

Curriculum at a Glance

Project Lead The Way - Digital Electronics

Grade 11-12

Digital electronics is the study of electronic circuits that are used to process and control digital signals. In contrast to analog electronics, where information is represented by a continuously varying voltage, digital signals are represented by two discrete voltages or logic levels. This distinction allows for greater signal speed and storage capabilities and has revolutionized the world of electronics. The major focus of the DE course is to expose students to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards, and technical documentation. Utilizing the activity-project-problem-based (APB) teaching and learning pedagogy, students will analyze, design, and build digital electronic circuits. While implementing these designs, students will continually hone their professional skills, creative abilities, and understanding of the circuit design process. Digital Electronics (DE) is a high school level course that is appropriate for 10th or 11th grade students interested in exploring electronics. Other than their concurrent enrollment in college preparatory mathematics and science courses, this course assumes no previous knowledge.

Unit Description	Content and/or Skills
Unit 1.1 Foundations in Electronics	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 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 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.

	<p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
Unit 1.2 Introduction to Circuit Design	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
2.1 Combinational Logic Circuit Design	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
2.2 Alternative Design: Universal Gates and K-Mapping	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>G2 – Demonstrate an ability to design a system, component, or process to meet desired needs within</p>

	<p>realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
<p>2.3 Specific Combinational Logic Designs</p>	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
<p>2.4 Introduction to Programmable Logic</p>	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
<p>3.1 Sequential Logic Circuit Design</p>	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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,</p>

	<p>manufacturability, and sustainability.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
3.2 Asynchronous Counters	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
3.3 Synchronous Counters	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning.</p>
4.1 Introduction to State Machines	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p>

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<p>4.2 Introduction to Microcontrollers</p>	<p>G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.</p> <p>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.</p> <p>G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.</p> <p>G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p> <p>G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</p> <p>G7 – Demonstrate an understanding of professional and ethical responsibility.</p> <p>G8 – Demonstrate an ability to function on multidisciplinary teams.</p> <p>G9 – Demonstrate an ability to communicate effectively.</p> <p>G10 – Gain knowledge of contemporary issues.</p> <p>G11 – Recognize the need for, and develop an ability to engage in life-long learning</p>