculum, the actual instruction time exclusive of final examinations should be used.

Activities which are not lessons, laboratories, tutorials, or workshops, such as research projects, internships or practice hours at an industry must be reported by the institution using accreditation equivalent units. The procedure used for their calculation must be clearly explained.

CFIA's Accreditation Board may consider situations that deviate from this approach and methodology provided that a convincingly documented justification is submitted to support it and that there is evidence of an innovation process being used in engineering education.

C. Minimum Curriculum Components

The program course contents for evaluation purposes are grouped in five categories: mathematics, natural sciences, engineering sciences, engineering design, and complementary courses.

The entire program must include at least 2250 AU.

- Mathematics: minimum 225 AU
- Natural sciences: minimum 225 AU
- Mathematics and natural sciences combined: minimum 495 AU
- Engineering sciences: minimum 315 AU
- Engineering design: minimum 315 AU
- Engineering sciences and engineering design combined: minimum 990 AU
- Complementary courses: minimum 315 AU
- Instruction in laboratory principles, standards, safety procedures, and experience

1.7 Mathematics

225 AU minimum, including at least the topics corresponding to linear algebra, differential and integral calculus, differential equations, probability, statistics, and numerical analysis

1.8 Natural Sciences

225 AU minimum, including elements of physics and chemistry and, as applicable, elements of biology and geology

1.9 Mathematics and Natural Sciences Combined

It must include at least 495 AU, leaving 45 AU for any combination considered appropriate.

The technical aspects of the courses must be complemented with adequate laboratory hands-on activities taking into consideration the safety principles, standards, and procedures.

1.10 Engineering Sciences

315 AU minimum; engineering sciences imply the application of mathematics and natural sciences to analyze and solve practical problems. They involve the development of mathematical or numerical techniques, modeling, simulation, and experimental procedures. These contents must be pertinent to the “state of the art” of the profession according to the nature of each discipline: strength of materials, thermodynamics, fluid mechanics, solid mechanics, electrical circuits, electronic systems, automatic control, environmental sciences, soil mechanics, computer science, transport phenomena, materials science, aerodynamics, and geotechnics.

The inclusion of contents from other engineering disciplines other than those specific to the program should be favored in order to enable assessment of and exposure to a multidisciplinary perspective.

Priority should be given to the inclusion of engineering science contents and to making sure that the program is at a “state-of-the-art” level regarding the use of the pertinent engineering tools.

Appropriate laboratory experience must be a complement to the course theoretical aspects, taking into consideration instruction in safety principles, standards, and procedures.

1.11 Engineering Design

315 AU minimum; engineering design incorporates mathematics, natural sciences, engineering sciences, and complementary studies in order to develop elements, systems, and processes to meet specific needs. It is a creative, interactive, and open-ended process, subject to the constraints brought about by standards, regulations, economic, health, safety, environmental, or societal factors, as applicable.

The engineering curriculum must culminate in a significant design experience that is relevant, integrates the knowledge and skills acquired throughout the educational process, and gives students the possibility of being involved in teamwork and project management. This experience must be supervised by a faculty member licensed to practice engineering in Costa Rica.

The engineering design content must include the use of modern engineering tools.

The natural sciences, engineering sciences, and engineering design courses must include as part of their learning process effective and pertinent laboratory and fieldwork experiences, as well as instruction in safety principles, standards, and procedures.

1.12 Engineering Sciences and Engineering Design Combination

It must include at least 995 AU, leaving 360 AU for any combination considered appropriate.

1.13 Complementary Courses

315 AU minimum; the curriculum should include objectives and contents that provide for a comprehensive education, complement the technical aspects of the program, and favor the development of general competencies or “soft skills.” The areas of knowledge to consider include humanities, social sciences, arts, administration, engineering economics, the impact of technology on society and the environment, sustainable development, professional ethics, equity and legislation, leadership, teamwork, occupational health and safety, oral and written communication.

As many specific mandatory courses in these areas as necessary should be included in order to cover the whole range of the topics and the required accreditation units.

Language courses may be included in this category, but may not replace the requirements in the areas specified above.

1.14 Final Graduation Project

It must be mandatory and a requirement for graduation. Regardless of the graduation modality used (research project, thesis, comprehensive examinations, or supervised professional practice), the final graduation project must have at least a research component and a significant design experience whose results are recorded in a formal document.

1.15 Instruction in Safety Principles, Standards, and Procedures

As part of the training and daily experiential education, all students in particular and the academic community at large should be trained in the safety standards, principles, and procedures applicable to the different options.

2 Faculty

The evaluation of the program faculty members seeks to determine their suitability to contribute to the achievement of the graduate attributes, as well as the contextual conditions that favor their efforts in this sense.

A. General Characteristics

2.1 Organizational Climate

The operational planning, curricular development, and achievement of the graduate attributes primarily depend on the faculty; therefore, the institution must provide the adequate conditions for their effective work and ensure, through effective and timely policies and actions, the quality, morale, and commitment of all of its members.

The program should carry out and report a general assessment of the quality, morale, and commitment of its faculty members and use its results as input for continual improvement. It is advisable that the main outcomes of this assessment be published in a transparent manner in some institutional means of communication to inform the academic community.

2.2 Number of Faculty Members

There must be sufficient faculty to cover all areas of the curriculum, allow for adequate faculty – student interaction, provide academic counseling, and participate in the development, control, and administration of the curriculum.

A significant percentage of the faculty teaching the courses related to engineering sciences or engineering design must be full-time faculty members.

A significant percentage of the faculty teaching the mathematics and natural science courses must be full-time faculty members.

If full-time equivalent calculations are used, then care should be taken to assign and distribute academic work equitably.

Faculty members working less than a quarter of a full time are not considered.

2.3 Teaching Career

There should be a faculty hierarchy scheme or ranks in place that allows faculty members to be promoted within the institution based on their experience and academic and professional merits.

2.4 Faculty Council (or Equivalent Body)

Full-time faculty members and program authorities should meet periodically (at least once every term) to share information, engage in a dialogue, and express their opinion on the program academic and administrative aspects. Other faculty members may also be invited to participate in these meetings. The Council must record in minutes the main discussions, actions, and agreements taken. The program authorities must follow up on the agreements and enforce their implementation.

2.5 Authority and Responsibility over the Program

The Faculty Council should clearly understand and document its authority and responsibility toward the program academic aspects, regardless of its administrative structure.

2.6 Curriculum Committee

There must be a faculty committee in charge of managing the program curriculum by focusing on the constant update of the curriculum and course syllabi and on adjusting them to achieve the graduate attributes and comply with other educational requirements. Most of the members of this committee should be professionals who are members of CFIA or the corresponding professional association and licensed to practice the profession.

2.7 Faculty Work Load

Faculty duties should be appropriately balanced to allow for effective participation in teaching (give lessons and tutorials, guide laboratory experiences or workshops), research, social outreach activities, professional development activities, and interactions with the industry.

The number of students per course must be adequate to the nature and demands of the educational activities being performed. The number of students per course should be the ideal in order for it not to be an obstacle to their effectiveness and the teachers' performance.

A percentage of the full-time faculty members' work load related to engineering sciences or engineering design courses should be devoted to doing research or engaging in social outreach activities. If due to justified reasons, a full-time faculty member does not participate in research or social outreach activities, the program must assign additional personnel (part-time faculty members) to these activities to compensate for the deficit in the time devoted to these activities.

A percentage of the full-time faculty members' work load must be devoted to student meetings and academic counseling and class preparation.

Part-time faculty members, in addition to teaching activities, should devote some of their time to student meetings and academic counseling.

2.8 Research, innovation and Community Outreach

At least full-time faculty members teaching engineering science or engineering design courses must participate or must have participated in a research project, of innovation, a community outreach activity, or a professional development activity in the last year. The program must report the main impacts of their actions.

It is convenient for faculty members to effectively incorporate to their teaching work the results of their own or third-party research, as well as to encourage their students to

develop their research competencies and to participate in community outreach activities.

2.9 Performance Evaluation

A teacher performance evaluation instrument must be in place and be applied to allow faculty members to improve, get promoted, and remain in the institution.

The faculty evaluation process must be filled out by the program director and the students of the courses taught by each teacher.

The evaluation categories and their criteria must be well known by the faculty members. It is advisable for the evaluation to include the following competencies for teaching at a university level: effective communication, adequate use of effective teaching methods, use of adequate learning assessment strategies, the interest and motivation they project on their students, the preparation and current relevance of their course topics, the relationship of the course contents with the professional practice, their availability to meet with students and answer their questions, their respect for and interest in their students' learning.

The performance evaluation must be applied at least once every academic term.

As part of the continual improvement process, the performance evaluation must lead to specific improvement actions in the event the performance results are less than satisfactory.

2.10 Job Stability

There must be a policy in place that encourages faculty members who show commitment to ongoing improvement of their performance to remain at the institution. If the institution uses a tenure / temporary hiring model, most faculty members must have tenure. If any other hiring model is used, it must secure the permanence of the most qualified faculty members over the next few years.

2.11 Continuous Education

There must be a continuous education program related to engineering education at a university level that allows faculty members to participate in formal training processes, either internal or external to the institution, either by attending classes or at a distance.

An updated record of all faculty members' participation in the continuous education program and their evaluation must be kept.

2.12 Commitment to Continual Improvement

The program faculty members must express their clear interest in continual improvement by demonstrating substantial progress in the performance evaluations applied by the institution. For this purpose, there must be comparative charts of the faculty members' performance for the last 3 years.

2.13 Commitment to the Profession and Teaching

It is necessary to document the activities that show the faculty's interest in supporting the curriculum and the program extracurricular activities. It is also important to document their acknowledgement of the role and importance of selfregulating the profession and joining CFIA, as an ethical commitment with society, the profession, their relationship with colleagues, and the provision of professional services.

B. Academic Qualifications

2.14 Academic Background

The program should strive to ensure that the faculty members have the highest possible academic degree in order to favor specialization, research, and innovation.

All of the faculty members must have at least the academic degree of *Licenciatura* or equivalent. If the program reports exceptions to this provision, it must properly justify it.

A significant percentage of the program faculty members must have a Master's degree, preferably in the professional field of the program.

A significant percentage of the program faculty members must have a Doctorate, preferably in the professional field of the program.

Priority should be given to hiring full-time teachers who hold post-graduate degrees.

2.15 Academic Production

The program faculty members must have a relevant and updated academic production in engineering or engineering education, either through the publication of books, articles

in journals endorsed by an editorial board and indexed in wellknown publications, or through presentations in seminars or congresses.

2.16 Teaching Experience in Higher Education

Most program faculty members must have teaching experience in higher education, preferably in accredited programs.

C. Professional Qualifications

2.17 Membership

All program faculty members, whether working full time or part time, and who teach the courses primarily dealing with engineering sciences or engineering design, must be members of CFIA or the corresponding professional association.

2.18 Professional License and Good Standing

All program faculty members, whether working full time or part time, and who teach the courses primarily dealing with engineering sciences or engineering design, must be licensed and in good standing to practice the profession.

2.19 Membership in Professional Associations and Technical Committees

It is advisable for the program to strongly encourage faculty members to join pertinent professional associations and technical committees and to participate in CFIA's professional certification process.

2.20 Continuous professional education

The program should make sure that all its full-time or part-time faculty members who teach engineering science or engineering design courses have the opportunity to actively participate in professional development activities and interact with the industry. There should be a pertinent and effective continuous education program in place that allows faculty members to participate frequently in relevant educational activities in their professional field, including courses, workshops, hands-on activities, internships, forums, seminars, and congresses of professional associations. The institution must keep a record of these participations and indicate the corresponding certification gained. It is recommended that will encourage teacher participation in the process of professional updating of the CFIA or relevant professional association.

2.21 Professional Experience

Most program faculty members should have practical experience in their professional field certified by the companies where such experience was developed. Such evidence may also be obtained from the professional projects for which they are responsible and that have been registered at CFIA or the corresponding professional association.

3 Infrastructure

Buildings, equipment, and materials must aid in the adequate development of the curriculum, facilitate the students' learning process, and contribute to achieve the program's goals, in particular the graduate attributes. Therefore, timely access to all these resources should be provided to students, faculty, support staff, and administrative personnel.

A maintenance, replacement and/or updating program for buildings, equipment, and materials must be in place and be implemented.

A. Buildings

The physical facilities where the program is developed must have the pertinent conditions to foster compliance of its objectives, meet all of the curriculum requirements, favor the achievement of the graduate attributes, and encompass the principles of universal design.

3.1 Emergency Response

All buildings must have emergency response plans and protocols for any contingencies that may endanger the physical integrity of the building users. These plans and protocols must be known by the users and their effectiveness and pertinence must be validated by means of drills, training, and incidence records.

3.2 Classrooms

Classrooms must be sufficient in number and have adequate physical conditions of accessibility, space, and comfort according to the number and characteristics of students and the activities held in them.

They must be well illuminated, ventilated, and insulated against noise.

They must have adequate conditions according to occupational health and safety and environmental hygiene standards, so that education may take place without disturbances and faculty's and students' physical integrity is protected.

They must be properly and sufficiently furnished, and all furniture must be in good condition.

3.3 Laboratories and/or Workshops

Their number and layout must be adequate for the courses requiring hands-on activities to complement the theory.

The program must have duly conditioned laboratories to carry out experiments in natural sciences and engineering sciences and to execute engineering design projects.

They must be characterized by their ease of access, sufficient space, comfort, and the right number of work stations.

They must be well illuminated, well ventilated, and insulated against noise.

They must have adequate conditions according to occupational health and safety and environmental hygiene standards: signaling, fire extinguishers, smoke detectors, emergency exits, first-aid kits, eye-wash stations, showers, and any other safety device or equipment required for the activities performed therein.

They must be properly and sufficiently furnished, and all furniture must be in good condition.

It is necessary for faculty, students, and any support staff who use the laboratories or workshops to know the proper occupational health and safety and environmental hygiene norms used in laboratories and workshops and with the equipment and materials they handle.

3.4 Computer Lab

The program must have the necessary computer labs to run the applications used in the different courses. The rules of use and schedules should allow for the program students to be able to use them effectively at the time they are needed.

They must be characterized by their ease of access, sufficient space, and the right number of workstations.

They must be well illuminated, well ventilated, and insulated against noise. They must have adequate conditions according to occupational health and safety and environmental hygiene standards: signaling, fire extinguishers, and emergency exits.

They must be properly and sufficiently furnished, and all furniture must be in good condition.

3.5 Sports and Cultural Facilities, Cafeteria & Library

The institution should provide access to these resources either by running them on their own or through a third party and make sure that they meet the proper conditions to favor faculty members', students', and administrative staff's wellbeing.

3.6 Faculty Offices

There should be adequate offices or rooms assigned to faculty members, especially those working full time, to prepare their lessons, meet with students, and perform other activities inherent to their duties.

For part-time teachers, at least one interaction space (teacher's room or similar) must be enabled, which allows the exchange of ideas, coordination of activities and eventually the attention of students.

3.7 Library

The institution must provide the program with a library that allows achieving the program and course objectives, obtaining in-depth knowledge of the lesson contents, and researching literature.

It must be characterized by its sufficient space, ease of access, the right number of work stations, and appropriate opening hours.

It must be well illuminated, well ventilated, and insulated against noise.

It must have adequate conditions according to occupational health and safety and environmental hygiene standards: signaling, emergency exits, and fire extinguishers.

It must be properly and sufficiently furnished with functional spaces for individual study, group work, and meetings.

It must provide access to bibliographic collections, remote documentation centers (virtual or online libraries), and have internet connectivity.

3.8 Facilities for the Administrative and Support Staff

The institution must provide adequate offices to carry out the program administrative tasks.

They must be characterized by their ease of access, sufficient space, and the right number of work stations.

They must be well illuminated, well ventilated, and insulated against noise.

They must have adequate conditions according to occupational health and safety and environmental hygiene standards: signaling, emergency exits, and fire extinguishers.

They must be properly and sufficiently furnished, and all furniture must be in good condition.

B. Equipment

The program must have the equipment, devices, and instruments required to achieve its objectives, support the curriculum, and facilitate teaching and management.

3.9 Audiovisual Resources

It is necessary to have adequate and sufficient audiovisual aids that allow making presentations and aiding teaching. These resources must be accessible at the sites where the theoretical lessons, laboratories, or workshops are taught.

3.10 Laboratory or Workshop Equipment

It is necessary to have laboratory and workshop equipment and measuring and safety instruments adequate for the courses. They must be available in sufficient number, variety, and good operating condition.

3.11 Computer Equipment

The computer lab for the use of the institution or the program in particular must consist of modern computers in sufficient number with the required peripheral devices needed to run the software used by the curriculum, including internet connectivity and access.

3.12 Administrative and Support Staff Equipment

For administrative duties, office equipment in sufficient number and good operating condition must be available.

C. Materials

The program must have all reusable or consumable materials required to achieve its objectives, support the curriculum, the laboratories, and the workshops, as well as to facilitate faculty member's work, and support the program administration.

3.13 Laboratory and Workshop Materials

The institution must provide all reusable and consumable materials needed for laboratory and workshop practices related to the curriculum implementation in sufficient quantity and good condition.

3.14 Computer Software

The institution must provide updated software with the corresponding license or open source software as required by the courses and make sure that their intellectual property rights are respected.

3.15 Specialized Books, Manuals, and Periodic Publications

The library must have recently published textbooks, reference books, and technical data manuals (manufacturer's specifications, technical codes, technical norms and standards) in sufficient quantity and assortment as required by the courses. These documents may be hardcopies or digital copies.

There must be at least one subscription to as many specialized periodic publications as required by the number of curricular options or thematic areas. They may be hardcopies or digital copies.

3.16 Laboratory and Workshop Practice Manuals

Depending on the particularities of each curriculum, the program must make sure that occupational health and safety standards and environmental hygiene standards, equipment care, and laboratory or workshop activities are properly included as contents

in manuals of standards, practices and procedures available to students, either as a hardcopy or a digital copy.

It is necessary to verify proper alignment between the theoretical content and the hands-on or experiential practices proposed.

3.17 Reference Materials

The institution must have reference materials in sufficient quantity, assortment, and proper condition to support teaching and to be used as students' learning resources.

It is recommended that the institution has info-communication resources applied to the training process, such as: virtual aids for contents under study, web pages of the program's subjects, social network channels for interaction between teachers and students, among others.

4 Institution and Program Administration

The evaluation of the program administration focuses on determining if it facilitates the conditions for the consolidation of the graduate attributes upon graduation.

A. Administrative Structure

4.1 Financial and Administrative Management

It must be effective and efficient to secure the attainment of the program goals and favor the achievement of the graduate attributes. The existence of a guidance or strategic plan expressed in a balanced scorecard or any other management tools must be in place. Audited financial statements must also be available.

4.2 Participation in the Faculty Council or Equivalent Body

The role of the council, faculty council, or equivalent body must be clear in strategic decision making regarding the program. Therefore, faculty members must participate in the analysis and design of the program of a guidance or strategic plan.

4.3 Institutional and Program Planning

The plans, programs, and projects needed for the various components (curriculum, faculty, infrastructure, and student counseling) to fully meet their objectives and established accreditation criteria must be planned, executed, and evaluated.

4.4 Organization

The organization of the institution and program administrative units must be such that it enables full, diligent, and efficient management of the services offered to the students, faculty, and the public at large. Minimum pertinent documentation (organizational chart, duties of each unit and management indicators) that evidence their composition should be provided.

4.5 Constitution

Management should be in the hands of the right number of qualified people, whose permanence, dedication, and qualifications make them suitable to run the different units of the organizational structures and properly comply with their duties.

4.6 Program Administration

There should be at least one director who must be a member of CFIA or the corresponding professional association, who is licensed to practice engineering, and who is a reputable and well-known leader in the academic and professional arenas to run the program.

There must be at least one person to provide administrative support to the program, in addition to the people in charge of the laboratories or workshops; they must all have the required qualifications for their positions.

4.7 Department Environment

The program must carry out and report an overall qualitative assessment of the quality, attitude, and commitment of the administrative and support staff and of the laboratory or workshop employees. Specific examples must be included. The results of this assessment must generate pertinent and timely actions to solve potential weaknesses and maintain and improve the strengths.

B. Administrative Policies

This includes the general administrative guidelines that favor the provision of the services needed for the program development and the attainment of its objectives, in particular the graduate attributes.

4.8 Commitment with Continual Improvement

Self-evaluation, planning, and ongoing improvement must be embedded in the program administration. For this purpose, there must be documents in place that explain the guidance or strategic administrative plan, the specific development projects, and continual improvement projects.

4.9 Financial Resources

The program must have sufficient and timely financial resources to meet the needs of the curriculum, the faculty, the infrastructure, student counseling, and management. For this purpose, it must allocate a budget with different lines and economic resources assigned to them.

The financial resources must be sufficient to guarantee that qualified academic and support staff can be recruited, retained, and provided with actual continuous professional development opportunities. It should allow buying, maintaining, and renewing the infrastructure and equipment as needed.

4.10 Information and Registrar System

The management must make sure that the information about the program is available in a clear, accurate, and timely manner to students, faculty, and the public at large.

A complete, safe, reliable, and updated database must be set to include information about all program students and to be used as input for decision making. Students' academic qualifications and socio-demographic traits must be recorded there.

The information system should enable the extraction of different academic indicators related to students, courses, and the program (registration, course passing and failure rates, dropouts, permanence, recognition of internal and external studies, weighted average, and graduation data).

A database about faculty and administrative staff should be maintained to record any relevant information about them.

The management must make sure that students have access to certifications and accurate transcripts of the courses taken and the corresponding scores.

4.11 Relationship with the Professional Sector

The management must promote and take actions aiming at building a relationship between the program, faculty, and students with the professional and business sectors by means of colloquium, internships, professional practice, joint project development, cooperation agreements, and service provision.

Special emphasis should be given to faculty and students' active participation and relationship with the corresponding professional association, its committees, and societies. Therefore, there should be specific policies to encourage the understanding that joining associations and getting licensed are indicators of social responsibility, professional dignity, respect to the relationship with colleagues, and excellence in the provision of services underlying the professional activities.

4.12 Community Outreach

A significant portion of the program efforts should be devoted to performing actions (seminars, conferences, forums, workshops, free attendance courses, continuous education courses, and technical assistance to organized community groups) for the benefit of the community and that actively engage students, faculty, and the administrative staff.

4.13 Research, innovation and technological development

The institution and the program must promote and encourage faculty and students' participation in the research projects and programs, innovation and technological development included in the corresponding institutional plan as well as to add their results to the educational process.

4.14 Occupational Health and Safety and Environmental Hygiene

The institution and the program should have occupational health and safety and environmental hygiene policies that encompass specific actions aiming at consolidating a "culture" on these matters.

C. Rules and Regulations

The institution and the program should have regulations that govern the rights and duties of the institution's community and oversee their strict compliance.

4.15 Faculty and Administrative Staff

There must be regulations to govern the selection, entry, permanence, safety, evaluation, training, development, incentives, rights and duties of the faculty members, the administrative staff, and the support personnel.

4.16 Teaching, Learning, and Assessment Processes

There must be regulations to govern the teaching and learning processes and that set the general assessment policies. The assessment of the students must be an adequate combination of formative assessment and summative assessment, consistent with the expected progression of the students and the learning results that are sought, especially the attributes of the graduates.

4.17 Final Graduation Projects

There must be proper regulations to govern the graduation project options, their development, the presentation and public defense of the results, and their evaluation.

4.18 Students

There must be a regulation to govern the admission, permanence, progress, graduation, safety, rights and duties of the students.

4.19 Curriculum Control

There must be a pertinent regulation to govern the modifications and control of the curriculum.

The participation of the program director and faculty in curricular modifications must be made explicit by means of minutes.

4.20 Course Validation

There must be a pertinent regulation to govern the process of recognition and validation of studies from other programs in and out of the institution.

The recognition of prior studies may not exceed 50% of the courses of the curriculum or an equal proportion if the calculation is based on academic credits rather than accreditation units.

In any case, students must take at least 50% of the program courses. If courses from an accredited program are recognized, they may not exceed 50%, and if the courses belong to a non-accredited program, they may not exceed 20%.

Prior studies dealing with engineering sciences and engineering design can only be recognized if they were part of a university level program duly accredited by CFIA's Accreditation Board or some other accreditation agency recognized by it. If prior courses at a post-secondary level in mathematics, natural sciences, or complementary courses are recognized, the criteria and procedures must be clearly stated in the institution's admission policies.

5 Students and Graduates

This evaluation category includes the program aspects and characteristics related to admission and those that favor students' wellbeing and evidence the impact of the program on the achievement of the graduate attributes and on the labor environment.

A. Students

The evaluation focuses on the conditions that favor the generation, development, and consolidation of the graduate attributes that the program students must evidence upon completion of their education.

5.1 Student Environment

The program must perform and report a general qualitative assessment of the quality, attitude, and commitment of the students with the program and the achievement of the graduate attributes; it should include specific examples.

5.2 Admission

The admission processes and policies must be well documented.

As a vehicle of social mobility, the institution and the program must include equalitarian access policies without distinctions of any nature.

The program must verify and demonstrate that admission through advanced studies, prior studies, credit transfer, exchange studies, and validation of studies taken in other institutions meet all the accreditation criteria and that the process is applied rigorously.

5.3 Promotion and Graduation Process and Policies

The processes and policies to promote and graduate students must be properly documented. The institution must provide evidence that all students have met all the graduation requirements of the program identified in their transcript and that the educational plan attended is aligned with the program being accredited.

5.4 Academic Counseling and Orientation

The institution should provide the program students with the necessary counseling and orientation that would allow them to choose their major, validate their permanence in the program, and undergo a successful educational process.

5.5 Performance Improvement Strategies

The program management and the faculty must undertake specific strategic actions to monitor students' academic progress, particularly if there is evidence of low performance indicators.

5.6 Student Affairs

The institution and program management must set guidelines to deal with students' affairs in a prompt and efficient manner. This office should listen to and channel students' concerns and initiatives; offer them the pertinent and timely orientation in administrative processes, their rights and duties; and manage the scholarships and financial aid available equitably.

5.7 Student Association

As part of the educational commitment, the institution and the program must effectively promote the creation and permanence of students in associations or groups that favor their participation in the program development and improvement, the expression of their artistic and sports talents and community involvement, or that enhance the development of competencies such as leadership, teamwork, solidarity, and social commitment.

5.8 Audit

The institution must provide evidence that all its policies, procedures, and regulations related to the students are applied and enforced equally. The purpose is to verify the effectiveness of the monitoring and control actions developed by the institution and program authorities.

B. Graduates

The evaluation seeks to come up with evidence of the impact of the program on its graduates, as well as to determine their opinion about the program.

5.9 Graduate Information

Efforts should be made to have timely information about the graduates by keeping a complete, secure, reliable, and updated database.

5.10 Curriculum Pertinence and Perception

As a strategy to learn about the program impact, the institution must undertake periodic studies of the effect, validity, relevance, and perception of the program and its graduates among employers and professionals and incorporate the results as input for continual improvement. The frequency to perform these studies should not be longer than the average time it takes students to complete the program.

5 Accreditation Procedure

5.1 Application

The application process for a program accreditation is done upon request of a particular institution and with the consent of the corresponding authorities.

5.2 Invitations to Apply

CFIA's Accreditation Board will issue two annual ordinary invitations for engineering programs to apply for accreditation. If CFIA's Accreditation Board considers it advisable, it may issue special invitations.

5.3 Heteroevaluation Phase

The external evaluation process consists of two parts: a program evaluation by a visiting team and the accreditation decision by CFIA's Accreditation Board. The program evaluation is based on the detailed data provided by the institution in the self-evaluation document and the consensus view of the visiting team members.

The accreditation decision is made by CFIA's Accreditation Board according to qualitative and quantitative considerations.

5.4 Self-Evaluation

It is necessary for the program to do a self-evaluation of the program prior to sending its application.

The self-evaluation purpose is to determine if the program meets the minimum requirements to be able to participate in an accreditation process or, otherwise, determine what areas or aspects need to be reinforced before subjecting it to the accreditation process.

5.5 Self-Evaluation Document

The self-evaluation document gathers general information about the institution that offers the program and the academic unit being evaluated, as well as a detailed analysis

of the accreditation criteria, indicating strengths and weaknesses. The self-evaluation document format prepared by CFIA's Accreditation Board must be used. Any additional information considered relevant should be ready on the first day of the visit at the site prepared for the evaluation team.

5.6 Accreditation Application and Submission of the Self-Evaluation Document

The provost or maximum authority of the institution interested in evaluating an engineering program must send an application addressed to the chair of CFIA's Accreditation Board, asking to start the accreditation process and stating that they know all the conditions listed in the manual of instructions and procedures.

This application should include at least the following information:

- Name(s) of the academic program(s)
- Name of the program authorities: dean, school director, or equivalent
- Address, phone number, and e-mail address
- A clause stating that the commitments acquired are known and accepted, and that the amounts for the agency's accreditation services have already been paid by the means provided.

If the request is made through physical support (printed documents), the institution must send the self-evaluation document of the program to be evaluated using a means that allows accessing the information electronically.

If the information is not received as required (complete, clear, accurate, objective, and relevant), CFIA's Accreditation Board will not authorize the accreditation visit.

5.7 Acceptance and Initiation of the Accreditation Process

CFIA's Accreditation Board will inform the applicant university in writing its acceptance to initiate an accreditation process. This letter will enclose the calendar stating the dates, activities, names of the visiting team members, and the costs of the accreditation process.

To be able to start the next phase of the accreditation process, an agreement will be signed stating the parties' contractual obligations.

5.8 Selection of the Evaluation Team and Document Analysis

CFIA's Accreditation Board will select and appoint the evaluation team who will analyze the documentation submitted by the program and participate in the onsite visit.

The evaluation team will be composed of at least three professionals in engineering who are members of CFIA when dealing with only one program. These members are: a chair, a vice chair, and a specialist. For each additional program in the same university, a specialist will be added to the team. At least the specialist will be a professional in the same discipline as the program to be evaluated. In case of there not being sufficient specialists, a specialist in a related field will be appointed.

The chair of the visiting team will usually, but not necessarily, be one of the members of CFIA's Accreditation Board or one of the members of the accreditation technical committees.

At least one member of the evaluation team may be a foreigner certified in accreditation processes. Observers, endorsed by CFIA's Accreditation Board and the program, may also participate in the onsite visit.

CFIA's Accreditation Board will inform the university prior to the visit the names of the professionals who will constitute the program evaluation team.

If the program authorities have any objections about the appointment of any of the visiting team members, it must send a letter to CFIA's Accreditation Board stating the reasons for the objections. CFIA's Accreditation Board will have absolute sovereignty to accept or reject the reasons explained.

Before the program visit, the evaluation team will analyze the program selfevaluation document. All visiting team members must make a first assessment of the accreditation criteria based on the documentary information submitted. The purpose of this prior assessment is to get a high-level opinion of the program's compliance with the accreditation criteria and to determine any potential "weak links" in the program on which to focus during the evaluation visit. If an improvement project is in place as a result of prior visits, the corresponding annual reports must be part of the documentation to analyze.

5.9 Program Visit

The accreditation visit provides an opportunity for the visiting team to verify the information in the self-evaluation document and assess qualitative factors such as the

intellectual environment and morale (organizational climate), professional attitudes, and the staff's, faculty members', and students' quality.

Before the beginning of the evaluation visit, CFIA's Accreditation Board will send the program authorities the corresponding agenda, which will have already been defined by mutual agreement between the program authorities and the evaluation team. A copy of the final agenda must be attached to the evaluation report.

The accreditation visit will usually last three days; however, if the program has any particularities, such as courses being offered (partially or in full) in different locations or campuses, the visit may be extended one or two days maximum in order to collect the pertinent information.

The first day of the visit, the evaluation team will analyze in depth and verify the data in the documentation submitted. It will also review the information about the students and faculty members, including:

- Recent examinations and academic work (for the term prior to the visit)
- Manuals of laboratory standards and procedures
- Student transcripts
- Laboratory or workshop practice reports from students in different courses
- Graduation projects at the *Licenciatura* level: project documents and theses
- Research projects done by students
- Student academic records (anonyms, if necessary)
- Faculty portfolio and course syllabi (hardcopy or digital) or their equivalent
- Plans or strategic directions, results of surveys, graphic evidence of actions, regulations samples and results of the evaluation of the attributes of the graduates.

This information must be available, well organized, and sorted out at the office or room prepared for the visiting team.

The second and third days, interviews will be held with students, faculty members, school and center directors, university authorities, and support staff. An evaluation of the facilities (infrastructure, equipment, and materials) of the program and university will also be performed. At least the following activities will be carried out:

- Interview with the Provost or maximum authority of the institution
- Interviews with the Dean or equivalent of the College and the Faculty Council
- Interview with the school, department, or academic unit (or equivalent) Director
- Interview with the members of the commission in charge of coordinating the program evaluation

- Interview with school or department faculty members individually and in groups in order to assess their professional attitudes, teamwork, and overall opinions about the theoretical and practical elements of the curriculum
- Interview with students and members of the program student association, individually and in groups
- Interview with the administrative and support staff of the program
- Interview with the directors (or equivalent) of the schools or departments that teach the complementary courses, mathematics, and basic sciences for the program
- Interview with the Vice president of Student Affairs and the Financial Manager (or equivalent)
- Walkthrough of the program facilities (laboratories, workshops, specialized classrooms, and computer centers)
- Walkthrough of the university facilities and interview with the people in charge of the various centers (library, resource centers, computer centers, student diner, sports and cultural facilities)

The university must appoint a person in charge of the visit logistics, whose name must be reported to the evaluation team chair before the visit. This person must have decision-making power, may not be part of the interviewees, and must be available at all times during the visit to care for the needs and requirements of the evaluation team.

Transportation and meal costs for the evaluation team during the visit days will be borne by the university.

The university must provide the evaluation team with an office or room within the campus for the team to hold the study and analysis meetings needed. This place must be private, comfortable, and have adequate office equipment and resources.

The last day of the visit a general meeting will be held in which the evaluation team will make a preliminary oral report of the main findings of the visit: strengths, weaknesses, and areas of concern. This meeting may be attended by the people designated by the program authorities. This is a preliminary report and does not necessarily correspond to the final position of CFIA's Accreditation Board about the accreditation of the program.

5.10 Evaluation Team Report

After the visit, the chair of the evaluation team will send CFIA's Accreditation Board a report summarizing the visit and stating the strengths, weaknesses, and areas of concern of the program based on the established criteria. This report will not include

recommendations as to whether the program should or should not be accredited, as this is the sole prerogative of CFIA's Accreditation Board.

CFIA's Accreditation Board will then send this report to the program authorities to make sure that the information is accurate and complete.

The program authorities may respond to the comments of the evaluation team indicating how the weaknesses reported in the preliminary report will be overcome. An improvement project has to be submitted stating specific actions to take as well as its implementation schedule, its goals, expected budget allocation, and the people who will be in charge of the implementation. This document will be considered as a commitment from the program and, therefore, must have the endorsement of the top authorities.

CFIA's Accreditation Board will follow up this improvement project; thus, the program must send an annual report of its implementation. The submission of this annual report is indispensable to keep the accreditation status of the program.

5.11 Accreditation Decision

CFIA's Accreditation Board will meet in order to make the accreditation decision. This meeting may be attended by the members of the national evaluation team, the Dean (or equivalent) of the college or the Director of the program being evaluated, if CFIA's Accreditation Board so decides.

To make the accreditation decision, the following documents will be considered:

- The information provided by the program
- The evaluation team report
- The program response to the evaluation team's report
- The improvement project

Before this meeting, CFIA's Accreditation Board will appoint from among its members a team to analyze the information that will be responsible for preparing, if needed, either the questions that will be asked during the session to the program representatives or visiting team members or a summary report of the program compliance with the accreditation criteria and a recommendation as to whether to accredit the program or not and the term for which it should be effective. If this team believes it convenient, it may also list possible improvement actions as a respectful recommendation to the program. CFIA's Accreditation Board will solely decide whether to send these recommendations to the program or not.

The member of CFIA's Accreditation Board or of the Accreditation Technical Committee who served as chair of the evaluation team will present to the other members of CFIA's Accreditation Board his/her comments about the visit and will refer to the program compliance with the established criteria and clarify the aspects and conclusions presented by the analysis team.

If the representatives of the evaluated program are present, they may refer to the evaluation report and to the questions of the members of CFIA's Accreditation Board.

At the end of their appearance, the university representatives, as well as any other member of CFIA's Accreditation Board who acknowledges a conflict of interest, must leave the room so that the remaining members may deliberate about the accreditation status of the evaluated program. Its resolution will be sent to CFIA's Board of Directors for their information.

The accreditation term of a program will solely decided by the Accreditation Board and may last a maximum of six years.

The accreditation resolution, its term, as well as the observations and recommendations of CFIA's Accreditation Board will be reported in writing to the university authorities of the evaluated program.

5.12 Review Appeal

In the event of a decision by the Accreditation Board to terminate the accreditation of a program or to deny accreditation to an unaccredited program, the program authorities may apply for a formal review of the decision.

The formal review appeal must identify clearly and precisely the points of the accreditation result that the institution wants to be clarified or reviewed and the reasons for this.

The Accreditation Board will appoint a three-member ad-hoc committee selected from its members to analyze and make the corresponding recommendation regarding the review appeal.

Once the ad-hoc committee has presented its report, CFIA's Accreditation Board will make a decision and report it to the program authorities.

The accreditation resolutions made by CFIA's Accreditation Board are subject to the appeals provided by the applicable law.

The whole accreditation process and the reports are confidential. However, the annual report of CFIA's Board of Directors will list all newly accredited programs during the period and those whose accreditation is still in force. The programs that were not accredited will not be mentioned.

The program must report to CFIA's Accreditation Board any changes in the program made during the accreditation term. Any changes related to an aspect included in the accreditation criteria, the procedures and related regulations are considered significant and compel the program to submit a report about them. This might require an immediate re-evaluation if it is so decided by CFIA's Accreditation Board.

Any change in the name of the degree of an accredited program requires the approval of CFIA's Accreditation Board in order for the program to keep its accredited status.

When an entity provides information to renew or extend the accreditation, it must emphasize and report any changes made to the program to CFIA's Accreditation Board.

CFIA's Accreditation Board reserves the right to modify the accreditation status of any program from any institution if it finds out that the program does not comply with any of the established accreditation criteria.

5.13 Terminal plans:

In the case of terminal plans with current accreditation, the Accreditation Council will define the term of validity of the accreditation considering the date of conclusion of the program, so as not to harm people who have not yet completed the training process in such program.

6 Glossary

Academic – professional profile: Set of minimum attributes that a person must have at the time of completing an educational program.

Accreditation: Accreditation is a periodic evaluation process of an educational program that ultimately makes a value judgment about its quality and ensures compliance with

the minimum necessary conditions to provide pertinent academic training in a professional discipline.

Accreditation unit (AU): Accreditation units (AU) are defined for the activities that grant academic credits and for which the number of hours granted corresponds to actual student – faculty interaction time, as follows:

- One hour of class time (corresponding to 50 minutes of activity) = 1 AU
- One hour of laboratory, workshop, scheduled tutorial, or practice = 0.5 AU.

This definition applies to most theoretical classes or lessons, laboratory practices, workshops, or tutorials. Classes of other than the nominal 50-minute duration are calculated proportionally to their actual duration. Preparatory or leveling courses that do not receive academic credits are not considered in the calculation of the program accreditation units.

For activities which cannot use student – faculty interaction hours, such as important design or research projects or the like officially recognized by the institution as a requirement to get a degree, the institution must use an equivalent measure in accreditation units to describe the scope of the work. To determine this equivalence, the academic credit definition accepted by the competent authorities (CONARE and CONSEUP) should be used.

A K factor may be calculated to transform these credits into accreditation units (AU) using the following division:

$\sum AU$ (for all common mandatory core courses in the program for which the calculation was done in hours)

$$K = \frac{\text{-----}}{\sum \text{academic credits defined by the institution for the same courses}}$$

Assertiveness: Communication strategy and ability that is neither passive nor aggressive. The purpose is to achieve direct, consistent, congruent, concise, and balance communication.

Attitude: Qualitative construct that seeks to determine the motivation of those involved and reveals their State of mind. It is an underlying disposition that contributes to a variety of behaviors, favorable or not, in relation to the achievement of the objectives of the programme.

Categories: General units of analysis on which a program is broken down for evaluation purposes. They are the different building blocks of a program that interact with each other and that have their own characteristics. As an evaluation strategy, each category is broken down in criteria, which, in turn, are broken down in indicators. This manual establishes the following evaluation categories: curriculum, faculty, infrastructure, administration, and students.

Coherence: It is manifested in a stable, logical, and adequate relationship between two things, parts, or elements so that no contradiction or opposition occurs between them.

Common core: It refers to the set of courses, objectives, or contents that are shared by the program being evaluated with other engineering programs and that provide universal, multidisciplinary education at the beginning of the program

Competencies: These are each of the abilities that people use in diverse real work situations to resolve the problems they pose according to the standards of professionalism and the social responsibility criteria inherent to each professional discipline. These elements encompass verifiable knowledge, skills, and attitudes that constitute the traits of a professional's profile in any discipline.

Complementary studies: They include contents that provide comprehensive education and complement the curriculum technical courses. This category includes topics and courses in humanities, social sciences, administration, technology's impact on society and the environment, sustainable development, professional ethics, leadership, teamwork, occupational health, oral and written communication.

Concern: Qualitative judgment that means that a program complies with an established criterion but there is a potential risk of not complying in a near future. It is expressed with regard to a program weakness that has the potential of becoming a deficiency.

Conformity: Suitability or correspondence of some things with others with respect to their purpose, form, or function. Referring to scoring a minimum standard, conformity corresponds to a value judgment based on a criterion by contrasting the indicators with the established standard. It may include four different levels:

C±: The program exceeds all minimum referents in the criterion being evaluated. The aspect evaluated is an evident strength of the program.

C: The program meets all minimum referents of the criterion being evaluated. The program shows normal performance in the criterion evaluated; the trend detected is toward consolidation of the aspect as a strength in the near future.

C-: The program meets all or most of the minimum referents of the criterion being evaluated, but there is evidence of a trend or potential risk of near noncompliance. The aspect evaluated shows a weakness of the program in a near future and, therefore, is a matter of concern.

N: The program does not comply at all with the minimum referents of the criterion evaluated. The aspect evaluated is a deficiency of the program.

Continual or ongoing improvement: Reiterated process of planning, implementation, evaluation, and correction that seeks to exceed the goals or expectations established by mitigating or eliminating errors or deviations.

Continuous improvement cycle: also called “Deming cycle”, proposed as stages of the improvement process: planning (P) what and how is to improve something, do (D) run as planned, check (C) evaluating the results of the actions undertaken and Act (A) correcting any deviation or implementing the improvements made.

Criteria: These are the assessment principles that regulate the manifestations of the object being evaluated in several dimensions. They correspond to the aspects (inherent characteristics) of each evaluation category in which they are broken down for evaluation purposes.

Curriculum map: Graphic representation of the curriculum that provides a holistic vision of its structure. It includes the development topics, thematic areas, or curricular categories, courses (name, brief description, code, and number of credits), organization, and sequence. If the curriculum includes multidisciplinary options, they are shown as well.

Deficiency: Noncompliance with an established criterion because it does not meet at all the minimum demands established by the referents or standards; it is an extreme weakness.

Degree audit: activities of monitoring and control, carried out by the authorities of a program, to verify that all of its policies related to students, procedures and regulations are applied and met by all students who are they graduate from the program.

Effectiveness: Certainty of achieving the objectives, outcomes, or desired effects now in a way that will be even better in the future.

Efficacy: Ability to achieve the objectives, outcomes, or desired or expected effects regardless of the resources or means used.

Efficiency: Ability to achieve an end using the best possible means and by optimizing resources.

Engineering design: Engineering design integrates knowledge in mathematics, basic sciences, engineering sciences, and complementary courses in the development of elements, systems, and processes to meet specific needs. It is a creative, iterative, and usually open-ended process subject to the restrictions of the technical standards and economical, social, legal, environmental, and occupational health and safety aspects or those of an interdisciplinary nature.

Engineering sciences: The contents of engineering sciences are founded on mathematics and basic sciences but focus on creative applications. They involve the use of mathematical techniques or numerical analysis as well as simulation, modeling, and experimental methods. Emphasis is placed on the identification and solution of practical engineering problems.

Environment or climate of the program: set of features of people, the environment relationships, interactions and perceptions that determine the quality of working life, influence productivity and the development of human talent in the program or institution.

Evaluation: It is a structured and in-depth analysis that allows understanding the nature of an object of study, making a value judgment and providing information to act accordingly. As a process evaluation encompasses gathering information and its analysis and interpretation in light of a reference framework in order to make decisions.

Equity: Balance, fairness. Quality of giving each person what they deserve according to their merits or conditions; it does no favor treating a person well, while mistreating another.

Excellence: Superior quality or qualification that makes a thing or person be worthy of appreciation and care; it exceeds by much the standard or average performance.

Full time (FT): It is considered as a work schedule consisting of 40 hours per week.

Full-time equivalent (FTE): It is considered as the total sum of time corresponding to the work contribution of those working part time and those working full time.

$$FTE = [\sum(FT/40) + \sum(PT)]$$

Functionality: Set of attributes or characteristics of something that allow achieving an objective or purpose in a useful and practical way.

Graduate Attributes: Set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. They identify the abilities that characterize the actions of the graduates achieved throughout the educational process and as a result thereof.

Heteroevaluation: Time in the accreditation process in which mostly the external consistency of the program is evaluated. The heteroevaluation is performed by external “academic peers and professionals” who are considered to be qualified evaluators and who, according to the objectivity required by their position, are responsible for issuing an assessment report stating whether the program being evaluated complies or not with the criteria.

Impact: Most relevant positive or negative outcome or effect of an action or project.

Indicators: These are the sources of evidence to score the evaluation criteria which express the qualities or properties. The indicators may be qualitative or quantitative. Each criterion is deemed excellent, good, fair, or deficient during the assessment process.

Laboratory experiences: Hands-on learning activities where by means of experimentation and empirical verification the theoretical assumptions about a certain topic are tested or hypotheses are contrasted within the framework of research, tests, or design.

Learning experiences: Opportunities and deliberate actions that are planned, implemented, and assessed in order for students to develop their knowledge, skills, and attitudes significantly; they subsume the graduate attributes.

Measurement: It is the part of the evaluation process (evaluation subsumes measurement) associated with the gathering of information which may be compared with a parameter or standard of interest if it is quantified. The measurement expresses an absolute value, at a specific point in time rather than as part of a process; it does not imply an evaluation but constitutes a means of assessment.

Meta-evaluation: Global evaluation of the whole accreditation process, standards, procedures, stakeholders, and outcomes. Its purpose is the program's continual improvement.

Minimum referent: It also called standard. It is considered as the minimum parameter required to consider the achievement of the program as satisfactory in any one indicator. In the evaluation process, the “measurement” takes place at the time that the peer

reviewer contrasts the program situation in one of the indicators with the minimum referent set for it.

Natural sciences: These correspond to the scientific disciplines that are devoted to studying nature. They look into the physical aspects of reality, are supported in logical reasoning, and the methodological apparatus of formal sciences, especially mathematics and logic, whose relationship with the reality of nature is indirect. They include chemistry, physics, biology, and geology.

Opportunity: Convenient for a certain context; confluence of space and time appropriate to gain an advantage or achieve an objective.

Part time (PT): It is considered as a work schedule consisting of less than 40 hours a week.

Pertinence: Convenient for what is being sought or wanted.

Professional career: Process of professional development, growth, and maturity in teaching that characterizes, distinguishes, and values teachers' role based on their merits and experience. It is usually manifested by a hierarchy whose ranks express the different degrees of progress reached.

Professional competency: Effective ability to successfully carry out a professional, fully identified activity. It is not a probability of success in the execution of a job or activity; it is an actual and demonstrated ability to do so. It integrates and articulates knowledge, abilities, skills, and attitudes in the execution of the related tasks.

Professional profile: Set of minimum professional competencies that are needed for the pertinent professional practice in the fields or areas of action inherent to a discipline.

Program: Object of the evaluation in an accreditation process. It includes all the actions and educational experiences, material and management conditions that make it possible to educate a person in a specific professional field. A program is characterized by a formally approved and published curriculum which is considered as an entity by the institution and that can be considered independently and distinguishes itself from other educational efforts offered by the institution.

Program environment: The set of people's traits and their surroundings, relationships, interactions, and perceptions that determine the quality of the work life, influence productivity, and the development of the program's or institution's human talent.

Quality: It is an abstract and relative (comparative in nature), multidimensional concept usually associated with excellence, efficiency, the achievement of expectations, and the adjustment according to the intended purposes.

Quality is manifested in two consistency components: internal and external (merit and value). Thus, the degree of adjustment between the actions and outcomes of a program and its stated purpose define its internal consistency (merit). The degree of adjustment of a program with criteria defined in advance and accepted as pertinent (evaluation criteria) define its external consistency (value).

Quality of the program: Operationally, a program is considered to be of quality if it provides pertinent training evidence by effective conditions, resources and results that contribute to the achievement of the graduate attributes.

Quality, morale, and commitment: Qualitative construct that seeks to determine the aptitude, attitude (motivation), and responsibility of the faculty members, administrative staff, or students toward the program and their academic, professional, or administrative duties, as applicable.

Relevance (relevant): Importance or significance that stands out from something.

Responsibility: Ability to respond with diligence, distinction, and balance to the commitments assumed.

Self-evaluation: Time during the accreditation process in which mostly the internal consistency of the curriculum is evaluated. The self-evaluation is performed by the “university agents” responsible for the program, and its immediate purpose is the program ongoing improvement and its preparation for the external evaluation.

Significant: That is important because of what it represents as it connotes and denotes some value.

Significant design experience: Hands-on experience that meets a need or solves an engineering problem executed at the end of the learning process by integrating and articulating the abilities achieved throughout the program and evidence the attributes gained.

State of the art: it is understood as the current state or situation, recent advances or state of the matter, as the case may be.

Strength: Characteristic of compliance by the program with an accreditation criterion in such a degree that allows qualifying it as a strong point in the program because it exceeds the demands established in the referents or standards.

Sufficiency: Suitability, capacity, disposition, aptitude, or minimum level for something.

Suitability (suitable): Characteristic of a person or object of interest that reveals that it is convenient, apt, capable, useful, appropriate, and adequate and that has the necessary condition to do a job or take on certain functions or works, or to achieve the objectives.

SWOT: Situational analysis of the strengths, weaknesses, opportunities, and threats of some aspect of the program. Its purpose is to guide decision-making and coming up with actions to improve, overcome the weaknesses, mitigate the threats, maintain the strengths, and take the most advantage of the opportunities.

Transparency (transparent): Coherence between what is said and done, being both aspects of knowledge of the stakeholders; way of acting guided by sincerity and a willingness to provide all of the information involved.

Universal design: Set of characteristics, products, services, and environments that enable easy access to and utilization and use by the largest number of people possible, without it being necessary to adapt or redesign them in a special manner.

Universality: Of a universal quality or character; fact or idea that encompasses and is for all.

Updated: It means to be kept at the level of the state of the art in their specific field.

Validity (valid): What is consistent, plausible, or admissible.

Weak link: It refers to the qualitative indicator that shows the highest noncompliance degree in an accreditation criterion or set and, therefore, identifies an evident weakness or deficiency, as applicable.

Weakness: Characteristic of compliance of an accreditation criterion in a degree that does not allow qualifying it as strength because it only meets the minimum demand levels established by the referents or standards.

7 Terms and Milestones

Process Phases	Term	Dates	Executing Unit
Self-evaluation	Decision made by the institution		University
Delivery of accreditation application and self-evaluation document	Document Reception		
	I Term	Last two weeks of January	University
	II Term	Last two weeks of July	
Acceptance of the initiation of the accreditation process	Send notice to University		
	I Term	Last week of February	Accreditation Board
	II Term	Last week of August	
Selection of the evaluation team and document analysis	Appointment of evaluation team		
	I Term	Last two weeks of February	Accreditation Board
	II Term	Last two weeks of August	
Report the names of the evaluation team members to the university	I Term	Last two weeks of March	Accreditation Board
	II Term	Last two weeks of September	
Visit to the program	I Term	Beginning of May	Evaluation Team
	II Term	Beginning of November	
Evaluation team report	I Term	Third week of June	Evaluation Team
	II Term	Third week of December	
Accreditation decision	I Term	Last week of August	Accreditation Board
	II Term	Last week of February	
Appeal for revision (if submitted)	I Term	Last week of September	University
	II Term	Last week of March	
Final accreditation decision	I Term	Last week of October	Accreditation Board

II Term	Last week of April
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