Maryland CTE Programs of Study

Electrical II (2025)

GENERAL REQUIREMENTS. This course is recommended for students in Grades 11-12. 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 Systems Technology 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 II extends students' foundational electrical skills into advanced principles and industry practices. Learners develop and apply knowledge of alternating current theory, power calculations, and transformer operations. The course emphasizes lighting systems, including selection and installation of luminaires, and advances conduit bending proficiency—covering both manual and powered methods in accordance with NEC® requirements. Students master the sizing and installation of pull and junction boxes, cable tray systems, cable pulling techniques, and secure conductor terminations and splices. Hands-on exploration of grounding, bonding, and control systems—including contactors, relays, and lighting controls— prepares students for real-world scenarios and troubleshooting. Successful completion begins preparation for NCCER Electrical Level 2 (or comparable) certification and progression into apprenticeship or advanced coursework 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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F **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

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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

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 understands alternating current principles and applications. The student is expected to: 3.E

1 Analyze AC waveform characteristics and behavior. 3.E.1

2 Calculate unknown values in AC circuits using appropriate formulas. 3.E.2

3 Solve power calculation problems in AC circuits. 3.E.3

4 Evaluate transformer operation and characteristics. 3.E.4

F The student analyzes electric lighting principles and applications. The student is expected to: 3.F

1 Explain the relationship between human vision and artificial lighting. 3.F.1

2 Evaluate and select appropriate light sources and luminaires for specific applications. 3.F.2

3 Demonstrate proper selection and installation of luminaires for various settings. 3.F.3

G The student performs conduit bending operations. The student is expected to: 3.G

1 Apply NEC® requirements for conduit bends. 3.G.1

2 Calculate proper bend distances using mathematical formulas. 3.G.2

3 Demonstrate proper use of mechanical benders. 3.G.3

4 Operate electric and hydraulic conduit benders safely and effectively. 3.G.4

5 Install PVC conduit according to specifications. 3.G.5

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The student installs and sizes pull and junction boxes. The student is expected to: 3.H

1 Identify appropriate boxes and fittings for specific applications. 3.H.1

2 Calculate proper sizing for pull and junction boxes. 3.H.2

3 Select and install specialty enclosures correctly. 3.H.3

I The student demonstrates proper conductor installation techniques. The student is expected to: 3.I

1 Install cable in conduit systems according to specifications. 3.I.1

2 Set up and perform high-force cable pulls safely. 3.I.2

3 Evaluate and observe cable limitations during pulling operations. 3.I.3

J The student understands cable tray systems and installations. The student is expected to: 3.J

1 Identify and select appropriate cable tray components. 3.J.1

2 Calculate cable tray load requirements. 3.J.2

3 Determine proper cable tray fill limitations. 3.J.3

K The student performs conductor terminations and splices. The student is expected to: 3.K

1 Demonstrate proper conductor stripping and training techniques. 3.K.1

2 Make secure and reliable wire connections. 3.K.2

3 Apply proper insulation methods for electrical connections. 3.K.3

L The student demonstrates knowledge of grounding and bonding principles. The student is expected to: 3.L

1 Apply grounding requirements for various applications. 3.L.1

2 Install service grounding according to approved methods. 3.L.2

3 Size and select appropriate equipment grounding conductors and components. 3.L.3

4 Demonstrate proper bonding of service equipment. 3.L.4

5 Install grounding and bonding for separately derived systems. 3.L.5

6 Perform effective ground testing procedures. 3.L.6

M The student demonstrates understanding of control systems. The student is expected to: 3.M

1 Wire and test magnetic and mechanically held contactors. 3.M.1

2 Troubleshoot various types of relay systems. 3.M.2

3 Install and configure low-voltage lighting control systems. 3.M.3