

Standards: [NGSS HS.Engineering Design](#) standards and [ABET](#) standards

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DC Introduction to Electrical and Computer Engineering BSU: Semiconductors 2 Alignment Table

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
HS-ETS1-1.			x					x
HS-ETS1-2.						x		x
HS-ETS1-3.			x					x
HS-ETS1-4.						x		x
ABET-1		x	x	x	x	x	x	x
ABET-2			x		x			x
ABET-3	x		x		x	x		x
ABET-4			x					
ABET-5						x		x

ABET-6		x		x	x	x	x	x
ABET-7	x	x	x		x			x

DC Introduction to Electrical and Computer Engineering BSU: Semiconductors 2 Course Map

Unit 1: What is Electrical and Computer Engineering?

Idaho Standards	Unit Objectives
ABET ABET-3 an ability to communicate effectively with a range of audiences. ABET-7 an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	• discuss the history and foundations of electrical engineering and computer science. • explain the different specialties in electrical engineering, computer engineering, and computer science. • discuss your own personal interests and career goals.
Lesson 1: Introduction to Electrical and Computer Engineering	
Lesson Objectives 1. describe the people and things important to engineering and computer science. ○ correlation: ABET-3, ABET-7 2. reflect on what important technology is most critical in your life. ○ correlation: ABET-3, ABET-7	Assessments • Objective 1: U1D1: People and Things of Engineering and Computer Science...And You • Objective 2: U1D1: People and Things of Engineering and Computer Science...And You
Lesson 2: What Do Engineers Do?	
Lesson Objectives 1. distinguish the specialty areas in electrical engineering (EE), computer engineering (CE), and computer science (CS). ○ correlation: ABET-7 2. explain what electrical engineering (EE), computer	Assessments • Objective 1: U1A1: Where Could I Work? • Objective 2: U1A1: Where Could I Work?

engineering (CE), and computer science (CS) graduates can do. ○ correlation: ABET-7	
Lesson 3: Charting Your Path	
Lesson Objectives 1. discuss your career values. ○ correlation: ABET-7 2. identify your “favorite” area of specialization. ○ correlation: ABET-7 3. assess your values in relation to selecting preferred specializations. ○ correlation: ABET-7	Assessments ● Objective 1: U1A2: My Perfect Job ● Objective 2: U1A2: My Perfect Job ● Objective 3: U1A2: My Perfect Job

Unit 2: Learning the Basics

Idaho Standards	Unit Objectives
ABET ABET-1 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. ABET-6 an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. ABET-7 an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	● identify basic electrical and electronic components, including the parts of an Arduino board. ● construct a simple Arduino project. ● explain the requirements for a Bachelor of Science (BS) degree in electrical engineering (EE), computer engineering (CE), or computer science (CS) at BSU and other Idaho universities.
Lesson 1: Electronic Devices and Their Connection	
Lesson Objectives 1. identify basic electrical and electronic components. ○ correlation: ABET-1 2. describe how electricity flows in a circuit using the water analogy and basic terminology. ○ correlation: ABET-1	Assessments ● Objective 1: U2L1: Electronic Devices and Their Connection–Drawing the Circuit interactive ● Objective 2: U2A1: Electronic Devices and Their Connections Quiz

Lesson 2: First Arduino Project	
Lesson Objectives - complete the Arduino setup process for your device. - correlation: ABET-6 - demonstrate the first LED blinking light and modify the code slightly to change behavior. - correlation: ABET-6	Assessments - Objective 1: U2A2: Arduino Setup - Objective 2: U2A2: Arduino Setup
Lesson 3: Building a Simple Circuit	
Lesson Objectives - construct a simple Arduino project on the breadboard and show it behaves correctly. - correlation: ABET-6	Assessments Objective 1: U2D1: Circuit Building Reflections
Lesson 4: EE, CE, and CS in College	
Lesson Objectives - compare and contrast the requirements for electrical engineering (EE), computer engineering (CE), and computer science (CS) degrees at Idaho universities. - correlation: ABET-7	Assessments Objective 1: U2D2: Comparing Program Requirements

Unit 3: Becoming an Engineer

Idaho Standards	Unit Objectives
Next Generation Science Standards HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions. HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs. ABET ABET-1 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering,	- identify major issues in ethics that might be experienced as an engineer. - describe ways to improve your current study habits and explain some of the theory behind how we learn. - complete a more advanced Arduino UNO R3 project and report your experience.

science, and mathematics. ABET-2 an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. ABET-3 an ability to communicate effectively with a range of audiences. ABET-4 an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. ABET-7 an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	
Lesson 1: Ethics in Engineering	
Lesson Objectives 1. describe the differences and similarities between ethics and morals. - o correlation: HS-ETS1-1, ABET-4 2. identify issues of ethics that are critical for professional engineers and computer scientists. - o correlation: HS-ETS1-1, ABET-3, ABET-4 3. apply personal or professional ethics to example cases. - o correlation: HS-ETS1-3, ABET-3, ABET-4	Assessments • Objective 1: U3L1: Ethics in Engineering–What Are Ethics? interactive • Objective 2: U3D1: An Ethical Dilemma Example • Objective 3: U3D1: An Ethical Dilemma Example
Lesson 2: Having a Growth Mindset	
Lesson Objectives 1. identify strategies to help you be successful in college. - o correlation: ABET-7 2. describe the research into the science of learning. - o correlation: ABET-7	Assessments • Objective 1: U3A1: Growth Mindset and Study Habits Notes • Objective 2: U3A1: Growth Mindset and Study Habits Notes
Lesson 3: Effective Study Habits	
Lesson Objectives	Assessments

1. identify strategies to help you be successful in college. ○ correlation: ABET-7 2. describe the research into the science of learning. ○ correlation: ABET-7	● Objective 1: U3A1: Growth Mindset and Study Habits Notes ● Objective 2: U3A1: Growth Mindset and Study Habits Notes
Lesson 4: Intermediate Arduino Project	
Lesson Objectives 1. explain the role of sensors in Arduino projects. ○ correlation: ABET-1 2. complete an Arduino project that uses an LCD display as an output device. ○ correlation: ABET-2	Assessments ● Objective 1: U3A2: Thermometer Project Reflection ● Objective 2: U3A2: Thermometer Project Reflection

Unit 4: Circuit Analysis Basics

Idaho Standards	Unit Objectives
ABET ABET-1 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. ABET-6 an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	● identify various circuit topologies. ● analyze series and parallel resistor networks. ● analyze electronic circuits using simple measurement equipment.
Lesson 1: Circuit Topologies	
Lesson Objectives 1. differentiate between series and parallel elements in a circuit. ○ correlation: ABET-1 2. calculate the effective resistance of networks of resistors. ○ correlation: ABET-1, ABET-6	Assessments ● Objective 1: U4L1: Circuit Topologies–Knowledge Check: Series and Parallel Resistor interactive ● Objective 2: U4A1: Ohm's Law and Equivalent Resistance
Lesson 2: Drawing Circuits in Tinkercad	

Lesson Objectives 1. create a simple circuit using Tinkercad. ○ correlation: ABET-1, ABET-6 2. draw a circuit with more components in Tinkercad. ○ correlation: ABET-1, ABET-6	Assessments ● Objective 1: U4A2: RGB LED Circuit Drawing ● Objective 2: U4A2: RGB LED Circuit Drawing
Lesson 3: Test and Measurement in Tinkercad	
Lesson Objectives 1. measure current and voltage in a circuit. ○ correlation: ABET-1, ABET-6 2. describe what a diode is and how it behaves in a circuit. ○ correlation: ABET-1, ABET-6	Assessments ● Objective 1: U4A3: Tinkercad Drawing Analysis ● Objective 2: U4A3: Tinkercad Drawing Analysis

Unit 5: Success as an Engineer

Idaho Standards	Unit Objectives
ABET ABET-1 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. ABET-2 an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. ABET-3 an ability to communicate effectively with a range of audiences. ABET-6 an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. ABET-7 an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	● identify opportunities for experiential learning during college. ● discuss how experiential learning could be part of your college plan. ● draw simple circuit schematics from an English-language description of the circuit. ● measure more complex circuit behavior.
Lesson 1: Experiential Learning	
Lesson Objectives	Assessments

1. describe the various opportunities available to learn more about an engineering career while you are in college. ○ correlation: ABET-3, ABET-7 2. identify resources from the State of Idaho to help you going forward. ○ correlation: ABET-3, ABET-7	● Objective 1: U5D1: My Future Career Priorities Poster ● Objective 2: U5D1: My Future Career Priorities Poster
Lesson 2: Drawing Schematics	
Lesson Objectives 1. draw schematics using a schematic capture tool. ○ correlation: ABET-1 2. apply circuit analysis to schematics. ○ correlation: ABET-1	Assessments ● Objective 1: U5A1: LED Schematic and Circuit ● Objective 2: U5A1: LED Schematic and Circuit
Lesson 3: Tinkercad Project	
Lesson Objectives 1. create a Tinkercad design for testing. ○ correlation: ABET-1, ABET-2, ABET-6 2. measure current in a circuit for a combination of voltage and resistor values. ○ correlation: ABET-1, ABET-2, ABET-6 3. write in order to report on your experiment. ○ correlation: ABET-1, ABET-2, ABET-6	Assessments ● Objective 1: U5A2: LED Circuit Project Lab Data ● Objective 2: U5A2: LED Circuit Project Lab Data ● Objective 3: U5A2: LED Circuit Project Lab Data

Unit 6: Digital Logic

Idaho Standards	Unit Objectives
Next Generation Science Standards HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, manageable problems. HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and	● convert between binary, decimal, and hexadecimal number systems. ● describe simple logic gates including schematic representation, truth tables, and functionality. ● simplify logic expressions using Boolean algebra.

between systems relevant to the problem. ABET ABET-1 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. ABET-3 an ability to communicate effectively with a range of audiences. ABET-5 an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. ABET-6 an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
Lesson 1: Logic Gates	
Lesson Objectives - convert between binary, decimal, and hexadecimal number systems. - correlation: ABET-1, ABET-6 - describe the fundamental operations of digital logic gates. - correlation: ABET-1, ABET-6	Assessments - Objective 1: U6A1: Binary Conversions - Objective 2: U6A2: Logic Gate Truth Tables
Lesson 2: How Are Logic Gates Made?	
Lesson Objectives - create truth tables to describe the function of logic gates. - correlation: ABET-1, ABET-6 - create more complex functions from basic gates. - correlation: ABET-1, ABET-6	Assessments - Objective 1: U6A2: Logic Gate Truth Tables - Objective 2: U6A2: Logic Gate Truth Tables
Lesson 3: Boolean Algebra	
Lesson Objectives identify the rules of Boolean algebra.	Assessments Objective 1: U6D1: Logic Gate Challenge

○ correlation: HS-ETS1-2, HS-ETS1-4, ABET-3, ABET-5, ABET-6 2. draw simple logic schematics with Scheme-it. ○ correlation: HS-ETS1-2, HS-ETS1-4, ABET-3, ABET-5, ABET-6 3. simplify Boolean algebra expressions. ○ correlation: HS-ETS1-2, HS-ETS1-4, ABET-3, ABET-5, ABET-6	● Objective 2: U6D1: Logic Gate Challenge ● Objective 3: U6D1: Logic Gate Challenge
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Unit 7: What is a Computer?

Idaho Standards	Unit Objectives
ABET ABET-1 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. ABET-6 an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	● describe the functions that make up a modern computer including memory, storage, processing, and input/output devices. ● compare and contrast different types of memory and their advantage/disadvantages. ● explain the techniques used to perform high-speed addition in a modern CPU.
Lesson 1: How Does a Computer Compute?	
Lesson Objectives 1. identify hardware and software components of a computer. ○ correlation: ABET-1	Assessments ● Objective 1: U7A1: Hardware and Software
Lesson 2: Memory and Storage	
Lesson Objectives 1. describe different types of computer memory (DRAM, SRAM, registers, Flash, ROM, etc.). ○ correlation: ABET-1 2. compare performance and cost of different memory types. ○ correlation: ABET-6	Assessments ● Objective 1: U7A2: Types of Memory ● Objective 2: U7A2: Types of Memory

Lesson 3: The Brains of the Computer (CPU)	
Lesson Objectives 1. describe the flow of instructions and data through the CPU of a computer. ○ correlation: ABET-1 2. explain how and why computers can do arithmetic so quickly. ○ correlation: ABET-6	Assessments ● Objective 1: U7A3: The CPU Flow ● Objective 2: U7A3: The CPU Flow
Lesson 4: Simple Computer Programming	
Lesson Objectives 1. identify the primary constructs used in most high-level programming languages. ○ correlation: ABET-1	Assessments ● Objective 1: U7A4: Computer Programming

Unit 8: What's Next?

Idaho Standards	Unit Objectives
Next Generation Science Standards HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions. HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, manageable problems. HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs. HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. ABET ABET-1 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering,	● present the final Arduino project. ● identify future objectives and plans for education and career success. ● describe the hardware and software tools that engineers use.

science, and mathematics. ABET-2 an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. ABET-3 an ability to communicate effectively with a range of audiences. ABET-5 an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. ABET-6 an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. ABET-7 an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	
Lesson 1: What It Means to Study Electrical and Computer Engineering	
Lesson Objectives - list education and career goals. - correlation: ABET-7 - identify education paths for electrical and computer engineering. - correlation: ABET-7 - describe computer science education opportunities. - correlation: ABET-7	Assessments - Objective 1: U8A1: My Perfect Job, Take Two - Objective 2: U8A1: My Perfect Job, Take Two - Objective 3: U8A1: My Perfect Job, Take Two
Lesson 2: Tools of Engineering and Computer Science	
Lesson Objectives - describe several pieces of lab equipment seen in a BSU ECE lab. - correlation: ABET-1 - describe some of the software tools used by engineers and computer scientists in school and in the workforce. - correlation: ABET-1	Assessments - Objective 1: U8A2: Engineering and Computer Science Tools - Objective 2: U8A2: Engineering and Computer Science Tools

Lesson 3: Presenting Your Arduino Project	
Lesson Objectives 1. create a presentation describing your final Arduino project. ○ correlation: HS-ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-ETS1-4, ABET-1, ABET-2, ABET-3, ABET-5, ABET-6, ABET-7 2. provide feedback for your fellow classmates' Arduino project presentations. ○ correlation: HS-ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-ETS1-4, ABET-1, ABET-2, ABET-3, ABET-5, ABET-6, ABET-7	Assessments ● Objective 1: U8A3: Arduino Project Presentation, U8D1: Arduino Presentation Peer Celebrations ● Objective 2: U8D1: Arduino Presentation Peer Celebrations