Maryland CTE Programs of Study

Machining Technology II (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 II builds on Machining Technology I, preparing students for the NIMS certification in Job Planning, Benchwork, and Layout. The course combines lectures, discussions, and lab activities, where students apply knowledge to hands-on projects using industrial tools. Team-based, real-world scenarios enhance technical skills and understanding of machining industry standards.** 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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Students are encouraged to participate in extended learning experiences through aligned 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 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, particularly in advanced machining tasks. 3.A.2

3 Employ effective reading, writing, and technical documentation skills in creating job plans and layout drawings. 3.A.3

4 Solve advanced machining-related problems using critical thinking techniques and structured troubleshooting methodologies, including planning for complex machining tasks. 3.A.4

5 Demonstrate leadership skills and collaborate effectively as a team member during advanced lab activities and projects, taking on greater responsibility in team tasks. 3.A.5

6 Implement advanced safety procedures in all aspects of machining, including the use of specialized tools, equipment, and materials in line with industry safety guidelines. 3.A.6

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

8 Demonstrate time-management skills and the ability to prioritize tasks in a high-paced technical environment, especially in complex machining projects. 3.A.8

B The student identifies various career pathways in the machining and manufacturing fields. 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 advanced machining and manufacturing. 3.B.1

2 Create a professional resume and portfolio that reflects advanced machining skills, projects, certifications (e.g., NIMS Job Planning, Benchwork and Layout), and recommendations. 3.B.2

3 Demonstrate effective interview skills for advanced roles in machining, manufacturing, and production planning. 3.B.3

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

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1 Demonstrate technology as a tool for research, organization, communication, and problem-solving in machining job planning and layout. 3.C.1

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

3 Demonstrate proficiency in using industry-standard technologies, including Computer- Aided Design (CAD), Computer-Aided Manufacturing (CAM), and specialized software for job planning and layout. 3.C.3

4 Understand ethical and legal considerations for technology use, including principles of data protection and responsible technology use in 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, in reporting on advanced machining tasks and job plans. 3.D.1

2 Apply mathematical concepts such as trigonometry, geometry, and advanced measurement techniques in job planning, layout, and machining processes. 3.D.2

3 Describe scientific principles such as material properties, tool dynamics, and forces involved in machining to understand and troubleshoot advanced machining tasks. 3.D.3

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

1 Identify and describe the functions of advanced machining equipment, including CNC machines, surface grinders, and advanced milling and turning machines. 3.E.1

2 Perform advanced machine setup, tool installation, and equipment calibration in line with industry standards, including preparing machines for specific job plans and layouts. 3.E.2

3 Demonstrate the ability to operate advanced machine tools safely and efficiently by following manufacturer's guidelines and standard operating procedures for complex tasks. 3.E.3

4 Perform regular maintenance and adjustments on machines, including cleaning, lubricating, and replacing worn parts, with attention to precision and accuracy in setup. 3.E.4

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

1 Understand and apply advanced measurement techniques using precision instruments such as micrometers, calipers, height gauges, and CMMs, especially in the context of job planning and layout. 3.F.1

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

3 Apply principles of geometric dimensioning and tolerancing (GD&T) to ensure machining accuracy and consistency. 3.F.3

4 Understand and implement advanced quality control procedures for verifying parts meet necessary specifications and tolerances, including preparation for NIMS certification. 3.F.4

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

1 Identify and describe different types of materials used in advanced machining processes, including alloys, composites, and heat-treated materials. 3.G.1

2 Demonstrate the ability to select appropriate materials based on material properties, job planning needs, and machining processes. 3.G.2

3 Prepare materials for machining by carrying out tasks such as cutting, shaping, and cleaning, ensuring readiness for precise operations. 3.G.3

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

H The student demonstrates the necessary skills to complete job planning, benchwork, and layout tasks. The student is expected to: 3.H

1 Develop and execute detailed job plans, outlining the steps, tools, and equipment required for machining tasks. 3.H.1

2 Perform benchwork tasks such as filing, sawing, drilling, and tapping with precision and accuracy, in preparation for machining operations. 3.H.2

3 Organize machining tasks on materials by accurately marking dimensions, locations, and angles to ensure processes proceed according to the job plan. 3.H.3

4 Apply appropriate machining strategies based on job requirements, machine capabilities, and available materials. 3.H.4

I The student demonstrates proficiency in preparing for the NIMS certification in Job Planning, Benchwork, and Layout. The student is expected to: 3.I

1 Demonstrate knowledge of the job planning process, including preparation of specifications, material selection, tool requirements, and detailed operation instructions. 3.I.1

2 Demonstrate competency in performing precise benchwork tasks, such as accurate measurement, layout, and assembly, in preparation for NIMS certification. 3.I.2

3 Apply principles of job layout, including marking, drilling, and milling operations required to meet job specifications in the certification context. 3.I.3