

Course Title: Production Technology I
Course Number: 8600540
Course Credit: 1

Course Description:

This course provides students with an introduction to the knowledge, human relations, and technological skills found today in production technology.

| CTE Standards and Benchmarks | | NGSSS-Sci |
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| 04.0 | Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to: | SC.912.N.1.1 |
| 04.01 | Discuss the nature and development of technological knowledge and processes. | |
| 04.02 | Explain the rapid increase in the rate of technological development and diffusion. | |
| 04.03 | Conduct specific goal-directed research related to inventions and innovations. | |
| 05.0 | Demonstrate an understanding of the core concepts of technology. – The student will be able to: | SC.912.N.1.1, 3, 4, 7 |
| 05.01 | Identify systems thinking logic and creativity with appropriate compromises in complex real-life problems. | |
| 05.02 | Define technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. | |
| 05.03 | Identify resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. | |
| 05.04 | Identify the criteria and constraints of a product or system and determine how they affect the final design and development. | |
| 05.05 | Define a management system as the process of planning, organizing, and controlling work. | |
| 06.0 | Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study. – The student will be able to: | SC.912.N.1.1, 4, 5 |
| 06.01 | Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. | |
| 06.02 | Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. | |
| 06.03 | Outline the process of patenting to protect a technological idea. | |
| 06.04 | Identify technological progresses that promote the advancement of science and mathematics. | |
| 07.0 | Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to: | SC.912.N.4.2 |
| 07.01 | Classify the use of technology involving weighing the trade-offs between the positive and the negative effects. | |

| CTE Standards and Benchmarks | NGSSS-Sci |
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| 07.02 Identify ethical considerations important in the development, selection, and use of technologies. | |
| 07.03 List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. | |
| 08.0 Demonstrate an understanding of the effects of technology on the environment. . – The student will be able to: | SC.912.L.17.16, 17, 20 |
| 08.01 List trade-offs of developing technologies to reduce the use of resources. | |
| 08.02 Identify technologies devised to reduce the negative consequences of other technologies. | |
| 08.03 Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. | |
| 09.0 Demonstrate an understanding of the influence of technology on history. – The student will be able to: | SC.912.N.2.4; 3.2 |
| 09.01 Research how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. | |
| 09.02 Define the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. | |
| 09.03 Discuss that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how. | |
| 09.04 Define the Iron Age as the use of iron and steel as the primary materials for tools. | |
| 10.0 Demonstrate an understanding of the attributes of design. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2 |
| 10.01 Recognize the design process; including 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. | |
| 10.02 Restate design problems that are seldom presented in a clearly defined form. | |
| 10.03 Check and critique a design continually, and improve and revise the idea of the design as needed. | |
| 10.04 List competing requirements of a design, such as criteria, constraints, and efficiency. | |
| 11.0 Demonstrate an understanding of engineering design. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2 |
| 11.01 Identify design principles used to evaluate existing designs, to collect data, and to guide the design process. | |
| 11.02 Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process. | |
| 11.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. | |

| CTE Standards and Benchmarks | | NGSSS-Sci |
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| 11.04 | Identify factors taken into account in the process of engineering. | |
| 12.0 | Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2 |
| 12.01 | Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace. | |
| 12.02 | Identify research needed to solve technological problems. | |
| 12.03 | Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. | |
| 12.04 | Utilize a multidisciplinary approach to solving technological problems. | |
| 13.0 | Demonstrate the abilities to apply the design process. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2 |
| 13.01 | Identify the design problem to solve and decide whether or not to address it. | |
| 13.02 | List criteria and constraints and determine how these will affect the design process. | |
| 13.03 | Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. | |
| 13.04 | 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. | |
| 13.05 | Develop a product or system using a design process. | |
| 13.06 | Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models. | |
| 14.0 | Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to: | SC.912.N.1.1 |
| 14.01 | Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. | |
| 14.02 | Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. | |
| 14.03 | Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. | |
| 14.04 | Operate systems so that they function in the way they were designed. | |
| 14.05 | Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. | |
| 15.0 | Demonstrate the abilities to assess the impact of products and systems. – The student will be able to: | SC.912.L.17.4, 16; SC.912.N.1.1, 4, 6 |
| 15.01 | Collect information and evaluate its quality. | |

| CTE Standards and Benchmarks | | NGSSS-Sci |
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| 15.02 | Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. | |
| 15.03 | Define assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. | |
| 15.04 | Identify forecasting techniques to evaluate the results of altering natural systems. | |
| 16.0 | Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to: | SC.912.P.8.8 |
| 16.01 | Service products to keep them in good operating condition. | |
| 16.02 | Classify materials based on their qualities as natural, synthetic, or mixed. | |
| 16.03 | Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. | |
| 16.04 | Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. | |
| 16.05 | Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. | |
| 16.06 | Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products. | |
| 16.07 | Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. | |
| 17.0 | Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to: | |
| 17.01 | Define infrastructure as the underlying base or basic framework of a system. | |
| 17.02 | Identify a variety of processes and procedures used in constructing structures. | |
| 17.03 | Identify requirements involved in the design of structures. | |
| 17.04 | Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. | |
| 17.05 | Identify prefabricated materials used in some structures. | |
| 18.0 | Demonstrate safe and appropriate use of tools and machines in production technology. – The student will be able to: | |
| 18.01 | Select appropriate tools, procedures, and/or equipment. | |
| 18.02 | Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment. | |
| 18.03 | Follow laboratory safety rules and procedures. | |

| CTE Standards and Benchmarks | NGSS-Sci |
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| 18.04 Demonstrate good housekeeping at workstation within total laboratory. | |
| 18.05 Identify color-coding safety standards. | |
| 18.06 Explain fire prevention and safety precautions and practices for extinguishing fires. | |
| 18.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment. | |
| 19.0 Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to: | |
| 19.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules. | |
| 19.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. | |
| 19.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently. | |
| 19.04 Display an understanding of the efficient use of human resources. | |
| 20.0 Demonstrate an understanding of entrepreneurship. – The student will be able to: | |
| 20.01 Define entrepreneurship. | |
| 20.02 Describe the importance of entrepreneurship to the American economy. | |
| 20.03 List the advantages and disadvantages of business ownership. | |
| 20.04 Identify the risks involved in ownership of a business. | |
| 20.05 Identify the necessary personal characteristics of a successful entrepreneur. | |
| 20.06 Identify the business skills needed to operate a small business efficiently and effectively. | |
| 21.0 Produce a custom product from industrial materials and composites using preprocessing, processing, and post-processing production technology skills. – The student will be able to: | SC.912.P.8.8 |
| 21.01 Apply the technology processes of separating and forming materials. | |
| 21.02 Apply the technology processes of conditioning materials. | |
| 21.03 Apply the technology processes of combining in the fabrication and finishing of materials. | |
| 21.04 Apply modern production technology practices and equipment in the processes of separating, forming, conditioning, fabricating and finishing of materials (CNC, CAD, CAM, Robotics, etc.). | |
| 21.05 Produce a custom product. | |

| CTE Standards and Benchmarks | NGSSS-Sci |
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| 22.0 Plan and participate in a mass production system for manufacturing a product. – The student will be able to: | |
| 22.01 Design and develop jigs, fixtures, or a model system for product mass production. | |
| 22.02 Develop an organized plan of tools, materials, processes, and systems to efficiently mass-produce a product. | |
| 22.03 Apply pre-processing, processing, and post-processing techniques in the mass production of a product. | |
| 22.04 Participate in the organized mass production of a product. | |
| 24.0 Demonstrate technical knowledge and skills in the designing and engineering of constructed works. – The student will be able to: | |
| 24.01 Develop construction plans using appropriate tools, symbols, and technical drawing techniques. | |
| 24.02 Describe building codes, permits, and inspection requirements. | |
| 24.03 Sketch and draw a plan for a construction project. | |
| 24.04 Display knowledge about regional planning and the construction of civil and community projects (roads, parks, dams, airports, seaports, warehouses, shopping centers, factories, skyscrapers, etc.). | |
| 26.0 Demonstrate technical knowledge and skills in the construction and finishing of structures. – The student will be able to: | |
| 26.01 Describe the properties of structures. | |
| 26.02 Use appropriate terminology associated with construction technology. | |
| 26.03 Identify and describe the materials used in the construction of superstructures. | |
| 26.04 Apply a variety of techniques, tools, materials, and processes in the construction of structures. | |

Course Title: Production Technology II
Course Number: 8600640
Course Credit: 1

Course Description:

This program provides students with an intermediate understanding of the knowledge, human relations, and technological skills found today in production technology.

| CTE Standards and Benchmarks | | NGSSS-Sci |
|------------------------------|--|-----------------------|
| 04.0 | Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to: | SC.912.N.1.1 |
| 04.01 | Discuss the nature and development of technological knowledge and processes. | |
| 04.02 | Explain the rapid increase in the rate of technological development and diffusion. | |
| 04.03 | Conduct specific goal-directed research related to inventions and innovations. | |
| 04.04 | Discuss current technological developments that are/were driven by profit motive and the market. | |
| 05.0 | Demonstrate an understanding of the core concepts of technology—The student will be able to: | SC.912.N.1.1, 3, 4, 7 |
| 05.01 | Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. | |
| 05.02 | Discuss technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. | |
| 05.03 | Select resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. | |
| 05.04 | Identify the criteria and constraints of a product or system and determine how they affect the final design and development. | |
| 05.05 | List strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. | |
| 05.06 | Discuss new technologies that create new processes. | |
| 05.07 | Describe a quality control process to ensure that a product, service, or system meets established criteria. | |
| 05.08 | Organize a management system as the process of planning, organizing, and controlling work. | |
| 06.0 | Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.—The student will be able to: | SC.912.N.1.1, 4, 5 |
| 06.01 | Discuss technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. | |
| 06.02 | Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. | |

| CTE Standards and Benchmarks | | NGSSS-Sci |
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| 06.03 | Report the process of patenting to protect a technological idea. | |
| 06.04 | Discuss technological progresses that promote the advancement of science and mathematics. | |
| 07.0 | Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to: | SC.912.N.4.2 |
| 07.01 | Compare the use of technology involving weighing the trade-offs between the positive and the negative effects. | |
| 07.02 | Discuss ethical considerations important in the development, selection, and use of technologies. | |
| 07.03 | Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. | |
| 08.0 | Demonstrate an understanding of the effects of technology on the environment. . – The student will be able to: | SC.912.L.17.16, 17, 20 |
| 08.01 | Compare trade-offs of developing technologies to reduce the use of resources. | |
| 08.02 | Identify technology to monitor the environment and provide information as a basis for decision-making. | |
| 08.03 | Discuss technologies devised to reduce the negative consequences of other technologies. | |
| 08.04 | Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. | |
| 09.0 | Demonstrate an understanding of the influence of technology on history. – The student will be able to: | SC.912.N.2.4; 3.2 |
| 09.01 | Discuss how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. | |
| 09.02 | Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. | |
| 09.03 | Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how. | |
| 09.04 | Define the Iron Age as the use of iron and steel as the primary materials for tools. | |
| 09.05 | Define the Middle Ages and its development of many technological devices that produced long-lasting effects on technology and society. | |
| 09.06 | Define the Renaissance, a time of rebirth of the arts and humanities, as an important development in the history of technology. | |
| 09.07 | Define the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. | |
| 09.08 | Define the Information Age and its placement of emphasis on the processing and exchange of information. | |

| CTE Standards and Benchmarks | | NGSS-Sci |
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| 10.0 | Demonstrate an understanding of the attributes of design. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2 |
| 10.01 | Apply the design process; including 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. | |
| 10.02 | Translate design problems that are seldom presented in a clearly defined form. | |
| 10.03 | Evaluate a design continually, and improve and revise the idea of the design as needed. | |
| 10.04 | Consider competing requirements of a design, such as criteria, constraints, and efficiency. | |
| 11.0 | Demonstrate an understanding of engineering design. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 2.2; 3.3, 5; 4.2 |
| 11.01 | Investigate design principles used to evaluate existing designs, to collect data, and to guide the design process. | |
| 11.02 | Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process. | |
| 11.03 | Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. | |
| 11.04 | Evaluate factors taken into account in the process of engineering. | |
| 12.0 | Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2 |
| 12.01 | Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace. | |
| 12.02 | Conduct research needed to solve technological problems. | |
| 12.03 | Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. | |
| 12.04 | Utilize a multidisciplinary approach to solving technological problems. | |
| 13.0 | Demonstrate the abilities to apply the design process. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2 |
| 13.01 | Interpret the design problem to solve and decide whether or not to address it. | |
| 13.02 | Evaluate criteria and constraints and determine how these will affect the design process. | |
| 13.03 | Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. | |
| 13.04 | 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. | |

| CTE Standards and Benchmarks | NGSSS-Sci |
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| 13.05 Produce a product or system using a design process. | |
| 13.06 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models. | |
| 14.0 Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to: | SC.912.N.1.1 |
| 14.01 Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. | |
| 14.02 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. | |
| 14.03 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. | |
| 14.04 Operate systems so that they function in the way they were designed. | |
| 14.05 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. | |
| 14.06 Use the tools of data analysis for managing information. | |
| 15.0 Demonstrate the abilities to assess the impact of products and systems. – The student will be able to: | SC.912.L.17.4, 16; SC.912.N.1.1, 4, 6 |
| 15.01 Collect information and evaluate its quality. | |
| 15.02 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. | |
| 15.03 Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. | |
| 15.04 Design forecasting techniques to evaluate the results of altering natural systems. | |
| 16.0 Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to: | SC.912.P.8.8 |
| 16.01 Service products to keep them in good operating condition. | |
| 16.02 Classify materials based on their qualities as natural, synthetic, or mixed. | |
| 16.03 Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. | |
| 16.04 Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. | |
| 16.05 Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. | |
| 16.06 Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products. | |

| CTE Standards and Benchmarks | | NGSSS-Sci |
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| 16.07 | Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. | |
| 17.0 | Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to: | |
| 17.01 | Define infrastructure as the underlying base or basic framework of a system. | |
| 17.02 | Identify a variety of processes and procedures used in constructing structures. | |
| 17.03 | Identify requirements involved in the design of structures. | |
| 17.04 | Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. | |
| 17.05 | Identify prefabricated materials used in some structures. | |
| 18.0 | Demonstrate safe and appropriate use of tools and machines in production technology. – The student will be able to: | |
| 18.01 | Select appropriate tools, procedures, and/or equipment. | |
| 18.02 | Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment. | |
| 18.03 | Follow laboratory safety rules and procedures. | |
| 18.04 | Demonstrate good housekeeping at workstation within total laboratory. | |
| 18.05 | Identify color-coding safety standards. | |
| 18.06 | Explain fire prevention and safety precautions and practices for extinguishing fires. | |
| 18.07 | Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment. | |
| 19.0 | Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to: | |
| 19.01 | Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules. | |
| 19.02 | Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. | |
| 19.03 | Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently. | |
| 19.04 | Display an understanding of the efficient use of human resources. | |
| 20.0 | Demonstrate an understanding of entrepreneurship. – The student will be able to: | |
| 20.01 | Define entrepreneurship. | |

| CTE Standards and Benchmarks | NGSS-Sci |
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| 20.02 Describe the importance of entrepreneurship to the American economy. | |
| 20.03 List the advantages and disadvantages of business ownership. | |
| 20.04 Identify the risks involved in ownership of a business. | |
| 20.05 Identify the necessary personal characteristics of a successful entrepreneur. | |
| 20.06 Identify the business skills needed to operate a small business efficiently and effectively. | |
| 21.0 Produce a custom product from industrial materials and composites using preprocessing, processing, and post-processing production technology skills. – The student will be able to: | SC.912.P.8.8 |
| 21.01 Apply the technology processes of separating and forming materials. | |
| 21.02 Apply the technology processes of conditioning materials. | |
| 21.03 Apply the technology processes of combining in the fabrication and finishing of materials. | |
| 21.04 Produce a custom product. | |
| 22.0 Plan and participate in a mass production system for manufacturing a product. – The student will be able to: | |
| 22.01 Design and develop jigs, fixtures, or a model system for product mass production. | |
| 22.02 Develop an organized plan of tools, materials, processes, and systems to efficiently mass-produce a product. | |
| 22.03 Apply pre-processing, processing, and post-processing techniques in the mass production of a product. | |
| 22.04 Participate in the organized mass production of a product. | |
| 23.0 Utilize modern production technology in the processes of separating, forming, combining, fabrication, and finishing of materials. – The student will be able to: | |
| 23.01 Design a program to be used in the separating forming and finishing of materials. | |
| 23.02 Develop and perform an operational program of forming materials. | |
| 23.03 Develop and perform an operational program of finishing materials. | |
| 23.04 Develop and perform an operational program that will use combination of modern production processes, equipment, and materials. | |
| 24.0 Demonstrate technical knowledge and skills in the designing and engineering of constructed works. – The student will be able to: | |
| 24.01 Develop construction plans using appropriate tools, symbols, and technical drawing techniques. | |

| CTE Standards and Benchmarks | NGSSS-Sci |
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| 24.02 Describe building codes, permits, and inspection requirements. | |
| 24.03 Sketch and draw a plan for a construction project. | |
| 24.04 Display knowledge about regional planning and the construction of civil and community projects (roads, parks, dams, airports, seaports, warehouses, shopping centers, factories, skyscrapers, etc.). | |
| 26.0 Demonstrate technical knowledge and skills in the construction and finishing of structures. – The student will be able to: | |
| 26.01 Describe the properties of structures. | |
| 26.02 Use appropriate terminology associated with construction technology. | |
| 26.03 Identify and describe the materials used in the construction of superstructures. | |
| 26.04 Apply a variety of techniques, tools, materials, and processes in the construction of structures. | |
| 27.0 Perform advanced study and technical skills related to production technology. – The student will be able to: | |
| 27.01 Select an individual or group project in cooperation with the teacher. | |
| 27.02 Develop a written plan of work to carry out the project. | |
| 27.03 Show evidence of technical study in support of the project. | |
| 27.04 Perform skills related to the project. | |
| 27.05 Complete the project as planned. | |

Course Title: Production Technology III
Course Number: 8601740
Course Credit: 1

Course Description:

This program provides students with an advanced understanding of the knowledge, human relations, and technological skills found today in production technology.

| CTE Standards and Benchmarks | | NGSSS-Sci |
|-------------------------------------|--|-----------------------|
| 04.0 | Demonstrate an understanding of the characteristics and scope of technology. – The student will be able to: | SC.912.N.1.1 |
| 04.01 | Graph the rapid increase in the rate of technological development and diffusion. | |
| 04.02 | Conduct specific goal-directed research related to inventions and innovations. | |
| 04.03 | Evaluate current technological developments that are/were driven by profit motive and the market. | |
| 05.0 | Demonstrate an understanding of the core concepts of technology—The student will be able to: | SC.912.N.1.1, 3, 4, 7 |
| 05.01 | Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems. | |
| 05.02 | Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems. | |
| 05.03 | Assess the stability of a technological system and its influence by all of the components in the system, especially those in the feedback loop. | |
| 05.04 | Compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste. | |
| 05.05 | Identify the criteria and constraints of a product or system and determine how they affect the final design and development. | |
| 05.06 | Propose strategies for optimizing a technological process or methodology of designing or making a product, dependent on criteria and constraints. | |
| 05.07 | Discuss new technologies that create new processes. | |
| 05.08 | Recommend a quality control process to ensure that a product, service or system meets established criteria. | |
| 05.09 | Organize a management system as the process of planning, organizing, and controlling work. | |
| 05.10 | Outline complex systems that have many layers of controls and feedback loops to provide information. | |
| 06.0 | Demonstrate an understanding of the relationships among technologies and the connection between technology and other fields of study.—The student will be able to: | SC.912.N.1.1, 4, 5 |
| 06.01 | Identify technology transfer occurring when a new user applies an existing innovation developed for one purpose in a different function. | |

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| 06.02 | Identify technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. | |
| 06.03 | Outline the process of patenting to protect a technological idea. | |
| 06.04 | Identify technological progresses that promote the advancement of science and mathematics. | |
| 07.0 | Demonstrate an understanding of the cultural, social, economic, and political effects of technology. – The student will be able to: | SC.912.N.4.2 |
| 07.01 | Classify the use of technology involving weighing the trade-offs between the positive and the negative effects. | |
| 07.02 | Identify ethical considerations important in the development, selection, and use of technologies. | |
| 07.03 | List the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. | |
| 08.0 | Demonstrate an understanding of the effects of technology on the environment. – The student will be able to: | SC.912.L.17.16, 17, 20 |
| 08.01 | Select technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling. | |
| 08.02 | List trade-offs of developing technologies to reduce the use of resources. | |
| 08.03 | Use technology to monitor the environment and provide information as a basis for decision-making. | |
| 08.04 | Identify technologies devised to reduce the negative consequences of other technologies. | |
| 08.05 | Discuss the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment. | |
| 09.0 | Demonstrate an understanding of the influence of technology on history. – The student will be able to: | SC.912.N.2.4; 3.2 |
| 09.01 | Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. | |
| 09.02 | Research the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape. | |
| 09.03 | Debate that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how. | |
| 09.04 | Define the Iron Age as the use of iron and steel as the primary materials for tools. | |
| 09.05 | Discuss the Industrial Revolution and the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. | |
| 10.0 | Demonstrate an understanding of the attributes of design. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2 |

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| 10.01 Apply the design process; including 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. | |
| 10.02 Translate design problems that are seldom presented in a clearly defined form. | |
| 10.03 Evaluate a design continually, and improve and revise the idea of the design as needed. | |
| 10.04 Analyze competing requirements of a design, such as criteria, constraints, and efficiency. | |
| 11.0 Demonstrate an understanding of engineering design. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 2.2; 3.3, 5; 4.2 |
| 11.01 Select design principles used to evaluate existing designs, to collect data, and to guide the design process. | |
| 11.02 Examine the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the engineering design process. | |
| 11.03 Construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments. | |
| 11.04 Evaluate factors taken into account in the process of engineering. | |
| 12.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 2.1, 4, 5; 3.1, 3, 5; 4.2 |
| 12.01 Employ research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace. | |
| 12.02 Conduct research needed to solve technological problems. | |
| 12.03 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology. | |
| 12.04 Utilize a multidisciplinary approach to solving technological problems. | |
| 13.0 Demonstrate the abilities to apply the design process. – The student will be able to: | SC.912.N.1.1, 3, 4, 5, 6, 7; 3.3, 5; 4.2 |
| 13.01 Interpret the design problem to solve and decide whether or not to address it. | |
| 13.02 Evaluate criteria and constraints and determine how these will affect the design process. | |
| 13.03 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. | |
| 13.04 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. | |
| 13.05 Produce a product or system using a design process. | |

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| 13.06 | Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models. | |
| 14.0 | Demonstrate the abilities to use and maintain technological products and systems. – The student will be able to: | SC.912.N.1.1 |
| 14.01 | Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. | |
| 14.02 | Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it. | |
| 14.03 | Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision. | |
| 14.04 | Operate systems so that they function in the way they were designed. | |
| 14.05 | Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. | |
| 15.0 | Demonstrate the abilities to assess the impact of products and systems. – The student will be able to: | SC.912.L.17.4, 16; SC.912.N.1.1, 4, 6 |
| 15.01 | Collect information and evaluate its quality. | |
| 15.02 | Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. | |
| 15.03 | Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. | |
| 15.04 | Design forecasting techniques to evaluate the results of altering natural systems. | |
| 16.0 | Demonstrate an understanding of and be able to select and use manufacturing technologies. – The student will be able to: | SC.912.P.8.8 |
| 16.01 | Service products to keep them in good operating condition. | |
| 16.02 | Classify materials based on their qualities as natural, synthetic, or mixed. | |
| 16.03 | Classify goods as durable goods designed to operate for a long period of time, or non-durable goods designed to operate for a short period of time. | |
| 16.04 | Identify and classify manufacturing systems into types, such as customized production, batch production, and continuous production. | |
| 16.05 | Discuss the interchangeability of parts to increase the effectiveness of manufacturing processes. | |
| 16.06 | Identify chemical technologies providing a means for humans to alter or modify materials and to produce chemical products. | |
| 16.07 | Employ marketing techniques involving establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. | |
| 17.0 | Demonstrate an understanding of and be able to select and use construction technologies. – The student will be able to: | |

| CTE Standards and Benchmarks | NGSS-Sci |
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| 17.01 Define infrastructure as the underlying base or basic framework of a system. | |
| 17.02 Identify a variety of processes and procedures used in constructing structures. | |
| 17.03 Identify requirements involved in the design of structures. | |
| 17.04 Recommend maintenance, alterations, or renovations to improve a structure or alter its intended use. | |
| 17.05 Identify prefabricated materials used in some structures. | |
| 18.0 Demonstrate safe and appropriate use of tools and machines in production technology. – The student will be able to: | |
| 18.01 Select appropriate tools, procedures, and/or equipment. | |
| 18.02 Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment. | |
| 18.03 Follow laboratory safety rules and procedures. | |
| 18.04 Demonstrate good housekeeping at workstation within total laboratory. | |
| 18.05 Identify color-coding safety standards. | |
| 18.06 Explain fire prevention and safety precautions and practices for extinguishing fires. | |
| 18.07 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment. | |
| 19.0 Demonstrate the ability to properly identify, organize, plan, and allocate resources. – The student will be able to: | |
| 19.01 Demonstrate the ability to select goal-relevant activities, rank them, allocate time, and prepare and follow schedules. | |
| 19.02 Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives. | |
| 19.03 Demonstrate the ability to acquire, store, allocate, and use materials or space efficiently. | |
| 19.04 Display an understanding of the efficient use of human resources. | |
| 20.0 Demonstrate an understanding of entrepreneurship. – The student will be able to: | |
| 20.01 Define entrepreneurship. | |
| 20.02 Describe the importance of entrepreneurship to the American economy. | |
| 20.03 List the advantages and disadvantages of business ownership. | |

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| 20.04 Identify the risks involved in ownership of a business. | |
| 20.05 Identify the necessary personal characteristics of a successful entrepreneur. | |
| 20.06 Identify the business skills needed to operate a small business efficiently and effectively. | |
| 23.0 Utilize modern production technology in the processes of separating, forming, combining, fabrication, and finishing of materials. – The student will be able to: | |
| 23.01 Design a program to be used in the separating forming and finishing of materials. | |
| 23.02 Develop and perform an operational program of forming materials. | |
| 23.03 Develop and perform an operational program of finishing materials. | |
| 23.04 Develop and perform an operational program that will use combination of modern production processes, equipment, and materials. | |
| 23.05 Produce a product using modern production technology. | |
| 24.0 Demonstrate technical knowledge and skills in the designing and engineering of constructed works. – The student will be able to: | |
| 24.01 Develop construction plans using appropriate tools, symbols, and technical drawing techniques. | |
| 24.02 Describe building codes, permits, and inspection requirements. | |
| 24.03 Sketch and draw a plan for a construction project. | |
| 24.04 Display knowledge about regional planning and the construction of civil and community projects (roads, parks, dams, airports, seaports, warehouses, shopping centers, factories, skyscrapers, etc.). | |
| 25.0 Demonstrate technical knowledge and skills in the contracting, estimating, bidding, and scheduling processes. – The student will be able to: | |
| 25.01 Estimate construction costs using various methods. | |
| 25.02 Read and prepare bid invitations for contractors to build a construction project. | |
| 25.03 Establish criteria for awarding a construction contract. | |
| 25.04 Develop a construction schedule. | |
| 25.05 Describe the content of a construction contract and performance bond. | |
| 26.0 Demonstrate technical knowledge and skills in the construction and finishing of structures. – The student will be able to: | |
| 26.01 Describe the properties of structures. | |

| CTE Standards and Benchmarks | NGSSS-Sci |
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| 26.02 Use appropriate terminology associated with construction technology. | |
| 26.03 Identify and describe the materials used in the construction of superstructures. | |
| 26.04 Apply a variety of techniques, tools, materials, and processes in the construction of structures. | |
| 26.05 Apply technical knowledge and skills in the installation of utilities. | |
| 26.06 Apply technical knowledge and skills in the process of enclosing structures. | |
| 26.07 Apply technical knowledge and skills in the process of finishing the interior and exterior of a constructed structure. | |
| 27.0 Perform advanced study and technical skills related to production technology. – The student will be able to: | |
| 27.01 Identify and research a design problem related to production technology. | |
| 27.02 Produce a detailed design and plan for the production of the solution. | |
| 27.03 Complete the advanced design project as planned. | |
| 27.04 Deliver a professional quality presentation of the design process and solution. | |
| 31.0 Demonstrate an understanding of career opportunities and requirements in the field of production technology. – The student will be able to: | |
| 31.01 Discuss individual interests related to a career in production technology. | |
| 31.02 Explore career opportunities related to production technology. | |
| 31.03 Explore secondary education opportunities related to production technology. | |
| 31.04 Conduct a job search. | |
| 31.05 Complete a job application form correctly. | |
| 31.06 Demonstrate competence in job interview techniques. | |
| 31.07 Create a professional resume and letter of introduction. | |
| 31.08 Solicit awards, letters of recommendation and recognition. | |
| 31.09 Organize work samples in a professional, presentable format. | |