

Curriculum Framework – Gateway (2017-2018)

Introduction to Gateway Engineering – Lesson A What is Engineering?

Desired Results (stage 1)	
<p>ESTABLISHED GOALS It is expected that students will...</p> <ul style="list-style-type: none"> G1 – Demonstrate an ability to identify, formulate, and solve engineering problems. 	Transfer
	<p>TRANSFER: Students will be able to independently use their learning to ...</p> <ul style="list-style-type: none"> T1 – Understand the impact of engineering solutions in a global, economic, environmental, and societal context. T2 – Function on a multidisciplinary team.
	Meaning

- G2 – Demonstrate an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.
- G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.
- G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

UNDERSTANDINGS: *Students will understand that ...*

- U1 – An engineering notebook is used to record original ideas or designs and to document the design process related to an invention or innovation.
- U2 – A portfolio is an organized collection of best works.
- U3 – Science is the study of the natural world, while technology is the study of how humans develop new products to meet needs and wants.
- U4 – Teams of people can accomplish more than one individual working alone.
- U5 – Technological change is seen through inventions, innovations, and the evolution of technological artifacts, processes, and systems.
- U6 – Technology can have positive and negative social, cultural, economic, political, and environmental consequences.
- U7 – Engineers, designers, and engineering technologists are needed in high demand for the development of future technology to meet societal needs and wants.

ESSENTIAL QUESTIONS: *Students will keep considering ...*

- Q1 – Why is it important for an engineer to document their work in an engineering notebook?
- Q2 – How are our lives impacted by engineers?
- Q3 – What inventions and innovations do you think are essential to your life?
- Q4 – How does the use of technology affect the way that you live?

- G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- G7 – Demonstrate an understanding of professional and ethical responsibility.
- G8 – Demonstrate an ability to function on multidisciplinary teams.
- G9 – Demonstrate an ability to communicate effectively.
- G10 – Gain knowledge of contemporary issues.
- G11 – Recognize the need for, and develop an ability to engage in life-long learning.

KNOWLEDGE: *Students will ...*

- K1 – Describe the relationship between science, technology, engineering, and math. U3
- K2 – Identify the differences between invention and innovation. U5
- K3 – Describe impacts that technology has had on society. U6

SKILLS: *Students will ...*

- S1 – Utilize standard procedures to use and maintain an engineering notebook. U1
- S2 – Use guidelines for developing and maintaining an engineering notebook to evaluate and select pieces of one's own work for inclusion in a portfolio. U2
- S3 – Operate as an effective member of a team to complete an investigation. U4
- S4 – Describe engineering and explain how engineers participate in or contribute to the invention and innovation of products. U5, U7

Curriculum Framework – Gateway (2017-2018)

Introduction to Gateway Engineering – Lesson B Design Process

Desired Results (stage 1)

ESTABLISHED GOALS

It is expected that students will...

- G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.
- G2 – Demonstrate an

Transfer

TRANSFER: *Students will be able to independently use their learning to ...*

- T1 – Apply the engineering design process to design a system, component, or process to meet desired needs within realistic constraints.
- T2 – Understand the role and impact of engineering and engineering solutions within a global, economic, environmental, and societal context.

Meaning

ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

- G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.
- G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.
- G5 – Demonstrate an

UNDERSTANDINGS: *Students will understand that ...*

- U1 – Many different design processes are used to guide people in developing solutions to problems.
- U2 – The design brief is a tool for defining the problem; it is an agreement between the engineer and client.
- U3 – Engineers use design briefs to explain the problem, identify solution expectations, and establish project constraints.
- U4 – Design teams use brainstorming techniques to generate large numbers of ideas in a short amount of time, striving for quantity, not quality.
- U5 – A decision matrix is a tool used to compare solution ideas to the criteria so that you can select the best solution.

ESSENTIAL QUESTIONS: *Students will keep considering ...*

- Q1 – How is a design process different than how you solve problems in the past?
- Q2 – Why is brainstorming important when modifying or improving a product?
- Q3 - Why do people work in teams when solving design problems?
- Q4 - Why are design elements considered when engineers and designers invent or innovate a product?

ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

- G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- G7 – Demonstrate an understanding of professional and ethical responsibility.
- G8 – Demonstrate an ability to function on multidisciplinary teams.
- G9 – Demonstrate an ability to communicate effectively.
- G10 – Gain knowledge of contemporary issues.
- G11 – Recognize the need for, and develop an ability to engage in life-long learning.

KNOWLEDGE: *Students will ...*

- K1 – Describe the design process and how it is used to aid in problem solving. U1
- K2 – Describe the elements of design. U1
- K3 – Recognize design criteria and constraints. U2, U3
- K4 – Describe the purpose and importance of working in a team. U4

SKILLS: *Students will ...*

- S1 – Use the design process to solve a technical problem. U1
- S2 – Apply the elements of design to the design process. U1
- S3 – Explain a design brief and apply the concept when using the design process. U2, U3
- S4 – Operate effectively as a member of a team to complete a design project. U4
- S5 – Use a decision matrix to select the best solution to a design problem. U5

Curriculum Framework – Gateway

Energy and the Environment – Lesson 1 Investigating Energy

Desired Results (stage 1)

ESTABLISHED GOALS

It is expected that students will...

- G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.
- G2 – Demonstrate an ability to design a system, component, or process to

Transfer

TRANSFER: *Students will be able to independently use their learning to ...*

- T1 - Design and conduct experiments, as well as to analyze and interpret data to make improvements on blade designs for a wind turbine.
- T2 - Function on multidisciplinary teams.
- T3 - Understand the impact of energy related engineering solutions in a global, economic, environmental, and societal context.

Meaning

component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

- G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.
- G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.
- G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and

UNDERSTANDINGS: *Students will understand that ...*

- U1 – Two types of energy exist: potential (stored energy) and kinetic (energy in motion).
- U2 – Energy sources can be renewable, exhaustible, or inexhaustible. There are advantages and disadvantages to each.
- U3 – The six main forms of energy include solar or light radiation, thermal, electrical, mechanical, chemical, and nuclear.
- U4 – Energy efficiency and conservation are necessary in order to minimize pollution, improve business/economy, reduce dependence on foreign sources, and reduce our carbon footprint to create a sustainable world.
- U5 – Energy can be transferred, or moved, from one object to another.
- U6 – Energy can be transformed, or changed, from one form to another.
- U7 – The second law of thermodynamics states that not all energy is 100 percent efficient when it is converted from one form to another.
- U8 – Work is measured in Joules and is defined as force acting over a distance. Power is measured in Watts and is defined by how fast work is done.
- U9 – Engineers, designers, and engineering technologists are high demand for the development of future technology to meet societal needs and wants.

ESSENTIAL QUESTIONS: *Students will keep considering ...*

- Q1 – What is energy?
- Q2 – What causes an energy crisis?
- Q3 – What would be the results if humans used only renewable and inexhaustible forms of energy?

environmental, and societal context.

- G7 – Demonstrate an understanding of professional and ethical responsibility.
- G8 – Demonstrate an ability to function on multidisciplinary teams.
- G9 – Demonstrate an ability to communicate effectively.
- G10 – Gain knowledge of contemporary issues.
- G11 – Recognize the need for, and develop an ability to engage in life-long learning.

Acquisition

KNOWLEDGE: *Students will ...*

- K1 – Describe the differences between, and the advantages and disadvantages of exhaustible, inexhaustible, renewable, and non-renewable energy sources. U2, U5, U6
- K2 – Describe the six main forms of energy; including solar or light radiation, thermal, electrical, mechanical, chemical, and nuclear. U3, U5, U6
- K3 – Describe the roles and responsibilities of STEM professionals for high demand technological careers. U9

SKILLS: *Students will ...*

- S1 – Differentiate between potential and kinetic energy. U1
- S2 – Identify global energy uses and explain trends toward future demands. U4
- S3 – Demonstrate ways to increase the efficiency of energy used in homes and at school. U4, U5, U6
- S4 – Calculate financial savings and explain effects of our carbon footprint as a result of using energy efficiently. U4, U5, U6
- S5 – Use the design process to design, model, and test a wind turbine for efficiency. U5, U6, U7, U8
- S6 – Calculate power and work by measuring force, distance, and time using the wind turbine model. U8