Maryland CTE Programs of Study

Electrical I (2025)

GENERAL REQUIREMENTS. This course is recommended for students in Grades 10-12. 1

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INTRODUCTION 2

A **Career and Technical Education (CTE) instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.** 2.A

B **The Construction Career Cluster prepares students for careers in designing, planning, and building sustainable infrastructure. This field includes architects, engineers, construction managers, and skilled trades professionals.** 2.B

C **The Electrical program prepares students for careers in residential, commercial, and industrial electrical systems. Through a comprehensive curriculum aligned with industry standards, students develop foundational construction skills and specialized electrical knowledge while earning industry-recognized certifications. The program emphasizes hands-on learning, safety protocols, and real-world applications, preparing graduates for immediate entry into the electrical trade or advanced technical education.** 2.C

D **Electrical I builds upon core construction knowledge to introduce students to fundamental electrical theory and hands-on applications in the electrical trade. Students explore electrical safety protocols, circuit theory, and residential wiring practices while developing proficiency in electrical tool and test equipment operation. The course emphasizes proper interpretation of the National Electrical Code® and electrical construction documentation. Through hands-on practice, students learn essential skills including conduit bending, electrical box installation, and cable and conductor installation. Upon successful completion, students may be prepared for NCCER Electrical Level 1 (or similar industry related) certification, establishing their foundation for advancement in the electrical trade.** 2.D

E **Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.** 2.E

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Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a

cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland. 2.F

KNOWLEDGE AND SKILLS 3

A The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to: 3.A

1. Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work. 3.A.1
2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn. 3.A.2
3. Employ effective reading, writing, and technical documentation skills. 3.A.3
4. Solve problems using critical thinking techniques and structured troubleshooting methodologies. 3.A.4
5. Demonstrate leadership skills and collaborate effectively as a team member. 3.A.5
6. Implement safety procedures, including proper handling of hardware and following OSHA guidelines. 3.A.6
7. Exhibit an understanding of legal and ethical responsibilities in the construction field, following applicable laws and best practices for safety. 3.A.7
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting. 3.A.8

B The student identifies various career pathways in the Electrical field. The student is expected to: 3.B

1. Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles as an Electrician or in the electrical field. 3.B.1
2. Create a professional resume and portfolio that reflect skills, projects, certifications, and recommendations. 3.B.2
3. Demonstrate effective interview skills for roles in the electrical field. 3.B.3

C The student identifies the issues associated with electrical hazards found on a jobsite. The student is expected to: 3.C

1. Demonstrate safe working procedures in a construction environment. 3.C.1
2. Explain the purpose of the Occupational Safety and Health Administration (OSHA) and how it promotes safety on the job. 3.C.2
3. Identify electrical hazards and how to avoid or minimize them in the workplace. 3.C.3
4. Explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection. 3.C.4

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D **The student integrates core academic skills into electrical construction practices. The student is expected to:** 3.D

1. Demonstrate the use of clear communication techniques, both written and verbal, that are consistent with industry standards. 3.D.1
2. Apply mathematical concepts such as calculating with whole numbers, fractions, and decimals; measuring lengths and converting between measurement systems; calculating geometric areas and volumes; applying Ohm's law and Kirchhoff's laws to solve for circuit values; and performing electrical load calculations for residential systems including demand factors and service sizing. 3.D.2
3. Use scientific principles include atomic structure and its relationship to electricity, magnetism in electrical devices, principles of conductors and insulators, electrical theory (including Ohm's Law and Kirchhoff's Laws), effects of electrical shock on the human body, and principles of circuit behavior in series and parallel configurations. 3.D.3

E **The student explores career opportunities and responsibilities in the electrical industry. The student is expected to:** 3.E

1. Analyze various sectors and trade options within the electrical industry. 3.E.1
2. Evaluate the roles and responsibilities of employees and employers in electrical related fields. 3.E.2

F **The student implements job site and electrical safety protocols and procedures. The student is expected to:** 3.F

1. Analyze electrical hazards and their effects on human safety. 3.F.1
2. Evaluate how personal protective equipment (PPE) mitigates injury risk. 3.F.2
3. Research standards and regulations related to electrical safety. 3.F.3
4. Apply appropriate safety requirements for various electrical hazards. 3.F.4
5. Understand appropriate lift operating techniques. 3.F.5
6. Understand safety requirements (OSHA) for trenching and excavation as they apply to electrical work. 3.F.6
7. Demonstrate proper utility location identification techniques and the role of Miss Utility. 3.F.7

G **The student understands fundamental electrical principles and circuit analysis. The student is expected to:** 3.G

1. Explain atomic structure and its relationship to electrical principles. 3.G.1
2. Calculate circuit values using appropriate electrical equations. 3.G.2
3. Interpret simple schematic diagrams of electrical circuits. 3.G.3
4. Solve for various values in resistive circuits. 3.G.4
5. Demonstrate the application of Ohm's and Kirchhoff's laws in different circuit types. 3.G.5

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H **The student implements proper installation of electrical boxes and enclosures. The student is expected to:** 3.H

1. Calculate appropriate sizing and demonstrate installation of outlet boxes. 3.H.1
2. Calculate appropriate sizing and demonstrate installation of pull and junction boxes. 3.H.2
3. Demonstrate proper navigation and application of the NEC® to this content. 3.H.3

I **The student demonstrates conduit installation and modification techniques. The student is expected to:** 3.I

1. Demonstrate methods for cutting, reaming, and threading conduit. 3.I.1
2. Apply appropriate methods for hand bending EMT and PVC conduit. 3.I.2

J **The student implements various electrical containment systems. The student is expected to:** 3.J

1. Demonstrate proper selection and installation of raceway systems. 3.J.1
2. Select and install appropriate fasteners and anchors for raceway systems. 3.J.2
3. Demonstrate selection and installation of wireways and specialty raceways. 3.J.3
4. Apply proper techniques for cable tray selection and installation. 3.J.4
5. Execute proper handling and storage procedures for raceways. 3.J.5
6. Demonstrate proper navigation and application of the NEC® to this content. 3.J.6

K **The student demonstrates knowledge of electrical conductors and their applications. The student is expected to:** 3.K

1. Analyze conductors based on wire size, insulation, and application requirements. 3.K.1
2. Demonstrate proper installation techniques for conductors in conduit systems. 3.K.2
3. Demonstrate proper navigation and application of the NEC® to this content. 3.K.3

L **The student interprets electrical construction documentation. The student is expected to:** 3.L

1. Describe the types of drawings usually included in a set of plans and list the information found on each type. 3.L.1
2. Identify the different types of lines used on construction drawings. 3.L.2
3. Identify selected architectural symbols commonly used to represent materials on plans. 3.L.3
4. Identify selected electrical, mechanical, and plumbing symbols commonly used on plans. 3.L.4
5. Identify selected abbreviations commonly used on plans. 3.L.5

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6 Read and interpret plans, elevations, schedules, sections, dimensions/measurements and other details contained in basic construction drawings. 3.L.6

7 State the purpose of written specifications. 3.L.7

8 Identify and describe the parts of a specification. 3.L.8

9 Demonstrate and/or describe how to create a materials list based on drawings/specifications. 3.L.9

M The student demonstrates residential electrical installation techniques. The student is expected to: 3.M

1 Calculate appropriate electric service size for residential applications. 3.M.1

2 Apply proper grounding requirements for residential electrical systems. 3.M.2

3 Demonstrate installation techniques for service-entrance equipment. 3.M.3

4 Select appropriate wiring methods for various residential applications. 3.M.4

5 Design and size branch circuits and outlet boxes. 3.M.5

6 Select and install various wiring devices according to specifications. 3.M.6

7 Demonstrate proper navigation and application of the NEC® to this content. 3.M.7

N The student utilizes electrical testing equipment safely and effectively. The student is expected to: 3.N

1 Evaluate different types of electrical test equipment for specific applications. 3.N.1

2 Apply appropriate safety requirements based on meter category ratings. 3.N.2