

PRECISION MACHINING I

Precision Machining I is designed to provide students with a basic understanding of the precision machining processes used in industry, manufacturing, maintenance, and repair. The course instructs students in industrial safety, terminology, tools and machine tools, measurement and layout. Students will become familiar with the setup and operation of power saws, drill press, lathe, milling machine, grinders and receive an introduction to CNC (computer controlled) machines.

- DOE Code: 5782
- Recommended Grade Level: Grade 11-12
- Recommended Prerequisites: None
- Credits: 2-3 credits a semester, maximum of 6 credits
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- This course is aligned with postsecondary courses for Dual Credit:
 - Ivy Tech
 - MTTC 101- Intro to Machining
 - Vincennes University
 - PMTD 110/L- Manufacturing Processes and Lab

Dual Credit

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in SkillsUSA, the CTSO for this area.

Content Standards

Domain – Project Planning and Management

Core Standard 1 Students develop skills for project and job planning to ensure quality parts creation.

Standards

- PMI-1.1 Demonstrate job process planning
- PMI-1.2 Examine basic problem solving
- PMI-1.3 Assess basic decision making rules

Domain – Tools and Processes

Core Standard 2 Students apply and adapt basic hand and machine tool processes to create machined parts per industry specifications.

Standards

- PMI-2.1 Perform basic benchwork
- PMI-2.2 Demonstrate basic layout procedures
- PMI-2.3 Perform turning operations
- PMI-2.5 Perform basic milling operations
- PMI-2.6 Demonstrate proper grinding wheel safety
- PMI-2.7 Perform surface grinding operations
- PMI-2.8 Perform basic drill press operations
- PMI-2.9 Develop basic CNC programming/operations

Domain – Quality Process Control and Inspection

Core Standard 3 Students analyze processes and finished products to ensure compliance with job specifications.

Standards

- PMI-3.1 Evaluate proper piece part inspection procedures
- PMI-3.2 Recognize and explain control and improvement processes

Domain – General Maintenance

Core Standard 4 Students Integrate preventive maintenance schedules and tasks to ensure safe and accurate equipment upkeep.

Standards

- PMI-4.1 Demonstrate general housekeeping and maintenance tasks
- PMI-4.2 Identify routine preventive maintenance tasks
- PMI-4.3 Recognize tooling maintenance procedures

Domain – Industrial Safety and Environmental Protection

Core Standard 5 Students apply concepts of industrial safety and recycling to meet industry and governmental environmental protection regulations and standards.

Standards

- PMI-5.1 Evaluate machine operations and material handling safety procedures
- PMI-5.2 Assess hazardous materials handling and disposal processes
- PMI-5.3 Implement recycling of materials and environmental protection measures

Domain – Written and Oral Communications

Core Standard 6 Students communicate using appropriate subject terminology and definitions both in writing and speaking to ensure the accurate reflection of ideas.

Standards

- PMI-6.1 Demonstrate technical reading skills
- PMI-6.2 Develop writing skills for a technical field
- PMI-6.3 Utilize proper speaking in an industrial environment
- PMI-6.4 Exercise effective listening skills

Domain – Mathematics

Core Standard 7 Students select appropriate mathematical functions to perform various machining

processes.

Standards

- PMI-7.1 Implement basic geometry applications in product design
- PMI-7.2 Select appropriate algebraic operations in product design and creation process
- PMI-7.3 Perform trigonometry functions as appropriate
- PMI-7.4 Study applied statistics

Domain – Engineering Drawings and Sketches

Core Standard 8 Students draw sketches and interpret engineering drawings to determine product dimensions and specifications.

Standards

- PMI-8.1 Examine and comprehend standard orthographic prints
- PMI-8.2 Examine and comprehend standard GD&T orthographic prints
- PMI-8.3 Identify and utilize GD&T datum, symbology and tolerances

Domain – Measurement

Core Standard 9 Students validate the proper use of precision measuring and layout instruments and inspection processes to ensure the quality of the finished product.

Standards

- PMI-9.1 Differentiate between basic measuring instruments
- PMI-9.2 Compare various precision measuring instruments
- PMI-9.3 Recognize basic surface plate instruments
- PMI-9.4 Convert metric measurements and dimensions to inches

Domain – Metalworking Theory

Core Standard 10 Students examine material properties and tooling processes to create finished products.

Standards

- PMI-10.1 Explain cutting theory concepts
- PMI-10.2 Identify appropriate tooling processes per product specifications
- PMI-10.3 Evaluate the properties of various metals
- PMI-10.4 Select appropriate machine tools for job completion
- PMI-10.5 Examine the role of cutting fluids and coolants in the machining process

Domain – Personal/Professional Development and Employment Relations

Core Standard 11 Students establish a personal and professional development plan for their career.

Standards

- PMI-11.1 Create a continuing education plan that identifies the need for further education and training options
- PMI-11.2 Prepare for exams leading to certifications recognized by business and industry
- PMI-11.3 Develop skills needed to enter the workforce
- PMI-11.4 Evaluate resources that keep workers current in the career field
- PMI-11.5 Demonstrate skills and attitudes needed for lifelong learning
- PMI-11.6 Apply effective money management strategies
- PMI-11.7 Adopt career planning skills

- PMI-11.8 Create/complete job applications
- PMI-11.9 Construct successful resumes and cover letters
- PMI-11.10 Demonstrate effective interviewing skills
- PMI-11.11 Build teamwork and interpersonal relations
- PMI-11.12 Construct organizational structures and work relations
- PMI-11.13 Develop employment relations
- PMI-11.14 Comprehend and practice acceptable work place ethics and behavior
- PMI-11.15 Accept group participation and teamwork
- PMI-11.16 Evolve personal group leadership skills

Process Standards

Common Core Literacy Standards for Technical Subjects

Reading Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Key Ideas and Details

- 11-12.RT.1 Cite specific textual evidence to support analysis of technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- 11-12.RT.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 11-12.RT.3 Follow precisely a complex multistep procedure when performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

- 11-12.RT.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific context relevant to *grades 11-12 texts and topics*.
- 11-12.RT.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- 11-12.RT.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Idea

- 11-12.RT.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- 11-12.RT.8 Evaluate the hypotheses, data, analysis, and conclusions in a technical subject, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

- 11-12.RT.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

- 11-12.RT.10 By the end of grade 12, read and comprehend technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Text Types and Purposes

- 11-12.WT.1 Write arguments focused on *discipline-specific content*.
- 11-12.WT.2 Write informative/explanatory texts, including technical processes.
- 11-12.WT.3 Students will not write narratives in technical subjects. *Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In technical, students must be able to write precise enough descriptions of the step-by-step procedures they use in their technical work that others can replicate them and (possibly) reach the same results.*

Production and Distribution of Writing

- 11-12.WT.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 11-12.WT.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- 11-12.WT.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

- 11-12.WT.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- 11-12.WT.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation
- 11-12.WT.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

- 11-12.WT.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

