



MANUFACTURING PRE-APPRENTICESHIP



The Pennsylvania College of Technology Manufacturing Pre-Apprenticeship program

is designed to increase awareness of employment opportunities in manufacturing and expand the number of students choosing manufacturing-related career pathways. The program, which runs from August-June and targets students in grades 9-12, prepares individuals with the foundational skills requires to enter a variety of manufacturing occupations. With its alignment to multiple registered apprenticeship programs, this model provides benefits to both the Pre-Apprentices and companies who may ultimately employ them. Pre-Apprentices who successfully complete the program will earn an industry-recognized Manufacturing Technician Level 1 (MT1) certification in addition to a certificate of completion from the College.

A Flexible Model for Any School

The Pre-Apprenticeship program is specifically designed to allow for maximum flexibility. For schools providing little to no instruction in the related topical areas, students will complete a greater number of online modules in order to cover the required training competencies. In schools with manufacturing instructional programs, online modules will be adopted to supplement any areas not adequately covered by existing curriculum. This customization is designed for each school participating in the Pre-Apprenticeship program.



The Pennsylvania College of Technology Pre-Apprenticeship Model



Self-paced online learning modules



Industry-recognized MT1 Certification



Industry-provided project templates



Multiple on-campus lab and assessment days



Project showcase and industry networking event

MANUFACTURING TECHNICIAN LEVEL 1 – TWELVE CRITICAL TECHNICAL SKILLS STANDARDS

Section 1: Mathematics and Measurement

I. MEASUREMENT

1. Use a decimal inch machinist's rule to measure a length.
2. Use a U.S. ruler and tape measure to measure a length.
3. Use a metric ruler.
4. Measure liquids and weights in Metric and U.S. customary units.
5. Convert between common fraction inches and decimal inches.
6. Convert between U.S. customary and Metric units.

II. ALGEBRA FOR MANUFACTURING

1. Perform correct order of operation to simplify mathematical expressions.
2. Generate linear equations with one unknown for situations described in text.
3. Solve simple linear equations with one unknown

III. MATH FOR QUALITY

1. Read and interpret histograms, bar charts, line graphs, and scatter plots.
2. Interpret descriptive statistics: mean, median, mode, and range.
3. Demonstrate qualitative reasoning for situations involving statistical data and probabilities.

Section 2: Spatial Reasoning and Manufacturing Technology

IV. SPATIAL REASONING

1. Visually translate from 2D drawings to 3D images and back.
 - a. Identify different views for given isometric drawing of an object
 - b. Identify the different elements of an object in various views.
2. Predict behavior of visual representations of simple mechanisms

V. MECHANICS

1. Demonstrate qualitative reasoning about mechanical force and systems involving pulleys, levers, and gears.
 - a. Determine mechanical advantage of different systems of pulleys.
 - b. Determine effects of lever configurations on the force required to lift and object.
 - c. Generate different configurations of gears and axels to increase power or speed.

VI. FLUID POWER AND THERMODYNAMICS

1. Generate casual explanations of behavior of (a) simple systems involving changes in pressure, temperature and volume, (b) simple hydraulic/pneumatic devices and (c) principles of heat transfer.
 - a. Predict the effects of changes in pressure on volume and temperature.
 - b. Predict the effects of changes in temperature on volume and pressure.
 - c. Predict the mechanical advantage of simple hydraulic and pneumatic systems.

VII. ELECTRICITY

1. Generate casual explanations of the relationship between electrical and magnetic forces and how electric motors, generators, solenoids, and relay switches behave.
2. Generate casual explanations and predictions of electric circuit behavior involving simple series and parallel circuits containing relays, capacitors, resistors and simple devices such as light bulbs and pumps.

VIII. CHEMISTRY

1. Classify substances as a molecule, element, mixture, or compound; classify changes in substances as chemical reaction, mixture, or physical change; classify and apply characteristics of acids and bases; interpret the periodic chart; and classify methods for separating mixtures (filtration, evaporation, distillation).
2. Explain chemical bonding and structural changes that take place in common chemical reactions and interpret chemical formulas and equations.
3. Polymers: Generate explanations of molecular structural difference and physical characteristics between common types of polymers such as slime, flexi-putty, rubber and plastic bags.

IX. MANUFACTURING PROCESSES AND CONTROLS

1. Generate the Sequence of Operation and a Flow Diagram for production tasks and processes.
2. Generate explanations of how electrical-mechanical controls and sensors operate in simple systems and devices.
3. Create flow charts for models of simple computer controlled systems such as a traffic light or washing machine.

Section 3: Quality and Business Acumen

X. QUALITY AND LEAN MANUFACTURING CONCEPTS

1. Identify descriptions of manufacturing quality and lean production initiatives as examples of value stream mapping, waste eliminations, 5S's, DMAIC (Define, Measure, Analyze, Improve and Control) and Total Productive Maintenance (TPM).
2. Create a process map and value stream map to improve a process or reduce waste.
3. Demonstrate using an industry standard problem solving method, such as DMAIC, for improving production processes.

XI. STATISTICAL PROCESS CONTROL (SPC) CONCEPTS

1. Determine plausible causes of fluctuations in processes based on statistical information (mean, range, & variation patterns).

XII. FINANCIAL LITERACY AND BUSINESS ACUMEN

1. Predict how actions, strategies, and decisions impact the bottom line.
2. Classify examples of common business financial terms.

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Penn College operates on a nondiscriminatory basis.

Penn College is approved by the PA Department of Labor & Industry as a sponsor of apprenticeship programs.