Project Lead the Way: Principles of Engineering, (POE) Grades 9-12

Standards		Benchmarks	Activities/Examples
1. Students will develop an understanding of the characteristics and scope of technology.	M	Most development of technologies these days is driven by the profit motive and the market.	Engineering for reliability. Students will write a paper and present on case studies of failed engineering projects.
2. Students will develop an understanding of the core concepts of technology.	W	Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.	Engineering systems: Mechanical Advantage, Simple Machines, and Thermodynamics.
			Fischer Technic projects including the marble sorter project.
	X	Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.	Engineering systems: Mechanical Advantage, Simple Machines, and Thermodynamics.
	Y	The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.	Engineering systems: Mechanical Advantage, Simple Machines, and Thermodynamics.
	A A	Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development.	Engineering for reliability. Students will write a paper and present on case studies of failed engineering projects.
	E E	Management is the process of planning, organizing, and controlling work.	Fischer Technic projects including the marble sorter project.
	F F	Complex systems have many layers of controls and feedback loops to provide information.	Fischer Technic projects including the marble sorter project.

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3. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	H	Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	Research paper and present a PowerPoint on an engineering career.
			Materials and material testing.
	J	Technological progress promotes the advancement of science and mathematics.	Student will draw a multiview/orthographic drawing using the computer program "Inventor."
			Engineering systems: Mechanical Advantage, Simple Machines, and Thermodynamics.
			Students will make a heat engine poster and present it.
			Students will learn and use moments, reaction forces on trusses and build a scaled model bridge.
			Materials and material testing.
			Engineering for reliability. Students will write a paper and present on case studies of failed engineering projects.
			Dynamics/Kinematics. Students will design and build a ballistic device.
4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.	I	Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.	Engineering for Reliability. Students will write a paper and present on case studies of failed engineering projects.
5. Students will develop an understanding of the effects of technology on the environment.	L	Decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment.	Students will make a heat engine poster and present it.
7. Students will develop an understanding of the influence of technology on history.	G	Most technological development has been evolutionary, the result of a series of refinements to a basic invention.	Dynamics/Kinematics. Students will design and build a ballistic device.

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Standards		Benchmarks	Activities/Examples
8. Students will develop an understanding of the attributes of design.	H	The design process includes defining a problem, brainstorming, researching an degenerating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.	Design Process will be introduced and students will perform it on each project in class.
			Fischer Technic projects including the marble sorter project.
	I	Design problems are seldom presented in a clearly defined form.	Student will draw a multiview/orthographic drawing using the computer program "Inventor."
	K	Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.	Students will learn and use moments, reaction forces on trusses and build a scaled model bridge.
			Engineering for Reliability. Students will write a paper and present on case studies of failed engineering projects.
9. Students will develop an understanding of engineering design.	I	Established design principles are used to evaluate existing designs, to collect data, and to guide the design process.	Materials and material testing.
	J	Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.	Student will draw a multiview/orthographic drawing using the computer program "Inventor."
	K	A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.	Fischer Technic projects including the marble sorter project.
			Students will learn and use moments, reaction forces on trusses and build a scaled model bridge.
			Dynamics/Kinematics. Students will design and build a ballistic device.
	L	The process of engineering design takes into account a number of factors.	Engineering for Reliability. Students will write a paper and present on case studies of failed engineering projects.

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Standards		Benchmarks	Activities/Examples
10. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.	L	Many technological problems require a multidisciplinary approach.	Fischer Technic projects including the marble sorter project.
			Students will learn and use moments, reaction forces on trusses and build a scaled model bridge.
			Dynamics/Kinematics. Students will design and build a ballistic device.
11. Students will develop the abilities to apply the design process.	N	Identify criteria and constraints and determine how these wil affect the design process.	Design Process will be introduced and students will perform it on each project in class.
	Q	Develop and produce a product or system using a design process.	Dynamics/Kinematics. Students will design and build a ballistic device.
	R	Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	Student will draw a multiview/orthographic drawing using the computer program “Inventor.”
12. Students will develop the abilities to use and maintain technological products and systems.	O	Operate systems so that they function in the way they were designed.	Fischer Technic projects including the marble sorter project.
			Dynamics/Kinematics. Students will design and build a ballistic device.
	P	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.	Fischer Technic projects including the marble sorter project.
			Materials and material testing.

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Standards		Benchmarks	Activities/Examples
13. Students will develop the abilities to assess the impact of products and systems.	J	Collect information and evaluate its quality.	Materials and material testing.
16. Students will develop an understanding of and be able to select and use energy and power technologies.	J	Energy cannot be created nor destroyed; however, it can be converted from one form to another.	Students will make a heat engine poster and present it.
	M	Energy resources can be renewable or nonrenewable.	Students will make a heat engine poster and present it.
	N	Power systems must have a source of energy, a process, and loads.	Students will make a heat engine poster and present it.
17. Students will develop an understanding of and be able to select and use information and communication technologies.	Q	Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.	Students will apply knowledge and processes that communicate measurements, symbols, and graphic images. All of the assignments will have these elements in them.
20. Students will develop and understanding of and be able to select and use construction technologies.	J	Infrastructure is the underlying base or basic framework of a system.	Students will learn and use moments, reaction forces on trusses and build a scaled model bridge.
	K	Structures are constructed using a variety of processes and procedures.	Fischer Technic projects including the marble sorter project.
			Dynamics/Kinematics. Students will design and build a ballistic device.
	L	The design of structures includes a number of requirements.	Engineering for Reliability. Students will write a paper and present on case studies of failed engineering projects.
			Dynamics/Kinematics. Students will design and build a ballistic device.