Maryland CTE Programs of Study

Non-Structural Repair & Welding (2025)

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

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

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 Supply Chain & Transportation Career Cluster encompasses the transfer, coordination, and management of goods from production to consumption, ensuring efficient movement across various modes of transportation including air, ground, and water, as well as Collision Repair and Refinishing of the respective transport modes. This Cluster integrates logistics and distribution networks to facilitate the seamless flow of materials and products, playing a crucial role in global commerce, economic development, and community health.** 2.B

C **The Automotive Collision and Repair program prepares students for careers in the automotive collision industry through a four-course sequence combining hands-on skills with technical knowledge. Students progress from foundational safety and repair principles through advanced structural analysis and modern vehicle systems. Throughout the program, students master essential skills including metal straightening, welding, refinishing techniques, and structural repairs while gaining experience with industry-standard tools and equipment. Students learn to analyze damage, write estimates, repair panels, apply primers and paints, and work with advanced driver assistance systems (ADAS). The program aligns with ASE Education Foundation Entry-Level certifications: Non-structural Analysis & Damage Repair, Painting & Refinishing, and Structural Analysis & Damage Repair. Additionally, systems who use the I-CAR PDP-EE Curriculum may also earn ICAR Platinum ProLevel 1 credentials. These certifications position students for immediate employment in collision centers, dealerships, or custom shops, or continued education in advanced automotive programs.** 2.C

D **The Non-Structural Repair and Welding course focuses on advanced panel repair techniques and welding procedures, directly aligning with the ASE Entry-Level Certification in Non- structural Analysis & Damage Repair. Students will become**

Skip to main content

familiar with GMAW (MIG) welding, plasma cutting, and adhesive bonding while developing proficiency in complex panel repair procedures. The course covers moveable glass operations, trim removal and installation, and quality control measures. Students learn to perform repairs on both metal and plastic components, gaining hands-on experience with panel alignment, fastener selection, and structural tolerances. Special emphasis is placed on developing technical skills through practical application while maintaining industry-standard quality control procedures. 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

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, Collision Repair and Refinishing 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, Collision Repair and Refinishing 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 automotive 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 Automotive Collision Repair and Refinishing field. The student is expected to:** 3.B

1. Develop a career plan that includes the necessary education, certifications, job skills, experience, and progression steps for specific roles as a technician or in the Automotive Collision Repair and Refinishing field. 3.B.1
2. Create a professional resume and portfolio that reflects skills, projects, certifications, and recommendations. 3.B.2

Skip to main content

3 Demonstrate effective interview skills for roles in the Automotive Collision Repair and Refinishing field. 3.B.3

C The student identifies the issues associated with Automotive Collision Repair and Refinishing hazards found on a jobsite. The student is expected to: 3.C

1 Demonstrate safe working procedures in a lab/shop 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 Automotive Collision Repair and Refinishing related workplace hazards and how to avoid or minimize them. 3.C.3

4 Explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, automotive lift safety, and other equipment related safety protocols. 3.C.4

D The student integrates core academic skills into Automotive Collision Repair and Refinishing 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 geometric principles in panel alignment and structural measurements. Students utilize trigonometric functions for angular measurements in welding positions, apply Pythagorean theorem in panel alignment, and perform advanced ratio calculations for material thickness and penetration depth. The coursework incorporates basic statistical concepts for quality control measurements, including mean, tolerance ranges, and standard deviation. Students develop proficiency in three-dimensional measurements, spatial relationships, and advanced estimation techniques for multi-stage repair procedures. 3.D.2

3 Explore metallurgical principles and thermodynamics in welding processes. Students examine crystalline structures of metals, phase transformations during heating and cooling, and the physics of heat transfer through conduction and radiation. The chemistry of metal oxidation, gas shielding principles in welding, and electrochemical reactions in corrosion protection are explored in depth. Students apply gas laws and pressure relationships in plasma cutting operations, while studying electrical theory in welding operations, including current flow, resistance, and circuit characteristics. Material science expands to include stress/strain relationships, work hardening phenomena, and metal fatigue principles. 3.D.3

E The student demonstrates proficiency in welding and joining techniques. The student is expected to: 3.E

1 Perform GMAW (MIG) welding procedures on various materials. [WE-A2-5, NS-E7] 3.E.1

2 Execute proper plasma cutting techniques. [WE-A16] 3.E.2

3 Apply adhesive bonding procedures according to manufacturer specifications. [NS-E8-10] 3.E.3

Demonstrate squeeze-type resistance spot welding techniques. [WE-A17] 3.E.4

Skip to main content

5 Evaluate weld quality using destructive and non-destructive testing methods. [WE-A13-14] 3.E.5

F The student masters advanced panel repair techniques. The student is expected to: 3.F

1 Perform complex metal finishing procedures. [NS-C1-3] 3.F.1

2 Apply advanced body filling techniques. [NS-C6-8] 3.F.2

3 Execute comprehensive plastic repair procedures. [NS-E3-6] 3.F.3

4 Demonstrate proper panel alignment methods. [NS-B4-7] 3.F.4

5 Implement quality control measures throughout repair processes. [NS-B11-12] 3.F.5

G The student performs trim and hardware operations. The student is expected to: 3.G

1 Remove and install moveable glass components. [NS-D1-2] 3.G.1

2 Execute interior trim removal and installation. [NS-A4] 3.G.2

3 Perform exterior trim removal and installation. [NS-A3] 3.G.3

4 Demonstrate proper panel adjustment techniques. [NS-B1-3] 3.G.4

5 Apply appropriate fastening methods for different components. [NS-B8-10] 3.G.5

H The student implements quality control procedures. The student is expected to: 3.H

1 Utilize proper inspection techniques. [DAECS-A1-5] 3.H.1

2 Perform accurate measurements using precision instruments. [SA-A1] 3.H.2

3 Create detailed documentation of repair procedures. [DAECS-B1-5] 3.H.3

4 Analyze repair quality using industry standards. [NS-B11-12] 3.H.4

5 Develop solutions for common repair issues. [NS-B13-15] 3.H.5