

Mechatronics-Level 1

General Assessment Information

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Test Type: The Mechatronics-Level 1 industry-based credential 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 Illinois, Ohio, South Carolina, Tennessee, and Virginia.



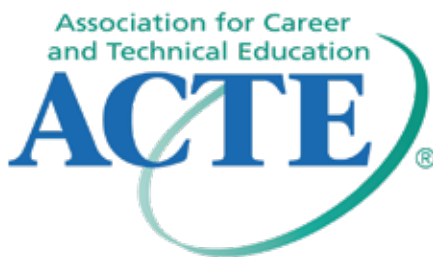
14.4201- Mechatronics, Robotics,
and Automation Engineering



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



17-2199.05 - Mechatronics Engineers



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!



NATIONAL COLLEGE CREDIT RECOMMENDATION SERVICE
University of the State of New York - Regents Research Fund

In the lower division baccalaureate/associate degree category, 3 semester hours in Engineering (Control, Mechanical, Electrical, or Computer) or General Technology.

Written Assessment

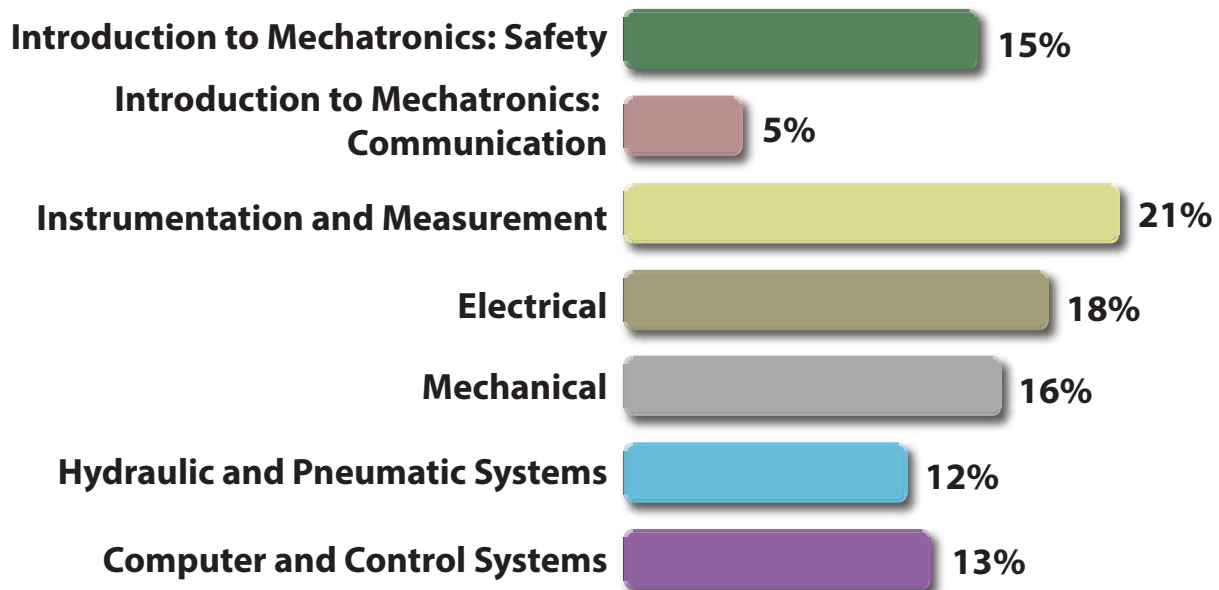
NOCTI written assessments consist of questions to measure an individual’s factual theoretical knowledge.

Administration Time: 3 hours

Number of Questions: 209

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

Areas Covered



Specific Standards and Competencies Included in this Assessment

Introduction to Mechatronics: Safety

- Follow workplace electrical safety guidelines (NEC) lock-out/tag-out)
- Identify safety components of workplace (e.g., fire protection, emergency exit plans, emergency routes, and confined spaces)
- Wear appropriate personal protective (PPE) safety equipment (NFPA 70-E)
- Interpret major parts of MSDS sheets
- Perform machine guarding procedures
- Administer first aid
- Properly use hand and power tools
- Perform proper HazCom operations (perform proper hazardous waste disposal)
- Follow workplace mechanical safety guidelines (e.g., energy isolation, potential energy)
- Use proper techniques to navigate workplace (walking and working surfaces)

Introduction to Mechatronics: Communication

- Use operating documents and work instructions
- Interpret equipment test, operating, and failure logs
- Verbalize instructions and communicate problems



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Please note, due to a shift in OSHA terminology, that any references to “Material Safety Data Sheets (MSDS)” will be changed to “Safety Data Sheets (SDS)” during the next scheduled revision.

Specific Standards and Competencies (continued)

Instrumentation and Measurement

- Properly use a voltmeter, multimeter, and ammeter
- Properly use a torque wrench
- Read various gauges
- Describe and identify sensors of various functions (e.g., pressure, flow)
- Describe and identify transducers (thermocouples, photoelectric cell)
- Read and convert a standard and metric ruler
- Measure input and output impedance
- Calibrate electrical equipment
- Identify reed sensors
- Diagnose electrical equipment
- Measure angles, square, level, and plumb
- Determine appropriate measurement tool
- Demonstrate proper care and handling of measurement instruments

Electrical

- Apply circuit terminology
- Describe relationships between circuit components
- Describe types of switches (e.g., limit, potentiometer)
- Read resistor color bands
- Use Ohm's and Kirchoff's Laws for voltage and current (AC and DC)
- Understand role of magnetism and electromagnetism
- Describe series and parallel circuits
- Interpret wiring, schematics, and ladder diagrams
- Analyze and troubleshoot circuits
- Describe microprocessors
- Select proper wire size for a circuit's (NEC) load
- Describe power supply (transformers, inverters, and generators – 24 volts)

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Specific Standards and Competencies (continued)

Mechanical

- Differentiate between different types of materials and their properties (plastic, stainless)
- Understand vibration and noise control (ergonomics)
- Understand mechanical valve operation (shut-off)
- Understand bearing properties and uses
- Perform shaft alignment, gear reduction
- Perform speed calculations on gears, sprockets, and pulleys
- Apply gear ratios and direction
- Select type of lubrication
- Read and interpret drawings of mechanical parts (sectional and scale views)
- Describe drive systems (chains and belts; conveyor system)
- Describe proper mounting of components (using proper fasteners)

Hydraulic and Pneumatic Systems

- Differentiate between hydraulic and pneumatic system components
- Identify types of valve (pressure, flow, directional)
- Apply working knowledge of types of cylinders
- Read schematics relating to system components
- Apply Pascal's Law
- Describe hydraulic fluid characteristics
- Identify different hydraulic and pneumatic conductors
- Understand essentials of system filtration

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Specific Standards and Competencies (continued)

Computer and Control Systems

- Identify components of a computer network
- Describe basic functions of PLCs in a system
- Understand truth tables and logic
- Apply basics of CAD
- Understand basics of computer programming
- Download a program to input information into a computer system
- Describe system control and monitoring interfaces
- Identify different types of communication cabling
- Describe wireless versus hardwired systems



Sample Questions

What should be used to feed material into a machine?

- A. joy stick
- B. push stick
- C. your feet
- D. your hands

All hazardous waste container must be

- A. made of clear materials
- B. plastic
- C. labeled
- D. fire proof

A multimeter measures

- A. hertz
- B. impedance and resistance
- C. ohms, amps, and volts
- D. watts

The basic unit of electrical charge is the

- A. coulomb
- B. joule
- C. volt
- D. watt

The most important part of bearing maintenance is

- A. good seals
- B. proper lubrication
- C. even loads
- D. periodic cleaning

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Sample Questions (continued)

HazCom classifies all paint, concrete, and wood dust as _____ materials.

- A. hazardous
- B. common
- C. inexpensive
- D. nonhazardous

How is force measured when tightening bolts using a torque wrench?

- A. inch feet
- B. kilowatts
- C. Newton meter
- D. ohms

The best component for adjusting the sensitivity of an electrical sensor is a

- A. potentiometer
- B. resistor
- C. capacitor
- D. diode

With respect to DC resistive parallel circuits, all of the _____ leaving the source will return to the source.

- A. volts
- B. amps
- C. ohms
- D. watts

A worker should lubricate equipment

- A. when there is spare time
- B. only when necessary
- C. at regular intervals
- D. when the equipment is going to be used