

# Massachusetts CTE Teacher Testing Program Electronics Content Outline

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## Written and Performance Exam General Overview

- The intent of this exam is to assess the candidate's ability to teach the skills found in the Massachusetts Technical Education Framework.
- The written exam is a state-developed exam aligned to the frameworks which can be accessed [here](#). The performance exam is a NOCTI-developed teacher test and has been determined by DESE to align to the state frameworks.
- Many questions and tasks require a synthesis of knowledge based on experience in the field and may not be found in any book.
- Use this exam outline and the Massachusetts Technical Education Framework to focus your preparation for the exams.
- Candidates are encouraged to prepare for their written exam by reviewing textbooks and reference material which have been listed as part of this exam outline. These resources can be found using online search tools, online vendors, and websites.

## Written Exam

- Number of Questions: 100
- Administration Time: 3 hours
- Passing Score: 70.0%
- Administration Method: Remote Proctored Online Testing Session

## Written Exam Content Coverage

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### **10% Health and Safety**

- Health and Safety Regulations, Practices and Work Habits
- OSHA, Right-to-Know, SDS
- PPE, LOTO, ESD
- Ergonomics

### **2% Fundamentals of Electronic Circuit Assembly**

- Component Symbols
- Printed Circuit Boards (PCBs)
- Parts List

### **15% Theory and Applications of DC**

- Electronic Circuit Laws
- Electronic Circuit Theories

### **15% Theory and Applications of AC**

- Calculations in AC Circuits
- Measurements in AC Circuits

- 12%**    ***Theory and Application of Analog Electronics***
- Analyze Semiconductors
  - Construct and Test Semiconductor Circuits
  - Evaluate Operational Amplifier Circuits
- 22%**    ***Theory and Application of Digital Electronics***
- Calculations in Digital Circuits
  - Identify and Apply Digital Principles
  - Construct and Test Digital Circuits
- 7%**    ***Applied Engineering***
- Engineering Concepts
  - Electric Motors
- 2%**    ***Software Applications***
- PCB Fabrication
- 5%**    ***Applied Electronic Devices in a Manufacturing Environment***
- Electronic Measuring Equipment
  - Oscilloscope, Waveforms
  - Tools Used to Build Electronic Projects
- 10%**    ***Advanced Standards***
- Computer Electronics
  - Computer Sectors, Memory
  - Databases/Bandwidth
  - Optical Electronics
  - Audio and Video Systems

### Written Exam Reference Materials (Reference Current Edition)

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- **Introduction to Electronics** by Earl Gates (Cengage Learning)
- **Electronics Principles and Applications** by Charles A. Schuler (McGraw-Hill)
- **Digital Electronics** by Roger Tokheim (Glencoe)
- **Digital Systems Principles and Applications** by Ronald J. Tocci (Prentice Hall)
- **Electronics Technicians Association** ([www.eta-i.org](http://www.eta-i.org))

### Materials Needed for the Written Exam

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- A four-function calculator is included in the online testing system. No other calculators are permitted.
- Scrap paper and pencil/pen are permitted.

## Written Exam Sample Items

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Each question on the exam consists of one incomplete sentence or question followed by four choices. Some items reference an image or diagram. A few sample items are included below; the correct answer is designated with an asterisk (\*).

The induced voltage in a conductor is directly proportional to the rate at which the conductor cuts the magnetic lines of force is:

- a. Faraday's Law. (\*)
- b. electromagnetic induction.
- c. Lenz's Law.
- d. inductance.

The unit for measuring electrical charge is:

- a. ampere.
- b. Coulomb. (\*)
- c. electron.
- d. current.

### NOCTI Performance Exam

- Administration Time: 3 hours and 15 minutes
- NOCTI Criterion-Referenced Cut Score/Passing Score: 96.9%
- Administration Method: Onsite at a DESE approved Massachusetts Area Testing Center (MATC) location. Candidates must register and schedule their exam session through NOCTI.

### Performance Exam Content Coverage

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**27% De-Soldering and Soldering**

*Safety glasses, selection of components, de-soldering, soldering (re-soldering), component identification, quality of soldering, work area clean up, and time to complete Job 1.*

**23% Power Supply Construction and Circuit Analysis**

*Safety glasses, selection of components, use of tools and equipment, quality of construction, circuit measurements, capacitors installed to X and Y, measure voltages for X and Y with DMM, and time to complete Job 2.*

**18% Op Amp Construction and Analysis**

*Safety glasses, selection of components, use of tools and equipment, measure output voltage with DMM, display input versus output on oscilloscope, gain measurement, and time to complete Job 3.*

**32% Design and Build a Combinational Logic Circuit**

*Develop Boolean expression from truth table, simplification of Boolean expression, draw the gate logic diagram, build/test the designed circuit, time to complete Task 1 of Job 4, time to complete Task 2 of Job 4, time to complete Task 3 of Job 4, and time to complete Task 4 of Job 4.*

## Performance Exam Requirements

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### Candidate Supplied

Candidates must bring all appropriate Personal Protective Equipment (PPE), attire/uniform, and any other safety items as is routinely expected to be used by an employee in the related industry. If the candidate does not bring what is needed to safely complete all jobs on the exam as required in the workplace, the testing session will need to be rescheduled at the candidate's expense.

### Site Supplied

Additional equipment and supplies needed to complete the jobs on the performance test will be provided by the testing site.

## Performance Exam Site Requirements

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Testing sites may have individual requirements based on location and any relevant and current guidance from the Center for Disease Control and Prevention (CDC).