Graduate Attributes for CEAB Certification – next certification in 2021

1. Knowledge base for engineering
2. Problem Analysis
3. Investigation
4. Design
5. Use of Engineering Tools
6. Individual and Team Work
7. Communication Skills
8. Professionalism
9. Impact on Society and Environment
10. Ethics and Equity
11. Economics and Project Management
12. Life-Long Learning

Need to define indicators of the attribute

- Indicators describe the various elements of the attribute
- Indicators must be measurable

Overall Measurement Procedure

1. Decide on which student work will be used for measurement (I.e. tests, exams, presentations, project reports)
2. Develop a rubric to describe desired student learning outcomes (more detail on this to come)
3. While you are marking, keep track of how the student did by ticking the appropriate box
4. Analyze results to provide information for continuous improvement (I.e. identify learning outcomes that the students are struggling with)
5. Document measurement results

Summary of Graduate Attributes

1. **Knowledge Base for Engineering**

   Description: Demonstrated competence in university level mathematics, natural sciences engineering fundamentals and specialized engineering knowledge appropriate to the program

   Indicators

   1.1. Competence in Mathematics
   1.2. Competence in Natural Sciences
   1.3. Competence in Engineering Fundamentals
   1.4. Competence in Specialized Engineering Knowledge

2. Problem Analysis

Description: An ability to use appropriate knowledge and skills to identify, formulate, analyze and solve complex engineering problems in order to reach substantiated conclusions.

2.1 Demonstrates an ability to identify reasonable assumptions that could/should be made before a solution path is defined

- Includes identifying uncertainties and imprecise information

2.2 Demonstrate an ability to identify a range of suitable engineering fundamentals that are potentially useful for analyzing a technical problem

- Includes mathematical techniques

2.3 Obtains substantiated conclusions as a result of a problem solution including recognizing the limitations of the solutions

3. Investigation

Description: Ability to investigate complex problems by methods including appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions

3.1 Recognizes and discusses applicable theory knowledge base

3.2 Selects appropriate model and methods and identifies assumptions and constraints

3.3 Estimates outcomes, uncertainties and determines appropriate data to collect

4. Design

Description: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specific needs with appropriate attentions to health and safety risks, applicable standards, economic, environmental, cultural and societal considerations

4.1 Recognizes and follows an engineering design process

- An iterative activity that might include:
  - Recognizing goal
  - Specifying constraints and desired outcomes
  - Proposing solutions
  - Evaluating alternatives
  - Deciding on a solution
  - Implementing solution

4.2 Recognizes and follows engineering design principles including consideration of:

- Environmental aspects
- Social and economic aspects
- Health and safety issues

4.3 Proposes solutions to open ended problems

4.4 Employs appropriate techniques for generation of creative ideas such as brainstorming and structured inventive thinking

4.5 Include appropriate health and safety considerations

4.6 Determines and employs applicable standards and codes of practice

5. Use of Engineering Tools

Description: An ability to create, select, apply, adapt, and extend appropriate techniques, resources and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations

5.1 Evaluates and selects appropriate modern tools

5.2 Demonstrates an ability to use modern/state of the art tools

5.3 Creates, adapts, modifies and extends tools and techniques as appropriate to solve problems

6. Individual and Team Work

Description: An ability to work effectively as a member and leaders in teams, preferably in a multi-disciplinary setting

6.1 Manages time and processes effectively, prioritizing competing demands to achieve personal and team goals and objectives

6.2 Develops and implements processes and methodologies to manage the effectiveness of a team both in terms of quality of work produced by the team as well as the inter-personal relationships within the team

6.3 Works in a group, taking a leadership role as appropriate and relinquishing the leadership role as appropriate

7. Communication Skills

Description: An ability to communicate complex engineering concepts within the profession and with society at large. Abilities include:

- Reading, writing
- Speaking, listening
- Comprehending and writing effective reports and design documentation
- Give and effectively respond to clear instructions

7.1 Demonstrates ability to respond to technical and non-technical instructions and questions

7.2 Presents instructions and information clearly and concisely as appropriate to audience

7.3 Constructs effectively oral/written arguments as appropriate

8. Professionalism

Description: An understanding of the roles and responsibilities of a professional engineer in society – especially primary role of protection and interest of the public

8.1 demonstrates understanding of role of engineer in society – especially concerns for the public

8.2 demonstrates understanding of legal requirements governing engineering activities

- Including but not limited to personnel, health, safety and risk issues

8.3 Shows an awareness of the PEO and the role of licensing

9. Impact of engineering on society and the environment

Description: an ability to analyze social and environmental aspects of engineering.

Abilities Include an understanding of the interactions that engineering has with:

- Economic aspects of society
- Social aspects of society
- Health aspects of society
- Safety aspects of society
- Legal aspects of society
- Cultural aspects of society
- Uncertainties of predictions of such interactions
- Concepts of sustainable design and development, environmental stewardship

9.1 Identifies and quantifies the full range of short-term, long-term, local and global impacts of their engineering projects on society, including: economic aspects; social, cultural, and human health aspects, and; ecosystem integrity aspects.

9.2 Addresses uncertainties in the prediction of interactions on society and the environment in a structured and transparent manner.

9.3 Assesses possible options and design configurations from a sustainability engineering perspective, which emphasizes environmental stewardship, life-cycle analysis, and long-term decision-making principles.

10. Ethics and Equity

Description: An ability to apply professional ethics, accountability, and equity

10.1 Applies the engineering code of ethics, understanding of the stakeholders: the individual, the employer, and the public.

10.2 Applies ethical frameworks and reasoning in situations where there may be conflicting interests among the stakeholders

10.3 Applies knowledge of law and principles of equity to ensure equitable treatment of others

11. Economics and Project Management

Description: An ability to appropriately incorporate and understand limitations of economics and business practices including project, risk and change management into the practice of engineering

11.1 Applies economic principles in decision making

11.2 Plans and effectively manages time, resources, and scope

11.3 Understands the business processes for implementing engineering ideas

11.4 Identifies, characterizes, assesses, and manages risks to project success

12. Life-Long Learning

Description: The ability to identify and to address their own educational needs in a changing world. Sufficiently maintains their competence and contribute to the advancement of knowledge

12.1 Critically evaluates and applies knowledge, methods and skills procured through self-directed and self-identified sources, including those that lie outside the nominal course curriculum.

12.2 Shows an awareness of the wide range of engineering societies, literature, conferences, and other information sources.