

## 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