# Scope & Sequence

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| Course Name: Manufacturing Engineering Technology II **TSDS PEIMS Code:** 13032950 | | | **Course Credit:** 1.0  **Course Requirements:** This course is recommended for students in grades 11-12.  **Prerequisites:** Manufacturing Engineering l.  **Recommended Prerequisites:** Algebra II, Computer Science, or Physics. |
| **Course Description:** In Manufacturing Engineering Technology II, 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. The study of Manufacturing Engineering Technology II will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. | | | |
| **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**  **130.356. (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. | 15 Periods  675 Minutes | 1. The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) use teamwork to solve problems;  (B) demonstrate a work ethic that meets common employers' expectations;  (C) use time-management techniques to develop work schedules;  (D) describe how teams measure results;  (E) demonstrate the skills required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;  (F) communicate effectively with others in the workplace to clarify objectives; and  (G) apply skills related to health and safety in the workplace as specified by appropriate governmental regulations | |
| **Unit 2: Academic Knowledge and Skills for Manufacturing**  This unit will include lessons on terminology and skills that are associated with mathematics and science knowledge specifically pertaining to manufacturing. Students will focus on understanding, interpreting, analyzing and knowing how to correctly use units of measure, mathematics concepts, and science principles to solve problems. | 20 Periods  900 Minutes | 2. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:  (A) apply mathematics to problems arising in everyday life, society, and the workplace;  (B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;  (C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;  (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;  (E) create and use representations to organize, record, and communicate mathematical ideas;  (F) analyze mathematical relationships to connect and communicate mathematical ideas; and  (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication | |
| **Unit 3: 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 understand 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 | 3. The student applies design 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;  (C) fabricate a prototype design of a mechanical part; and  (D) use computer-integrated manufacturing techniques to simulate a manufacturing process | |
| **Unit 4: 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 project using computer-aided manufacturing (CAM) software for a CNC lathe;  (B) produce a product on a CNC lathe or simulator;  (C) design a project using CAM software for a CNC mill;  (D) produce a product on a CNC mill or simulator; and  (E) complete data sheets for plan, do, check, and act forms and projects | |
| **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. | 15 Periods  675 Minutes | 4. The student performs functions and solves problems in the electricity and electronics field. The student is expected to:  (A) develop solutions to use control devices; and  (B) troubleshoot control devices such as programmable logic circuit devices  7. The student demonstrates an understanding of electrical and thermal systems. The student is expected to:  (A) use electrical controls | |
| **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. | 15 Periods  675 Minutes | 6. The student demonstrates an understanding of mechanical and fluid systems. The student is expected to:  (A) use mechanical devices;  (B) use pneumatics devices; and  (C) use hydraulics 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 demonstrates an understanding of electrical and thermal systems. The student is expected to:  (A) use electrical controls;  (B) analyze the effects of heat energy and temperature on products; and  (C) develop an understanding of ventilation such as heating, air conditioning, and refrigeration | |
| **Unit 8: Analyzing Quality Control Systems**  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). | 20 Periods  900 Minutes | 8. The student analyzes quality-control systems. The student is expected to:  (A) apply statistical process control;  (B) determine hardness values of different materials; and  (C) analyze attribute and Pareto charts | |
| **Unit 9: Electrical Controls and Pneumatics/Hydraulic Devices**  During this unit, students will design and build a system that incorporates electrical controls on a pneumatic or hydraulic device. Students will learn to critically think to test and troubleshoot the system, which incorporates electrical controls and pneumatic or hydraulic devices, they developed to ensure a quality product. | 25 Periods  1,125 Minutes | 9. The student develops a system using electrical controls and pneumatics or hydraulics devices. The student is expected to:  (A) design a system that incorporates electrical controls and either a pneumatic or hydraulic device;  (B) build a system that incorporates electrical controls and either a pneumatic or hydraulic device; and  (C) test and troubleshoot the system that incorporates electrical controls and either a pneumatic or hydraulic device | |