PLTW INTRODUCTION TO ENGINEERING AND DESIGN (IED)	
CURRICULUM/CONTENT AREA	COURSE LENGTH
Applied & Technical Education (ATE)	*2 Terms*
GRADE LEVEL	DATE LAST REVIEWED
9-12	*2023*
PREREQUISITE(s) *if applicable*	BOARD APPROVAL DATE
none	*9/10/24*
PRIMARY RESOURCE *if applicable*	
Project Lead the Way resources.	

DESIRED RESULTS

COURSE DESCRIPTION AND PURPOSE

Are you ready to design the future? Engineers make a world of difference!
Students are introduced to the engineering design process, applying math, science, and engineering standards to identify and design solutions to a variety of real problems. They work both individually and in collaborative teams to develop and document design solutions using engineering notebooks and 3D modeling software. In IED, students explore engineering tools and apply a common approach to the solution of engineering problems, an engineering design process. Utilizing the activity-project-problem-based (APB) teaching and learning pedagogy, students progress from completing structured activities to solving open-ended projects and problems that require them to plan, document, communicate, and develop other professional skills.

ENDURING UNDERSTANDINGS *Students will understand that...*	ESSENTIAL QUESTIONS *Students will keep considering...*
Creativity, innovation, and critical thinking are essential for success in a technologically advanced world.	Why is creativity and innovation important? How is creativity and innovation used in engineering?
	How do teams efficiently and effectively solve problems in an increasingly complex world?
	What strategies and processes can I use to become a more effective creator, thinker and problem solver?

The ability to communicate and collaborate with people with diverse backgrounds and perspectives is key to participation in a global economic society.	Why is communication and collaboration important? How do positive work behaviors and personal qualities impact communication and collaboration?
	What is effective teamwork? What strategies can I use/teams use to work better together? How can perspectives and experiences of a diverse group develop innovative solutions to a given problem?
Career and technical education provides pathways to high-demand, high-wage career opportunities, and personal fulfillment.	Why is career and life readiness important? What jobs and careers are available to meet individual and societal needs locally, regionally, and nationally?
	How might technical knowledge and skills influence one's employability and advancement opportunities within various work settings?
	What are employability skills? How do I prepare myself for a career that is in demand now and in 5, 10, or 20 years from now?

PRIORITY CAREER & TECHNICAL STANDARDS
Students will be skilled at...

Creativity, Critical Thinking, Communication and Collaboration
4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.
a: I develop effective resolutions for a given problem, decision or opportunity using available information.
b: I develop and implement a resolution for a new situation using personal knowledge and experience.

Career Development
CD4: Students will identify and apply employability skills.
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.
b: I demonstrate skills related to seeking and applying for employment to find and obtain a desired job.
c: I identify and exhibit traits for retaining employment.
d: I develop positive relationships with others.

Information, Media, Technology
IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.
a: I choose appropriate sources of data and information for a given purpose.
b: I determine the relevance, validity and timeliness of data and information.
c: I select relevant information necessary for making decisions and solving problems
d: I apply data and information to communicate ideas and create new opportunities.

PRIORITY CONTENT STANDARDS *Students will know...*	
Standard: BB1: Students will analyze the core concepts of technology.	
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	
Standard: ICT1: Students will analyze, select and use information and communication technologies.	
Standard: MNF1: Students will be able to select and use manufacturing technologies.	
Potential INDUSTRY-RECOGNIZED CREDENTIALS (IRCs) Opportunties associated with the course	**Potential WORK BASED LEARNING (WBL) opportunities associated with the course**
Autodesk Fusion or Autodesk Inventor (optional)	
Potential DUAL CREDIT Opportunties associated with the course	
WCTC, when also completed CAD course.	
College Credit with applicable universities.	

UNIT 1: DESIGN AND PROBLEM SOLVING		
Unit 1 provides an overview of the engineering design process and helps students develop an understanding of the purpose and practice of modeling in engineering communication. Students are introduced to modeling methods and practice modeling skills important to the design of mechanical systems including technical sketching, 3D solid modeling and technical drawing using Computer-Aided Design (CAD), statistical analysis, and prototyping. Emphasis is placed on building CAD skills applied throughout the course. In addition, students learn statistical techniques to evaluate design solutions and apply statistics to inform the design of a game.		
STAGE 1: Desired Unit Results What will students understand as a result of the unit?		**STAGE 2: Assessment Evidence** By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?
ESSENTIAL QUESTION (s) What thought-provoking questions will foster inquiry, understanding, and transfer of learning?		**Success Criteria with Standards** The criteria for evaluating performance on standards is constant.
What strategies and processes can I use to become a more effective creator, thinker and problem solver?		CTE standards-based Rubric: Throughout course, students and teachers use rubric for communication of success criteria, reflection, goal setting, and feedback. Students continually reflect on and discuss essential questions in their engineering notebook and orally in class.
Why is communication and collaboration important? How do positive work behaviors and personal qualities impact communication and collaboration?		
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.**		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.11.h: I can determine the information needed to address an identified problem.	*-Using the engineering notebook to document, reflect, and refine.* *-Quick Write Reflections 1. What strategies and processes did I use to become a more effective creator, thinker and problem solver? 2. Why is communication and collaboration important?3. How have positive work behaviors and personal qualities impacted communication and collaboration?*
	4C2.a.13.h: I can predict how an action could result in unintended consequences, both positive and negative.	
	4C2.a.15.h: I can determine the best resolution for a problem, decision or opportunity based on given criteria.	
b: I develop and implement a resolution for a new situation using personal knowledge and experience.	4C2.b.5.h: I can apply past experience to develop a course of action for a new situation.	*Collaboratively build and test a solution to a problem.*
	4C2.b.6.h: I can use existing knowledge to develop a resolution for a new situation, problem or opportunity.	
Career Development **CD4: Students will identify and apply employability skills.**		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.6.h: I can evaluate how selfdiscipline, self-worth, positive attitude and integrity displayed in a work situation affect employment status.	Students will develop team norm, job responsibilities and participate with a team to complete a design.
	CD4.a.10.h: I can manage work roles and responsibilities to balance them with other life roles and responsibilities.	Students will develop project timeline and schedules and meet deadlines setforth in the team schedules.
b: I demonstrate skills related to seeking and applying for employment to find and obtain a desired job.	CD4.b.5.h: I can use multiple resources to locate job opportunities.	Students will be able to describe at least 3 sources of information regarding job opportunity and the academic pathway individual used to prepare for the jobs.
d: I develop positive relationships with others.	CD4.d.7.h: I can examine the skills required to enable students to successfully transition to postsecondary opportunities.	Student will add at least 3 skills to their toolbox of transferable skills.

Information, Media, Technology **IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.**		
b: I determine the relevance, validity and timeliness of data and information.	IMT1.b.9.h: I can defend a position or decision using relevant, valid and timely data and information.	Students will collect testing data, create a box plot, and use the plot to make predictions
c: I select relevant information necessary for making decisions and solving problems	IMT1.c.5.h: I can defend a solution or conclusion using appropriate data and information.	Students will collect testing data, create a box plot, and use the plot to make predictions
	IMT1.c.6.h: I can interpret and select appropriate information to develop a resolution for a given situation.	Students will analyze test data and refect on possible improvements.
d: I apply data and information to communicate ideas and create new opportunities.	IMT1.d.6.h: I can defend a proposal for a new product or service based on data and information analysis.	Students will present finding in written, oral, or video format.
	IMT1.d.8.h: I can manage and share stored data and information for a specific purpose.	Students will effectively documents engineering work in an organized notebook so someone unfamiliar with the work can follow and understand the process.
PRIORITY CONTENT STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Standard: BB1: Students will analyze the core concepts of technology.	**BB1.c.4.h:** I can build, test and trouble shoot simple linear, rotary and compound mechanisms.	Students will develop at test a model to evaluate its performance based on design criteria
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	**ENG1.a.9.h:** I can examine how the design needs to continually be evaluated and the ideas of the design must be redefined and improved.	Students will generate a design matrix to analyze attributes of design.
Standard: ICT1: Students will analyze, select and use information and communication technologies.		Students will use CAD visually communicate a design solution.
Standard: MNF1: Students will be able to select and use manufacturing technologies.	**MNF1.a.9.h:** I can select and apply the appropriate units and scales for situations involving measurement.	Students will manufacture design solutions using 3d printers or similar technology.
Stage 3: Learning Activities A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unforld in a natural flow?		
GUIDING UNIT QUESTIONS Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning	**STRATEGIES/ACTIVITIES** What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.	**RESOURCES/MATERIALS** This includes an applicable textbooks, software, industry recognized certification software/tools, subcriptions (such asPLTW), etc.
How can you use the design process to optimize a design?	notetaking	PLTW IED Online Curriculum
When solving an engineering problem, how can we be reasonably sure that we have created the best solution possible? What is the evidence?	problem solving activity	PLTW Supplies and consumables
What is the most effective way to generate potential solutions to a problem? How many alternate solutions are necessary to ensure a good final solution?		

UNIT 2: ASSEMBLY DESIGN		
Unit 2 emphasizes the design of systems of components. Students are introduced to the concept of reverse engineering and how to investigate and document the design of multi-component systems. Students learn various techniques used to connect components in a system, how systems are designed to allow desired interaction between components, and how to identify and select the materials from which products are made. They are also introduced to methods to improve the manufacturability of a product and reduce production costs. Students learn to apply two methods to create 3D assembly models in CAD and apply those techniques to design and document assemblies.		
STAGE 1: Desired Unit Results What will students understand as a result of the unit?		**STAGE 2: Assessment Evidence** By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?
ESSENTIAL QUESTION (s) What thought-provoking questions will foster inquiry, understanding, and transfer of learning?		**Success Criteria with Standards** The criteria for evaluating performance on standards is constant.
What strategies and processes can I use to become a more effective creator, thinker and problem solver?		CTE standards-based Rubric: Throughout course, students and teachers use rubric for communication of success criteria, reflection, goal setting, and feedback. Students continually reflect on and discuss essential questions in their engineering notebook and orally in class.
Why is communication and collaboration important? How do positive work behaviors and personal qualities impact communication and collaboration?		
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.**		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.12.h: I can contrast the benefits and drawbacks of various proposed resolutions to a given situation.	*-Using the engineering notebook to document, reflect, and refine.* *-Quick Write Reflections 1. What strategies and processes did I use to become a more effective creator, thinker and problem solver? 2. Why is communication and collaboration important?3. How have positive work behaviors and personal qualities impacted communication and collaboration?*
	4C2.a.13.h: I can predict how an action could result in unintended consequences, both positive and negative.	
b: I develop and implement a resolution for a new situation using personal knowledge and experience.	4C2.b.5.h: I can apply past experience to develop a course of action for a new situation.	*Collaboratively build and test designs to meet criteria and constraints.*
	4C2.b.6.h: I can use existing knowledge to develop a resolution for a new situation, problem or opportunity.	
Career Development **CD4: Students will identify and apply employability skills.**		
c: I identify and exhibit traits for retaining employment.	CD4.c.4.h: I can model behaviors that demonstrate reliability and dependability.	*Collaboratively build and test simple and compound designs to complete tasks.*
d: I develop positive relationships with others.	CD4.d.6.h: I can evaluate the best method to assist co-workers in accomplishing goals and tasks.	*Collaboratively build and test simple and compound designs to complete tasks.*
Information, Media, Technology **IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.**		
a: I choose appropriate sources of data and information for a given purpose.	IMT1.a.6.h: I can justify the selection of various information sources for a given purpose.	*Document original design and design iterations in Engineering Notebook.*

	IMT1.a.7.h: I can explain the level of objectivity for a given source of information.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.a.8.h: I can model how raw data can be applied differently to support opposing arguments or premises.	*Document original design and design iterations in Engineering Notebook.*
b: I determine the relevance, validity and timeliness of data and information.	IMT1.b.7.h: I can use raw data and information appropriately to support an argument, idea or initiative.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.b.8.h: I can compare and contrast validity of information from electronic and non-electronic sources.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.b.9.h: I can defend a position or decision using relevant, valid and timely data and information.	*Document original design and design iterations in Engineering Notebook.*
c: I select relevant information necessary for making decisions and solving problems	IMT1.c.5.h: I can defend a solution or conclusion using appropriate data and information.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.c.6.h: I can interpret and select appropriate information to develop a resolution for a given situation.	*Document original design and design iterations in Engineering Notebook.*
d: I apply data and information to communicate ideas and create new opportunities.	IMT1.d.6.h: I can defend a proposal for a new product or service based on data and information analysis.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.d.7.h: I can synthesize data and information from multiple sources to identify new trends.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.d.8.h: I can manage and share stored data and information for a specific purpose.	*Document original design and design iterations in Engineering Notebook.*
PRIORITY CONTENT STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
Standard: BB1: Students will analyze the core concepts of technology.	**BB1.a.5.h:** I can describe how systems can fail because of design flaws, defect parts, poorly matched parts or they were used beyond their design capabilities.	*Students will investigate tolerance in design.*
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	**ENG1.a.9.h:** I can examine how the design needs to continually be evaluated and the ideas of the design must be redefined and improved.	*Students will use reverse engineering to evaluate and improve design.*
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	**ENG3.a.5.h:** I can explain technological problems must be researched before they can be solved.	*Students will perform a functional analysis of a product or system to determine the purpose, inputs and outputs, and operation of a product or system.*
Standard: ICT1: Students will analyze, select and use information and communication technologies.	**ICT1.a.13.h:** I can assess how information and communication technologies include the inputs, processes and outputs associated with sending and receiving information.	*Students will use CAD to visually communicate a design solution.*
SUPPORTING STANDARDS AND LEARNING TARGETS		**Performance Tasks Options/ Assessment Strategies by Standard** Students may be given options to show their learning in varied ways.
enter supporting standards here, add more rows as needed	enter learning targets, add more rows as needed	

Stage 3: Learning Activities

A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unforld in a natural flow?

GUIDING UNIT QUESTIONS Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning	STRATEGIES/ACTIVITIES What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.	RESOURCES/MATERIALS This includes an applicable textbooks, software, industry recognized certification software/tools, subcriptions (such asPLTW), etc.
What is reverse engineering and why is it valuable for engineers and designers?	Perform a mechanical discetion of an item and thoroughly document the process, all the parts, and functions.	PLTW IED Online Curriculum
		AutoDesk Fusion or AutoDesk Inventor
		PLTW IED supplies

UNIT 3: THOUGHTFUL PRODECT DESIGN		
Unit 3 introduces students to a broader interpretation of the word design to include universal principles that contribute to successful product design. Students are exposed to design principles (other than the visual design principles presented in Unit 2) that can impact the appeal, usability, safety, and sustainability of a product. Design topics that are introduced or reinforced include product life-cycle, sustainability, manufacturability, humancentered design, and systems thinking.		
STAGE 1: Desired Unit Results *What will students understand as a result of the unit?*		**STAGE 2: Assessment Evidence** *By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?*
ESSENTIAL QUESTION (s) *What thought-provoking questions will foster inquiry, understanding, and transfer of learning?*		**Success Criteria with Standards** *The criteria for evaluating performance on standards is constant.*
What is effective teamwork? What strategies can I use/teams use to work better together? How can perspectives and experiences of a diverse group develop innovative solutions to a given problem?		CTE standards-based Rubric: Throughout course, students and teachers use rubric for communication of success criteria, reflection, goal setting, and feedback. Students continually reflect on and discuss essential questions in their engineering notebook and orally in class.
Why is career and life readiness important? What jobs and careers are available to meet individual and societal needs locally, regionally, and nationally?		
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.**		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.11.h: I can determine the information needed to address an identified problem.	*-Using the engineering notebook to document, reflect, and refine.* *-Quick Write Reflections 1. What strategies and processes did I use to become a more effective creator, thinker and problem solver? 2. Why is communication and collaboration important?3. How have positive work behaviors and personal qualities impacted communication and collaboration?*
	4C2.a.12.h: I can contrast the benefits and drawbacks of various proposed resolutions to a given situation.	
	4C2.a.13.h: I can predict how an action could result in unintended consequences, both positive and negative.	
	4C2.a.14.h: I can analyze the impact of a decision using a systems thinking model.	
	4C2.a.15.h: I can determine the best resolution for a problem, decision or opportunity based on given criteria.	
	C2.a.16.h: I can defend an action taken or a decision implemented.	
b: I develop and implement a resolution for a new situation using personal knowledge and experience.	4C2.b.5.h: I can apply past experience to develop a course of action for a new situation.	*Collaboratively develop norms for a design team.*
	4C2.b.6.h: I can use existing knowledge to develop a resolution for a new situation, problem or opportunity.	
Career Development **CD4: Students will identify and apply employability skills.**		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.8.h: I can apply communication strategies when adapting to a culturally diverse environment.	*Students will develop and adhere to norms as they work with teams.*
	CD4.a.10.h: I can manage work roles and responsibilities to balance them with other life roles and responsibilities.	*Students will select roles on a team and complete tasks specific to their role.*
c: I identify and exhibit traits for retaining employment.	CD4.c.4.h: I can model behaviors that demonstrate reliability and dependability.	*Select and use collaborative tools, such as cloud-based tools, document sharing, and video and text functions, to successfully complete a project.*

d: I develop positive relationships with others.	CD4.d.6.h: I can evaluate the best method to assist co-workers in accomplishing goals and tasks.	*Collaboratively build and test simple and compound designs to complete tasks.*
Information, Media, Technology **IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.**		
a: I choose appropriate sources of data and information for a given purpose.	IMT1.a.6.h: I can justify the selection of various information sources for a given purpose.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.a.7.h: I can explain the level of objectivity for a given source of information.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.a.8.h: I can model how raw data can be applied differently to support opposing arguments or premises.	*Document original design and design iterations in Engineering Notebook.*
b: I determine the relevance, validity and timeliness of data and information.	IMT1.b.7.h: I can use raw data and information appropriately to support an argument, idea or initiative.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.b.8.h: I can compare and contrast validity of information from electronic and non-electronic sources.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.b.9.h: I can defend a position or decision using relevant, valid and timely data and information.	*Document original design and design iterations in Engineering Notebook.*
c: I select relevant information necessary for making decisions and solving problems	IMT1.c.5.h: I can defend a solution or conclusion using appropriate data and information.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.c.6.h: I can interpret and select appropriate information to develop a resolution for a given situation.	*Document original design and design iterations in Engineering Notebook.*
d: I apply data and information to communicate ideas and create new opportunities.	IMT1.d.6.h: I can defend a proposal for a new product or service based on data and information analysis.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.d.7.h: I can synthesize data and information from multiple sources to identify new trends.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.d.8.h: I can manage and share stored data and information for a specific purpose.	*Document original design and design iterations in Engineering Notebook.*
PRIORITY CONTENT STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	**ENG1.a.12.h:** Requirements of a design, such as criteria, constraints and efficiency, sometimes compete with each other.	*Document original design and design iterations in Engineering Notebook.*
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	**ENG3.a.5.h:** I can explain technological problems must be researched before they can be solved.	
Standard: ICT1: Students will analyze, select and use information and communication technologies.	**ICT1.a.15.h:** I can evaluate how information and communication systems can be used to inform, persuade, entertain, control, manage and educate.	
SUPPORTING STANDARDS AND LEARNING TARGETS		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
enter supporting standards here, add more rows as needed	*enter learning targets, add more rows as needed*	

Stage 3: Learning Activities *A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unforld in a natural flow?*		
GUIDING UNIT QUESTIONS *Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning*	**STRATEGIES/ACTIVITIES** *What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.*	**RESOURCES/MATERIALS** *This includes an applicable textbooks, software, industry recognized certification software/tools, subcriptions (such asPLTW), etc.*
How are life cycle analysis and human centered design used to create better solution to problems?	Problem Solving project	PLTW IED online curriculum
		PLTW IED supplies

UNIT 4: MAKING THINGS MOVE		
Unit 4 focuses on familiarizing students with basic engineering knowledge related to simple mechanical and electrical systems and the use of mathematical models to represent design ideas and to inform design decisions. Students will apply their new knowledge in the design of an electromechanical solution. Students also learn advanced CAD skills to support the design, documentation, and communication of engineering solutions.		
STAGE 1: Desired Unit Results *What will students understand as a result of the unit?*		**STAGE 2: Assessment Evidence** *By what criteria will performances of understanding be assessed? Through what authentic performance tasks will students demonstrate the desired unit results?*
ESSENTIAL QUESTION (s) *What thought-provoking questions will foster inquiry, understanding, and transfer of learning?*		**Success Criteria with Standards** *The criteria for evaluating performance on standards is constant.*
How might technical knowledge and skills influence one's employability and advancement opportunities within various work settings?		CTE standards-based Rubric: Throughout course, students and teachers use rubric for communication of success criteria, reflection, goal setting, and feedback. Students continually reflect on and discuss essential questions in their engineering notebook and orally in class.
What are employability skills? How do I prepare myself for a career that is in demand now and in 5, 10, or 20 years from now?		
PRIORITY CAREER & TECHNICAL STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
Creativity, Critical Thinking, Communication and Collaboration **4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.**		
a: I develop effective resolutions for a given problem, decision or opportunity using available information.	4C2.a.14.h: I can analyze the impact of a decision using a systems thinking model.	*-Using the engineering notebook to document, reflect, and refine.* *-Quick Write Reflections 1. What strategies and processes did I use to become a more effective creator, thinker and problem solver? 2. Why is*
	C2.a.16.h: I can defend an action taken or a decision implemented.	
b: I develop and implement a resolution for a new situation using personal knowledge and experience.	4C2.b.5.h: I can apply past experience to develop a course of action for a new situation.	*Collaboratively build and test simple and compound designs to complete tasks.*
	4C2.b.6.h: I can use existing knowledge to develop a resolution for a new situation, problem or opportunity.	
Career Development **CD4: Students will identify and apply employability skills.**		
a: I identify and demonstrate positive work behaviors and personal qualities needed to be employable.	CD4.a.8.h: I can apply communication strategies when adapting to a culturally diverse environment.	*Students will develop and adhere to norms as they work with teams.*
	CD4.a.10.h: I can manage work roles and responsibilities to balance them with other life roles and responsibilities.	*Select and use collaborative tools, such as cloud-based tools, document sharing, and video and text functions, to successfully complete a project.*
c: I identify and exhibit traits for retaining employment.	CD4.c.4.h: I can model behaviors that demonstrate reliability and dependability.	
	CD4.c.5.h: I can maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.	
d: I develop positive relationships with others.	CD4.d.6.h: I can evaluate the best method to assist co-workers in accomplishing goals and tasks.	
Information, Media, Technology **IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.**		
a: I choose appropriate sources of data and information for a given purpose.	IMT1.a.6.h: I can justify the selection of various information sources for a given purpose.	*Document original design and design iterations in Engineering Notebook.*

	IMT1.a.7.h: I can explain the level of objectivity for a given source of information.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.a.8.h: I can model how raw data can be applied differently to support opposing arguments or premises.	*Document original design and design iterations in Engineering Notebook.*
b: I determine the relevance, validity and timeliness of data and information.	IMT1.b.7.h: I can use raw data and information appropriately to support an argument, idea or initiative.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.b.8.h: I can compare and contrast validity of information from electronic and non-electronic sources.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.b.9.h: I can defend a position or decision using relevant, valid and timely data and information.	*Document original design and design iterations in Engineering Notebook.*
c: I select relevant information necessary for making decisions and solving problems	IMT1.c.5.h: I can defend a solution or conclusion using appropriate data and information.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.c.6.h: I can interpret and select appropriate information to develop a resolution for a given situation.	*Document original design and design iterations in Engineering Notebook.*
d: I apply data and information to communicate ideas and create new opportunities.	IMT1.d.6.h: I can defend a proposal for a new product or service based on data and information analysis.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.d.7.h: I can synthesize data and information from multiple sources to identify new trends.	*Document original design and design iterations in Engineering Notebook.*
	IMT1.d.8.h: I can manage and share stored data and information for a specific purpose.	*Document original design and design iterations in Engineering Notebook.*
PRIORITY CONTENT STANDARDS & Learning Targets		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
Standard: BB1: Students will analyze the core concepts of technology.	**BB1.c.4.h:** I can build, test and trouble shoot simple linear, rotary and compound mechanisms.	*Students will design and build a automata box that uses linear and rotory power.*
Standard: ENG1: Students will analyze and demonstrate the attributes of design.	**ENG1.a.10.h:** I can interpret design problems are seldom presented in a clearly defined form.	Students will generate a design matrix to analyze attributes of design.
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	**ENG3.b.5.h:** I can describe how many technological problems require a multidisciplinary approach.	*Students will design, build, test and redesign an automata box that uses linear and rotory power.*
Standard: ICT1: Students will analyze, select and use information and communication technologies.		Students will use CAD visually communicate a design solution.
Standard: MNF1: Students will be able to select and use manufacturing technologies.	**MNF1.a.8.h:** I can use appropriate tools, materials, and machines to repair a malfunctioning system.	Students will manufacture design solutions using 3d printers or similar technology.
SUPPORTING STANDARDS AND LEARNING TARGETS		**Performance Tasks Options/ Assessment Strategies by Standard** *Students may be given options to show their learning in varied ways.*
enter supporting standards here, add more rows as needed	*enter learning targets, add more rows as needed*	
Stage 3: Learning Activities *A brief summary of the key learning activities- How will students build knowledge & develop skills? How will learning be relevant, accessible, and engaging? How will the learning unforld in a natural flow?*		

GUIDING UNIT QUESTIONS *Using Costas Level of Thinking, what questions will hook and hold students so that they develop a deep understanding of the desired results? The guiding questions are more topic-specific to the particular unit. They guide the exploration of the essential questions and rigor of the standards. This may include questions that guide project based/ problem based learning*	STRATEGIES/ACTIVITIES *What learning strategies and experiences will authentically engage students so that they gain understanding the desired results? This includes strategies and activities that help learners acquire targeted knowledge and skills, make meaning of important ideas, and transfer their learning to new situations. Consider how the learning will be tailored and flexible to address the interests and learning styles of all students.*	RESOURCES/MATERIALS *This includes an applicable textbooks, software, industry recognized certification software/tools, subcriptions (such asPLTW), etc.*
How are mechanical and electrical systems designed to provide motion and automation of systems?	Design and build a mechanism to provide motion for your design.	PLTW IED online curriculum
		3D Printers
		AutoDesk Fusion or AutoDesk Inventor
		PLTW IED supplies