



## Job Ready Assessment Blueprint

# Pre-Engineering/Engineering Technology



Test Code: 2475 / Version: 01

Copyright 2007

## General Assessment Information

### Blueprint Contents

General Assessment Information	Sample Written Items
Written Assessment Information	Performance Assessment Information
Specific Competencies Covered in the Test	Sample Performance Job

**Test Type:** The Pre-Engineering/Engineering Technology assessment is included in NOCTI's Job Ready assessment battery. Job Ready assessments measure technical skills at the occupational level and include items which gauge factual and theoretical knowledge. Job Ready assessments typically offer both a written and performance component and can be used at the secondary and post-secondary levels. Job Ready assessments can be delivered in an online or paper/pencil format.

**Revision Team:** The assessment content is based on input from secondary, post-secondary, and business/industry representatives from the states of Kentucky, New York, Pennsylvania, and Virginia.



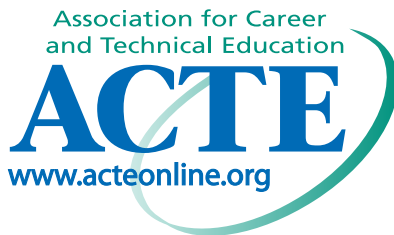
15.9999- Engineering Technologies/Technicians, Other



Career Cluster 15 - Science, Technology, Engineering, and Mathematics



17-3027.00 Mechanical Engineering Technicians



The Association for Career and Technical Education (ACTE), the leading professional organization for career and technical educators, commends all students who participate in career and technical education programs and choose to validate their educational attainment through rigorous technical assessments. In taking this assessment you demonstrate to your school, your parents and guardians, your future employers and yourself that you understand the concepts and knowledge needed to succeed in the workplace. Good Luck!



In the lower division baccalaureate/associate degree category, 3 semester hours in Introduction to Engineering or Engineering Technology

## Written Assessment

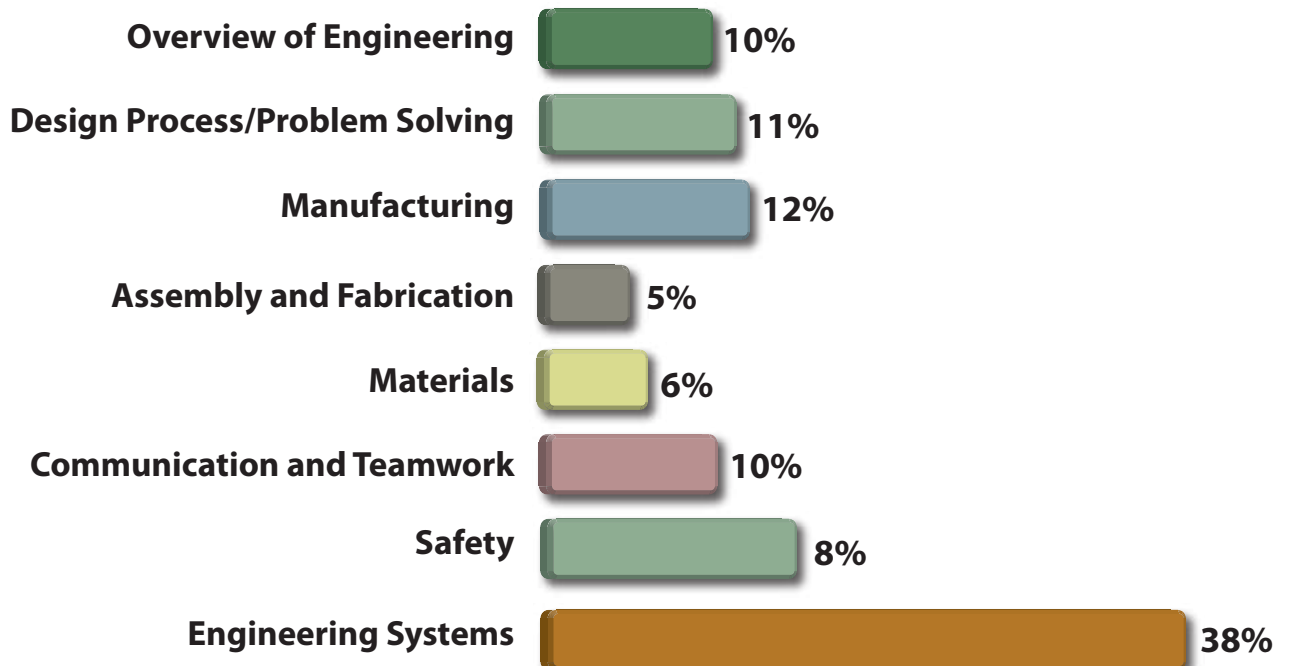
NOCTI written assessments consist of questions to measure an individual's factual theoretical knowledge.

**Administration Time:** 3 hours

**Number of Questions:** 202

**Number of Sessions:** This assessment may be administered in one, two, or three sessions.

### Areas Covered



## Specific Competencies and Skills Tested in this Assessment

### Overview of Engineering

- Describe major engineering fields
- Identify functions an engineer performs
- Describe education required to be an engineer
- Identify ethics related to engineering situations
- Describe relationships between the engineer and other technical personnel
- Identify the progression of the engineering field

### Design Process/Problem Solving

- Identify principles of the problem solving process
- Outline the steps in the design process
- Translate word problems into mathematical statements
- Analyze solutions, identifying strengths and weaknesses
- Develop details of a solution
- Develop, test, and redesign prototypes

### Manufacturing

- Explain components of set up, machining, casting, molding, welding, and finishing
- Identify and use common hand tools
- Identify and properly use fasteners
- Estimate and measure the size of objects using SI and US units
- Explain the role of quality control in manufacturing
- Measure with precision tools and instruments

(Continued on the following page)

## Specific Competencies and Skills (continued)

### Assembly and Fabrication

- Explain the role of quality control in assembly and fabrication
- Identify situations of supplying and outsourcing
- Identify the order and methodology of the assembly process

### Materials

- Identify common materials
- Compare and contrast physical properties of materials
- Select correct materials for specific functions
- Test materials for specific characteristics

### Communication and Teamwork

- Read and understand design documentation and technical manuals
- Write technical reports
- Make an oral presentation
- Interpret critical aspects and/or types of engineering drawings and plans
- Express data in tables, graphs, and charts
- Contribute to a team project



(Continued on the following page)

## Specific Competencies and Skills (continued)

### Safety

- Exhibit knowledge of appropriate personal safety procedures
- Describe the role of OSHA in the technical workplace
- Describe and use safety equipment
- Describe the function of safety devices

### Engineering Systems

- Solve problems using vectoring, predict resultant forces
- Demonstrate the effect of resistance
- Apply Ohm's Law, Watt's Law, and Kirchoff's Law
- Identify series, parallel, and combination circuits
- Apply knowledge of AC and DC systems
- Identify what causes resistance in a fluid system
- Apply knowledge of hydraulic and pneumatic systems
- Identify the three ways heat is transferred
- Explain the difference between Celsius and Fahrenheit scales
- Describe heat conductors and insulators
- Solve thermal problems using appropriate units
- Identify the six simple machines and their applications
- Solve problems using appropriate units in engineering systems
- Identify the uses and types of inductors and capacitors
- Use appropriate electrical units to solve problems
- Draw a circuit diagram and lay out the circuit
- Identify the difference between analog and digital signals
- Identify direction of heat flow given differences in temperature
- Understand the use of insulation to minimize heat flow
- Identify electrical components and their functions

## Sample Questions

**Which of the following is a method of prototype testing?**

- A. destructive
- B. visualization
- C. brainstorming
- D. manufacturing

**What is the approximate piston area for a 5-inch diameter cylinder?**

- A. 3.93 square inches
- B. 15.7 square inches
- C. 19.6 square inches
- D. 78.5 square inches

**A protractor can measure**

- A. volume
- B. angles
- C. polygons
- D. area

**Which of the following is a ferrous metal?**

- A. aluminum
- B. copper
- C. magnesium
- D. mild steel

**Winds blowing west at a speed of 10 to 15 mph are called**

- A. scalars
- B. vectors
- C. directions
- D. magnitudes

*(Continued on the following page)*

### Sample Questions (continued)

**The relationship of force, pressure, and piston area in an air cylinder is represented by**

- A.  $\text{pressure} = (\text{force}) \times (\text{area})$
- B.  $\text{force} = (\text{pressure}) \times (\text{area})$
- C.  $\text{area} = (\text{pressure}) \times (\text{force})$
- D.  $\text{force} = (\text{pressure}) / (\text{area})$

**One creative method of increasing the number of engineering design alternatives is**

- A. computer-aided design
- B. computer-aided manufacturing
- C. brainstorming
- D. optimizing

**Undercutting is a condition that generally occurs when the**

- A. welding current is too high
- B. welding current is too low
- C. welding travel speed is too slow
- D. arc length is too short

**A design drawing with a completed and signed title block is a**

- A. graphic contract
- B. living document
- C. scheduling plan
- D. maintenance list

**The third color band on a resistor defines the**

- A. multiplier
- B. tolerance
- C. significant figure
- D. voltage rating



## Performance Assessment

NOCTI performance assessments allow individuals to demonstrate their acquired skills by completing actual jobs using the tools, materials, machines, and equipment related to the technical area.

**Administration Time:** 3 hours and 30 minutes

**Number of Jobs:** 2

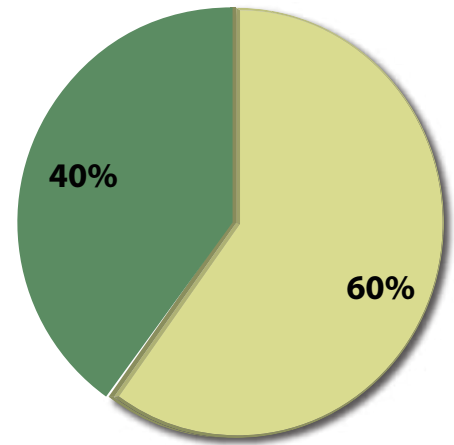
### Areas Covered:

#### 60% Technical Writing

Participants will identify a problem or need, evaluate alternatives, design a solution, test the solution, analyze the results, draw conclusions and format the report correctly.

#### 40% Oral Presentation

Participants will give a presentation within the allotted time, with correct number of slides following the technical report and a slide with a chart, a question and answer period, with a good overall presentation.



## Sample Job

### Oral Presentation

**Maximum Time:** 1 hour

**Participant Activity:** The participant will prepare and present an oral presentation on the previously prepared technical report.

