

## Unit 1: Principles of Design

ITEA/STL-1: Understanding the Characteristics and Scope of Technology

ITEA/STL-8: Understanding the Attributes of Design

ITEA/STL-9: Understanding Engineering Design

NCTM -5: Represent and analyze mathematical situations and structures using algebraic symbols.

NCTM-12: Understand measurable attributes of objects and the units, systems, and processes of measurement

AAAS-E: Understanding about science and technology

AAAS-A: Science as inquiry

AAAS-F: Science in personal and social perspectives

<b>ITEA - Benchmarks for Technological Literacy</b>	<b>AAAS - Benchmarks for Science</b>	<b>NCTM - Benchmarks for Mathematics</b>
<ul style="list-style-type: none"> <li>• The nature and development of technological knowledge and processes are functions of the setting.</li> <li>• Inventions and Innovations are the results of specific, goal-oriented research.</li> <li>• Most development of technologies these days is driven by the profit motive and the market.</li> <li>• Design includes-defining a problem, brainstorming, researching and generating 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.</li> <li>• Design problems are seldom presented in a clearly defined form.</li> <li>• The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.</li> <li>• Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.</li> <li>• The process of engineering design takes into account a</li> </ul>	<ul style="list-style-type: none"> <li>• In designing a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced, and disposed of and who will sell, operate, and take care of it. The costs associated with these functions may introduce yet more constraints on the design.</li> <li>• Social and economic forces strongly influence which technologies will be developed and used. Which will prevail is affected by many factors, such as personal values, consumer acceptance, patent laws, the availability of risk capital, the federal budget, local and national regulations, media attention, economic competition, and tax incentives.</li> <li>• The value of any given technology may be different for different groups of people and at different points in time.</li> <li>• Investigations are conducted for different reasons, including to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.</li> <li>• Mathematics provides a precise language for science and technology to describe objects and events, to characterize relationships between variables and to argue logically.</li> <li>• Mathematics, creativity, logic, and originality are all needed to improve technology.</li> <li>• Participate in group discussions on scientific topics by restating or summarizing accurately what others</li> </ul>	<ul style="list-style-type: none"> <li>• Use symbolic algebra to represent and explain mathematical relationships.</li> <li>• Use a variety of symbolic representations, including recursive and parametric equations, for functions and relations.</li> <li>• Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.</li> </ul>

number of factors.	<p>have said, asking for clarification or elaboration, and expressing alternative positions.</p> <ul style="list-style-type: none"> <li>• Use tables, charts, and graphs in making arguments and claims in oral and written presentations.</li> </ul>	
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### Unit Level - Extract and Organize Content

**Big Idea(s):** There are fundamental principles which impact human thinking and actions when engaged in the process of designing technological products. A combination of personal qualities such as creativity and resourcefulness and design constraints imposed by numerous factors are employed in a formal process to create new or refined technologies.

### Unit Objective(s): At the completion of this unit, students will be able to:

- Recognize, analyze, and clarify specific engineering design problems using unique principles employed by engineers and technologists
- Identify specific principles of design used in engineering and use them appropriately and effectively
- Recognize, describe, and address the influences that impact a final design in contemporary market economies
- Describe and use a formal engineering design process to address a specific design brief.