

## **Pre-Engineering**

TECH019056  
Credits: 0.5 units / 5 hours

### **Course Description**

This course is designed to provide students with a clear picture of the basics of engineering and the types of work engineers in various disciplines perform, as well as the functions of engineers, the regulating bodies and professional associations that govern professionals in the engineering industry, ethics, and the importance of teamwork. Students will learn the importance of the Engineering Design Process and why each step is necessary when designing new products, devices or systems. The second half of the course will focus on distinct engineering disciplines with an in-depth look at the fields of Mechanical engineering, Manufacturing engineering, Computer engineering, Civil engineering, Aerospace engineering, and Environmental engineering. For each discipline the course covers the professional aspects, educational requirements, applications, and a snapshot of engineering in action. Student projects are hands-on activities that will require materials that can be obtained locally. There is no laboratory kit provided for this course.

**Graded Assessments:** 4 Unit Evaluations; 4 Projects; 2 Proctored Progress Tests

### **Course Objectives**

When you have completed the materials in this course, you should be able to:

1. Define engineering and give examples of engineering projects from the past and the present.
2. Identify and explain the major activities of engineering.
3. Explain how science, technology, engineering and math are related and why they are important.
4. Describe and explain the engineering design process.
5. Use the engineering design process to solve a problem.
6. Explain the function and value of drawings and models to engineering.
7. Create technical drawings using appropriate techniques.
8. Explain what a civil engineer does and give examples of civil engineering.

9. Explain what electrical engineering is and give examples of both electrical and electronics engineering.
10. Explain what mechanical engineering is and give examples of the wide variety of ways mechanical engineering can be applied.
11. Explain the role and significance of a computer engineer.
12. Explain what aerospace engineers do and give examples of modern aerospace engineering.
13. Define environmental engineering and give examples of how environmental engineers help protect our planet.
14. Identify emerging disciplines within engineering.
15. Explain the importance of teamwork to engineering.
16. Describe the type of education typically required to get into the field of engineering and identify different opportunities available for different levels of education.
17. Identify some of the key challenges facing engineers in the future.

## **Course Outline**

### **Unit 1: Introduction to Engineering**

- Lesson 1: What is Engineering?
- Lesson 2: Engineering as a Profession
- Lesson 3: Engineering Design
- Unit 1 Evaluation
- Project 1

### **Unit 2: The Engineering Design Process**

- Lesson 4: Defining Problems
- Lesson 5: Researching Designs
- Lesson 6: Communicating Solutions
- Lesson 7: Modeling, Testing and Outputs
- Unit 2 Evaluation
- Project 2
- Progress Test 1

### **Unit 3: Engineering Careers Part 1**

Lesson 8: Mechanical Engineering  
Lesson 9: Electrical Engineering  
Lesson 10: Computer Engineering  
Unit 3 Evaluation

#### **Unit 4: Engineering Careers Part 2**

Lesson 11: Civil Engineering  
Project 3  
Lesson 12: Aerospace Engineering  
Lesson 13: Environmental Engineering  
Unit 4 Evaluation  
Project 4  
Progress Test 2

#### **Required Textbook and Materials**

(available through Follett virtual bookstore at <http://highschool.nebraska.bkstr.com>)

You will need the following textbook to complete this course:

*Engineering Fundamentals*. 2018. Goodheart-Willcox Publishing. ISBN: 9781631262852

You will need the following materials to complete the projects in this course:

#### **Project Materials Needed:**

- ping pong ball (or other small, lightweight plastic ball)
- bucket or garbage can (or other container that holds about 5 gallons)
- plastic spoon
- pencil, ruler, stick or other object to use as a launcher
- rubber bands (as many as you like)
- safety glasses
- bridge building materials: straws, balsa wood or bass wood strips with dimensions around  $\frac{1}{4}$ " x  $\frac{1}{4}$ ", folded paper, clear tape, pins, glue, string
- 5 Gallon bucket or container that you can hang
- scale that measures in grams (or if you measure in pounds and ounces, convert to grams: 1 ounce = 28.3495 grams)