Precision Machining | Scope & Sequence

Year 1, Semester 1
PM101 - Precision Machining I

District Pre-Assessment

Unit Name: (1) Introduction to Machining (1 week)
● Intro to Machining, Careers in Machining
● Workplace Skills
● Intro to Safety
CTSO Integration (Leadership Skills): Officer Elections, Chapter Meeting
Work-based Learning: Career Exploration
Technical Standard: 1.1-.4, 2.1, 2.2, 2.3

Unit Name: (2) Blueprint Reading (6 weeks)
● Blueprint Symbols
● Dimensioning & Tolerances
● Drawing Views
CTSO Integration (Leadership Skills): Chapter Meeting, Officer Training
Work-based Learning: Guest Speaker
Technical Standard: 4.1-.4, 5.1

Unit Name: (3) Semi-Precision and Precision Measurement (6 weeks)
● Measurement Systems
● Machine Tool Math
● Semi-Precision and Precision Measurement
CTSO Integration (Leadership Skills): Chapter Meeting, Fundraiser
Work-based Learning: Field Trip
Technical Standard: 3.1-.4
Certification: NIMS- Level 1 Measurement, Materials & Safety Exam

Unit Name: (4) Bench Work and Layout (1 week)
● Hand Tools
● Layout Techniques
CTSO Integration (Leadership Skills): Chapter Meeting, SkillsUSA Fall Conference

Work-based Learning: Simulated Lab Experience, Community Projects
Technical Standard: 5.2-.5
Certification: NIMS- Level 1 Job Planning, Bench Work and Layout Exam

Unit Name: (5) Intro to the Drill Press (1 week)
● Drill Speeds & Hand Tapping
● Drilling and Reaming
CTSO Integration (Leadership Skills): Chapter Meeting
Work-based Learning: Simulated Lab Experience, Community Projects
Technical Standard: 5.6, 6.1-.4, 12.1-.6
Certification: NIMS- Level 1 Drill Press Skills Exam

Unit Name: (6) Intro to the Manual Lathe (1 week)
● Identify Parts of the Lathe
● Explain Basic Operation
CTSO Integration (Leadership Skills): Chapter Meeting, Competition Prep
Work-based Learning: Guest Speaker, Simulated Lab Experience, Community Projects
Technical Standard: 7.1, 7.2

Unit Name: (7) Intro to the Manual Mill (1 week)
● Identify Parts of the Lathe
● Explain the Basic Operation
CTSO Integration (Leadership Skills): Chapter Meeting, Competition Prep
Work-based Learning: Simulated Lab Experience, Community Projects
Technical Standard: 8.1, 8.2

Semester Exam

Year 1, Semester 2
PM – 102 Precision Machining II

Unit Name: (8) Work and Tool Holding Devices for the Lathe (1 week)
● Identify Work with Holding Devices
● Identify Tool Holding Devices
● Explain Function and Application

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Unit Name: (9) Machining Operations on the Lathe (8 weeks)
- Demonstrate Turning, Boring and Facing Operations
- Describe Form Cutting
- Off Center Turning
- Indicate the Part

Unit Name: (10) Tools, Tool holding, and Work holding for the Vertical Milling Machine (1 week)
- Identify Work Holding Devices
- Identify Tool Holding Devices
- Explain Function and Application

Unit Name: (11) Vertical Milling Machining Operations (8 weeks)
- Demonstrate End Mill Cutting
- Describe Fly Cutting
- Identify Speeds and Feeds

Unit Name: (12) Indexing on the Manual Milling Machine (3 weeks)
- Setup and Operating the Indexer
- Setup and Operating the Rotary Tables
- Speeds and Feeds
- Safety Review

Unit Name: (13) Precision Grinding Operations (1 week)
- Precision Grinding Machines
- Grinder Components and Functions

Year 2, Semester 1
PM201 - Precision Machining III

Unit Name: (1) Intro to Computer Numerical Control (1 week)
- History of CNC
- G-Code basics
- M Codes
- Machine Controls

Unit Name: (2) CNC Lathe Programming (4 weeks)
- G & M codes for turning
- Program Structure
- Cartesian Coordinate Systems in relation to CNC Lathe
- Tool Compensation
- canned Cycles for the lathe

Unit Name: (3) CNC Turning Operations (4 weeks)
- G and M codes for turning
- Tool Compensation
- Tool paths for the lathe

District Post-Assessment
Work-based Learning: Student-Based Enterprise, Guest Speaker

Technical Standard: 11.1-.4

Certification: OSHA 10

Unit Name: (3) Machining Center Programming (4 weeks)
- G & M codes for milling
- Program Structure
- Cartesian Coordinate Systems in relation to CNC Mill
- Tool Compensation
- Canned Cycles for milling

CTSO Integration (Leadership Skills): Chapter Meeting, SkillsUSA Fall Conference


Work-based Learning: Student-Based Enterprise, Field Trip

Technical Standard: 12.3, 12.4

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Unit Name: (4) Intro to CNC Turning (2 weeks)
- Identify parts of CNC Lathe
- Explain Part Fixturing
- Turning Cycles
- Explain Coordinate Systems

CTSO Integration (Leadership Skills): Chapter Meeting


Work-based Learning: Student-Based Enterprise, Simulated Lab Experience, Community Projects

Technical Standard: 12.1, 12.2

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Unit Name: (5) CNC Lathe Setup & Operation (8 weeks)
- Tooling for the Turning Center
- Tool Setup and Offsets
- Work Location and Geometry Offsets
- Demonstrate Safe Setup and Program Prove-Out Procedures
- Run Parts on CNC Lathe

CTSO Integration (Leadership Skills): Chapter Meeting, Competition Prep


Work-based Learning: Student-Based Enterprise, Guest Speaker

Technical Standard: 11.5., 11.6

Certification: NIMS-CNC Turning Operator and Programming Exam

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Unit Name: (6) Intro to CNC Milling (2 weeks)
- Identify Parts of CNC Mill
- Explain Parts Fixturing
- Milling Cycles
- Explain Coordinate Systems

CTSO Integration (Leadership Skills): Chapter Meeting, Fundraiser, SkillsUSA Regional Conference


Work-based Learning: Student-Based Enterprise, Resume Writing

Technical Standard: 12.1, 12.2

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Unit Name: (7) Machining Center Setup & Operation (8 weeks)
- Machine Center Tooling
- Tool Setup and Tool Length Offsets
- Work Fixture Offsets
- Demonstrate Safe Setup and Program Prove-Out Procedures
- Run Parts on CNC Mill

CTSO Integration (Leadership Skills): Chapter Meeting, Community Service Event, Skills USA Competition Preparation


Work-based Learning: Service Learning, Student-Based Enterprise, Mock Interviews, Guest Speaker

Technical Standard: 12.5, 12.6

Certification: NIMS-CNC Milling Operator and Programming Exam

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Unit Name: (8) Computer-Aided Design/Computer-Aided Manufacturing (9 weeks)
- Wire-Frame, Surface and Solid Model Drawing
- 2D and 3D Toolpath Creation
- Post Processing
- Additive Manufacturing
- 3D Printing

CTSO Integration (Leadership Skills): Chapter Meeting, SkillsUSA State Conference, SkillsUSA National Conference


Work-based Learning: Student-Based Enterprise, Simulated Lab Experience, Community Projects, Guest Speaker

ADE Technical Skills Assessment

Arizona Department of Education (ADE)
Common AZCCR Math Standards (CAMS)
English Language Arts Standards (ELAS)
National Institute for Metalworking Skills (NIMS)