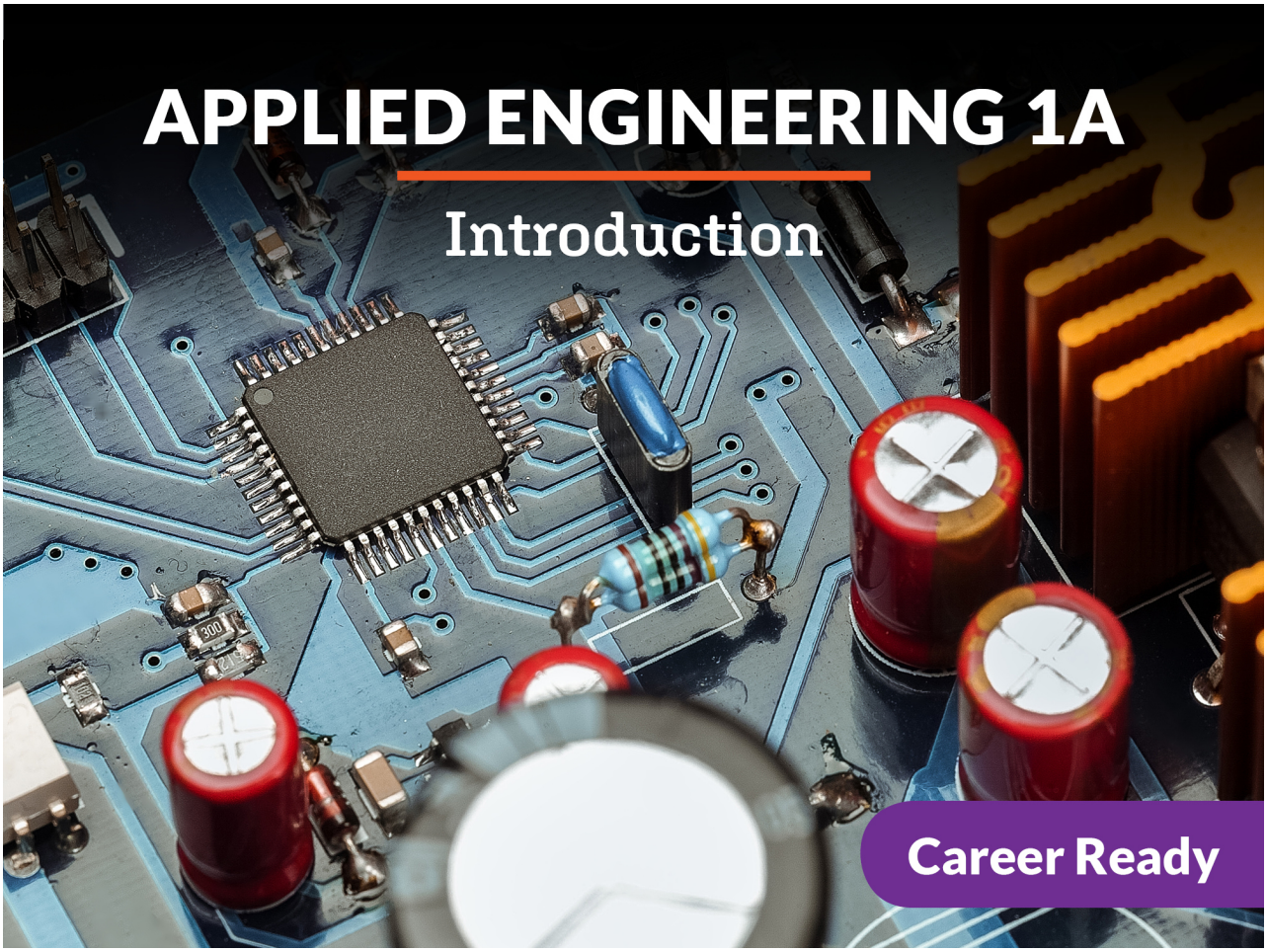
Course **Syllabus**

What you will learn in this course



Applied Engineering 1a: Introduction

Discover how technology has changed the world around us by pursuing technological solutions to everyday problems. While using scientific and engineering methods, learn how electricity, electronic systems, magnets, and circuits work. Understand the design process and bring your ideas to life. Explore how engineering advances your ideas and the world!

Unit 1: What is Engineering?

Are you creative or innovative? Are you an inventor? Peering into history we find the human race has been effective at piecing together ideas from their natural resources. New ideas are created every day, sometimes by accident, sometimes out of need to solve a local or world problem. Let's begin our discussion by first understanding how we have arrived at today's technology and concepts of engineering.

What will you learn in this unit?

- Define and identify a technological system
- Define engineering and describe its history
- Explain how and why technological development and diffusion has rapidly increased
- Describe how technology has shaped social, cultural, political, and economic landscapes throughout history
- Describe how the development and use of technology has influenced past events

UNIT 1 Assignments

Assignment	Type
Unit 1 Critical Thinking Questions	Homework
Unit 1 Lab	Homework
Unit 1 Activity	Homework
Unit 1 Discussion 1	Discussion
Unit 1 Discussion 2	Discussion
Unit 1 Quiz	Quiz

Unit 2: The Science of Electricity

In this unit we peer into the atom and its properties. We identify what electricity is and how we can manipulate the electrons of an atom. We will cover some invaluable formulas that allow us to quantify electricity as it is applied to the generation and consumption of energy.

What will you learn in this unit?

- Describe the structure of the atom and how it defines a conductor, semiconductor, and insulator
- State the relationships between voltage, current, and resistance by the use of Ohm's Law.
- Calculate electrical power and energy
- Describe the three laws of electrostatics
- Explain the difference between a base unit and a derived unit

UNIT 2 Assignments

Assignment	Type
Unit 2 Critical Thinking Questions	Homework
Unit 2 Lab	Homework
Unit 2 Activity	Homework
Unit 2 Discussion 1	Discussion
Unit 2 Discussion 2	Discussion
Unit 2 Quiz	Quiz

Unit 3: Circuits: The Building Blocks

As technology advances, so do the tools of discovery. The historical experiments, formulas, and data collection of the past have led to many amazing discoveries, yet we don't stop there. Imagine if advances in the light bulb stopped with Thomas Edison; perhaps his invention would have sufficed if we didn't know better. Since Edison first illuminated his world, the light bulb hasn't changed because of a newer type of coiled metal filament. Rather, it was a process of innovation driven by our understanding of the atom and how we can manipulate known elements that continue to allow advances to happen. The latest light bulb technology generates less heat and extends the life of the bulb, and it achieves this by employing easier manufacturing methods. Many times new technology is integrated into existing processes as manufacturers make the transition from one product to the next. Some processes just make sense to keep. In this unit we will compare examples of technology processes that have remained essentially unchanged with others that are always evolving in the process of becoming greater.

What will you learn in this unit?

- Describe an open and closed loop electronic system with its input, process, and output components
- Describe characteristics of permanent and electromagnets
- Apply Ohm's Law and Watt's Law in a resistive circuit
- Understand the differences between direct current and alternating current.
- Identify electronic components such as resistors, capacitors, inductors

UNIT 3 Assignments

Assignment	Type
Unit 3 Critical Thinking Questions	Homework
Unit 3 Lab	Homework
Unit 3 Activity 1	Homework
Unit 3 Activity 2	Homework
Unit 3 Activity 3	Homework
Unit 3 Discussion 1	Discussion
Unit 3 Discussion 2	Discussion
Unit 3 Quiz	Quiz

Unit 4: Types of Circuits

Have you ever wondered how computers think and answer questions? How applications make extensive use of artificial intelligence? Humans may think logically, but do computers? To answer these questions, we must first identify how we make decisions in our world with given choices. How is a question asked and how is an answer delivered? We will find that, with the proper electronic components, we can mimic the yes and no answers using on and off digital signals. In this unit we will view the transition from analog devices with vacuum tubes and hand-wired circuitry to far more complex digital signal processing using digital integrated circuits (IC).

What will you learn in this unit?

- Describe Kirchhoff's Current and Voltage Laws
- Describe the use of diodes and transistors
- Understand how to use logic gates
- Interconvert binary, decimal, and hexadecimal values
- Identify various common electronic schematic symbols

UNIT 4 Assignments

Assignment	Type
Unit 4 Critical Thinking Questions	Homework
Unit 4 Lab	Homework
Unit 4 Activity 1	Homework
Unit 4 Activity 2	Homework
Unit 4 Discussion 1	Discussion
Unit 4 Discussion 2	Discussion
Unit 4 Quiz	Quiz

Applied Engineering 1a Midterm Exam

- Review information acquired and mastered from this course up to this point.
- Take a course exam based on material from the first four units in this course (Note: You will be able to open this exam only one time.)

MIDTERM Assignments

Assignment	Type
Midterm Exam	Exam
Midterm Discussion	Discussion

Unit 5: Engineering Tools and Safety

Engineers design, invent, and create; they solve problems. They need tools to assemble their ideas as well as tools to make adjustments and test that their ideas are working properly. Those tools were once just an idea themselves and eventually became the appropriate tool for specific applications.

What will you learn in this unit?

- Describe various tools and equipment used by engineers
- Identify common hazards found in the lab or workplace
- Apply safety protocols in a lab or workplace

- Identify rules and regulations that govern employees and employers

UNIT 5 Assignments

Assignment	Type
Unit 5 Critical Thinking Questions	Homework
Unit 5 Lab	Homework
Unit 5 Activity	Homework
Unit 5 Discussion 1	Discussion
Unit 5 Discussion 2	Discussion
Unit 5 Quiz	Quiz

Unit 6: Putting Scientific Tools into Action

Before there was a formal study of science, there was natural philosophy. Philosophers sought to understand the natural world by questioning how it all operated. They theorized and kept records of observations about the world. Eventually, mankind sought to manipulate the resources found in the world for the benefit of both the inhabitants and the environment. Today's scientists seek to understand this natural world and help advance our knowledge one step further into the future with each experiment.

What will you learn in this unit?

- Identify the steps that formulate the scientific method
- Make a clearly defined hypothesis
- Differentiate between an independent and dependent variable
- Differentiate between qualitative and quantitative data
- Collect and write data in significant figures

UNIT 6 Assignments

Assignment	Type

Unit 6 Critical Thinking Questions	Homework
Unit 6 Lab	Homework
Unit 6 Activity	Homework
Unit 6 Discussion 1	Discussion
Unit 6 Discussion 2	Discussion
Unit 6 Quiz	Quiz

Unit 7: The Engineering Design Process

Our technological resources are the ingredients that an engineer will use to cook up an awesome design. Some of the technological resources by themselves will be limited in purpose; however, when combined like pieces in a puzzle, a great piece of artwork develops to serve a greater good. For example a thermometer alone can give us data from its temperature reading, but when coupled with an alarm or flashing light it can now become an alert, a method of communicating information to us, or when coupled with a switch, it can now turn on or off an electrical signal at a set temperature for air conditioning. The efforts of how the engineer arrives at a solution still follows a logical order and is itself a process. In this unit we will break down those steps that engineers take in order to arrive at their goal.

What will you learn in this unit?

- Understand the engineering design process
- Identify criteria and constraints
- Identify the qualities of a great design
- Understand the evaluation process for testing a design

UNIT 7 Assignments

Assignment	Type
Unit 7 Critical Thinking Questions	Homework
Unit 7 Lab	Homework
Unit 7 Activity	Homework
Unit 7 Discussion 1	Discussion

Unit 7 Discussion 2	Discussion
Unit 7 Quiz	Quiz

Unit 8: Putting it All Together: Solid Modeling, Technical Drawing, and Prototyping

The most complicated event of invention and innovation is taking the idea from the mind and moving it into the real world. As much as you can verbally express an idea, most of the time it is not until you sketch or model that idea that others understand it. The invention of paper, in itself, has brought us a method of expressing ideas, and it even acts as a medium to store that knowledge. With the onset of computers, we now have vast storage space to design multistory buildings and multilevel ships that may be accessed via virtual reality. Elements inside those models can even be manipulated in that virtual space. Once a design is realized, it can be simulated, testing its physical properties while still in the computer. Once finalized, it can be prototyped or placed into production. From a computer file, an object or idea can be run through various manufacturing processes including 3D printing, laser cutting, or even computerized milling. These and many other machines take the design and produce the object. Our advances in materials manipulation and production allows ideas to move from our brain to the computer and into a prototype or even final production sometimes as quick as a few minutes. This unit identifies those key features that our ideas prototyped.

What will you learn in this unit?

- Identify various pictorial and orthographic drawing techniques
- Apply ISO and ANSI standards on technical drawings
- Apply part-dimensioning techniques
- Apply CAD software for 3D solid modeling
- Identify CAD based tools for part analysis

UNIT 8 Assignments

Assignment	Type
Unit 8 Critical Thinking Questions	Homework
Unit 8 Lab	Homework
Unit 8 Activity	Homework

Unit 8 Discussion 1	Discussion
Unit 8 Discussion 2	Discussion
Unit 8 Quiz	Quiz

Applied Engineering 1a Final Exam

- Review information acquired and mastered from this course up to this point.
- Take a course exam based on material from units five to eight in this course – the last four units. (Note: You will be able to open this exam only one time.)

FINAL Assignments

Assignment	Type
Final Exam	Exam
Final Exam Discussion	Discussion