



## GRADUATE ATTRIBUTES

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Knowledge Base for Engineering</b>                   | <ul style="list-style-type: none"><li>• Demonstrated competence in university-level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.</li></ul>                                                                                                                                                                                                                     |
| <b>Problem Analysis</b>                                 | <ul style="list-style-type: none"><li>• An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering programs in order to reach substantiated conclusions.</li></ul>                                                                                                                                                                                                                    |
| <b>Investigation</b>                                    | <ul style="list-style-type: none"><li>• An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis, and interpretation of data, and synthesis of information in order to reach valid conclusions.</li></ul>                                                                                                                                                                          |
| <b>Design</b>                                           | <ul style="list-style-type: none"><li>• An ability to design solutions for complex, open-ended engineering problems and to design systems, components, or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural, and societal considerations.</li></ul>                                                                                     |
| <b>Use of Engineering Tools</b>                         | <ul style="list-style-type: none"><li>• 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.</li></ul>                                                                                                                                                  |
| <b>Individual and Teamwork</b>                          | <ul style="list-style-type: none"><li>• An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.</li></ul>                                                                                                                                                                                                                                                                                |
| <b>Communication</b>                                    | <ul style="list-style-type: none"><li>• An ability to communicate complex engineering concepts within the profession and society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.</li></ul>                                                                          |
| <b>Professionalism</b>                                  | <ul style="list-style-type: none"><li>• An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and private interest.</li></ul>                                                                                                                                                                                                                  |
| <b>Impact of Engineering on Society and Environment</b> | <ul style="list-style-type: none"><li>• An ability to analyze societal and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions, and the concepts of sustainable design development and environmental stewardship.</li></ul> |
| <b>Ethics and Equity</b>                                | <ul style="list-style-type: none"><li>• An ability to apply professional ethics, accountability, and equity.</li></ul>                                                                                                                                                                                                                                                                                                                       |
| <b>Economics and Project Management</b>                 | <ul style="list-style-type: none"><li>• An ability to properly incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand limitations.</li></ul>                                                                                                                                                                                                         |
| <b>Lifelong Learning</b>                                | <ul style="list-style-type: none"><li>• An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.</li></ul>                                                                                                                                                                                     |



## INDICATORS (College-Level)

### **Knowledge Base for Engineering (Mathematics)**

- 1Ai) Linear Algebra - Students have a working knowledge of vectors, matrices, determinants, and their basic properties, and can analyze and solve systems of linear algebraic equations with relevance to engineering problems.
- 1Aii) Probability and Statistics - Students can apply basic probability and statistics concepts and techniques to engineering related data.
- 1Aiii) Integral Calculus - Students can calculate integrals.
- 1Aiv) Differential Calculus - Students can calculate derivatives.
- 1Av) Differential Equations - Students can apply standard methods to solve ordinary and/or partial differential equations related to engineering problems.
- 1Avi) Numerical analysis - use numerical analysis and tools to solve equations.

### **Knowledge Base for Engineering (Natural Science)**

- 1Bi) Biology - Students can demonstrate a basic understanding of biological systems
- 1Bii) Chemistry - Acquire a basic understanding of chemistry.
- 1Biii) Earth Sciences - Students can demonstrate an understanding of physical and structural geology and its relationship to engineering.
- 1Biv) Physics - Students can demonstrate a fundamental understanding of optics, oscillations, and waves.

### **Knowledge Base for Engineering (Fundamental Engineering Science)**

- 1Ci-i) Computer Programming - Use a computer programming language to solve simple numerical problems
- 1Ci-ii) Computer Programming - Write computer programs using the fundamental concepts of computer science (variables, branching, looping, procedures, etc.)
- 1Ci-iii) Computer Software - Apply advanced computer science techniques in designing computer systems.
- 1Cii) Statics - students can demonstrate a fundamental understanding of forces as vectors, force equilibrium of particles, and force and moment equilibrium of rigid bodies.
- 1Ciii) Dynamics - students can demonstrate a fundamental understanding of kinematics, particle kinetics, centroids, centers of mass, and dynamics of rigid bodies.
- 1Civ) Electricity and Magnetism - Students can demonstrate a fundamental understanding of electricity, magnetism, and basic circuits.

### **Knowledge Base for Engineering (Specialized Engineering Science)**

- Varies by major.

### **Problem Analysis**

- 2A) Defines problem, including known and unknown information.
- 2B) Creates a problem solving approach, including appropriate equations, approximations and/or assumptions.
- 2C) Applies appropriate model or analysis to solve problems.
- 2D) Evaluates the validity of results and model for error, uncertainty.
- 2E) States a conclusion that addresses the problem.

### **Investigation**

- 3A) Demonstrates an ability to conduct an experiment.
- 3B) Demonstrates an ability to present and analyze data from the experiment.
- 3C) Demonstrates an ability to interpret the results.
- 3D) Demonstrates an ability to reach substantiated conclusions.



### **Design**

- 4A) Implement the relevant steps of the design process to solve complex, open-ended problems, components, core processes by addressing needs, constraints and design specifications.
- 4B) Demonstrate knowledge of applicable legislation, regulations and standards relating to the safety, health and welfare of the public, workers and protection of the environment including the Engineering and Geoscience Professions Act.
- 4C) Identify and address appropriate health and safety risks associated with design solutions.
- 4D) Develop an economic analysis for design solutions (e.g., cash flow) and interpret the results to determine economic feasibility of the project.
- 4E) Provide evidence of making decisions in an ethical manner that incorporates individual well-being, cultural, societal, and environmental factors in a foundational way.

### **Use of Engineering Tools**

- 5A) Selects and/or creates the most appropriate engineering technique, resource or tool (instrument, device, model, software, etc.), from various alternatives, for a given task
- 5B) Applies an appropriate engineering technique, resource or tool to accomplish a task.
- 5C) Adapts or extends an engineering technique, resource or tool to accomplish a task.
- 5D) Evaluates the appropriateness of results obtained from an engineering technique, resource or tool.

### **Individual and Teamwork**

- 6A) Demonstrates effort while completing tasks towards common goal.
- 6B) Contributes to discussion and decisions.
- 6C) Contributes towards healthy team environment.
- 6D) Demonstrates dependability within the team environment.
- 6E) Demonstrates the ability to give direction and guidance to others within the framework of a well communicated vision of the overall team goals

### **Communication**

- 7A) Identify relevant components of instruction and act upon directions.
- 7B) Identify, assess, evaluate & produce components of basic engineering documents.
- 7C) Synthesize, organize and present ideas in meetings, presentations, and reports.
- 7D) Adapt messages appropriately to the context (audience, message, purpose).
- 7E) Demonstrate fairness, courtesy and good faith, including the ability to give and receive honest and fair professional criticism.

### **Professionalism**

- 8A) Demonstrate knowledge of applicable legislation, regulations and standards relating to the safety, health and welfare of the public, workers and protection of the environment including the Engineering and Geoscience Professions Act.
- 8B) Recognize the limitations of their own competence and the value of integrating others' expertise.

### **Impact of Engineering on Society and Environment**

- 9A) Identify and analyze the central social issues including the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society
- 9B) Identify and analyze the concepts of environmental stewardship and sustainable development

### **Ethics and Equity**

- 10A) Acknowledging sources of information in a proper manner.
- 10B) Demonstrates accountability to stakeholders (co-workers, clients, supervisors, etc.)
- 10C) Demonstrate an equitable distribution of tasks within working groups. (relates to #6a-c)
- 10D) Recognize the importance of maintaining confidentiality.
- 10E) Recognize the importance of, and avoid, conflicts of interests.



**Economics and Project Management**

- 11A) Apply the concept of the time value of money to engineering projects, including consideration of risk and change management
- 11B) Apply principles of engineering project management as a basis for planning, organizing and managing resources including setting clear milestones.

**Lifelong Learning**

- 12A) Acquires relevant information effectively.
- 12B) Applies acquired knowledge and skills to new situations