Silicon Valley
Career Technical Education

Auto Body Refinishing

Course Outline

Course Description

This 519 hour NATEF approved course is designed to teach students the basics of auto body refinishing and painting. Instruction includes theory and techniques related to the process of surface preparation, painting, and detailing. Students will be prepared for entry-level employment in the auto body refinishing industry such as auto painter, detailer and auto painter assistant. Students will also be prepared for continuing their education after graduation.

Course Details

Length of Program and Academic Credits Earned: Year-long 3 hour course = 519 hours total (~261/semester) 30 total credits (15/semester): ● 30 non-a–g elective credits (15/semester) **Pre-Requisites:** ● High School Junior or Senior, or 16 years or older	**CTE Classification:** ● **Industry Sector:** Transportation ● **Industry Pathway:** Structural Repair and Refinishing ● **CA Basic Education Data System (CBEDS) Code:** 5666
Work Based Learning: Job shadowing and internships may be available with good standing in class	**Certifications & State Tests:** ● SVCTE Certificate of Completion awarded with "C" or better average for both semesters. ● Online Certifications optional (3M, I-CAR, S/P2)

Possible Education & Career Pathways

College & Career Pathways:	Career Opportunities	O*NET Codes
Post-Secondary: Students with a high school diploma and having successfully completed this course have a number of entry-level career opportunities, as well as continuing their education.	• Automotive Body and Related Repairers • Helpers--Installation, Maintenance, and Repair Workers • Cleaners of Vehicles and Equipment • Painters, Transportation Equipment	49-3021.00 49-9098.00 53-7061.00 51-9122.00
Community College Majors & Degrees/Technical School: • Collision Repair • AA or AS Automotive	• Automotive Body and Related Repairers • Helpers--Installation, Maintenance, and Repair Workers • Cleaners of Vehicles and Equipment • Painters, Transportation Equipment	49-3021.00 49-9098.00 53-7061.00 51-9122.00

Ongoing Unit: Career Readiness & Professionalism — 50 hours

Students will develop personal and professional skills in the classroom that will transfer to the workplace.

- Time management and organization
- Interpersonal skills
- Work with a variety of technology
- Creative thinking and problem solving
- Job search skills including: resume, job applications and effective interview skills

Standards Alignments:

CCSS: RLST 11-12.3; **WS** 11-12.1, 11-12.4, 11-12.6

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignment:** Student will participate in mock interviews with industry professionals, peers and instructors to increase their communication, interpersonal and employability skill-set.	2.1, 2.2, 2.3, 2.4, 2.5	

Assessment: career guidance center staff observation and feedback, self-reflection, peer feedback		
✓ **Key Assignment:** Students will prepare portfolio including a cover letter and resume through workshop, self and peer editing, and teacher instruction and demonstration. **Assessment:** portfolio review, self reflection, editing checklists	2.4, 11.5	
✓ **Key Assignment:** Students will have the opportunity to participate in a Skills USA Competition. In preparation for competition, students will fund raise, attend meetings, meet all requirements and dates and prepare for competition. At competition, students will compete in categories such as: brakes, alignment, engines, electrical, engine performance. **Assessment:** deadlines met, instructor observation of competition performance	1.0, 2.1, 2.2, 2.3, 2.4, 2.5, 3.0, 4.1, 5.0, 9.0, 10.0, 11.5	

Ongoing Unit: Safety and Environmental Inspection — 30 hours

Students will learn how to identify safety hazards in the lab and learn how to maintain a safe work environment according to federal, state, and local regulations.

- Environmental laws
- Proper waste disposal and recycling
- Introduction to tools safety
- Vehicle safety
- MSDS (materials safety data sheet
- safety glasses and other protection equipment

Standards Alignments:

CCSS: LS 11-12.1**; RLST** 11-12.3, 11-12.10; **WS** 11-12.4
NGSS: ESS 3.B, 3.C

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignment:** Using a checklist provided by the instructor aligning with EPA standards, students will individually explore the lab looking for potential safety violations in PPE, storage and open chemical containers, followed by student suggested improvements and corrective actions in written form. **Assessment:** teacher observation, sign-off sheet	6.1, 6.2, 6.3, 6.4 6.5, 6.6	B 1.2, B 1.3, B 1.4, B 1.5, B 2.1
✓ **Key Assignment:** Students will participate in an online safety course (S/P2) which consists of a series of online training, videos and quizzes related to safety in the auto body field. After	10.1, 10.2, 11.2	B 1.2, B 1.3, B 1.4, B 1.5, B 2.1

successful completion of the online course, students will receive a certificate acknowledging their achievement. **Assessment:** online multiple choice quiz		

Unit 1: Estimating and Damage Analysis — 55 hours

Students will explore and learn terminology related to estimating damage, calculating repair costs and estimating labor time.

- Identify and record vehicle options, including trim level, paint code, transmissions accessories and modifications
- Estimate labor value for operations requiring judgement
- Select and price aftermarket parts, verify availability, compatibility, and condition
- Determine labor value, prices, charges, allowances, or fees for non-included operations and miscellaneous items

Standards Alignments:

CCSS: LS 11-12.1; **RLST** 11-12.3, 11-12.10; **WS** 11-12.4, 11-12.6
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignment:** Using a damaged classroom vehicle and diagram of an automobile, students will individually work to locate and identify all outer panels of a vehicle (bumper, grill, hood, fenders, cowl, windshield, doors, roof, sail panel, quarter panel, trunk lid, rear panel, rear bumper, head and taillights). **Assessment:** quiz on panel ID, observation	4.1, 4.3, 6.0	B 5.2, B 5.3
✓ **Key Assignment:** Instructor will use all-writer marker on a vehicle to simulate damage. Students will analyze teacher comments and determine the correct procedure to initiate repair. Using the estimating guide and teacher provided checklist, they will calculate labor hours, operating procedures, determine parts costs and write a complete estimate. **Assessment:** written estimate, calculation checks, estimating guide, observation,	4.1, 4.5, 5.0, 6.0, 7.4, 7.7, 9.3, 9.4, 10.2, 10.4, 11.1, 11.2,	B 5.2

Unit 2: Surface Preparation — 203 hours

Students will explore surface preparation of modern and older vehicles, metals and plastic parts.

- Types of finish
- Surface condition
- Film thickness
- Strip paint to bare substrate (paint removal)
- Sand and featheredge paint surface
- Mix primers, primer surfacer, primer sealers and etch primers
- Apply two-component finishing filler to minor surface imperfections
- Metal part identification
- determine the materials needed, preparation, and refinishing procedures

Standards Alignments:

CCSS: LS 11-12.1; **RLST** 11-12.3, 11-12.10; **WS** 11-12.4, 11-12.6
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; **PS** 1.B, 2.C; **CC** 2, 3, 7

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignment:** Students will use a multi-sensory approach to identity imperfections on a body surface, determine the correct repair procedures and document the sequence of repair including which tools would be best to complete the job. **Assessment:** visual inspection, peer feedback, self reflect, written documentation	5.0, 6.0, 10.0	B 1.4
✓ **Key Assignment:** Students will accurately calculate proportions and measure paint products using mixing sticks, cups and scales. Student will read the mixing instructions, determine the mixing ratio, amount of product to mix, and apply to a variety of auto parts using a spray gun. **Assessment:** pair share, observation, quiz	5.0, 6.0, 10.0	B 1.2, B 1.5, B 9.4
✓ **Key Assignment:** Students will feather edge using a DA sander while properly controlling the sander speed and angle while sanding in the correct position with the contour of the surface of the panel. Students will demonstrate their skill on various body panels and vehicles. **Assessment:** observation, self-assessment, reflect	5.0, 6.0, 10.0	B 2.0
✓ **Key Assignment:** Students will analyze damaged body parts and panels using visual and physical inspection. Students will access the damage and determine the sequence, procedures and proper documentation of their repair plan. **Assessment:** observation, self-assessment, reflect	5.0, 6.0, 10.0	B 9.2

Unit 3: Spray Gun — 65 hours

While working on shop vehicles in shop lab students will learn spray gun operation and paint techniques.

- Spray gun parts and terminology
- Spray gun techniques
- Spray gun maintenance

Standards Alignments:

CCSS: RLST 11-12.3; **WS** 11-12.4, 11-12.6; **G-CO**.1
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; **PS** 1.B; **CC** 2

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignment:** Students will identify all spray gun parts and their function. Student wills verbally define and explain the spray gun operation, correctly identify all parts and their function in a clear and concise manner to the instructor. **Assessment:** pair share, oral questioning, test	2.4, 2.5, 4.1, 5.4, 6.0,	B 1.4, B 2.0, B 4.2
✓ **Key Assignment:** Students will research and properly apply industry standard paint products and procedures to different types of substrates (plastic, metal, aluminum) by fanning the gun, determining gun distance, proper leg and feet angles and proper position of air hos. **Assessment:** observation, self-assessment, pair share, test	4.1, 5.0, 6.0,	B 1.0, B 1.1, B 1.2, B 1.3, B 1.4, B 1.5, B 2.1, B 5.0

Unit 4: Paint, Matching, and Applying — 66 hours

Students will explore mixing paint using proportions, tinting, and paint application.

- Mix, stir, reduce, catalyze/activate, and strain refinish materials
- Apply finish using appropriate spray techniques (gun arc, angle, distance, travel speed)
- Apply basecoat/clearcoat for panel blending and overall refinishing
- Refinish plastic parts
- Tint colors using formula to achieve a blendable match

Standards Alignments:
CCSS: RLST 11-12.3; **G-CO**.1
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; **PS** 1.B; **ETS** 1. A, 1. B,1. C, 2.A; **CC** 2

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignment:** Students will mix a variety of paint additives (hardeners, reducers) using proportions, mixing cups and measuring sticks to accurately measure the amount of product. **Assessment:** pair share, self-assessment, test	4.1, 5.0, 6.0	B 1.1, B 1.2, B 1.3, B 1.4, B 1.5, B 3.1 B 3.2, B 3.4, B 6.1
✓ **Key Assignment:** Students will use a variety of spray gun techniques while considering gun angle, distance from panel, spray pattern and air pressure. Students will demonstrate proper gun operation, gun position and correct stance in accordance with industry standards. **Assessment:** observation, pair share, test	4.0, 5.0, 6.0	B 2.1, B 2.2, B 5.0,
✓ **Key Assignment:** Using color charts, color theory and formulas, students will match or tint colors to pre-existing body panel color by using an undamaged portion of the vehicle as a control sample. **Assessment:** observation, pair share,	4.0, 5.0, 6.0,	B 1.4, B 1.5, B 3.1, B 3.2, B 5.0

Unit 5: Vehicle Detailing — 50 hours

Students will explore polishing and buffing techniques. Vehicle washing, waxing, and final detail.

- Sand, buff and polish fresh or existing finish to remove defects as required
- Clean interior, exterior, glass and chrome, polish wheels and detail trim panels
- Perform vehicle clean-up
- Complete quality control using a checklist

Standards Alignments:
CCSS: RLST 11-12.3,11-12.10
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; **PS** 1.B; **CC** 2

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignment:** Using a polisher, rubbing and polishing compounds, degreasers, window cleaners, sealants and hand-waxes, students will wash, polish and wax vehicles inside and out using techniques needed for professional detailing such as: buffing, polishing, and hand-waxing while removing a variety of tar, bugs, grease, and oils. **Assessment:** checklist, rubric, visual inspection, teacher observation	4.0, 5.0, 6.0	B 1.1, B 1.2, B 1.4, B 2.1, B 2.2, B 3.2
✓ **Key Assignment:** Using a step-chart and industry standard manuals, students will sand, polish and restore faded and oxidized headlights from a variety of vehicles using a restoration kit to restore them to factory condition. **Assessment:** visual inspection, step-chart, rubric	5.0, 6.0	B 1.2, B 1.3, B 1.4, B 1.5, B 2.1, B 2.2, B 3.2, B 5.1, B 5.2, B 5.3, B 9.5
✓ **Key Assignment:** Students will polish and clean chrome to its original shine and lustre by using a buffer and various chrome products. **Assessment:** checklist, rubric, visual inspection, teacher observation	5.0, 6.0	B 1.2, B 1.3, B 1.4, B 1.5, B 2.1, B 2.2, B 3.2, B 5.1, B 5.2, B 5.3, B 9.5

Instructional Materials

Textbook:

Autobody Repair Technology 6th edition

James E Duffy – Delmar Learning© 2016

ISBN: 978-1133702856

Standards Assessed in this Course

CTE Anchor Standards:

1.0 Academics: Academics standards are aligned to pathways; see below.

2.0 Communications: Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0 Career Planning and Management: Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0 Technology: Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.

5.0 Problem Solving and Critical Thinking: Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

6.0 Health and Safety: Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.

7.0 Responsibility and Flexibility: Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.

8.0 Ethics and Legal Responsibilities: Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork: Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.

10.0 Technical Knowledge and Skills: Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.

Transportation Sector — Structural Repair and Refinishing Pathway Standards:

B1.0 Students understand the value and necessity of practicing personal and occupational safety and the environmental effects of collision repair and refinishing practices:

B1.1 Understand industry environmental conservation practices and their applications.

B1.2 Practice the safe handling and storage of chemicals and hazardous wastes as required by the Occupational Safety and Health Administration, Air Resources Board, Air Quality Management Districts, and other regulatory agencies.

B1.3 Understand the generation of waste products and other environmentally destructive substances.

B1.4 Use appropriate materials and repair technologies.

B1.5 Understand the environmental implications of using new and emerging materials, resources, and technologies.

B1.6	Understand the safety practices applied when servicing vehicle-body electronics and other vehicle systems.
B2.0	**Students understand the safe and appropriate use of tools, equipment, and work processes:**
B2.1	Understand how certain tools and equipment are used to perform maintenance and repair operations.
B2.2	Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating and direct-current applications, fluid/hydraulic and air/pneumatic systems).
B3.0	**Students understand and apply measurement systems and the mathematical functions necessary to perform required fabrication, maintenance, and operation procedures:**
B3.1	Understand industry-standard measurement scales, devices, and systems used to perform design, fabrication, diagnostic, maintenance, and repair procedures.
B3.2	Use technical vocabulary, technical reports and manuals, electronic systems, and related technical data resources, as appropriate, to determine repairs and estimates.
B3.3	Understand the different types of welding and heat processes used in repair processes and procedures.
B3.4	Understand the mathematical functions associated with collision repair and refinishing.
B4.0	**Students understand scientific principles in relation to chemical, mechanical, and physical functions and in relation to industry and manufacturer standards:**
B4.1	Understand the principles of mechanical, electrical, hydraulic, and pneumatic power in relation to collision repair and refinishing.
B4.2	Understand the physical and chemical characteristics of metals, plastics, and other materials.
B4.3	Understand the principles of electricity and electronics.
B4.4	Know the basic terms, characteristics, and concepts of physical and chemical processes.
B4.5	Understand body and frame construction.
B4.6	Understand the importance of calibration processes, systems, and techniques in using various measurement and testing devices.
B5.0	**Students perform and document repair procedures in accordance with manufacturer recommendations and industry standards:**
B5.1	Understand the recommended procedures and practices of various manufacturers.
B5.2	Document repair procedures accurately, as required by the Bureau of Automotive Repair and other regulatory agencies.
B5.3	Use reference books and materials, technical service bulletins, and other related documents to determine repairs and rate of pay.
B6.0	**Students understand basic business practices:**
B6.1	Understand work-related systems.
B6.2	Know the laws and regulations applicable to the recordkeeping and handling of hazardous materials.
B6.3	Understand the importance of and procedures for maintaining accurate records.
B6.4	Understand the concept and application of accepted ethical business practices.
B6.5	Understand the concept and application of acceptable customer relations services.
B7.0	**Students understand structural and nonstructural analysis and damage repair:**

B7.1	Understand how to perform frame inspection and repair.
B7.2	Know applications, installations, and removal of fixed and moveable glass and hardware.
B7.3	Know how to perform the principles of metal welding and cutting.
B7.4	Understand and know how to prepare and analyze vehicles for repair.
B7.5	Know how to perform outer body panel repairs, replacements, and adjustments.
B7.6	Understand and know how to prepare vehicles for metal finishing and body filling.
B8.0	**Students understand mechanical and electrical components in relation to industry and manufacturer standards:**
B8.1	Understand how to perform steering and suspension analysis and repairs.
B8.2	Know how to perform electrical repairs.
B8.3	Know how to perform brake analysis and repairs.
B8.4	Know how to perform heating, air conditioning, and cooling system repairs.
B8.5	Understand the operation of drivetrain, fuel, intake, and exhaust systems.
B8.6	Understand the operation of restraint systems.
B9.0	**Students understand the concepts, principles, and practices of painting and refinishing:**
B9.1	Understand how to identify, use, and repair plastics and adhesives.
B9.2	Know how to prepare surfaces for painting and finishing.
B9.3	Understand the operation of spray guns and related equipment.
B9.4	Know how to mix, match, and apply paint.
B9.5	Understand the causes and cures of paint defects.
B9.6	Understand how to prepare vehicles for final detail.

Common Core State Standards

Language Standards – LS (Standard Area, Grade Level, Standard #)

LS 11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Reading Standards for Literacy in Science and Technical Subjects – RLST (Standard Area, Grade Level, Standard #)

RLST 11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

RLST 11-12.10 By the end of grade 12 read and comprehend science/technical texts in the grades text complexity band independently and proficiently.

Writing Standards – WS (Standard Area, Grade Level, Standard #)

WS 11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WS 11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Geometry – G-CO – Congruence

G-CO. 1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

Next Generation Science Standards

Scientific and Engineering Practices – SEP

SEP 1 Asking questions (for science) and defining problems (for engineering)
SEP 2 Developing and using models
SEP 3 Planning and carrying out investigations
SEP 4 Analyzing and interpreting data
SEP 5 Using mathematics and computational thinking
SEP 6 Constructing explanations (for science)

Disciplinary Core Ideas

ETS 1: Engineering Design
ETS 1.A: Defining and Delimiting an Engineering Problem
ETS 1.B: Developing Possible Solutions
ETS 1.C: Optimizing the Design Solution
ETS 2.A: Interdependence of Science, Engineering, and Technology
ESS3.B: Natural Hazards
ESS3.C: Human Impacts on Earth Systems

Crosscutting Concept – CC

CC 2 Cause and effect: Mechanism and explanation
CC 3 Scale, proportion, and quantity
CC 7 Stability and change

and designing solutions (for engineering) SEP 7 Engaging in argument from evidence SEP 8 Obtaining, evaluating, and communicating information	PS1.B: Chemical Reactions PS2.C: Stability and Instability in Physical Systems