



**CROSS AND SPECIFIC COMPETENCIES OF PROFILES ASSESSED BY CONAIC
DEFINED BY ANIEI AND CONAIC
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The generic or cross and specific competencies detailed herein are the result of the effort made by ANIEI and CONAIC after one year and a half of work during which representatives of the institutions members of ANIEI participated, and it was endorsed by its General Assembly of Partners in June 2017 in Saltillo, Coahuila, Mexico in the National Meeting of Directors of Informatics and Computing organized by ANIEI, and Universidad Autonoma de Coahuila being the host university.

Definition of COMPETENCY, adopted by: ANIEI/IMPULSA-TI

Competency is what makes the person to use best practices to perform at work or an activity and to be successful in it, which may mean the combination of knowledge, skills, provisions and specific behaviors.

Classification of competencies

First-level competencies

- Reference competencies: "These are the competencies necessary for individuals to be productive since their entry into the labor market"

Second-level competencies

- Specific competencies: "These are the competencies necessary for individuals to be able to perform a job or activity according to their professional profile"

The bloom taxonomy was used in order to classify educational learning objectives into levels of complexity and specificity. The bloom levels used are:

1 Knowledge

2 Comprehension

3 Application

4 Analysis

5 Synthesis

6 Evaluation



Professional Profiles and Specific Competencies Assessed by CONAIC

The validation of the professional profiles assessed by CONAIC is shown below. As it can be seen, these profiles are those of Computing Professionals, with variations:

BA in Information Systems - A

Professional with knowledge and skills to improve organizational processes; exploit opportunities created by technological innovations; understand and resolve requests for information in organizations; design and manage the company architecture; identify and evaluate solutions, as well as their potential sources of supply or ways to be performed; manage data security and infrastructure, in addition to understand, manage and control IT risks; manage changes generated by IT solutions in organizations.

Professional with solid knowledge of Information Technologies applied to the administrative process of the organizations. Technological strategist that develops and implements solutions to support the competitiveness; he/she develops and implements solutions to support competitiveness and processes for managing knowledge and providing agility to organizations. This is an eminently professional profile type, but it does not exclude the need to pursue postgraduate studies, both in information sciences and technologies, and in areas benefiting from their contributions.

The bachelor's degree in Information Systems graduate will need to:

- Have proper knowledge of the internal and external organizational structures, as well as the importance of development of human resources.
- Visualize, describe and define the functioning and operation of a system and its interaction with the development of the organization.
- Perform feasibility analysis of economic, technological, social and human behavior for effective decision-making in organizations.
- Design, implement, monitor, and manage database systems for the administration of large volumes of information in organizations, optimizing hardware and software resources required, making use of the correct tools to support decision-making.

Profile A Specific Competencies:

Bloom Levels	No.	Competency	Attribute
3,4	1	Improves Organizational Processes	<p>It uses Administrative Theory principles, administrative process and the organization's characteristics.</p> <p>Recognizes the context of the organization (public and private).</p> <p>Applies the theories of administration (Business</p>

			Process Management) to improve the performance of organizations
6	2	Proposes and evaluates projects on information technologies	Recognizes Management needs in a system using techniques to identify, collect, analyze, prioritize, document, verify and validate requirements in the environment and processes in the development of computer systems
5	3	Establishes mechanisms for computer auditing	Creates or proposes methods and strategies for carrying out audits (documentation and monitoring of standards). Applies Computer Audits
5	4	Develops solutions in several application domains, making use of software engineering principles and methods	Capacity to analyze, design and build applications in desktop, mobile or network environments, choosing the appropriate paradigm and programming languages.
1,2	5	Describes database basic concepts	Describes concepts such as Database, Database Management System, Relational, Hierarchical and Network Database.
2,3	6	Manages Database Systems	Manages access control and user authorization, in addition to optimizing hardware and software resources needed for these systems. Develops routines and triggers to automate some tasks of the system itself and of the databases. Describes and applies database concepts to improve performance and provide greater security, as well as datawarehouse, OLAP, Data Mining, Big Data, Data Analytics.
3	7	Employs the Software Industry Best Practices	Describes and uses Best Practices concepts in the provision of Information Technologies Services based on International Quality Standards
5,6	8	To determine the appropriate hardware and software platforms.	To define, evaluate and select relevant hardware and software platforms to enable the development and implementation of systems, services and applications.
5	9	Designs the strategic plan using IT	Uses different planning processes and computer projects in order to align IT area's objectives with Organization's objectives, so as to achieve a sustainable value generation.

5	10	Proposes Comprehensive Computer Solutions	Understands the needs of the organization, Information Systems, modeling and design of Information Systems, organizational processes
5	11	Builds business applications	Develops new business models that take advantage of technological innovations. Analyzes, develops and builds information systems in order to model situations of the real environment, solve problems, and optimize decision-making to support the organization's Management.
3	12	IT Project Management	Applies a systematic methodology to initiate, plan, execute, monitor and close IT projects; manages the team, communication, calendar, resources, risks, and quality of the project.

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Bachelor's degree in Software Engineering - B

Specialist in the production of quality software systems for the solution of various problems in the environment. Responsible for the formulation, planning, implementation and maintenance of information systems that ensure the availability of high service levels.

Must have a solid training in analysis techniques and information systems design, and in the setup of computing services environments and networks, as well as the knowledge of programming tools and software engineering, in order to build programs and application systems with characteristics of finished and competitive products.

The bachelor's degree in Software Engineering graduate will need to:

- Describe main software concepts and models for use in systems development.
- Identify and analyze problems in order to propose, design, build, verify, and document software solutions.
- Apply techniques and methodologies for the production of quality software.
- Promote collaborative work and responsibility in the resolution of problems for the development of the competencies required.

Profile B Specific Competences:

Bloom Levels	No.	Competency	Attribute
4	1	Performs software engineering requirements	Recognizes the context and needs, and individuals involved in a system using techniques to identify, collect, analyze, prioritize, document, verify and validate the requirements in the context of life cycles and software development processes.
5,6	2	Designs Software	Designs and Evaluates the behavior, architecture and interface of software solutions based on requirements and using strategies, methods, techniques and modeling languages characteristic to software design.
5	3	Builds software	Develops software for different types of applications, using programming methodologies and paradigms in the context of life cycles and software development processes, with the required quality attributes.

3	4	Carries out Software Testing	Plans, assigns and runs types, techniques, processes and controls inside test scenarios according to the required quality attributes.
3	5	Carries out Software Maintenance	Applies maintenance types, processes and techniques, in accordance with the required quality attributes.
3	6	Manages software projects	Uses methods, strategies, processes, tools and techniques for software projects management.
3	7	Estimates parameters for the software project	Applies metrics for software estimation (size, cost, effort, personnel, time, productivity, quality and documentation) in accordance with system life cycle models.
3	8	Ensures Software Quality	Uses techniques, tools, and strategies for planning, ensuring and controlling a software product quality.
5, 6	9	Establishes security mechanisms	Creates, Evaluates or proposes methods and strategies to evaluate safety and selection of criteria to avoid security vulnerabilities in the software.
3	10	Uses life cycles	Uses elements and criteria in the use of life cycle models in accordance with the context of software development processes.
4	11	Checks software solutions quality	Uses various test models in order to ensure software product quality.
3	12	Uses software creation tools	Used industrial methods and CASE tools for the different stages in the software process.

Bachelor's degree in Computer Science - C

Professional with the ability and skills required for computer science study and development, resulting in decision making and planning in innovative applications within baseline software areas, the principles that characterize formal sciences, and the design and building of complex reality models, taking care of their consistency, efficiency and performance.

The bachelor's degree in Computer Science graduate will need to:

- Apply the knowledge acquired in computer science.
- Create environments, facilities and innovative computer applications within different environments and provide efficient solutions.
- Build baseline software and applications.
- Know how to take decisions and planning in innovative applications.
- Application of exact sciences in order to theoretically and practically develop complex reality models.
- Design, plan, and generate environments, models and projects, making use of the New Information Technologies.
- Implement and evaluate computer systems in various contexts to promote safety and sustainability.
- Know how to install, monitor, and tune systems in operational environments (databases, operating systems, middleware software, among others).

Profile C Specific Competences:

Bloom Level	No.	Competency	Attribute
4	1	Approaches and solves mathematical problems	Recognizes the context and needs, and individuals involved in a system using techniques to identify, collect, analyze, prioritize, document, verify and validate requirements.
3	2	Makes representations of mathematical entities (objects and situations).	Uses methods, strategies, processes, tools and mathematic techniques for the representation of objects and scenarios.
5	3	Builds algorithms and	Construction of algorithms and quality software through methodologies and programming languages in order to provide efficient solution to

		software.	problems.
3	4	Uses artificial intelligence methods and approaches.	Use of artificial intelligence methods and approaches, and pattern recognition for problem solving, with advanced methods and techniques.
5	5	Implements problem-solving software through computer approaches.	Development and implementation of problem-solving software by using the appropriate programming language, operating system, and architectures.
5, 6	6	Identifies, models and implements solutions through computer science	Identification, modeling, evaluation and implementation of an efficient solution to a real problem through computer science techniques.
3	7	Apply the scientific method to computer science problems.	Application of scientific method as a means to solve computer science problems that allow him/her to test hypotheses on algorithmic behaviors.
3	8	Produces programs by applying visual programming	Uses visual programming techniques, tools, and strategies for planning, securing and controlling a software product.



Computer Engineering - D

Professional with the mission of building, configuring, evaluating and selecting computer jobs and service environments, capable of generating new technology and finding and implementing efficient solutions in organizations. He/She will have command of the theoretical principles and practical and methodological aspects that support the design and development of complex systems, specification of hardware architectures and configuration of computer networks.

The Computational Engineering graduate will need to:

- Describe concepts, techniques and methodologies for the design and development of complex systems, hardware architectures and configuration of networks for use in the implementation of efficient computer solutions in organizations.
- Apply techniques, methodologies and mathematical models in the design, implementation, and evaluation of computer systems, as well as process automation through its components (microprocessors, circuit boards, routers and other embedded devices) to meet computing needs in organizations that use them.
- Promote collaborative work and responsibility in the resolution of problems for the development of the competencies required.
- Permanently incorporate new technologies to the needs of information while minimizing environmental impact.

Profile D Specific Competences:

Bloom Level	No.	Competency	Attribute
2	1	Describes computer components and systems	Recognizes and identifies the internal components of computer systems.
4,5	2	Develops computer solutions.	Analyzes and builds real-world solutions based on mathematical models.
3	3	Uses techniques, skills, and modern computer tools	Applies modern computer tools that facilitate reaching solutions to problems raised.
5	4	Designs and implements networks of personal, local, and global computers	Develops secure connectivity solutions.
4	5	Analyzes the existing computer	Identifies viable, sustainable and innovative

		solutions in order to propose innovative solutions	solutions to problems raised.
3	6	Implements computer architectures.	Apply various computer architectures in order to implement comprehensive solutions in computational systems.
3,6	7	Proposes alternative solutions that optimize the use of energy	Optimizes energy consumption by applying knowledge and evaluating options in the design of solutions.
5	8	Proposes innovative solutions that meet the needs of computer systems in both software and hardware	Permanently incorporates new technologies to the needs of information.

All profiles include the following cross-competencies:

"These are the competencies necessary for individuals to be productive since their entry into the labor market"

Cross- or generic competencies

Bloom Level	No.	Competency	Attribute
1	1	Oral and written communication skills.	Transmits knowledge, expresses ideas and arguments in a clear, rigorous and convincing manner, both orally and in writing, by properly using graphic resources and media, adapting to both the situation and the audience characteristics.
4	2	Information Analysis and Synthesis	Recognizes and describes the constituent elements of a reality, organizes significant information according to pre-established criteria appropriate to a purpose.
4	3	Problem approaching and solving	Analyzes the constituent elements of a problem in order to devise strategies that will allow to obtain, in a reasoned way, a proven solution, according to some pre-established criteria.
6	4	Solution Modeling	Discusses the existing models fundamentals and properties. Translates and interprets the model elements in terms of the real world.
2	5	Autonomous learning	Learns through self-initiative and interest throughout life.
4	6	Team Work	Participates effectively in diverse teams and actively collaborates in the pursuit of common goals.
6	7	Decision-making	Identifies patterns that anticipate possible explanations and/or solutions to industrial, technological and operational problems for proper decision-making.
3	8	Effective use of ICT tools (including new technologies)	Ability to become up to date on the use of technology in the area that has an impact on his/her continuous improvement.
2	9	Responsibility in performance	Understanding of professional, ethical, legal, and social aspects, as well as of the responsibility inherent in each one of them.
4	10	Vision on the impact of solutions	The ability to analyze the local and global impact of IT solutions on people, organizations, and society in general.