2011 Mississippi Curriculum Framework

Postsecondary Collision Repair Technology
(Program CIP: 47.0603 – Autobody/Collision and Repair Technology/Technician)

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Standards in this document are based on information from the following organizations:

Automotive Service Excellence/National Automotive Technicians Education Foundation
Reprinted with permission from ASE/NATEF–2009 Collision Repair & Refinish Standards (Painting and Refinishing, Non-Structural and Structural Analysis and Damage Repair, Mechanical & Electrical Components)
101 Blue Seal Drive, Suite 101, Leesburg, VA 20175

Related Academic Standards
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Preface

Collision Repair Technology Research Synopsis

Information listed at the end of each course was considered during the revision process. The Automotive Service Excellence Web site (ASE) and the National Automotive Technicians Education Foundation Web site (NATEF) were especially useful in providing insight into trends and issues in the field. These references are suggested for use by instructors and students during the study of the topics outlined.

Industry advisory team members from colleges throughout the state were asked to give input related to changes to be made to the curriculum framework. Specific comments related to soft skills needed in this program include a positive attitude, being at work every day and on time, and having reading and writing skills to complete work orders and other forms related to the automotive field. Occupational-specific skills stated include knowledge of fundamentals, identification of basic parts, operation, and troubleshooting. Safety practices emphasized include practicing all automotive technician safety rules and wearing the proper safety equipment.

Needs of the Future Workforce

Nationally collision repair jobs will experience very little growth, 4%. On the other hand, collision repair jobs are expected to have average growth, 9%, between 2010 and 2010 (EMSI, 2010). The number of vehicles on the road is also expected to increase. This will increase the demand for collision repair technicians as well as an increasing reliance on technology that will produce new opportunities for technicians and mechanics with knowledge and expertise with specific materials and vehicular systems. Other openings will be in the form of replacement jobs as experienced technicians retire and move to different jobs. Competition will be keen for those seeking entry-level employment.

Collision Repair Technology Employment Projections and Earnings

<table>
<thead>
<tr>
<th>Region</th>
<th>2010 Jobs</th>
<th>2020 Jobs</th>
<th>Change</th>
<th>% Change</th>
<th>Openings</th>
<th>2010 Median Hourly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Total</td>
<td>1,626</td>
<td>1,765</td>
<td>139</td>
<td>9%</td>
<td>637</td>
<td>$15.03</td>
</tr>
<tr>
<td>National Total</td>
<td>159,258</td>
<td>165,800</td>
<td>6,542</td>
<td>4%</td>
<td>54,322</td>
<td>$18.10</td>
</tr>
</tbody>
</table>

Curriculum

The following national standards were referenced in each course of the curriculum:

- CTB/McGraw-Hill LLC *Tests of Adult Basic Education, forms 7 and 8* Academic Standards
- 21st Century Skills
- NATEF- 2009 Collision Repair Program Standards

Industry and instructor comments, along with current research, were considered by the curriculum revision team during the revision process; and changes were made as needed and appropriate. Many of the skills and topics noted in the research were already included in the curriculum framework. Specific changes made to the curriculum at the of the curriculum revision meeting included:

- Competencies and objectives were reviewed to ensure accuracy and appropriateness.
• Specific additions or deletions to content were related to updating from the 2009 NATEF Standards to the 2009 NATEF Standards
• The Recommended Tools and Equipment list was updated to reflect the tool list for NATEF program certification.

Assessment
Students will be assessed using the Collision Repair Technology MS-CPAS2 test. The MS-CPAS2 blueprint can be found at http://www.rcu.msstate.edu/. All students will test after year one of their program. A second test covering the second year material will be administered to AAS track students upon completion of their program. If there are questions regarding assessment of this program, please contact the Transportation Instructional Design Specialist at the Research and Curriculum Unit at 662.325.2510.

There is no alternate assessment at this time.

Professional Learning
It is suggested that instructors participate in professional learning related to the following concepts:

• How to use the program Blackboard site
• Differentiated instruction – To learn more about differentiated instruction, please go to http://www.paec.org/teacher2teacher/additional_subjects.html, and click on Differentiated Instruction. Work through this online course, and review the additional resources.

Program Exceptions
No program exceptions exist at this time.

Articulation
Articulation credit from Secondary Collision Repair Technician to Postsecondary Collision Repair Technology will be awarded beginning upon implementation of this curriculum by the college. Courses to be articulated include Refinishing I (ABT 1314) with the stipulation of passing the MS-CPAS2 according to State Board for Community and Junior Colleges (MCCB) guidelines

<table>
<thead>
<tr>
<th>Articulated Secondary Course</th>
<th>Articulated Postsecondary Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>[S] Collision Repair Technology (CIP: 47.0603)</td>
<td>ABT 1314 – Refinishing I</td>
</tr>
</tbody>
</table>

Statewide Guidelines on Articulated Credit

Eligibility
• To be eligible for articulated credit, a student must do the following:
  o Complete the articulated Secondary Career Program.
  o Score 80% or higher on the Mississippi Career Planning and Assessment System (MS CPAS) in his or her secondary program of study.
To be awarded articulated credit, a student must do the following:
  o Complete an application for articulated credit at the community or junior college.
  o Enroll in the community or junior college within 18 months of graduation.
  o Successfully complete 12 non-developmental career/technical or academic credit hours in the corresponding articulated postsecondary Career-Technical program of study.

How MS CPAS will be documented
  The Research and Curriculum Unit of Mississippi State University will provide the SBCJC a list of all secondary CTE students scoring at or above the 80 percentile for the articulated programs.
  The SBCJC will forward the list of students eligible for articulated credit to the colleges.

Transcripting of Articulated Credit
  Students must complete 12 non-developmental career/technical or academic credit hours in the articulated postsecondary career-technical program of study before the articulated credit is transcripted.
  No grade will be given on the transcript for articulated courses; only hours granted will be transcripted (thus resulting in no change in quality points).

Time Limit
  MS CPAS scores will be accepted to demonstrate competencies for up to 18 months after high school graduation.

Cost
  No costs will be assessed on hours earned through articulated credit.
Foreword

As the world economy continues to evolve, businesses and industries must adopt new practices and processes in order to survive. Quality and cost control, work teams and participatory management, and an infusion of technology are transforming the way people work and do business. Employees are now expected to read, write, and communicate effectively; think creatively, solve problems, and make decisions; and interact with each other and the technologies in the workplace. Career-technical programs must also adopt these practices in order to provide graduates who can enter and advance in the changing work world.

The curriculum framework in this document reflects these changes in the workplace and a number of other factors that impact local career-technical programs. Federal and state legislation calls for articulation between high school and community college programs, integration of academic and career skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment. National skills standards, developed by industry groups and sponsored by the U.S. Department of Education and Labor, provide career and technical educators with the expectations of employers across the United States. All of these factors are reflected in the framework found in this document.

Referenced throughout the courses of the curriculum are the 21st Century Skills, which were developed by the Partnership for 21st Century Skills, a group of business and education organizations concerned about the gap between the knowledge and skills learned in school and those needed in communities and the workplace. A portion of the 21st Century Skills addresses learning skills needed in the 21st century, including information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. Another important aspect of learning and working in the 21st century involves technology skills. The International Society for Technology in Education, developer of the National Educational Technology Standards (NETS), was a strategic partner in the Partnership for 21st Century Skills. Each postsecondary program of instruction consists of a program description and a suggested sequence of courses that focus on the development of occupational competencies. The MS-CPAS2 blueprints are based upon the suggested course sequences to allow for year 1 and year 2 assessments for all exit options. Please refer to the blueprint online. Each career-technical course in this sequence has been written using a common format, which includes the following components:

- **Course Name** – A common name that will be used by all community and junior colleges in reporting students
- **Course Abbreviation** – A common abbreviation that will be used by all community and junior colleges in reporting students
- **Classification** – Courses may be classified as the following:
  - Career-technical core – A required career-technical course for all students
  - Area of concentration (AOC) core – A course required in an area of concentration of a cluster of programs
  - Career-technical elective – An elective career-technical course
  - Related academic course – An academic course that provides academic skills and knowledge directly related to the program area
• Academic core – An academic course that is required as part of the requirements for an associate’s degree

• Description – A short narrative that includes the major purpose(s) of the course and the recommended number of hours of lecture and laboratory activities to be conducted each week during a regular semester

• Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course

• Corequisites – A listing of courses that may be taken while enrolled in the course

• Competencies and Suggested Objectives – A listing of the competencies (major concepts and performances) and the suggested student objectives that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

• The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
  o Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
  o Activities that develop a higher level of mastery on the existing competencies and suggested objectives
  o Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
  o Activities that include integration of academic and career–technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career–technical programs
  o Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas

• Sequencing of the course within a program is left to the discretion of the local district. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors.

• Programs that offer an Associate of Applied Science degree must include a minimum 15-semester-credit-hour academic core. Specific courses to be taken within this core are to be determined by the local district. Minimum academic core courses are as follows:
  o 3 semester credit hours (sch) Math/Science Elective
  o 3 semester credit hours Written Communications Elective
  o 3 semester credit hours Oral Communications Elective
  o 3 semester credit hours Humanities/Fine Arts Elective
- 3 semester credit hours Social/Behavioral Science Elective

It is recommended that courses in the academic core be spaced out over the entire length of the program, so that students complete some academic and career–technical courses each semester. Each community or junior college has the discretion to select the actual courses that are required to meet this academic core requirement.

- Career–technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new competencies and suggested objectives
- Revising or extending the suggested objectives for individual competencies
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

In addition, the curriculum framework as a whole may be customized by doing the following:

- Resequencing courses within the suggested course sequence reflecting the new assessment format
- Developing and adding a new course that meets specific needs of industries and other clients in the community or junior college district (with MCCB approval)
- Utilizing the career technical elective options in many of the curricula to customize programs
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Program Description

Collision Repair Technology is an instructional program designed to prepare students for entry-level into the collision repair and refinishing trade. Upon completion of this program, the students will be prepared for beginning positions as body, frame, and refinish technicians. Students will be provided theory and practical repair and refinish work beginning with basic applications and progressing on to heavy collision repairs requiring major body and frame alignment and panel replacement. The instruction includes all phases necessary to teach collision repair including glass replacement, welding, replacement of hardware and trim items, cosmetic repairs, and structural repairs.

Industry standards referenced are from the 2009 ASE/NATEF Collision Repair & Refinish Standards (Painting and Refinishing, Non-Structural and Structural Analysis and Damage Repair, Mechanical & Electrical Components).
### Postsecondary Collision Repair Technology
#### Suggested Course Sequence*

**Career Certificate**

A One-Year Career Certificate of Collision Repair may be awarded to a student who successfully completes the first year or 28 semester credit hours of required courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collision Welding and Cutting (ABT 1213)</td>
<td>3 sch</td>
</tr>
<tr>
<td>Structural Analysis and Damage Repair I (ABT 1143)</td>
<td>3 sch</td>
</tr>
<tr>
<td>Non-Structural Analysis and Damage Repair I (ABT 1223)</td>
<td>3 sch</td>
</tr>
<tr>
<td>Mechanical and Electrical Components I (ABT 1443)</td>
<td>3 sch</td>
</tr>
<tr>
<td>Refinishing I (ABT 1314)</td>
<td>4 sch</td>
</tr>
<tr>
<td>Structural Analysis and Damage Repair II (ABT 1153)</td>
<td>3 sch</td>
</tr>
<tr>
<td>Non-Structural Analysis and Damage Repair II (ABT 1233)</td>
<td>3 sch</td>
</tr>
<tr>
<td>Mechanical and Electrical Components II (ABT 1453)</td>
<td>3 sch</td>
</tr>
<tr>
<td>Refinishing II (ABT 1323)</td>
<td>12 sch</td>
</tr>
</tbody>
</table>

* Students who lack entry-level skills in math, English, science, and so forth will be provided related studies.
# Suggested Course Sequence*

## Collision Repair Technology

**Technical Certificate**

### FIRST YEAR

<table>
<thead>
<tr>
<th>3 sch</th>
<th>Collision Welding and Cutting (ABT 1213)</th>
<th>3 sch</th>
<th>Structural Analysis and Damage Repair II (ABT 1153)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 sch</td>
<td>Structural Analysis and Damage Repair I (ABT 1143)</td>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair II (ABT 1233)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair I (ABT 1223)</td>
<td>3 sch</td>
<td>Mechanical and Electrical Components II (ABT 1453)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Mechanical and Electrical Components I (ABT 1443)</td>
<td>3 sch</td>
<td>Refinishing II (ABT 1323)</td>
</tr>
<tr>
<td>4 sch</td>
<td>Refinishing I (ABT 1314)</td>
<td>12 sch</td>
<td></td>
</tr>
<tr>
<td><strong>16 sch</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SECOND YEAR

<table>
<thead>
<tr>
<th>3 sch</th>
<th>Structural Analysis and Damage Repair III (ABT 2163)</th>
<th>3 sch</th>
<th>Structural Analysis and Damage Repair IV (ABT 2173)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair III (ABT 2243)</td>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair IV (ABT 2253)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Refinishing III (ABT 2333)</td>
<td>3 sch</td>
<td>Refinishing IV (ABT 2343)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Elective</td>
<td>3 sch</td>
<td>Elective</td>
</tr>
<tr>
<td><strong>12 sch</strong></td>
<td></td>
<td><strong>12 sch</strong></td>
<td></td>
</tr>
</tbody>
</table>

* Students who lack entry-level skills in math, English, science, and so forth will be provided related studies.
APPROVED ELECTIVES†

Other Instructor Approved Elective(s)
Fundamentals of Microcomputer Applications (CPT 1113)
Science and Technology (ATE 1113)
Special Problem in Collision Repair Technology (ABT 291[1-3])
Supervised Work Experience in Collision Repair Technology (ABT 292[1-6])
Work-Based Learning I, II, III, IV, V, and VI [WBL 191(1-3), WBL 192(1-3), WBL 193(1-3),
WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)]
# Suggested Course Sequence*

## Collision Repair Technology

### Associate of Applied Science Degree

**FIRST YEAR**

<table>
<thead>
<tr>
<th>3 sch</th>
<th>Collision Welding and Cutting (ABT 1213)</th>
<th>3 sch</th>
<th>Structural Analysis and Damage Repair II (ABT 1153)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 sch</td>
<td>Structural Analysis and Damage Repair I (ABT 1143)</td>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair II (ABT 1233)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair I (ABT 1223)</td>
<td>3 sch</td>
<td>Mechanical and Electrical Components II (ABT 1453)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Mechanical and Electrical Components I (ABT 1443)</td>
<td>3 sch</td>
<td>Refinishing II (ABT 1323)</td>
</tr>
<tr>
<td>4 sch</td>
<td>Refinishing I (ABT 1314)</td>
<td>3 sch</td>
<td>Math/Science Elective</td>
</tr>
<tr>
<td>3 sch</td>
<td>Written Communications Elective</td>
<td>15 sch</td>
<td></td>
</tr>
</tbody>
</table>

19 sch

**SECOND YEAR**

<table>
<thead>
<tr>
<th>3 sch</th>
<th>Structural Analysis and Damage Repair III (ABT 2163)</th>
<th>3 sch</th>
<th>Structural Analysis and Damage Repair IV (ABT 2173)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair III (ABT 2243)</td>
<td>3 sch</td>
<td>Non-Structural Analysis and Damage Repair IV (ABT 2253)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Refinishing III (ABT 2333)</td>
<td>3 sch</td>
<td>Refinishing IV (ABT 2343)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Elective</td>
<td>3 sch</td>
<td>Elective</td>
</tr>
<tr>
<td>3 sch</td>
<td>Social/Behavioral Science Elective</td>
<td>3 sch</td>
<td>Oral Communications Elective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 sch</td>
<td>Humanities/Fine Arts Elective</td>
</tr>
</tbody>
</table>

15 sch

18 sch

* Students who lack entry-level skills in math, English, science, and so forth will be provided related studies.

** Baseline competencies are taken from the high school Collision Repair Technician program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

## APPROVED ELECTIVES†

- Other instructor approved electives
- Fundamentals of Microcomputer Applications (CPT 1113)
- Science and Technology (ATE 1113)
- Special Problem in Collision Repair Technology (ABT 291[1-3])
Supervised Work Experience in Collision Repair Technology (ABT 292[1-6])
Work-Based Learning I, II, III, IV, V, and VI [WBL 191(1-3), WBL 192(1-3), WBL 193(1-3),
WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)]
Collision Repair Technology Courses

Course Name: Structural Analysis and Damage Repair I

Course Abbreviation: ABT 1143

Classification: Career–Technical Core

Description: A course to provide skills and practice in structural analysis and repair procedures that are used in the collision repair industry. This course also covers the complete inspection and non-structural analysis of damaged vehicles. It is designed to enable the student to determine the conditions and severity of the damage, the repair or replacement of parts, the estimated repair time, and correct use of reference manuals. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>1. Explain and apply procedures for use of collision and reference manuals.</th>
<th>(DOK 1, CRS2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Demonstrate the use of repair manuals and estimating systems crash books, parts books, and flat rate manuals, including computerized systems.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>b. Discuss legal aspects of body repair.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>c. Discuss practices for analyzing damage and estimating repair procedures utilizing manual and computerized systems.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>d. Discuss factors to consider in determining whether to replace or repair a part.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>e. Estimate time required for repair or replacement of parts.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>f. Prepare estimates for various body repair jobs.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>g. Discuss factors to consider in determining whether to repair or “total” a vehicle.</td>
<td>(DOK 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Apply methods of repair, and use tools to rough out and bump out auto panels.</th>
<th>(DOK 2, CRS2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Analyze types of sheet metal damage.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>b. Use hammer and dolly to rough out a panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>c. Use pull rods or slide hammer to rough out a panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>d. Use pry pick to rough out a panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>e. Use a body spoon to rough out a panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>f. Use vacuum cups to rough out a panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>g. Use heat shrinking methods to rough out a panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>h. Use cold shrinking methods to rough out a panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>i. Apply pressure and tension in relation to panel shape and reinforcement.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>j. Repair sheet metal using welded stud repair methods.</td>
<td>(DOK 2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Perform simple sheet metal repairs.</th>
<th>(DOK 2, CRS2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Use body filler to make simple sheet metal repairs.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>b. Use fiberglass to make panel repair.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>c. Use sheet metal patch to make panel repair.</td>
<td>(DOK 2)</td>
</tr>
</tbody>
</table>

STANDARDS
2009 ASE/NATEF Collision Repair & Refinish Standards

CRS2-Structural Analysis and Damage Repair (Welding)

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
M1 Addition of Whole Numbers (no regrouping, regrouping)
M2 Subtraction of Whole Numbers (no regrouping, regrouping)
M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
S3 Structural Unit (root, suffix)

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21st Century Skills

CSS1-21st Century Themes
   CS1 Global Awareness
   CS2 Financial, Economic, Business, and Entrepreneurial Literacy

Postsecondary Collision Repair Technology
CS3  Civic Literacy  
CS4  Health Literacy  
CS5  Environmental Literacy  
CSS2-Learning and Innovation Skills  
CS6  Creativity and Innovation  
CS7  Critical Thinking and Problem Solving  
CS8  Communication and Collaboration  
CSS3-Information, Media and Technology Skills  
CS9  Information Literacy  
CS10  Media Literacy  
CS11  ICT Literacy  
CSS4-Life and Career Skills  
CS12  Flexibility and Adaptability  
CS13  Initiative and Self-Direction  
CS14  Social and Cross-Cultural Skills  
CS15  Productivity and Accountability  
CS16  Leadership and Responsibility  

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Structural Analysis and Damage Repair II

Course Abbreviation: ABT 1153

Classification: Career–Technical Core

Description: This course is a continuation of Structural Analysis and Damage Repair I. This course provides instruction and practice in the removal and reinstallation of glass. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>1. Explore fixed glass practices and procedures. (DOK 1, CRS2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Describe laminated and tempered glass. (DOK 1)</td>
</tr>
<tr>
<td>b. Describe modular and solar glass. (DOK 1)</td>
</tr>
<tr>
<td>c. Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials and techniques. (DOK 1)</td>
</tr>
<tr>
<td>d. Remove and reinstall or replace modular glass using recommended materials. (DOK 1)</td>
</tr>
<tr>
<td>e. Check for water leaks, dust leaks, and wind noise. (DOK 1)</td>
</tr>
</tbody>
</table>

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRS2-Structural Analysis and Damage Repair

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
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M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
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21st Century Skills

CSS1-21st Century Themes
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CS4 Health Literacy
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CSS2-Learning and Innovation Skills
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CSS3-Information, Media and Technology Skills
CS9 Information Literacy
CS10 Media Literacy
CS11 ICT Literacy

CSS4-Life and Career Skills
CS12 Flexibility and Adaptability
CS13 Initiative and Self-Direction
CS14 Social and Cross-Cultural Skills
CS15 Productivity and Accountability
CS16 Leadership and Responsibility
SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Collision Welding and Cutting

Course Abbreviation: ABT 1213

Classification: Career–Technical Core

Description: A course to provide skills and practice in welding and cutting procedures that are used in the collision repair industry. This course also covers the complete inspection and non-structural analysis of damaged vehicles. It is designed to enable the student to determine the conditions and severity of the damage, the repair or replacement of parts, the estimated repair time, and correct use of reference manuals. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

Competencies and Suggested Objectives

1. Explore metal welding and cutting practices and procedures. (DOK 2, CRS2)
   a. Identify weldable and non-weldable substrates used in vehicle construction. (DOK 1)
   b. Weld and cut high-strength steel and other steels. (DOK 1)
   c. Weld and cut aluminum. (DOK 1)
   d. Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation. (DOK 1)
   e. Set up and adjust the GMAW (MIG) welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded. (DOK 1)
   f. Store, handle, and install high-pressure gas cylinders. (DOK 1)
   g. Determine work clamp (ground) location and attach. (DOK 1)
   h. Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions. (DOK 2)
   i. Protect adjacent panels, glass, vehicle interior, and so forth from welding and cutting operations. (DOK 1)
   j. Protect computers and other electronic control modules during welding procedures. (DOK 1)
   k. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp or tack as required. (DOK 1)
   l. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. (DOK 2)
   m. Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. (DOK 2)
   n. Perform the following welds: continuous, plug, butt weld with and without backing, and fillet. (DOK 1)
   o. Perform visual and destructive tests on each weld type. (DOK 1)
   p. Identify the causes of various welding defects; make necessary adjustments. (DOK 3)
   q. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. (DOK 3)
   r. Identify cutting process for different substrates and locations; perform cutting operation. (DOK 1)
   s. Identify different methods of attaching structural components [squeeze type resistance...
spot welding (STRSW), riveting, structural adhesive, and silicon bronze]. (DOK 1)

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRS2-Structural Analysis and Damage Repair (Welding)

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
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M8 Percents
M9 Algebraic Operations
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A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
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L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
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Postsecondary Collision Repair Technology
21st Century Skills

CSS1-21st Century Themes
  CS1 Global Awareness
  CS2 Financial, Economic, Business, and Entrepreneurial Literacy
  CS3 Civic Literacy
  CS4 Health Literacy
  CS5 Environmental Literacy

CSS2-Learning and Innovation Skills
  CS6 Creativity and Innovation
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CSS4-Life and Career Skills
  CS12 Flexibility and Adaptability
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  CS14 Social and Cross-Cultural Skills
  CS15 Productivity and Accountability
  CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


**Videos**


**Web Sites**


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*Postsecondary Collision Repair Technology*
Course Name: Non-Structural Analysis and Damage Repair I

Course Abbreviation: ABT 1223

Classification: Career–Technical Core

Description: A course in the procedures and practices for metal finishing and body filling. This course also covers the complete inspection and non-structural analysis of damaged vehicles. It is designed to enable the student to determine the conditions and severity of the damage, the repair or replacement of parts, the estimated repair time, and correct use of reference manuals. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Explain and apply procedures for use of collision and reference manuals.</td>
<td>(DOK 1, CRN1)</td>
</tr>
<tr>
<td>a. Demonstrate the use of repair manuals and estimating systems crash books, parts books, and flat rate manuals, including computerized systems.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>b. Discuss legal aspects of body repair.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>c. Discuss practices for analyzing damage and estimating repair procedures utilizing manual and computerized systems.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>d. Discuss factors to consider in determining whether to replace or repair a part.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>e. Estimate time required for repair or replacement of parts.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>f. Prepare estimates for various body repair jobs.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>g. Discuss factors to consider in determining whether to repair or “total” a vehicle.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td><strong>2.</strong> Explore and apply metal finishing and body filling principles and practices.</td>
<td>(DOK 2, CRN1)</td>
</tr>
<tr>
<td>a. Remove paint from the damaged area of a body panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>b. Locate and repair surface irregularities on a damaged body panel.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>c. Demonstrate hammer and dolly techniques.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>d. Heat shrink stretched panel areas to proper contour.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>e. Cold shrink stretched panel areas to proper contour.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>f. Mix and apply body filler.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>g. Rough sand body filler to contour; finish sand.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>h. Determine the proper metal finishing techniques for aluminum.</td>
<td>(DOK 3)</td>
</tr>
<tr>
<td>i. Determine proper application of body filler to aluminum.</td>
<td>(DOK 3)</td>
</tr>
</tbody>
</table>

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRN1-Non-Structural Analysis and Damage Repair
Related Academic Standards

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21st Century Skills

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  CS3 Civic Literacy
  CS4 Health Literacy
  CS5 Environmental Literacy
CSS2-Learning and Innovation Skills
  CS6 Creativity and Innovation

Postsecondary Collision Repair Technology
CS7 Critical Thinking and Problem Solving
CS8 Communication and Collaboration
CSS3-Information, Media and Technology Skills
CS9 Information Literacy
CS10 Media Literacy
CS11 ICT Literacy
CSS4-Life and Career Skills
CS12 Flexibility and Adaptability
CS13 Initiative and Self-Direction
CS14 Social and Cross-Cultural Skills
CS15 Productivity and Accountability
CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


**Web Sites**


Course Name: Non-Structural Analysis and Damage Repair II

Course Abbreviation: ABT 1233

Classification: Career–Technical Core

Description: This course is a continuation of Non-Structural Analysis and Damage Repair I. This course provides instruction for preparation principles and practices. (3 sch: 1-hr lecture, 4-hr lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>1. Explore and apply preparation principles and practices. [DOK 2,CRN1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Review damage report, and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan. [DOK 1]</td>
</tr>
<tr>
<td>b. Inspect, remove, store, and replace exterior trim and moldings. [DOK 2]</td>
</tr>
<tr>
<td>c. Inspect, remove, store, and replace interior trim and components. [DOK 2]</td>
</tr>
<tr>
<td>d. Inspect, remove, store, and replace body panels and components that may interfere with or be damaged during repair. [DOK 3]</td>
</tr>
<tr>
<td>e. Inspect, remove, store, and replace vehicle mechanical and electrical components that may interfere with or be damaged during repair. [DOK 3]</td>
</tr>
<tr>
<td>f. Protect panels, glass, parts and other vehicle adjacent to the repair area. [DOK 1]</td>
</tr>
<tr>
<td>g. Soap and water wash entire vehicle for inspection. [DOK 1]</td>
</tr>
<tr>
<td>h. Prepare damaged area using water based and solvent based cleaners. [DOK 2]</td>
</tr>
<tr>
<td>i. Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs. [DOK 2]</td>
</tr>
<tr>
<td>j. Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair. [DOK 2]</td>
</tr>
</tbody>
</table>

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRN1-Non-Structural Analysis and Damage Repair

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
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CS15 Productivity and Accountability
CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Refinishing I

Course Abbreviation: ABT 1314

Classification: Career–Technical Core

Description: A course to provide skills and practices in vehicle preparation, cleaning, sanding, metal treatment, and masking. Included is determining imperfections in paint jobs. Emphasis is placed upon personal safety and environmental concerns. (4 sch: 2-hr lecture, 4-hr lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Explore and apply safety precautions.</strong>&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;,CRP4&lt;/sup&gt;</td>
</tr>
<tr>
<td>a. Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>b. Identify safety and personal health hazards according to OSHA guidelines and the “Right to Know Law.”&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>c. Inspect spray environment and equipment to ensure compliance with federal, state, and local regulations and for safety and cleanliness hazards.&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>d. Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulations.&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>e. Select and use NIOSH approved supplied air (Fresh Air Make-up) personal respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulations.&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>f. Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>g. Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation.&lt;sup&gt;(DOK 2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>h. Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>i. Inspect and identify substrate, type of finish, surface condition, and film thickness; develop and document a plan for refinishing using a total product system.&lt;sup&gt;(DOK 3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>j. Dry or wet sand areas to be refinished.&lt;sup&gt;(DOK 2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>k. Featheredge damaged areas to be refinished.&lt;sup&gt;(DOK 2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>l. Apply suitable metal treatment or primer in accordance with total product systems.&lt;sup&gt;(DOK 3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>m. Mask and protect other areas that will not be refinished.&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>n. Mix primer, primer-surfacer, or primer-sealer.&lt;sup&gt;(DOK 1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>o. Apply primer onto surface of repaired area.&lt;sup&gt;(DOK 2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>p. Apply two-component finishing filler to minor surface imperfections.&lt;sup&gt;(DOK 3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>q. Dry or wet sand area to which primer-surfacer has been applied.&lt;sup&gt;(DOK 2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>r. Dry sand area to which two-component finishing filler has been applied.&lt;sup&gt;(DOK 2)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
m. Remove dust from area to be refinished, including cracks or moldings of adjacent areas. (DOK 1)

n. Clean area to be refinished using a final cleaning solution. (DOK 1)
o. Remove, with a tack rag, any dust or lint particles from the area to be refinished. (DOK 1)
p. Apply suitable sealer to the area being refinished. (DOK 2)
q. Scuff sand to remove nibs or imperfections from a sealer. (DOK 3)
r. Apply stone chip resistant coating. (DOK 3)
s. Restore corrosion-resistant coatings, caulking, and seam sealers to repaired areas. (DOK 1)
t. Prepare adjacent panels for blending. (DOK 1)
u. Identify the types of rigid, semi-rigid, or flexible plastic parts to be refinished; determine the materials, preparation, and refinishing procedures. (DOK 1)
v. Identify aluminum parts to be refinished; determine the materials, preparation, and refinishing procedures. (DOK 1)

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRP4-Painting and Refinishing

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
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M3 Multiplication of Whole Numbers (no regrouping, regrouping)
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M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
S3 Structural Unit (root, suffix)

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21st Century Skills

CSS1-21st Century Themes
  CS1 Global Awareness
  CS2 Financial, Economic, Business, and Entrepreneurial Literacy
  CS3 Civic Literacy
  CS4 Health Literacy
  CS5 Environmental Literacy
CSS2-Learning and Innovation Skills
  CS6 Creativity and Innovation
  CS7 Critical Thinking and Problem Solving
  CS8 Communication and Collaboration
CSS3-Information, Media and Technology Skills
  CS9 Information Literacy
  CS10 Media Literacy
  CS11 ICT Literacy
CSS4-Life and Career Skills
  CS12 Flexibility and Adaptability
  CS13 Initiative and Self-Direction
  CS14 Social and Cross-Cultural Skills
  CS15 Productivity and Accountability
  CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Refinishing II

Course Abbreviation: ABT 1323

Classification: Career–Technical Core

Description: Continuation of Refinishing I. Included are types of paint defects and paint gun application and maintenance procedures. (3 sch: 1-hr lecture, 4-hr lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore spray gun and related equipment operations. (DOK1,CRP4)</td>
</tr>
<tr>
<td>a. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment). (DOK 1)</td>
</tr>
<tr>
<td>b. Check and adjust spray gun operation for HVLP (high volume, low pressure) or compliant spray guns. (DOK 1)</td>
</tr>
<tr>
<td>c. Set up (fluid needle, nozzle, and cap), test, and adjust spray gun using fluid, air, and pattern control valves. (DOK 1)</td>
</tr>
<tr>
<td>d. Demonstrate an understanding of the operation of pressure spray equipment. (DOK 1)</td>
</tr>
<tr>
<td>2. Explore paint defects (causes and cures). (DOK 2,CRP4)</td>
</tr>
<tr>
<td>a. Identify blistering (raising of the paint surface); determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>b. Identify blushing (milky or hazy formation); determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>c. Identify a dry spray appearance in the paint surface; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>d. Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>e. Identify lifting; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>f. Identify clouding (mottling and streaking in metallic finishes); determine the cause(s), and correct the condition. (DOK 1) (DOK 2) (DOK 3)</td>
</tr>
<tr>
<td>g. Identify orange peel; determine the cause(s), and correct the condition. (DOK 1) (DOK 2) (DOK 3)</td>
</tr>
<tr>
<td>h. Identify overspray; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>i. Identify solvent popping in freshly painted surface; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>j. Identify sags and runs in paint surface; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>k. Identify sanding marks (sandscratch swelling); determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>l. Identify contour mapping (shrinking and splitting) while finish is drying; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>m. Identify color difference (off-shade); determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
<tr>
<td>n. Identify tape tracking; determine the cause(s), and correct the condition. (DOK 3)</td>
</tr>
</tbody>
</table>
Identify low gloss condition; determine the cause(s), and correct the condition. (DOK 3)

Identify poor adhesion; determine the cause(s), and correct the condition. (DOK 3)

Identify paint cracking (crow’s feet or line-checking, micro-checking, etc.); determine the cause(s), and correct the condition. (DOK 3)

Identify corrosion; determine the cause(s), and correct the condition. (DOK 3)

Identify dirt or dust in the paint surface; determine the cause(s), and correct the condition. (DOK 3)

Identify water spotting; determine the cause(s), and correct the condition. (DOK 3)

Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition. (DOK 3)

Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition. (DOK 3)

Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition. (DOK 3)

Identify chalking (oxidation); determine the cause(s), and correct the condition. (DOK 3)

Identify bleed-through (staining); determine the cause(s), and correct the condition. (DOK 3)

Identify pin-holing; determine the cause(s), and correct the condition. (DOK 3)

Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition. (DOK 3)

Identify pigment flotation (color change through film build); determine the cause(s), and correct the condition. (DOK 3)

Measure mil thickness. (DOK 1)

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRP4-Painting and Refinishing

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
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Postsecondary Collision Repair Technology
M9  Algebraic Operations  
A1  Numeration (ordering, place value, scientific notation)  
A2  Number Theory (ratio, proportion)  
A3  Data Interpretation (graph, table, chart, diagram)  
A4  Pre-Algebra and Algebra (equations, inequality)  
A5  Measurement (money, time, temperature, length, area, volume)  
A6  Geometry (angles, Pythagorean theory)  
A7  Computation in Context (whole numbers, decimals, fractions, algebraic operations)  
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L2  Sentence Formation (fragments, run-on, clarity)  
L3  Paragraph Development (topic sentence, supporting sentence, sequence)  
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L5  Punctuation (comma, semicolon)  
L6  Writing Conventions (quotation marks, apostrophe, parts of a letter)  
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21st Century Skills

CSS1-21st Century Themes
  CS1  Global Awareness  
  CS2  Financial, Economic, Business, and Entrepreneurial Literacy  
  CS3  Civic Literacy  
  CS4  Health Literacy  
  CS5  Environmental Literacy

CSS2-Learning and Innovation Skills
  CS6  Creativity and Innovation  
  CS7  Critical Thinking and Problem Solving  
  CS8  Communication and Collaboration

CSS3-Information, Media and Technology Skills
  CS9  Information Literacy  
  CS10  Media Literacy  
  CS11  ICT Literacy

CSS4-Life and Career Skills
  CS12  Flexibility and Adaptability  
  CS13  Initiative and Self-Direction  
  CS14  Social and Cross-Cultural Skills  
  CS15  Productivity and Accountability  
  CS16  Leadership and Responsibility
SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


**Course Name:** Mechanical and Electrical Components I

**Course Abbreviation:** ABT 1443

**Classification:** Career–Technical Core

**Description:** A course designed to provide theory and practice in the areas of restraint systems, cooling systems, and air conditioning/heating systems. An introduction to small business management techniques as applied to the collision repair shop. Includes computerized information and record systems. Also included are financial responsibilities, shop layout, inventory, and employee-employer relations. (3 sch: 3-hr lecture)

**Prerequisite:** None

---

### Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>Competency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore restraint systems.</td>
<td>(DOK 1, CRS3)</td>
</tr>
<tr>
<td>a. Identify vehicle manufacturer’s SRS recommended procedures before inspecting or replacing components.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>b. Inspect, remove, and replace seatbelt and shoulder harness assembly and components.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>c. Inspect restraint system mounting areas for damage; repair as needed.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>d. Verify proper operation of seatbelt.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>e. Deactivate and reactivate Supplemental Restraint System (SRS).</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>f. Inspect, remove, and replace Supplemental Restraint Systems (SRS) sensors and wiring; ensure sensor orientation.</td>
<td>(DOK 3)</td>
</tr>
<tr>
<td>g. Verify that Supplemental Restraint System (SRS) is operational.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>h. Inspect, remove, replace, and dispose of deployed and non-deployed airbag(s) and pretensioners.</td>
<td>(DOK 3)</td>
</tr>
<tr>
<td>i. Use Diagnostic Trouble Codes (DTC) to diagnose and repair the Supplemental Restraint System (SRS).</td>
<td>(DOK 3)</td>
</tr>
<tr>
<td>j. Demonstrate an understanding of advanced restraint systems.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>2. Explore cooling systems.</td>
<td>(DOK 1, CRS3)</td>
</tr>
<tr>
<td>a. Check engine cooling and heater system hoses and belts; determine needed repairs.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>b. Inspect, test, remove, and replace radiator, pressure cap, coolant recovery system, and water pump.</td>
<td>(DOK 2)</td>
</tr>
<tr>
<td>c. Recover, refill, and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA specifications.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>d. Remove, inspect, and replace fan (both electrical and mechanical), fan sensors, fan pulley, fan clutch, and fan shroud, check operation.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>e. Inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>f. Demonstrate an understanding of hybrid cooling systems.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>3. Explore heating and air conditioning.</td>
<td>(DOK 1, CRS3)</td>
</tr>
<tr>
<td>a. Identify and comply with environmental concerns relating to refrigerants and coolants.</td>
<td>(DOK 1)</td>
</tr>
<tr>
<td>b. Maintain and verify correct operation of certified refrigerant recovery and recharging systems.</td>
<td>(DOK 3)</td>
</tr>
</tbody>
</table>
c. Locate and identify A/C system service ports. (DOK 1)
d. Identify, recover, label, and store refrigerant from A/C system. (DOK 1)
e. Recycle refrigerant in accordance with EPA regulations. (DOK 1)
f. Evacuate and recharge A/C system; check for leaks. (DOK 2)
g. Identify oil type and maintain correct amount in A/C system. (DOK 1)
h. Inspect, adjust, and replace A/C compressor drive belts; check pulley alignment. (DOK 2)
i. Remove and replace A/C compressor; inspect and repair/replace A/C compressor mount. (DOK 2)
j. Inspect, repair or replace A/C system mufflers, hoses, lines, fittings, orifice tube, expansion valve, and seals. (DOK 2)
k. Inspect, test, and replace A/C system condenser and mounts. (DOK 2)
l. Inspect and replace receiver/drier or accumulator/drier. (DOK 2)
m. Inspect and repair A/C component wiring. (DOK 2)
n. Demonstrate an understanding of safe handling procedures associated with high voltage A/C compressors and wiring. (DOK 1)

4. Explain procedures for the operation of a collision repair business. (DOK 2, CRS3)
a. Describe the operation of a small business. (DOK 1)
b. Describe financial records required by small businesses. (DOK 1)
c. Complete forms and records used in automotive body repair using computer equipment and software. (DOK 1)
d. Describe procedures and forms for taking and maintaining an inventory. (DOK 1)
e. Describe practices for maintaining good employer/employee relationships. (DOK 1)
f. Describe legal responsibilities of a collision repair shop owner. (DOK 1)
g. Design the layout of a collision repair shop that includes the following: office area, metal work area, paint area, preparation area, drying area, makes ready area, and the parts and storage areas. (DOK 2)

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRS3-Mechanical and Electrical Components

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
M1 Addition of Whole Numbers (no regrouping, regrouping)
M2 Subtraction of Whole Numbers (no regrouping, regrouping)
M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)

Postsecondary Collision Repair Technology
M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
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L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
S3 Structural Unit (root, suffix)

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21st Century Skills

CSS1-21st Century Themes
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CS2 Financial, Economic, Business, and Entrepreneurial Literacy
CS3 Civic Literacy
CS4 Health Literacy
CS5 Environmental Literacy

CSS2-Learning and Innovation Skills
CS6 Creativity and Innovation
CS7 Critical Thinking and Problem Solving
CS8 Communication and Collaboration

CSS3-Information, Media and Technology Skills
CS9 Information Literacy
CS10 Media Literacy
CS11 ICT Literacy

CSS4-Life and Career Skills
CS12 Flexibility and Adaptability
CS13 Initiative and Self-Direction
CS14 Social and Cross-Cultural Skills
CS15 Productivity and Accountability
CS16 Leadership and Responsibility
SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Mechanical and Electrical Components II

Course Abbreviation: ABT 1453

Classification: Career–Technical Core

Description: A course designed to provide theory and practice in the areas of brakes and electrical (3 sch: 3-hr lecture)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore brake principles and practices. (DOK 1, CRS3)</td>
</tr>
<tr>
<td>a. Inspect brake lines, hoses, and fittings for leaks, dents, kinks, rust, cracks, or wear; tighten fittings and supports; replace brake lines (double flare and ISO types), hoses, fittings, seals, and supports. (DOK 1)</td>
</tr>
<tr>
<td>b. Identify, handle, store, and install appropriate brake fluids; dispose of in accordance with federal, state, and local regulations. (DOK 1)</td>
</tr>
<tr>
<td>c. Bleed (manual, pressure, vacuum or surge) hydraulic brake system. (DOK 1)</td>
</tr>
<tr>
<td>d. Pressure test brake hydraulic system; determine needed repair. (DOK 2)</td>
</tr>
<tr>
<td>e. Adjust brake shoes; remove and reinstall brake drums or drum/hub assemblies and wheel bearings. (DOK 2)</td>
</tr>
<tr>
<td>f. Remove, clean, inspect and reinstall caliper assembly and mountings for wear and damage; reinstall. (DOK 2)</td>
</tr>
<tr>
<td>g. Check parking brake system operation. (DOK 1)</td>
</tr>
<tr>
<td>h. Identify the proper procedures for handling brake dust. (DOK 1)</td>
</tr>
<tr>
<td>i. Check for bent or damaged brake system components. (DOK 1)</td>
</tr>
<tr>
<td>j. Demonstrate an understanding of various types of advanced braking systems (ABS, hydraulic, electronic, traction control). (DOK 1)</td>
</tr>
<tr>
<td>2. Explore electrical principles and practices. (DOK 1, CRS3)</td>
</tr>
<tr>
<td>a. Check for available voltage, voltage drop and/or current in electrical wiring circuits and components with a DMM (digital multimeter). (DOK 1)</td>
</tr>
<tr>
<td>b. Repair electrical circuits, wiring, and connectors. (DOK 1)</td>
</tr>
<tr>
<td>c. Inspect, test, and replace circuit breakers, and fuses. (DOK 1)</td>
</tr>
<tr>
<td>d. Perform battery state-of-charge test; and slow/fast battery charge. (DOK 1)</td>
</tr>
<tr>
<td>e. Inspect, clean, repair or replace battery, battery cables, connectors and clamps. (DOK 1)</td>
</tr>
<tr>
<td>f. Dispose of batteries and battery acid according to local, state, and federal requirements. (DOK 1)</td>
</tr>
<tr>
<td>g. Identify programmable electrical/electronic components and check for malfunction indicator lamp; record data for reprogramming before disconnecting battery. (DOK 1)</td>
</tr>
<tr>
<td>h. Inspect alignment, adjust, remove, and replace alternator (generator), drive belts, pulleys, and fans. (DOK 1)</td>
</tr>
<tr>
<td>i. Check operation and aim headlamp assemblies and fog/driving lamps; determine needed repairs. (DOK 1)</td>
</tr>
<tr>
<td>j. Inspect, test, and repair or replace switches, relays, bulbs, sockets, connectors, and wires of interior and exterior light circuits. (DOK 2)</td>
</tr>
</tbody>
</table>
### STANDARDS

**2009 ASE/NATEF Collision Repair & Refinish Standards**

CRS3-Mechanical and Electrical Components

**Related Academic Standards**

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21st Century Skills

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CS3 Civic Literacy
CS4 Health Literacy
CS5 Environmental Literacy
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CSS3-Information, Media and Technology Skills
CS9 Information Literacy
CS10 Media Literacy
CS11 ICT Literacy
CSS4-Life and Career Skills
CS12 Flexibility and Adaptability
CS13 Initiative and Self-Direction
CS14 Social and Cross-Cultural Skills
CS15 Productivity and Accountability
CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Structural Analysis and Damage Repair III

Course Abbreviation: ABT 2163

Classification: Career–Technical Core (Two Year Certificate, Associate Degree)

Description: This course is a continuation of Structural Analysis and Damage Repair II. This course provides instruction and practice in unibody inspection, measurement, and repair. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore unibody inspection, measurement, diagnosis, and repair. (DOK 3)</td>
</tr>
<tr>
<td>a. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems. (DOK 3)</td>
</tr>
<tr>
<td>b. Realign or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems. (DOK 3)</td>
</tr>
<tr>
<td>c. Measure and diagnose unibody damage using tram and gauges. (DOK 1)</td>
</tr>
<tr>
<td>d. Determine and inspect the locations of all suspension, steering, and powertrain component attaching points on the vehicle. (DOK 1)</td>
</tr>
<tr>
<td>e. Measure and diagnose unibody vehicles using a dedicated (fixture) measuring system. (DOK 1)</td>
</tr>
<tr>
<td>f. Diagnose and measure unibody vehicles using a three-dimensional measuring system (mechanical, electronic, and laser). (DOK 1)</td>
</tr>
<tr>
<td>g. Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair. (DOK 3)</td>
</tr>
<tr>
<td>h. Attach anchoring devices to vehicle; remove or reposition components as necessary. (DOK 2)</td>
</tr>
<tr>
<td>i. Straighten and align cowl assembly. (DOK 1)</td>
</tr>
<tr>
<td>j. Straighten and align roof rails/headers and roof panels. (DOK 1)</td>
</tr>
<tr>
<td>k. Straighten and align hinge and lock pillars. (DOK 1)</td>
</tr>
<tr>
<td>l. Straighten and align vehicle openings, floor pans, and rocker panels. (DOK 1)</td>
</tr>
<tr>
<td>m. Straighten and align quarter panels, wheelhouse assemblies, and rear body sections (including rails and suspension/powertrain mounting points). (DOK 2)</td>
</tr>
<tr>
<td>n. Identify, straighten and align front-end sections (aprons, strut towers, upper and lower rails, steering, and suspension/power train mounting points, etc.). (DOK 3)</td>
</tr>
<tr>
<td>o. Identify substrate and repair or replacement recommendations. (DOK 2)</td>
</tr>
<tr>
<td>p. Identify proper cold stress relief methods. (DOK 1)</td>
</tr>
<tr>
<td>q. Repair damage using power tools and hand tools to restore proper contours and dimensions. (DOK 3)</td>
</tr>
<tr>
<td>r. Remove and replace damaged sections of structural steel body panels. (DOK 3)</td>
</tr>
</tbody>
</table>
s. Restore corrosion protection to repaired or replaced unibody structural areas. (DOK 1)
t. Determine the extent of damage to aluminum structural components; repair, weld, or replace. (DOK 3)
u. Analyze and identify crush/collapse zones. (DOK 3)
v. Restore mounting and anchoring locations. (DOK 2)

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRS2-Structural Analysis and Damage Repair

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
M1 Addition of Whole Numbers (no regrouping, regrouping)
M2 Subtraction of Whole Numbers (no regrouping, regrouping)
M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
S3 Structural Unit (root, suffix)
21st Century Skills

CSS1-21st Century Themes
   CS1  Global Awareness
   CS2  Financial, Economic, Business, and Entrepreneurial Literacy
   CS3  Civic Literacy
   CS4  Health Literacy
   CS5  Environmental Literacy

CSS2-Learning and Innovation Skills
   CS6  Creativity and Innovation
   CS7  Critical Thinking and Problem Solving
   CS8  Communication and Collaboration

CSS3-Information, Media and Technology Skills
   CS9  Information Literacy
   CS10 Media Literacy
   CS11 ICT Literacy

CSS4-Life and Career Skills
   CS12 Flexibility and Adaptability
   CS13 Initiative and Self-Direction
   CS14 Social and Cross-Cultural Skills
   CS15 Productivity and Accountability
   CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Structural Analysis and Damage Repair IV

Course Abbreviation: ABT 2173

Classification: Career–Technical Core (Two Year Certificate, Associate Degree)

Description: This course is a continuation of Structural Analysis and Damage Repair III. This course provides the procedures and practices for frame inspection and repair. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

### Competencies and Suggested Objectives

1. Explore frame inspection diagnosis and repair.  
   a. Measure and diagnose structural damage using a tram and gauges.  
   b. Attach vehicle to anchoring devices.  
   c. Identify, analyze, straighten, and align mash (collapse) damage.  
   d. Identify, analyze, straighten, and align sag damage.  
   e. Identify, analyze, straighten, and align sideways damage.  
   f. Identify, analyze, straighten, and align twist damage.  
   g. Identify, analyze, straighten, and align diamond frame damage.  
   h. Remove and replace damaged structural components.  
   i. Restore corrosion protection to repaired or replaced frame areas.  
   j. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.  
   k. Align or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.  
   l. Identify heat limitations for structural components.  
   m. Restore structural foam.  
   n. Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser).  
   o. Diagnose and measure structural damage to vehicles using a dedicated (fixture) measuring system.  
   p. Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.  
   q. Analyze and identify crush/collapse zones.

### STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRS2-Structural Analysis and Damage Repair
Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
M1 Addition of Whole Numbers (no regrouping, regrouping)
M2 Subtraction of Whole Numbers (no regrouping, regrouping)
M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
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21st Century Skills

CSS1-21st Century Themes
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  CS4 Health Literacy
  CS5 Environmental Literacy
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  CS9 Information Literacy
  CS10 Media Literacy
  CS11 ICT Literacy
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  CS12 Flexibility and Adaptability
  CS13 Initiative and Self-Direction
  CS14 Social and Cross-Cultural Skills
  CS15 Productivity and Accountability
  CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


**Web Sites**


Course Name: Non-Structural Analysis and Damage Repair III

Course Abbreviation: ABT 2243

Classification: Career–Technical Core (Two Year Certificate, Associate Degree)

Description: This course is a continuation of Non-Structural Analysis and Damage Repair II. This course provides instruction for outer body panel repair, replacement, and adjustment principles and practices. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

Competencies and Suggested Objectives

1. Explore and apply outer body panel repair, replacement, and adjustment principles and practices.  
   a. Determine the extent of direct (primary) and indirect (secondary) damage and direction of impact; develop and document a repair plan.  
   b. Inspect, remove, and replace bolted, bonded, and welded steel panel or panel assemblies.  
   c. Determine the extent of damage to aluminum body panels; repair or replace.  
   d. Inspect, remove, replace, and align hood, hood hinges, and hood latch.  
   e. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.  
   f. Inspect, remove, replace, and align doors, latches, hinges, and related hardware.  
   g. Inspect, remove, replace, and align tailgates, hatches, liftgates, and sliding doors.  
   h. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware.  
   i. Inspect, remove, replace, and align front fenders, headers, and other panels.  
   j. Straighten contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments.  
   k. Weld damaged or torn steel body panels; repair broken welds.  
   l. Restore corrosion protection.  
   m. Replace door skins.  
   n. Restore sound deadeners and foam materials.  
   o. Perform panel bonding.  
   p. Diagnose and repair water leaks, dust leaks, and wind noise.  
   q. Identify one-time use fasteners.

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRN1-Non-Structural Analysis and Damage Repair
Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
M1 Addition of Whole Numbers (no regrouping, regrouping)
M2 Subtraction of Whole Numbers (no regrouping, regrouping)
M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
S3 Structural Unit (root, suffix)

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21st Century Skills

CSS1-21st Century Themes
  CS1 Global Awareness
  CS2 Financial, Economic, Business, and Entrepreneurial Literacy
  CS3 Civic Literacy
  CS4 Health Literacy
  CS5 Environmental Literacy
CSS2-Learning and Innovation Skills
  CS6 Creativity and Innovation
CS7  Critical Thinking and Problem Solving  
CS8  Communication and Collaboration  
CSS3-Information, Media and Technology Skills  
CS9  Information Literacy  
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CS11  ICT Literacy  
CSS4-Life and Career Skills  
CS12  Flexibility and Adaptability  
CS13  Initiative and Self-Direction  
CS14  Social and Cross-Cultural Skills  
CS15  Productivity and Accountability  
CS16  Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Non-Structural Analysis and Damage Repair IV

Course Abbreviation: ABT 2253

Classification: Career–Technical Core (Two Year Certificate, Associate Degree)

Description: This course is a continuation of Non-Structural Analysis and Damage Repair III. This course provides instruction and practice for the following areas: moveable glass, hardware associated with glass, plastics and adhesive. (3 sch: 2-hr lecture, 2-hr lab)

Prerequisite: None

Competencies and Suggested Objectives

1. Explore and apply moveable glass and hardware principles and practices.  \( \text{(DOK 2, CRN1)} \)
   a. Inspect, adjust, and repair/replace window regulators, run channels, glass, power mechanisms, and related controls.  \( \text{(DOK 2)} \)
   b. Inspect, adjust, repair, remove, reinstall, or replace weather-stripping.  \( \text{(DOK 2)} \)
   c. Identify, inspect, repair or replace, and adjust removable, power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.  \( \text{(DOK 2)} \)
   d. Identify, discuss, inspect, remove, reinstall, and align convertible top and related mechanisms.  \( \text{(DOK 2)} \)

2. Explore and apply plastics and adhesive principles and practices.  \( \text{(DOK 2, CRN1)} \)
   a. Identify the types of plastics; determine repairability.  \( \text{(DOK 1)} \)
   b. Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures.  \( \text{(DOK 1)} \)
   c. Repair rigid, semi-rigid, or flexible plastic panels.  \( \text{(DOK 2)} \)
   d. Remove or repair damaged areas from rigid exterior composite panels.  \( \text{(DOK 2)} \)
   e. Replace bonded rigid exterior composite body panels; straighten or align panel supports.  \( \text{(DOK 2)} \)

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRN1-Non-Structural Analysis and Damage Repair

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
M1 Addition of Whole Numbers (no regrouping, regrouping)
M2 Subtraction of Whole Numbers (no regrouping, regrouping)
M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
M5 Decimals (addition, subtraction, multiplication, division)
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M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
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A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
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A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
S3 Structural Unit (root, suffix)

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21st Century Skills

CSS1-21st Century Themes
   CS1 Global Awareness
   CS2 Financial, Economic, Business, and Entrepreneurial Literacy
   CS3 Civic Literacy
   CS4 Health Literacy
   CS5 Environmental Literacy

CSS2-Learning and Innovation Skills
   CS6 Creativity and Innovation
   CS7 Critical Thinking and Problem Solving
   CS8 Communication and Collaboration

CSS3-Information, Media and Technology Skills
   CS9 Information Literacy
   CS10 Media Literacy
   CS11 ICT Literacy

CSS4-Life and Career Skills
   CS12 Flexibility and Adaptability
   CS13 Initiative and Self-Direction
   CS14 Social and Cross-Cultural Skills

Postsecondary Collision Repair Technology
CS15  Productivity and Accountability
CS16  Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Refinishing III

Course Abbreviation: ABT 2333

Classification: Career–Technical Core (Two Year Certificate, Associate Degree)

Description: A continuation of Refinishing II with emphasis on advanced painting techniques including paint mixing, matching, and applying (3 sch: 1-hr lecture, 4-hr lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore paint (mixing, matching, and applying) procedures and practices. (DOK 2, CRP4)</td>
</tr>
<tr>
<td>a. Identify type and color code by manufacturer’s vehicle information label. (DOK 1)</td>
</tr>
<tr>
<td>b. Shake, stir, reduce, catalyze/activate, and strain refinish materials. (DOK 1)</td>
</tr>
<tr>
<td>c. Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied. (DOK 3)</td>
</tr>
<tr>
<td>d. Apply selected product on test and let-down panel; check for color match. (DOK 3)</td>
</tr>
<tr>
<td>e. Apply single stage topcoat. (DOK 2)</td>
</tr>
<tr>
<td>f. Apply basecoat/clearcoat for panel blending or panel refinishing. (DOK 2)</td>
</tr>
<tr>
<td>g. Apply basecoat/clearcoat for overall refinishing. (DOK 2)</td>
</tr>
<tr>
<td>h. Remove nibs or imperfections from basecoat. (DOK 1)</td>
</tr>
<tr>
<td>i. Refinish rigid, or semi-rigid, and plastic parts. (DOK 1)</td>
</tr>
<tr>
<td>j. Refinish flexible plastic parts. (DOK 1)</td>
</tr>
<tr>
<td>k. Apply multi-stage coats for panel blending or overall refinishing. (DOK 3)</td>
</tr>
<tr>
<td>l. Identify and mix paint using a formula according to a given formula. (DOK 1)</td>
</tr>
<tr>
<td>m. Identify poor hiding colors; determine necessary action. (DOK 3)</td>
</tr>
<tr>
<td>n. Tint color using formula to achieve a blendable match. (DOK 2)</td>
</tr>
<tr>
<td>o. Identify alternative color formula to achieve a blendable match. (DOK 1)</td>
</tr>
</tbody>
</table>

STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRP4—Painting and Refinishing

Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
M1 Addition of Whole Numbers (no regrouping, regrouping)
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M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
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21st Century Skills

CSS1-21st Century Themes
CS1 Global Awareness
CS2 Financial, Economic, Business, and Entrepreneurial Literacy
CS3 Civic Literacy
CS4 Health Literacy
CS5 Environmental Literacy

CSS2-Learning and Innovation Skills
CS6 Creativity and Innovation
CS7 Critical Thinking and Problem Solving
CS8 Communication and Collaboration

CSS3-Information, Media and Technology Skills
CS9 Information Literacy
CS10 Media Literacy
CS11 ICT Literacy

CSS4-Life and Career Skills
CS12 Flexibility and Adaptability
CS13 Initiative and Self-Direction
CS14 Social and Cross-Cultural Skills
CS15  Productivity and Accountability
CS16  Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Refinishing IV

Course Abbreviation: ABT 2343

Classification: Career–Technical Core (Two Year Certificate, Associate Degree)

Description: A continuation of Refinishing III, with emphasis on advanced techniques of painting; including, detailing (3 sch: 1-hr lecture, 4-hr lab)

Prerequisite: None

### Competencies and Suggested Objectives

1. Explore final detail procedures and practices. *(DOK 2,CRP4)*
   a. Apply decals, transfers, tapes, pinstripes (painted and taped), etc. *(DOK 1)*
   b. Buff and polish finish to remove defects as required. *(DOK 2)*
   c. Clean interior, exterior, and glass. *(DOK 1)*
   d. Clean body openings (door jambs and edges, etc.). *(DOK 1)*
   e. Remove overspray. *(DOK 1)*
   f. Perform pre-delivery detail and inspection. *(DOK 1)*

### STANDARDS

2009 ASE/NATEF Collision Repair & Refinish Standards

CRP4-Painting and Refinishing

Related Academic Standards

- R1 Interpret Graphic Information (forms, maps, reference sources)
- R2 Words in Context (same and opposite meaning)
- R3 Recall Information (details, sequence)
- R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
- R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)
- M1 Addition of Whole Numbers (no regrouping, regrouping)
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- M8 Percents
- M9 Algebraic Operations
- A1 Numeration (ordering, place value, scientific notation)
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L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
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21st Century Skills

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   CS10 Media Literacy
   CS11 ICT Literacy

CSS4-Life and Career Skills
   CS12 Flexibility and Adaptability
   CS13 Initiative and Self-Direction
   CS14 Social and Cross-Cultural Skills
   CS15 Productivity and Accountability
   CS16 Leadership and Responsibility

SUGGESTED REFERENCES

Journals


Texts


Videos


Web Sites


Course Name: Special Problem in Collision Repair Technology

Course Abbreviation: ABT 291(1-3)

Classification: Career–Technical Elective

Description: A course to provide students with an opportunity to utilize skills and knowledge gained in other Collision Repair Technology courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project. (1-3 sch: 2-6-hr lab)

Prerequisite: Consent of the Instructor

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Develop a written plan that details the activities and projects to be completed.</td>
</tr>
<tr>
<td>a. Use a written plan that details the activities and projects to be completed.</td>
</tr>
<tr>
<td>b. Perform written occupational objectives in the special problem.</td>
</tr>
<tr>
<td>2. Assess accomplishment of objectives.</td>
</tr>
<tr>
<td>a. Prepare daily written assessments of accomplishment of objectives.</td>
</tr>
<tr>
<td>b. Present weekly written reports to the instructor of activities performed and objectives accomplished.</td>
</tr>
<tr>
<td>3. Use and follow a set of written guidelines for the special problem.</td>
</tr>
<tr>
<td>a. Develop and follow a set of written guidelines for the special problem.</td>
</tr>
</tbody>
</table>

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for use in this course will depend upon the nature of the problem under investigation.
Course Name: Supervised Work Experience in Collision Repair Technology

Course Abbreviation: ABT 292(1-6)

Classification: Career–Technical Elective

Description: A course that is a cooperative program between industry and education designed to integrate the student’s technical studies with industrial experience. Variable credit is awarded on the basis of one semester hour per 45 industrial contact hours. (1-6 sch: 3-18-hr externship)

Prerequisite: Consent of instructor

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Follow a set of instructor-written guidelines for the supervised work experience program.</td>
</tr>
<tr>
<td>2. Apply skills needed to be a viable member of the workforce.</td>
</tr>
<tr>
<td>a. Prepare a description of skills to be developed in the supervised work experience program.</td>
</tr>
<tr>
<td>b. Practice skills needed to be a viable member of the workforce.</td>
</tr>
<tr>
<td>3. Practice human relationship skills in the supervised work experience program.</td>
</tr>
<tr>
<td>4. Practice positive work habits, responsibilities, and ethics.</td>
</tr>
<tr>
<td>5. Develop written occupational objectives in the supervised work experience program.</td>
</tr>
<tr>
<td>6. Assess performance of occupational skills.</td>
</tr>
<tr>
<td>a. Prepare daily written assessments of work performance as specified in the occupational objectives.</td>
</tr>
<tr>
<td>b. Present weekly written reports to the instructor of activities performed and objectives accomplished.</td>
</tr>
</tbody>
</table>

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for use in this course will depend upon the nature of the problem under investigation.
Course Name: Work-Based Learning I, II, III, IV, V, and VI

Course Abbreviation: WBL 191(1-3), WBL 192(1-3), WBL 193(1-3), WBL 291(1-3), WBL 292(1-3), and WBL 293(1-3)

Classification: Free Elective

Description: A structured work-site learning experience in which the student, program area teacher, Work-Based Learning Coordinator, and work-site supervisor/mentor develop and implement an educational training agreement. Designed to integrate the student’s academic and technical skills into a work environment. May include regular meetings and seminars with school personnel and employers for supplemental instruction and progress reviews. (1-3 sch: 3-9-hr externship)

Prerequisite: Concurrent enrollment in Career–Technical program area courses

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Apply technical skills and related academic knowledge needed to be a viable member of the workforce.</td>
</tr>
<tr>
<td>a. Demonstrate technical skills necessary to complete job requirements.</td>
</tr>
<tr>
<td>b. Demonstrate academic skills necessary to complete job requirements.</td>
</tr>
<tr>
<td>c. Perform tasks detailed in an educational training agreement at the work setting.</td>
</tr>
<tr>
<td>2. Apply general workplace skills to include positive work habits necessary for successful employment.</td>
</tr>
<tr>
<td>a. Demonstrate appropriate human relationship skills in the work setting to include conflict resolution, team participation, leadership, negotiation, and customer/client service.</td>
</tr>
<tr>
<td>b. Utilize time, materials, and resource management skills.</td>
</tr>
<tr>
<td>c. Use critical thinking skills such as problem solving, decision making, and reasoning.</td>
</tr>
<tr>
<td>d. Acquire, evaluate, organize, maintain, interpret, and communicate information.</td>
</tr>
</tbody>
</table>

STANDARDS

Specific standards for this course will depend upon the nature of the problem under investigation.

SUGGESTED REFERENCES

Specific references for this course will depend upon the nature of the problem under investigation.
Recommended Tools and Equipment

CAPITALIZED ITEMS

1. Any tools or equipment that are needed to meet NATEF certification or are on the NATEF tool list
2. Automotive paint mixing system with all materials, accessories, and paint shaker (1)
3. Beadblaster (1)
4. Booth, down draft heated paint (1)
5. Cleaner, high pressure (1)
6. Computer with operating software with multimedia kit (5)
7. Gauge set of 4, center line (1)
8. Gun, spray (gravity feed) (4)
9. Gun, battery powered caulking with three extra batteries (2)
10. Headlight set, aiming (1)
11. Jack, body and fender, portor power with attachments (10 ton) (1)
12. Jack, body and fender portor power with attachments (4 ton) (1)
13. Knife, equalizer (1)
14. Lift, 2 post, 9,000 pound above ground (2)
15. Paint mixing room (Separate explosion-proof room per NFPA regulations) (1)
16. Plasma arc cutting equipment with all attachments (1)
17. Rack, frame with measuring equipment (1)
18. Recovery system, air conditioning with all attachments (R12)/(134A) (1)
19. Regulator, air with extractors (12)
20. Respirator, fresh air supply completely hooded (4 man system) (1)
21. Sandblaster (1)
22. Scantool, universal with accessories (1)
23. Studless dent puller with accessories 220 volt (1)
24. Welder, spot (resistance gun) (1)
25. Welder, GMAW (115V) (135 A) with all attachments (2)
26. Welder, GMAW (220V) (225 A) with all attachments (1)
27. Welder, GMAW Aluminum capabilities (220 V) (225 A) with all attachments (1)

NON-CAPITALIZED ITEMS

1. Any tools or equipment that are needed to meet NATEF certification or are on the NATEF tool list
2. Battery booster box (1)
3. Bench, steel work (6)
4. Blade, razor scraper (5)
5. Block, sanding short (6)
6. Block, sanding long (6)
7. Board, file (6)
8. Brush, striping (6)
9. Brush, wire (20)
10. Cables, jumper (1)
11. Camera, digital (1)
12. Chains, bumper alignment hooks (2)
13. Charger, battery 120 A (1)
14. Chisel set, 15 piece assorted metal (1)
15. Chuck, air (30 sets)
16. Clamp, welder (locking pliers) (6)
17. Clamp, sheet metal (locking pliers) (6)
18. Clamp set, assorted body (2)
19. Clamp, C-clamp (locking pliers) (3 in.) (2)
20. Clamp, C-clamp (locking pliers) (7 in.) (2)
21. Clamp, C-clamp (locking pliers) (11 in.) (2)
22. Clamp, C-clamp (locking pliers) (18 in.) (2)
23. Cleaner, vacuum (1)
24. Come-along (2 ton) (2)
25. Cord, extension (50 ft) (4)
26. Cover, fender (4)
27. Cover, wheel (set of 4) (4)
28. Cup, viscosity (#2 Zahn) (2)
29. Cutter, sheet metal, hand (2)
30. Cutter, sheet metal, power (1)
31. Cutter set, panel (air drive) (1)
32. Cutter, disc grinder (2)
33. Dollies set, assorted (4)
34. Drill, electric (1/2 in.) (1)
35. Drill, pneumatic (1/2 in.) (1)
36. Drill set, 20 piece drill index cobalt tipped (2)
37. Drill, pneumatic (3/8 in.) (2)
38. Driver, hand impact (3/8-in. drive) (3)
39. Dryer, infrared paint 4 bulb (4)
40. Ear muffs for sound protection applicable to a collision repair setting (6)
41. Extractor set, screw (Easy Out) (1)
42. Face shield (4)
43. File, air (orbital or straight line) (6)
44. File, body round (2)
45. File, body flat (2)
46. Flashlight (2)
47. Gauge, tram (1)
48. Gloves, cutting goggles (4)
49. Gloves, pair welding (4)
50. Gloves, lineman (2)
51. Gloves, nitrile (6)
52. Goggles, safety (6)
53. Grater, ½ round cheese (24)
54. Grinder, 1 horse power bench (1)
55. Gun, air dusting (4)
56. Gun, spray assorted (6)
57. Gun, heat (1)  
58. Gun, staple (1)  
59. Hacksaw (2)  
60. Hammer, machinist (4)  
61. Hammer set, body (4)  
62. Hammer, slide large (snatch bar) (2)  
63. Hammer, slide small (snatch bar) (2)  
64. Hammer, sledge (1)  
65. Helmet, digital/auto darkening welding (4)  
66. Hoist, chain or pneumatic (2 T) (1)  
67. Hose, air with quick couplings (50 ft) (20)  
68. Jack, floor with casters (2 T) (4)  
69. Jack, mechanical (1)  
70. Jack, twin saddle (1)  
71. Jigsaw, (2)  
72. Jitterbug, orbital (4)  
73. Knife, cold (1)  
74. Knife, putty (1½ in.) (2)  
75. Knife, putty (3 in.) (8)  
76. Knife, putty (2 in.) (2)  
77. Knife, windshield wiggle (pneumatic) (1)  
78. Large cabinet (3)  
79. Light, extension (3)  
80. Machine, masking (2)  
81. Mallet, rubber (2)  
82. Mallet, plastic (1)  
83. Mask, particle (4 boxes)  
84. Pan, drain (2)  
85. Picks, set of assorted (2)  
86. Pliers, hog ring (1)  
87. Pliers set, assorted (3)  
88. Pliers, vise grip (10)  
89. Polisher, power (variable speed up to 2,000 rpm) (2)  
90. Printer, color (5)  
91. Punch set, metal assorted (1)  
92. Rack, stand (bumper and hood) (5)  
93. Repair kit, windshield (1)  
94. Sander, dual action (6 in.) (10)  
95. Sander/Grinder, automotive disc electric (2)  
96. Sander, dual action (8 in.) (2)  
97. Sander/Grinder, automotive disc pneumatic (2)  
98. Saw set, hole assorted (1)  
99. Saw, reciprocating (1)  
100. Screwdriver set, Phillips (#1,2,3,4) (4)  
101. Screwdriver set, Torx (#5-55) (2)  
102. Screwdriver set, clutch (1)
103. Screwdriver set, flat blade (6)
104. Scribe, (scratch awl) (4)
105. Shaker, paint (1)
106. Sockets, metric and standard (1/4 in., 3/8 in., and 1/2 in. drive) (2)
107. Sockets impact -metric and standard (1/2 in. drive) (2)
108. Soldering kit (gun or iron) (1)
109. Spoons, assorted (1)
110. Stands, adjustable (20)
111. Studgun dent puller with accessories (4)
112. Strap, fender pull (2)
113. Tap and die set, standard (1)
114. Tap and die set, metric (1)
115. Tape, steel (25 ft) (2)
116. Tester, circuit load (1)
117. Tester, multimeter (VOM) (2)
118. Tester, radiator pressure (1)
119. Tool, door handle clip remover kit (2)
120. Tool, door handle pin removing (1)
121. Tool, pop rivet, large (2)
122. Tool, pop rivet, small (2)
123. Tool, magnetic pickup (2)
124. Torx driver set (1/4 in. and 3/8 in. drive #5-55) (2)
125. Tubing set, double flaring tool (1)
126. Vise, table (5 in.) (4)
127. Welder, plastic with attachments (2)
128. Welder set, oxyacetylene with cutting torch and accessories (1)
129. Wrench set, combination metric (5mm - 21mm) (2)
130. Wrench, pneumatic ratchet (1/4 in. drive) (4)
131. Wrench, pneumatic ratchet (3/8 in. drive) (4)
132. Wrench, pneumatic impact (3/8 in. butterfly) (4)
133. Wrench, pneumatic impact (1/2 in.) (4)
134. Wrench set, box end (3/16 in. to 1¼ in.) (1)
135. Wrench, pneumatic impact 3/8 in. standard (1)
136. Wrench set, Allen (standard and metric) (2)
137. Wrench set, combination SAE (3/16 in. - 1¾ in.) (4)

* Additional equipment may be needed as certification requirements change.

RECOMMENDED INSTRUCTIONAL AIDS

It is recommended that instructors have access to the following items:

1. Online data access (Alldata, Mitchell, Motor)
2. Cart, AV (for TV-VCR) (1)
3. Cart, AV (for overhead projector) (1)
4. Mylar board (1)
5. Internet connection (1)
6. TV (Flat Screen)
7. VCR/DVD (1)
8. Video out (Microcomputer to TV monitor) (1)
9. Smart board
10. Laptop computer
11. Digital camera (1)
12. Microcomputer with monitor, printer (CD-ROM and cables) (Instructor use)
13. Light box projector (1 per program)
Appendix A: 2009 ASE/NATEF Collision Repair & Refinish Standards

CRN1-Non-Structural Analysis and Damage Repair
CRS2-Structural Analysis and Damage Repair
CRS3-Mechanical and Electrical Components
CRP4-Painting and Refinishing

Appendix B: Related Academic Standards²

Reading
R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
R4 Construct Meaning (main idea, summary/paraphrase, compare–contrast, cause–effect)
R5 Evaluate/Extend Meaning (fact/opinion, predict outcomes, point of view)

Mathematics Computation
M1 Addition of Whole Numbers (no regrouping, regrouping)
M2 Subtraction of Whole Numbers (no regrouping, regrouping)
M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
M5 Decimals (addition, subtraction, multiplication, division)
M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
M9 Algebraic Operations

Applied Mathematics
A1 Numeration (ordering, place value, scientific notation)
A2 Number Theory (ratio, proportion)
A3 Data Interpretation (graph, table, chart, diagram)
A4 Pre-Algebra and Algebra (equations, inequality)
A5 Measurement (money, time, temperature, length, area, volume)
A6 Geometry (angles, Pythagorean theory)
A7 Computation in Context (whole numbers, decimals, fractions, algebraic operations)
A8 Estimation (rounding, estimation)

Language
L1 Usage (pronoun, tense, subject–verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
L6 Writing Conventions (quotation marks, apostrophe, parts of a letter)

Spelling
S1 Vowel (short, long)
S2 Consonant (variant spelling, silent letter)
S3 Structural Unit (root, suffix)

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Appendix C: 21st Century Skills

CSS1-21st Century Themes
CS1 Global Awareness
1. Using 21st century skills to understand and address global issues
2. Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts
3. Understanding other nations and cultures, including the use of non-English languages
CS2 Financial, Economic, Business and Entrepreneurial Literacy
1. Knowing how to make appropriate personal economic choices
2. Understanding the role of the economy in society
3. Using entrepreneurial skills to enhance workplace productivity and career options
CS3 Civic Literacy
1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
2. Exercising the rights and obligations of citizenship at local, state, national and global levels
3. Understanding the local and global implications of civic decisions
CS4 Health Literacy
1. Obtaining, interpreting and understanding basic health information and services and using such information and services in ways that enhance health
2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance and stress reduction
3. Using available information to make appropriate health-related decisions
4. Establishing and monitoring personal and family health goals
5. Understanding national and international public health and safety issues
CS5 Environmental Literacy
1. Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems
2. Demonstrate knowledge and understanding of society’s impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)
3. Investigate and analyze environmental issues, and make accurate conclusions about effective solutions
4. Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)

CSS2-Learning and Innovation Skills
  CS6 Creativity and Innovation
    1. Think creatively
    2. Work creatively with others
    3. Implement innovations
  CS7 Critical Thinking and Problem Solving
    1. Reason effectively
    2. Use systems thinking
    3. Make judgments and decisions
    4. Solve problems
  CS8 Communication and Collaboration
    1. Communicate clearly
    2. Collaborate with others

CSS3-Information, Media and Technology Skills
  CS9 Information Literacy
    1. Access and evaluate information
    2. Use and manage information
  CS10 Media Literacy
    1. Analyze media
    2. Create media products
  CS11 ICT Literacy
    1. Apply technology effectively

CSS4-Life and Career Skills
  CS12 Flexibility and Adaptability
    1. Adapt to change
    2. Be flexible
  CS13 Initiative and Self-Direction
    1. Manage goals and time
    2. Work independently
    3. Be self-directed learners
  CS14 Social and Cross-Cultural Skills
    1. Interact effectively with others
    2. Work effectively in diverse teams
  CS15 Productivity and Accountability
    1. Manage projects
    2. Produce results
  CS16 Leadership and Responsibility
    1. Guide and lead others
    2. Be responsible to others