

The Regional Subject-Specific Qualifications and Assessment Reference Frameworks CALOHEA Subject Area Group (SAG) Civil Engineering

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This report consist of

The final version of
SAG Civil Engineering
Subject-Specific Qualifications
Reference Framework (SSQRF)
with explanatory texts

CIVIL ENGINEERING COMPETENCY FRAMEWORK

CALOHEA Subject Area Group (SAG) Civil Engineering

The competency framework for SAG Civil Engineering was systematically addressed to enhance clarity, alignment with international standards, and inclusivity. A critical aspect highlighted through the consultation process was the development of a Generic Civil Engineering Qualification Framework that comprehensively addresses the three dimensions of **KNOWLEDGE, SKILLS**, and **RESPONSIBILITY** domains.

The framework has DIMENSIONS and SUB-DIMENSIONS to describe the essential common outcomes for a civil engineering graduate. Each DIMENSIONS and SUB-DIMENSIONS will be further described by DESCRIPTORS for the KNOWLEDGE, SKILLS and RESPONSIBILITIES domains

A civil engineering graduate need to go through an academic program that will help him or her to develop as a responsible civil engineer, through a process of knowledge acquisition and skill development and these may be described as follows:

Narrative of Description	DIMENSION	SUB-DIMENSION
<p>1. A civil engineering graduate must have gone through the learning and development process in the fundamental domains of mathematics and sciences, as well as the core civil engineering and complementary disciplines to help with the knowledge, skills and the ability to serve as a competent civil engineer</p>	<p>1. Learning and Development</p>	1.1. Science and Mathematic Principles
		1.2. Civil Engineering Principles
		1.3. Other complementary Principles
<p>2. A civil engineering graduate must have gone through a training that will develop his or her ability to be investigative towards solving complex situations to be faced as a civil engineer. This will be facilitated through an academic program that would enhance the graduates' problem identification and experimentation abilities, backed by sound data analytical skills, which will enable them to design solutions for complex systems using the most appropriate tools and enablers</p>	<p>2. Investigative Towards Solution</p>	2.1. Problem Identification
		2.2. Experimentation and Data Analysis
		2.3. Design
		2.4. Utilization of Appropriate Tools
<p>3. A civil engineering graduate must have gone through a training that will prepare them to to make wise and correct decisions when practicing and delivering civil engineering products and services to the society. In serving the society, all actions of a civil engineer must be guided by the needs of sustainability, delivered through sound management principles and decisions, carried out ethically and in a professional manner</p>	<p>3. Serving the Society</p>	3.1. Decision making and practice
		3.2. Upholding sustainability
		3.3. Sound Management
		3.4. Ethics and Professionalism
<p>4. In order for a civil engineer to be able to meet the expectations, they must be given the right training for them to possess the appropriate character to make them function well in a team, able to communicate effectively, and with the ability to be adaptive to future and global challenges. It is critical for a civil engineer to be self-motivated and discipline for a life-long acquisition of new knowledge and enhancement of existing knowledge and skills, with all the necessary adoption and adaptations.</p>	<p>4. Abilities and Personality</p>	4.1. Desired Character
		4.2. Team Player
		4.3. Effective Communicator
		4.4. Future and Global Ready
		4.5. Life-long learner

CIVIL ENGINEERING SSQRF	The knowledge that a civil engineering graduate needs to acquire in order to perform the expected skills	Skills that a civil engineering graduate must develop to perform the expected responsibilities	The ultimate expectation from a civil engineer as an individual and as a professional
Dimensions & Sub-dimensions	KNOWLEDGE	SKILLS	RESPONSIBILITIES
1. LEARNING AND DEVELOPMENT	Demonstrate the competency in the acquired knowledge required for a civil engineering graduate to be able to perform expected responsibilities as a civil engineer	Able to apply the acquired knowledge with required skills, when performing the expected responsibilities as a civil engineer	Ready to perform all expected responsibilities as a civil engineer with sound knowledge and skills
1.1. Science and Mathematics principles	Competent in appropriate science and mathematic principles covering but not limited to the followings: material science; statistics, numerical science, and data science	Able to develop and be sufficiently competent in all required skills related to the science and mathematics principles	Competently perform responsibilities as a civil engineer with sound science and mathematics knowledge and skills
1.2. Civil Engineering principles	Competent in civil engineering principles covering but not limited to the followings: structural engr.; geotechnical engr.; water resources engr.; environmental engr.; transportation engr.; highway engr.; and construction management	Able to develop and be sufficiently competent in all required skills related to the civil engineering principles, covering but not limited to : Laboratory skills and necessary psychomotor skills.	Competently perform responsibilities as a civil engineer with sound civil engineering knowledge and skills
1.3. Other complementary principles	Competent in complementary domains, covering but not limited to the followings: knowledge on how to conduct research; knowledge domains of humanities and social sciences, innovation, management, sustainability- related, integrated engineering, visualization techniques, law and contract, and entrepreneurship	Able to develop and be sufficiently competent in all required skills related to all complementary principles	Competently perform responsibilities as a civil engineer with sound complementary knowledge and skills

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Dimensions & Sub-dimensions	KNOWLEDGE	SKILLS	RESPONSIBILITIES
2. INVESTIGATIVE TOWARDS SOLUTION	Demonstrate the competency in the knowledge required for investigative work to solve complex civil engineering problems	Able to identify and analyse problems as well as to provide design solutions for complex civil engineering problems using suitable tools or approaches	Able to carry out investigative works toward solving complex and civil engineering problems and situations
2.1 Problem identification	Competent in knowledge supporting problem identification needs, covering but not limited to problem identification, evidence-based approach, risk management, and quality assurance	Able to develop and be sufficiently competent in all required skills related to problem identification capabilities covering but not limited to : being observant, inquisitive, able to prompt, able to make conclusions and problem-solving skills	With appropriate problem identification ability based on sound engineering principles that are timely and accurate
2.2. Experimentation and Data Analysis	Competent in knowledge supporting experimentation and data analysis needs, covering but not limited to design of experiments, statistical and mathematical modelling, use of formula, data acquisition, and measuring science.	Able to develop and be sufficiently competent in all required skills related to experimentation and data analysis needs, covering but not limited to : software usage, simulation work, work-flow construction, drawing and diagram interpretation, data acquisition, and usage of statistical tools.	Able to formulate experimentation schemes for the identified problems, resulting in useful data conclusions for all subsequent needs
2.3. Design	Competent in knowledge supporting design needs, covering but not limited to Design approaches, optimization methods, and thinking methods	Able to develop and be sufficiently competent in all required skills related to the design work, covering but not limited to optimization capabilities, specifications, and guideline/manual interpretation, and with critical thinking	Able to design solutions for all civil engineering situations
2.4. Utilization of Appropriate Tools	Competent in knowledge to utilize new and appropriate tools covering but not limited to software, coding, and programming	Able to develop and be sufficiently competent in all required skills related to tool utilization, covering but not limited to coding and programming, the function of tools, and use or	Ready to utilize appropriate tools to carry out all necessary investigative work towards solving complex civil engineering problems and situations

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3. SERVING THE SOCIETY	Demonstrate the competency in knowledge needed to make appropriate decisions for practices in civil engineering	Able to apply knowledge and demonstrate skills in making decisions when practicing civil engineering with considerations of societal, sustainability, and ethical aspects	Ready to serve the society by performing responsibilities as a competent, ethical, and professional civil engineer through sound management principles, and by upholding sustainability values
3.1. Decision making and practice	Competent in knowledge for decision making and civil engineering practices, covering but not limited to construction management, construction technology, analysis of impacts, risk management, decision making, and knowledge concerning health and safety requirements	Competent in decision making skills and practices required for civil engineering work, covering but not limited to human skills, site management skills, project management skills, ability to see the big picture, able to prioritize, able to manage risks, and employing logical thinking	Able to make sound decisions and deliver civil engineering practices to meet the present and future expectations of society, and in line with the requirements of the authorities
3.2. Upholding sustainability	Competent in knowledge associated with sustainability issues, including those related to the sustainability of civil engineering facilities	Able to incorporate sustainability requirements when serving <u>the</u> society, including maintenance skills	All decisions and actions are made with the consideration of the principles and goals of sustainability, including the culture of maintenance
3.3. Sound Management	Competent in knowledge for sound management, covering but not limited to management principles, human issues, financially related, project management including appreciation of local norms	Practices decision making and civil engineering matters with effective managerial skills and approaches	All decisions and actions are made based on sound management principles
3.4. Ethics and Professionalism	Competent in the knowledge of codes and ethics, local values, law, and regulation	Develop appropriate skills and attitude towards upholding ethics and professionalism	Upholding ethics and professionalism without compromise, and actively involved in professional bodies and activities

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Dimensions & Sub-Dimensions	KNOWLEDGE	SKILLS	RESPONSIBILITIES
4. ABILITIES AND PERSONALITY	Demonstrate the competency in knowledge to build the ability and character needed for an effective and versatile civil engineer	Ability to apply the knowledge into practices to build the required character as an effective and versatile civil engineer	Possess the necessary abilities and character to function as an effective and versatile civil engineer
4.1. Desired Character	Competent in knowledge to help develop the desired character as an individual and as a civil engineer	Competent in skills that will give the following attributes, including but not limited to being agile, adaptive, conformant yet critical, upholding quality, cost-effective, resilient, independent, and inter- dependent	Portray and display the desired character and attributes as a responsible and competent civil engineer
4.2. Team Player	Competent in knowledge to help develop the ability to be a good team player, including but not limited to team dynamics and leadership knowledge	Competent in skills that will make one a better team player, including but not limited to the ability to lead and follow, be assertive yet able to compromise, listening skills, and logical thinking	An accomplished team player, as a leader or a follower in life, and as a civil engineer
4.3. Effective Communicator	Competent in knowledge to help to be an effective communicator, including but not limited to language proficiencies, visualization, communication, and localization	Having the skill to position ideas and views, in negotiating, in getting attention, be concise and with polished oratory skills	Able to communicate effectively as an individual and when performing duties as a civil engineer, including to society and others
4.4. Future and Global Ready	Competent in knowledge to help in making one future and global ready, including but not limited to general and current global knowledge, technology development, 4IR and subsequent revolutions, and language.	Having the skills that are appropriate for future and global readiness including but not limited to the abilities to apply new knowledge, exercise adaptation, manage change, transform, being agile and adaptive, multi-cultural and multi-dimension context, and global language proficiency	Ever-ready for change and adaptation towards becoming a competent and relevant civil engineer in the global market for the present as well as for the future.
4.5. Life-long learner	Competent in the knowledge that will help one be a life-long learner, including but not limited to research knowledge, data science, and self-development	Having the skills that will make one an able life-long learner, including but to limited to the abilities for information gathering, being self-motivated, ability to adopt, and adapt.	Keep abreast with and acquire the latest knowledge and new competencies to be a better, current and more competent civil engineer (actively involved in professional bodies and activities)

INSIGHTS



1. The Civil Engineering Subject-Specific Qualifications Reference Framework (SSQRF) serves as a catalyst for fostering mutual recognition among ASEAN universities.
2. The SSQRF will facilitate seamless credit transfer initiatives and enhance students' mobility within the region.
3. By adhering to standardized quality benchmarks and recognition mechanisms, universities can transcend geographical boundaries and collectively elevate the academic landscape of ASEAN higher education.
4. As the project continues to evolve and mature, its legacy will extend far beyond the confines of Civil Engineering, serving as a beacon of excellence and collaboration for the entire ASEAN higher education community.