Manufacturing Principles 1

Exam Information

Exam number
621

Items
44

Points
47

Prerequisites
None

Recommended course length
One semester

National Career Cluster
Manufacturing

Science, Technology, Engineering, & Mathematics

Performance standards
N/A

Certificate available
Yes

Description

The Manufacturing Principles 1 industry certification exam assesses learners' understanding of the history and operational structure of industry, lean manufacturing principles, product development, precision measurement, and quality management. The exam emphasizes the interaction of process selection, cost, and overall quality.

Exam Blueprint

Standard	Percentage of exam
1. Safety practices	6%
2. Fundamental habits & skills	9%
3. Technical documents	26%
4. Calibrated equipment	23%
5. Lean manufacturing principles	19%
6. Six sigma principles	17%

Standard 1

Students will follow safety practices

Objective 1 Identify potential safety hazards and follow general laboratory safety practices.

1. Assess workplace conditions with regard to safety and health.
2. Identify potential safety issues and align with relevant safety standards to ensure a safe workplace/jobsite.
3. Locate and understand the use of shop safety equipment.
4. Select appropriate personal protective equipment.

Objective 2 Use safe work practices

1. Use personal protective equipment according to manufacturer rules and regulations.
2. Follow correct procedures when using any hand or power tools.

Objective 3 Complete a basic safety test without errors (100%) before using any tools or shop equipment.

Standard 2

Students will develop and practice fundamental habits and skills required in the 21st century workplace

Objective 1 Demonstrate reliability and compliance with established attendance policies.

1. Understand and practice using a time clock
2. Demonstrate a record of regular, timely attendance
3. Notify supervisors (teachers) when a work shift (class period) will be missed prior to any absences.

Objective 2 Follow established practices and procedures with exactness.

1. Accept personal responsibility for work quality
2. Follow instructions precisely and record data accurately
3. Complete assigned tasks within a timely manner and with a high degree of workmanship.

Objective 3 Work productively as a member of a team.

1. Communicate effectively with other team members using a variety of methods (verbal, written, electronic)
2. Collaborate to solve problems and improve processes
    a. Consider the group's success and not just individual achievement
3. Use time effectively
4. Contribute "value-added work"

Objective 4 Contribute to a culture of safety.

1. Understand and comply with OSHA regulations, FDA regulations, SDS information, and established safety procedures
2. Watch for potential hazards, unsafe or impaired workers, or unsafe procedures

and speak out if they are observed
3. Care for the safety of others
4. Actively participate in improving safety conditions

Objective 5 Maintain a high standard of personal and industrial hygiene.

1. Practice good habits of personal hygiene and dress appropriately
2. Wear the appropriate personal protective equipment
   a. Adopt the habit to “clean as you go”
3. Learn and experience accepted protocols for working in a clean room environment and maintaining a sterile field
4. Guard against Foreign Object Debris (FOD) and particulates from contaminating the workspace or product

Objective 6 Use personal electronic devices appropriately.

1. Maintain a professional tone in all communications
2. Avoid use during work hours and remain focused on the task at hand

Objective 7 Understand the basic organization and respective functions of a typical corporation.

1. Administrative
2. Sales & Marketing
3. Engineering
4. Manufacturing / Production
5. Quality Assurance
6. Accounting

Standard 3

Students will increase their ability to comprehend and correctly interpret technical documents

Objective 1 Read technical documents for understanding.

1. Manufacturing Work Orders
2. Engineering Specifications
3. Standard Operating Procedures (SOPs)
4. Technical Manuals and Instructions

Objective 2 Correctly interpret technical drawings, including:

1. Orthographic projection
2. Basic dimensioning
3. Basic tolerancing (±)
4. General notes

Standard 4

Students will properly select and make accurate measurements with calibrated equipment

Objective 1 Demonstrate the use of applied mathematics.

1. Correctly add and subtract fractions
2. Correctly add and subtract decimals (at least 3 decimal places)
3. Convert fractions to decimals and decimals to fractions
4. Use ratios, proportions, and percentages
5. Practice rounding, estimating, and hand calculations
6. Know and recognize engineering notation
7. Convert between standard and metric units

Objective 2 Demonstrate the proper selection, use, and care of precision measurement equipment typically found in a manufacturing environment.

1. Measuring tape or scale
2. Protractor
3. Pin, block, ball, thread, go-no-go and feeler gauges
4. Calipers and micrometers

Objective 3 Understand the significance of and how to correctly handle calibrated measuring equipment.

Objective 4 Determine whether or not a selection of parts meet specifications.

Objective 5 Understand “traceability”, quality stamps, and an employee’s role in accurately maintaining record of process and part compliance.

Standard 5

Students will be able to describe basic lean manufacturing principles and the appropriate practices to apply in response to specific problems

Objective 1 Research and learn the general history of Lean Manufacturing and its development.

Objective 2 Understand 8 types of waste (“DOWNTIME”).

1. Defects
2. Overproduction
3. Waiting
4. Not utilizing people
5. Transportation
6. Inventory
7. Motion
8. Extra Process

Objective 3 Understand and employ the 5 S's.

1. Sort
2. Set in order
3. Shine
4. Straighten
5. Self-Discipline/Sustain

Objective 4 Understand "value-added work."

1. Value as defined by the customer
2. Is the customer willing to pay for it?
3. Does it change for, fit, or function?
4. Can it be done correctly the first time?

Standard 6

Students will be introduced to the basics of manufacturing using six sigma principles

Objective 1 Research and learn the general history of Six Sigma & Continuous Improvement.

Objective 2 Understand the fundamentals of Six Sigma.

1. DMAIC
   a. Define
   b. Measure
   c. Analyze
   d. Improve
   e. Control
2. Defining a process
3. Basic Metrics
   a. Defects per Unit (DPU)
   b. Defects per Million Opportunities (DPMO)
   c. First Time Yield (FTY)
   d. Rolled Throughput Yield (RTY)
   e. Cycle Time
4. Pareto Analysis (80:20 rule)
5. Critical Quality Characteristics (CTQs)
6. Cost of Poor Quality (COPQ)

Objective 3 Develop basic skills in failure analysis.

1. Create and use Cause and Effect / Fishbone diagrams
2. Conduct "5 Whys" root failure analysis