Maryland CTE Programs of Study

Machining Technology I (2025)

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Introduction. 2

A **Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.** 2.A

B **The Advanced Manufacturing Career Cluster focuses on preparing students for entry-level, technical, and professional careers in various engineering and manufacturing fields.** 2.B

C **The Machining Technology Career and Technical Education (CTE) Program of Study prepares students for a beginning career in manufacturing and machine technologies and aligns to the National Institute of Metalworking Skills (NIMS) Machining Level I Credentials. Students will progress through a program that includes hands-on education in precision machining while developing competency in process control, manual operations, process adjustment, part inspection as well as demonstrate usage of machine safety.** 2.C

D **Machining Technology I prepares students for the NIMS certification in Measurement, Materials, and Safety. The course covers machining industry fundamentals, including safety, precision measurement, milling, and grinding. Students participate in lectures and hands-on lab projects, applying knowledge to real-world scenarios to develop technical skills and industry understanding.** 2.D

E **Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.** 2.E

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tudents are encouraged to participate in extended learning experiences through ligned Career and Technical Student Organizations (CTSOs). CTSOs are a

cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland. 2.F

Knowledge and Skills. 3

A The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to: 3.A

1 Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work. 3.A.1

2 Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn. 3.A.2

3 Employ effective reading, writing, and technical documentation skills in the context of machining processes and procedures. 3.A.3

4 Solve machining-related problems using critical thinking techniques and structured troubleshooting methodologies. 3.A.4

5 Demonstrate leadership skills and collaborate effectively as a team member during lab activities and projects. 3.A.5

6 Implement safety procedures in all aspects of machining, including the proper handling of machinery, tools, and materials, while adhering to industry safety guidelines. 3.A.6

7 Exhibit an understanding of legal and ethical responsibilities in the machining industry, following relevant laws, standards, and best practices. 3.A.7

8 Demonstrate time-management skills and the ability to prioritize tasks in a technical manufacturing environment. 3.A.8

B The student identifies various career pathways in the machining and manufacturing field. The student is expected to: 3.B

1 Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles in machining and manufacturing. 3.B.1

2 Create a professional resume and portfolio that reflects machining skills, projects, certifications (e.g., NIMS certification), and recommendations. 3.B.2

3 Demonstrate effective interview skills for roles in machining and manufacturing. 3.B.3

C The student develops technology and digital literacy skills. The student is expected to: 3.C

1 Use technology as a tool for research, organization, communication, and problem-solving within the machining industry. 3.C.1

2 Use digital tools, including computers, mobile devices, and collaboration platforms, to access, manage, and create information related to machining projects. 3.C.2

3 Demonstrate proficiency in using industry-standard technologies, including Computer- Aided Design (CAD), Computer-Aided Manufacturing (CAM), and other relevant machining software. 3.C.3

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4 Understand ethical and legal considerations for technology use, including principles of data protection and responsible technology use within the machining field. 3.C.4

D The student integrates core academic skills into machining practices. The student is expected to: 3.D

1 Demonstrate clear communication techniques, both written and verbal, consistent with industry standards, when reporting on machining tasks and outcomes. 3.D.1

2 Apply mathematical concepts such as measurements, geometric dimensioning and tolerancing (GD&T), conversions, and calculations in machining processes. 3.D.2

3 Use scientific principles such as material properties, thermodynamics, and machine dynamics to understand and troubleshoot machining tasks. 3.D.3

E The student demonstrates the necessary skills to understand and operate machining equipment in a safe and efficient manner. The student is expected to: 3.E

1 Identify and describe the functions of different machining equipment, including lathes, milling machines, grinders, and CNC machines. 3.E.1

2 Perform basic machine setup, tool installation, and equipment calibration in line with industry standards. 3.E.2

3 Demonstrate the ability to operate machine tools safely and efficiently, following manufacturer's guidelines and standard operating procedures. 3.E.3

4 Perform regular maintenance and adjustments on machines, including cleaning, lubricating, and replacing worn parts. 3.E.4

F The student demonstrates the necessary skills to measure and inspect parts accurately. The student is expected to: 3.F

1 Understand and apply measurement techniques using precision instruments such as micrometers, calipers, height gauges, and coordinate measuring machines (CMM). 3.F.1

2 Demonstrate proficiency in interpreting engineering drawings and blueprints to ensure part dimensions meet required specifications. 3.F.2

3 Apply standards of accuracy and precision in all measurement tasks, ensuring parts meet tolerances within industry standards. 3.F.3

4 Understand and implement quality control procedures for ensuring finished products meet the necessary specifications. 3.F.4

G The student demonstrates the necessary skills for material handling and preparation in machining. The student is expected to: 3.G

1 Identify and describe various types of materials used in machining, including metals, plastics, and composites. 3.G.1

2 Demonstrate the ability to select appropriate materials for specific machining tasks based on material properties and project requirements. 3.G.2

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3 Properly prepare materials for machining, including cutting, shaping, and cleaning processes. 3.G.3

4 Demonstrate knowledge of material safety data sheets (MSDS) and handling procedures to ensure safe usage and disposal of materials. 3.G.4

H The student demonstrates the necessary skills to complete projects and troubleshoot issues in a professional environment. The student is expected to: 3.H

1 Identify and troubleshoot common machining issues, including tool wear, misalignment, and dimensional inaccuracy, using systematic diagnostic methods. 3.H.1

2 Document technical issues, troubleshooting steps, and solutions in line with industry documentation practices. 3.H.2

3 Apply teamwork and collaboration skills in group exercises and projects, adhering to professional work practices. 3.H.3

4 Apply customer service skills in machining-related scenarios, practicing professional communication and problem-solving techniques. 3.H.4

I The student demonstrates proficiency in preparing for the NIMS certification in Measurement, Materials, and Safety. The student is expected to: 3.I

1 Demonstrate knowledge of safety standards and protocols required for obtaining NIMS certification, including the safe use of machinery, tools, and equipment. 3.I.1

2 Display competency in using precision measuring tools and understanding material properties as part of NIMS certification preparation. 3.I.2

3 Understand and apply the principles of machining to prepare for the NIMS certification examination in measurement, materials, and safety. 3.I.3