

<b>Project Lead the Way: Robotics</b>				<b>Grades 9-12</b>
<b>Code</b>	<b>Chapter</b>	<b>Grades</b>	<b>Standard</b>	<b>Benchmarks</b>
1.J	The Nature of Technology	9-12	Students will develop an understanding of the characteristics and scope of technology.	The nature and development of technological knowledge and processes are functions of the setting.
1.K	The Nature of Technology	9-12	Students will develop an understanding of the characteristics and scope of technology.	The rate of technological development and diffusion is increasing rapidly.
1.L	The Nature of Technology	9-12	Students will develop an understanding of the characteristics and scope of technology.	Inventions and innovations are the results of specific, goal-directed research.
1.M	The Nature of Technology	9-12	Students will develop an understanding of the characteristics and scope of technology.	Most development of technologies these days is driven by profit motive and the market.
2.W	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.
2.X	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.
2.Z	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	Selecting resources involves tradeoffs between competing values, such as availability, cost, desirability, and waste.
2.AA	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	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.
2.BB	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints.
2.CC	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	New technologies create new processes.
2.EE	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	Management is the process of planning, organizing, and controlling work.
2.FF	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	Complex systems have many layers of controls and feedback loops to provide information.
3.G	The Nature of Technology	9-12	Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	Technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function.
3.H	The Nature of Technology	9-12	Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	Technological innovation often results when ideas, knowledge or skills are shared within a technology, among technologies or across other fields.
3.I	The Nature of Technology	9-12	Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	Technology ideas are sometimes protected through the process of patenting.
3.J	The Nature of Technology	9-12	Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	Technological progress promotes the advancement of science and mathematics.

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4.H	Technology and Society	9-12	Students will develop an understanding of the cultural, social, economic, and political effects of technology	Changes caused by the use of technology can range from gradual to rapid and from subtle to obvious.
4.I	Technology and Society	9-12	Students will develop an understanding of the cultural, social, economic, and political effects of technology	Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.
5.H	Technology and Society	9-12	Students will develop an understanding of the cultural, social, economic, and political effects of technology	When new technologies are developed to reduce the use of resources, considerations of tradeoffs are important.
5.K	Technology and Society	9-12	Students will develop an understanding of the cultural, social, economic, and political effects of technology	Humans devise technologies to reduce the negative consequences of other technologies.
8.H	Design	9-12	Students will develop an understanding of the attributes of design.	The design process 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.
8.I	Design	9-12	Students will develop an understanding of the attributes of design.	Design problems are seldom presented in a clearly defined form.
8.J	Design	9-12	Students will develop an understanding of the attributes of design.	The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.
8.K	Design	9-12	Students will develop an understanding of the attributes of design.	Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.
9.I	Design	9-12	Students will develop an understanding of engineering design.	Established design principles are used to evaluate existing designs, to collect data, and to guide the design process.
9.J	Design	9-12	Students will develop an understanding of engineering design.	Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
9.K	Design	9-12	Students will develop an understanding of engineering design.	A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.
9.L	Design	9-12	Students will develop an understanding of engineering design.	The process of engineering design takes into account a number of factors.
10.I	Design	9-12	Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.	Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.
10.J	Design	9-12	Students will develop an understanding of the role of troubleshooting, research and development,	Technological problems must be researched before they can be solved.
10.K	Design	9-12	Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.	Not all problems are technological, and not every problem can be solved using technology.
10.L	Design	9-12	Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.	Many technological problems require a multidisciplinary approach.

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12.L	Abilities for a Technological World	9-12	Students will develop the abilities to use and maintain technological products and systems.	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.
12.P	Abilities for a Technological World	9-12	Students will develop the abilities to use and maintain technological products and systems.	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.
13.J	Abilities for a Technological	9-12	Students will develop the abilities to assess the impact of products and systems.	Collect information and evaluate its quality.
13.K	Abilities for a Technological	9-12	Students will develop the abilities to assess the impact of products and systems.	Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.
17.L	The Designed World	9-12	Students will develop an understanding of and be able to select and use information and communication technologies.	Information and communication technologies include the inputs, processes, and outputs associated with sending and receiving information.
17.M	The Designed World	9-12	Students will develop an understanding of and be able to select and use information and communication technologies.	Information and communication systems allow information to be transferred from human to human, human to machine, machine to human, and machine to machine.
17.N	The Designed World	9-12	Students will develop an understanding of and be able to select and use information and communication technologies.	Information and communication systems can be used to inform, persuade, entertain, control, manage, and educate.
17.O	The Designed World	9-12	Students will develop an understanding of and be able to select and use information and communication technologies.	Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.
17.P	The Designed World	9-12	Students will develop an understanding of and be able to select and use information and communication technologies.	There are many ways to communicate information, such as graphic and electronic means.
17.Q	The Designed World	9-12	Students will develop an understanding of and be able to select and use information and communication technologies.	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.
19.L	The Designed World	9-12	Students will develop an understanding of and be able to select and use manufacturing technologies.	Servicing keeps products in good operating condition.
19.M	The Designed World	9-12	Students will develop an understanding of and be able to select and use manufacturing technologies.	Materials have different qualities and may be classified as natural, synthetic, or mixed.
19.N	The Designed World	9-12	Students will develop an understanding of and be able to select and use manufacturing technologies.	Durable goods are designed to operate for a long period of time, while non-durable goods are designed to operate for a short period of time.
19.O	The Designed World	9-12	Students will develop an understanding of and be able to select and use manufacturing technologies.	Manufacturing systems may be classified into types, such as customized production, batch production, and continuous production.
19.P	The Designed World	9-12	Students will develop an understanding of and be able to select and use manufacturing technologies.	The interchangeability of parts increases the effectiveness of manufacturing processes.
19.R	The Designed World	9-12	Students will develop an understanding of and be able to select and use manufacturing technologies.	Marketing involves establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it.

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20.J	The Designed World	9-12	Students will develop an understanding of and be able to select and use construction technologies.	Infrastructure is the underlying base or basic framework of a system.
20.K	The Designed World	9-12	Students will develop an understanding of and be able to select and use construction technologies.	Structures are constructed using a variety of processes and procedures.
20.L	The Designed World	9-12	Students will develop an understanding of and be able to select and use construction technologies.	The design of structures includes a number of requirements.
20.N	The Designed World	9-12	Students will develop an understanding of and be able to select and use construction technologies.	Structures can include prefabricated materials.
2.Y	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.
11.M	Abilities for a Technological	9-12	Students will develop the abilities to apply the design process.	Identify the design problem to solve and decide whether or not to address it.
11.N	Abilities for a Technological	9-12	Students will develop the abilities to apply the design process.	Identify criteria and constraints and determine how these will affect the design process.
11.O	Abilities for a Technological	9-12	Students will develop the abilities to apply the design process.	Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.
11.P	Abilities for a Technological World	9-12	Students will develop the abilities to apply the design process.	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.
11.Q	Abilities for a Technological	9-12	Students will develop the abilities to apply the design process.	Develop and produce a product or system using a design process.
11.R	Abilities for a Technological World	9-12	Students will develop the abilities to apply the design process.	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.
12.M	Abilities for a Technological	9-12	Students will develop the abilities to use and maintain technological products and systems.	Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.
12.N	Abilities for a Technological	9-12	Students will develop the abilities to use and maintain technological products and systems.	Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.
12.O	Abilities for a Technological	9-12	Students will develop the abilities to use and maintain technological products and systems.	Operate systems so that they function in the way they were designed.

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13.L	Abilities for a Technological World	9-12	Students will develop the abilities to assess the impact of products and systems.	Use assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.
13.M	Abilities for a Technological World	9-12	Students will develop the abilities to assess the impact of products and systems.	Design forecasting techniques to evaluate the results of altering natural systems.
2.DD	The Nature of Technology	9-12	Students will develop an understanding of the core concepts of technology.	Quality control is a planned process to ensure that a product, service, or system meets established criteria.
7.G	Technology and Society	9-12	Students will develop an understanding of the influence of technology on history.	Most technological development has been evolutionary, the result of a series of refinements to a basic invention.
16.J	The Designed World	9-12	Students will develop an understanding of and be able to select and use energy and power technologies.	Energy cannot be created nor destroyed; however, it can be converted from one form to another.
16.K	The Designed World	9-12	Students will develop an understanding of and be able to select and use energy and power technologies.	Energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.
16.L	The Designed World	9-12	Students will develop an understanding of and be able to select and use energy and power technologies.	It is impossible to build an engine to perform work that does not exhaust thermal energy to the surroundings.
16.M	The Designed World	9-12	Students will develop an understanding of and be able to select and use energy and power technologies.	Energy resources can be renewable or nonrenewable.
16.N	The Designed World	9-12	Students will develop an understanding of and be able to select and use energy and power technologies.	Power systems must have a source of energy, a process, and loads.
19.Q	The Designed World	9-12	Students will develop an understanding of and be able to select and use manufacturing technologies.	Chemical technologies provide a means for humans to alter or modify materials and to produce chemical products.
20.M	The Designed World	9-12	Students will develop an understanding of and be able to select and use construction technologies.	Structures require maintenance, alteration, or renovation periodically to improve them or to alter their intended use.
5.G	Technology and Society	9-12	Students will develop an understanding of the effects of technology on the environment	Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.
7.O	Technology and Society	9-12	Students will develop an understanding of the influence of technology on history.	The Information Age places emphasis on the processing and exchange of information.