# Scope & Sequence

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| Course Name: Manufacturing Engineering Technology I **TSDS PEIMS Code:** 13032900 | | | **Course Credit:** 1.0  **Course Requirements:** This course is recommended for students in grades 10-12.  **Prerequisites:** None.  **Recommended Prerequisites:** Algebra I. |
| **Course Description:** In Manufacturing Engineering Technology I, students will gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. Students will prepare for success in the global economy. The study of manufacturing engineering will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings in a manufacturing setting. | | | |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. | | | |
| **Total Number of Periods**  **Total Number of Minutes**  **Total Number of Hours** | 175 Periods  7,875 Minutes  131.25 Hours\* | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. | |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***  (assumes 45-minute periods)  Total minutes per unit | **TEKS Covered**  **130.355. (c) Knowledge and Skills** | |
| **Unit 1: Employability Skills**  This unit explores the professional standards and employability skills required by business and industry. Students will grow to understand that responsibility, time management, organization, positive attitude, and good character have a large impact on employability and job retention. | 20 Periods  900 Minutes | 1. The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) describe how teams function;  (B) explain employers' work expectations; and  (C) demonstrate knowledge of the concepts and skills related to health and safety in the workplace as specified by appropriate governmental regulations | |
| **Unit 2: Computer Aided Design & Manufacturing (CAD/CAM)**  During this unit, students will learn about the types of technology required to perform workplace tasks for the manufacturing industry. Students will identify the practices, programs and systems utilized in automated manufacturing in terms of complexity and understand how computerized systems are integral to businesses’ effectiveness and completing workplace tasks with accuracy and efficiency. After completing this unit, students will be able to demonstrate they have an understanding of computer-aided design software programs used in Manufacturing Engineering and how to create basic computer-aided design images that match the criteria. | 25 Periods  1,125 Minutes | 2. The student applies software skills to manufacturing. The student is expected to:  (A) use computer-aided design (CAD) software to complete a design;  (B) analyze the results of product testing in a simulated modeling environment; and  (C) fabricate a prototype design of a mechanical part  5. The student learns skills in production and programming of computer numerical control (CNC) operations. The student is expected to:  (A) design a product using computer-aided manufacturing (CAM) software for production on a CNC lathe | |
| **Unit 3: Computer Numeric Control (CNC)**  During this unit, students will learn key concepts in the operation of Computer Numerical Control (CNC) Machines and how computerized systems can increase the efficiency of a manufacturing facility. Students will describe and demonstrate the purposes for operation sheets, flow process charts, and operation process charts in the manufacturing process. | 25 Periods  1,125 Minutes | 5. The student learns skills in production and programming of computer numerical control (CNC) operations. The student is expected to:  (A) design a product using computer-aided manufacturing (CAM) software for production on a CNC lathe;  (B) produce a product on the CNC lathe or a simulation;  (C) design a product using CAM software for production on a CNC mill;  (D) produce a product on the CNC mill or a simulation; and  (E) complete data sheets for plan, do, check, and act forms and projects | |
| **Unit 4: Programmable Logic Controls (PLC)**  Students will define and describe how PLC and robotics can increase the efficiency of a manufacturing facility. Students will learn how to generate a device control flow chart or schematic for an automated manufacturing system. Students will understand the advantages and disadvantages of utilizing various control devices, including those for pressure, heat, volume control, color, weight and timing. Students will discuss the various architecture in developing a controlled system, including buss, PLC, and LAN. | 20 Periods  900 Minutes | 3. The student gains skills in writing programmable logic controls so that a robot can work in coordination with a machine. The student is expected to:  (A) use computer-integrated manufacturing techniques to simulate a manufacturing process; and  (B) troubleshoot programmable logic circuit devices | |
| **Unit 5: Electrical Controls and Wiring**  Students will learn how to use and troubleshoot electrical controls and wiring in a computer integrated manufacturing process.  Students will discuss the purpose of electrical controls and define terms used in typical electrical wiring schematics. Explain the theory of operation of electrical and control devices such as residential, power grid, elevator lift, etc. | 25 Periods  1,125 Minutes | 4. The student performs functions and solves problems in the electricity and electronics field. The student is expected to:  (A) research the use of control devices; and  (B) demonstrate the use of control devices  7. The student knows electrical and thermal systems. The student is expected to:  (A) identify and describe electrical devices; and  (B) demonstrate the use of electrical devices | |
| **Unit 6: Pneumatics and Hydraulics**  Students will learn the principles of hydraulic and pneumatic systems in a manufacturing process. Students will be able to discuss examples of cutting-edge technology innovations on the horizon that will involve pneumatic and hydraulic systems in a computer-integrated manufacturing process. | 20 Periods  900 Minutes | 6. The student knows mechanical and fluid systems. The student is expected to:  (A) identify, describe, and demonstrate the use of mechanical devices; and  (B) identify, describe, and demonstrate the use of fluid devices | |
| **Unit 7: Thermal Science**  Students will be able to explain and discuss the effects of heat energy and temperature including, but not limited to, air conditioning system operations, natural gas furnace systems, solar panel energy systems, and hydropower systems. Research key components of a hydropower system, how the increased use of hydropower energy has impacted the use of coal to produce electrical power, various forms of geothermal energy sources, unique geothermal energy applications used around the world and how much the use of geothermal energy has increased globally in the past 10 years. | 15 Periods  675 Minutes | 7. The student knows electrical and thermal systems. The student is expected to:  (C) research the effects of heat energy and temperature on products. | |
| **Unit 8: Analyzing Quality Control Systems**  During this unit, students will research and discuss the International Standards Organization and Military Specifications as organizations that promotes worldwide proprietary, industrial and commercial standards. Students will learn the terms used in Statistical Process Control (SPC) and be able to apply SPC concepts and principles in a computer integrated manufacturing process. Students will discuss the purpose of Pareto charts and be able to analyze quality control system issues in a computer integrated manufacturing process using concepts and principles of Pareto charts. Students will demonstrate and explain the purpose of a Gantt and pie chart when used as a tool in Statistical Process Control (SPC). | 25 Periods  1,125 Minutes | 8. The student understands quality-control systems. The student is expected to:  (A) research and recognize industrial standards such as International Standards Organization and Military Specifications;  (B) explain attribute and Pareto charts; and  (C) apply statistical process control | |