

# PRINCIPLES OF ENGINEERING AND TECHNOLOGY, SEMESTER A

Credits: 0.5

## COURSE OVERVIEW AND GOALS

This one-semester course is intended to help you familiarize yourself with engineering systems and technologies. This course has thirteen lessons organized into three units. Each unit has a Unit Activity, and each lesson contains one or more Lesson Activities.

This course will cover the evolution of engineering and technology, careers in engineering, and engineering systems and technologies.

You will submit the Unit Activities to your teacher, and you will grade your work in the Lesson Activities by comparing them with given sample responses. The Unit Activities (submitted to the teacher), and the Lesson Activities (self-checked) are the major components of this course. There are other assessment components, namely the mastery test questions that feature along with the lesson; the pre- and post-test questions that come at the beginning and end of the unit, respectively; and an end-of-semester test. All of these tests are a combination of simple multiple-choice questions and technology enhanced (TE) questions.

By the end of this course, you will be able to do the following:

- ❖ Evaluate the historical evolution and their impact on society and the environment.
- ❖ Analyze the ethical implications and societal applications of modern technologies, including high-precision measurement systems and job-specific technologies.
- ❖ Compare the branches of engineering and their associated technologies, including mechanical systems (simple and compound machines), fluid systems, thermal systems, electrical systems, biotechnology, and construction technologies.
- ❖ Evaluate career opportunities in engineering and technology fields in relation to essential employability characteristics and collaborative work practices.
- ❖ Analyze the design and function of engineering systems, including structural designs, electrical circuits, and fluid and thermal applications.

## COURSE COMPONENTS AND GRADING RUBRIC

The table gives a breakdown of the weight for each component in the course. Weight represents the percentage of the total score coming from each activity.

| Course Components                                                                                                                                                                                                                                                                                                                                                                                                                             | Count     | Weight*     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|
| <b>Pretest.</b> <i>A pretest is an optional assessment, typically designed for credit recovery. If a student shows mastery of a lesson objective, the student may be automatically exempted from the upcoming activities associated with the mastered objective. Pretests are not included as a component of the student's final grade.</i>                                                                                                   | 3         | 0%          |
| <b>Module.</b> <i>Each module in this course contains an interactive tutorial or study and an associated mastery test. Tutorials and studies combine instruction and practice to prepare students for the mastery test, which is a computer-scored lesson-level summative assessment. The module score comes from a student's score on the mastery test.</i>                                                                                  | 13        | 20%         |
| <b>Discussion.</b> <i>A discussion activity is an opportunity for students to collaborate with their peers. An online threaded discussion mirrors the educational experience of a classroom discussion initiated when a teacher asks a complex, open-ended question. Students can engage in the discussion by responding both to the question and to the thoughts of others allowing for higher-order thinking about terminal objectives.</i> | 3         | 20%         |
| <b>Unit Activity.</b> <i>A Unit Activity is at the end of a unit and constitutes one or more small tasks. Its purpose is to deepen understanding of key unit concepts and tie them together. Each Unit Activity includes a simple rubric. The teacher versions include both a rubric and modeled sample answers. Unit Activities are teacher graded.</i>                                                                                      | 3         | 20%         |
| <b>Posttest.</b> <i>A posttest appears at the end of each unit.</i>                                                                                                                                                                                                                                                                                                                                                                           | 3         | 20%         |
| <b>End-of-Semester Test.</b> <i>An end-of-semester test (EOS) appears at the end of each course.</i>                                                                                                                                                                                                                                                                                                                                          | 1         | 20%         |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>26</b> | <b>100%</b> |

Weight\* Teachers may manually adjust these weights if desired, per district grading requirements.

## SCOPE AND SEQUENCE

### UNIT 1: INTRODUCTION TO ENGINEERING AND TECHNOLOGY

In this unit, you will familiarize yourself with the advancements in technology and engineering. You will examine how technology has evolved and describe some modern technologies and their applications. You will examine job-specific technologies and demonstrate safe use of technological resources.

| Activity                                                         | Activity Objective                                                                                                                                                                     |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syllabus</b>                                                  | <ul style="list-style-type: none"> <li>Review the Course Syllabus at the beginning of the course.</li> </ul>                                                                           |
| <b>Engineering and Technology</b>                                | <ul style="list-style-type: none"> <li>Recognize the significance of engineering and technology in the context of human necessities, culture, society, and the environment.</li> </ul> |
| <b>A Survey of Modern Technology</b>                             | <ul style="list-style-type: none"> <li>Identify key technologies, their uses, and how they interact in modern society.</li> </ul>                                                      |
| <b>Job-Specific Technologies</b>                                 | <ul style="list-style-type: none"> <li>Identify critical-thinking and problem-solving concepts, workplace applications, and analytical steps.</li> </ul>                               |
| <b>Unit Activity: Introduction to Engineering and Technology</b> | <ul style="list-style-type: none"> <li>Compare different types of plastic.</li> </ul>                                                                                                  |

## UNIT 2: CAREER EXPLORATION

In this unit, you will examine the different branches of engineering and the technologies associated with them. You will explore various careers in engineering. You will identify some important employability characteristics. You will discuss the importance of leadership skills and teamwork.

| Activity                       | Activity Objective                                                                                                                               |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Branches of Engineering</b> | <ul style="list-style-type: none"> <li>Identify the major branches of engineering and the emerging technologies associated with them.</li> </ul> |

| Activity                                 | Activity Objective                                                                                                                                                                                      |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Careers in Engineering</b>            | <ul style="list-style-type: none"><li>• Identify career opportunities in engineering.</li><li>• Summarize how an engineering team works.</li></ul>                                                      |
| <b>Positive Work Ethics</b>              | <ul style="list-style-type: none"><li>• Recognize the importance of positive work ethics and describe good work habits.</li></ul>                                                                       |
| <b>Integrity</b>                         | <ul style="list-style-type: none"><li>• Identify integrity attributes outlined by many workplace policies and laws.</li></ul>                                                                           |
| <b>Unit Activity: Career Exploration</b> | <ul style="list-style-type: none"><li>• Examine the health and safety measures in the coal mining industry and identify career and skill requirements in the electrical engineering industry.</li></ul> |

### UNIT 3: ENGINEERING SYSTEMS AND TECHNOLOGIES

In this unit, you will describe the components of mechanical systems and explain their mechanisms. You will examine fluid systems and their applications. You will describe thermal systems and their functions. You will identify the components of electrical systems and analyze electrical circuits. You will describe the applications of biotechnology. You will examine construction technologies and analyze structural designs.

| Activity                  | Activity Objective                                                                                                      |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Mechanical Systems</b> | <ul style="list-style-type: none"><li>• Examine the concepts and components common to all mechanical systems.</li></ul> |
| <b>Fluid Systems</b>      | <ul style="list-style-type: none"><li>• Examine the structure, functions, and applications of fluid systems.</li></ul>  |
| <b>Thermal Systems</b>    | <ul style="list-style-type: none"><li>• Examine systems in which energy is transferred in the form of heat.</li></ul>   |

| Activity                                                   | Activity Objective                                                                                                                                           |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical Systems</b>                                  | <ul style="list-style-type: none"> <li>Examine the components of electrical systems.</li> <li>Apply physical laws to analyze electrical circuits.</li> </ul> |
| <b>Biotechnology</b>                                       | <ul style="list-style-type: none"> <li>Examine the field of biotechnology and its applications in medicine and agriculture.</li> </ul>                       |
| <b>Construction Technologies</b>                           | <ul style="list-style-type: none"> <li>Examine construction technologies.</li> <li>Analyze structural designs.</li> <li>Identify safety laws.</li> </ul>     |
| <b>Unit Activity: Engineering Systems and Technologies</b> | <ul style="list-style-type: none"> <li>Summarize the principle and functioning of a modern transportation system.</li> </ul>                                 |

## COURSE MAP

You will achieve course level objectives by completing each lesson's instruction, assignments, and assessments. For a detailed look at how the materials meet these objectives, review the [course map](#).