

COURSE SYLLABUS

LAST REVIEW	Fall 2022
COURSE TITLE	Structural Analysis and Damage Repair 1
COURSE NUMBER	ACRT 0140
DIVISION	Career and Technical Education
DEPARTMENT	ACRT
CIP CODE	47.0603
CREDIT HOURS	2
CONTACT HOURS/WEEK	Class: 1 Lab: 2 Clinical: X
PREREQUISITES	ACRT 0100 - Safety & Orientation ACRT 0101 - OSHA 10
COREQUISITES	None
COURSE PLACEMENT	None

COURSE DESCRIPTION

Through a variety of classroom and/or lab/shop learning and assessment activities, students in this course will: identify measuring procedures, analyze the basic structural damage conditions; identify the safety requirements pertaining to structural damage repair; analyze frame repair methods; analyze unibody inspection and measurement and identify procedures of welding for structural repair.

PROGRAM ALIGNMENT

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:

https://kansasregents.org/workforce_development/program-alignment

PROGRAM LEARNING OUTCOMES

1. Demonstrate adherence to safety and pollution prevention standards according to OSHA and EPA regulations.
2. Demonstrate the ability to communicate effectively in workplace scenarios with an appropriate level of preparedness for daily tasks and assignments.
3. Demonstrate the ability to diagnose and repair non-structural and structural damage according to Original Equipment Manufacturer (OEM) specifications and recommendations.

TEXTBOOKS

<http://kckccbbookstore.com/>

METHOD OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations,

projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE

- I. 1.A Frame Inspection and Repair
- II. 1.B Unibody Inspection, Measurement, and Repair
- III. 1.D Metal Welding and Cutting
- IV. 4.A Safety Precautions

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

A. Identify measuring procedures

1. Diagnose and measure structural damage using tram and self-centering gauges. (HP-I)(1.A.1)(DAM02 v.2.1 module 1 DAM02v.2.2 modules 2,3 MEA01 modules1,2).
2. Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser). (HP-G)(1.A.14)(DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2).
3. Diagnose and measure structural damage to vehicles using a dedicated (fixture) measuring system. (HP-G)(1.A.15)(MEA01 module 2).
4. Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system. (HP-G) (1.B.5).
5. Diagnose and measure unibody damage using tram and self-centering gauges. (HP-I)(1.B.3)(MEA01 modules 1, 2).
6. Diagnose and measure unibody vehicles using a universal measuring system (mechanical, electronic, laser). (HP-G)(1.B.6)(DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2).
7. Identify heat limitations in unibody vehicles. (HP-I)(1.B.15)(FCR01 module 1 SSS01 module 4).
8. Analyze and identify crush/collapse zones. (HP-I)(1.B.21)(SPS01 v.3.1 modules 1,4,6 SPS01 v.3.2 modules1,2).

B. Analyze the basic structural damage conditions.

9. Diagnose and measure structural damage using tram and self-centering gauges. HP-I(1.A.1)(DAM02 v.2.1 module 1 DAM02v.2.2 modules 2,3 MEA01 modules1,2).
10. Analyze, straighten and align mash (collapse) damage. (HP-G)(1.A.3)(MEA01 module 4 SSS01 module 5).
11. Analyze, straighten and align sag damage. (HP-G)(1.A.4)(MEA01 module 4 SSS01 module 5).
12. Analyze, straighten and align sidesway damage. (HP-G)(1.A.5)(MEA01 module 4 SSS01 module 5).
13. Analyze, straighten and align twist damage. (HP-G)(1.A.6)(MEA01 module 4 SSS01 module 5).
14. Analyze, straighten and align diamond frame damage. (HP-G)(1.A.7)(MEA01 module 4 SSS01 module 5).

15. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems. (HP-I)(1.A.10)(DAM03 v.2.2 modules 4,6 DAM03 v.2.4 module 6 DAM06 module 2).
 16. Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser). (HP-G)(1.A.14)(DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2).
 17. Diagnose and measure structural damage to vehicles using a dedicated (fixture) measuring system. (HP-G)(1.A.15)(MEA01 module 2).
 18. Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair. (HP- I)(1.A.16)(DAM02 v.2.1 modules1,3 DAM02 v.2.2 module 2 FCR01 v.2.1 module 2 FCR01 v.2.2 modules 2,3 SSS01 module 1).
 19. Analyze and identify crush/collapse zones. (HP-I)(1.A.17)(SPS03 module 3 SPS08 modules1,3).
 20. Diagnose and measure unibody damage using tram and self-centering gauges. (HP-I)(1.B.3)(MEA01 modules 1, 2).
 21. Determine and inspect the locations of all suspension, steering, and powertrain component attaching points on the vehicle. (HP-G)(1.B.4)(DAM03 module 6 DAM06 module 2 DRT01 modules2,5 MEA01 module 6).
 22. Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system. (HP-G)(1.B.5)(MEA01 module 2).
 23. Diagnose and measure unibody vehicles using a universal measuring system (mechanical, electronic, laser). (HP-G)(1.B.6)(DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2).
 24. Determine the extent of damage to aluminum structural components; repair, weld, or replace. (HP-G)(1.B.20)(DAM05 module 3 SPA01 modules 1,2 SPA02 modules 1,2 SSA01 modules 1,2,3).
 25. Analyze and identify crush/collapse zones. (HP-I)(1.B.21)(SPS01 v.3.1 modules 1,4,6 SPS01 v.3.2 modules 1,2).
- C. Identify the safety requirements pertaining to structural damage repair
26. Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations. (HP-I) (4.A.1)(EDS02 module 1 REF01 module 4 REF03 modules 2,4 WKR01 module3).
 27. Identify safety and personal health hazards according to OSHA guidelines. (HP-I) (4.A.2)(WKR01 module1).
 28. Select and use the NIOSH approved personal sanding respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation. (HP-I) (4.A.4)(WKR01module 4).
 29. 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.). (HP-I) (4.A.6)(EDS02 modules 1,2,3,4,5,6,7 REF02 module 2 REF03 modules 2,4 WKR01 module 4).
- D. The student will be able to analyze frame repair methods
30. Diagnose and measure structural damage using tram and self-centering gauges. (HP-I) (1.A.1)(DAM02 v.2.1 module 1 DAM02v.2.2 modules 2,3 MEA01 modules1,2).
 31. Analyze, straighten and align mash (collapse) damage. (HP-G)(1.A.3)(MEA01 module 4 SSS01 module 5).

32. Analyze, straighten and align sag damage. (HP-G)(1.A.4)(MEA01 module 4 SSS01 module 5).
 33. Analyze, straighten and align sidesway damage. (HP-G)(1.A.5)(MEA01 module 4 SSS01 module 5).
 34. Analyze, straighten and align twist damage. (HP-G)(1.A.6)(MEA01 module 4 SSS01 module 5).
 35. Analyze, straighten and align diamond frame damage. (HP-G)(1.A.7)(MEA01 module 4 SSS01 module 5).
 36. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems. (HP-I)(1.A.10)(DAM03 v.2.2 modules 4,6 DAM03 v.2.4 module 6 DAM06 module 2).
 37. Identify heat limitations in structural components. (HP-I)(1.A.12)(FCR01 module 1 SSS01 module 4).
 38. Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser). (HP-G)(1.A.14)(DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2).
 39. Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair. (HP-I)(1.A.16)(DAM02 v.2.1 modules 1,3 DAM02 v.2.2 module 2 FCR01 v.2.1 module 2 FCR01 v.2.2 modules 2,3 SSS01 module 1).
 40. Analyze and identify crush/collapse zones. (HP-I) (1.A.17)(SPS03 module 3 SPS08 modules 1,3).
- F. The student will be able to analyze unibody inspection and measurement
41. Diagnose and measure unibody damage using tram and self-centering gauges. (HP-I) (1.B.3)(MEA01 modules 1, 2).
 42. Determine and inspect the locations of all suspension, steering, and powertrain component attaching points on the vehicle. (HP-G) (1.B.4)(DAM03 module 6 DAM06 module 2 DRT01 modules 2,5 MEA01 module 6).
 43. Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system. (HP-G) (1.B.5)(MEA01 module 2).
 44. Diagnose and measure unibody vehicles using a universal measuring system (mechanical, electronic, laser). (HP-G)(1.B.6)(DAM02 v.2.1 module 1 DAM02 v.2.2 module 3 MEA01 module 2).
 45. Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair. (HP-I)(1.B.7)(DAM02 v.2.1 modules 1,3 DAM02 v.2.2 module 2 FCR01 v.2.1 module 2 FCR01 v.2.2 modules 2,3 SSS01 module 1).
 46. Identify heat limitations in unibody vehicles. (HP-I) (1.B.15)(FCR01 module 1 SSS01 module 4).
 47. Identify proper cold stress relief methods. (HP-I)(1.B.16)(SSS01 module 4).
 48. Analyze and identify crush/collapse zones. (HP-I)(1.B.21)(SPS01 v.3.1 modules 1,4,6 SPS01 v.3.2 modules 1,2).
- G. Identify procedures of welding for structural repair
49. Identify weldable and non-weldable materials used in collision repair. (HP-I)(1.D.1)(FCR01 module 1).
 50. Weld and cut high-strength steel and other steels. (HP-I)(1.D.2)(WCS01 v.1.2 modules 1,2,3,4 WCS01 v.1.3 modules 1,2,3,4,5).

51. Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation. (HP-I)(1.D.4)(WCS01 module 1).
52. 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 material being welded. (HP-I)(1.D.5)(WCS01 module 1).
53. Store, handle, and install high-pressure gas cylinders. (HP-I)(1.D.6)(WCS01 module 1).
54. Determine work clamp (ground) location and attach. (HP-I)(1.D.7)(WCS01 module 1).
55. 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. (HP-I)(1.D.8)(WCS01 v.1.2 module 1 WCS01 v.1.3 modules 1,2,3,4,5).
56. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. (HP-I)(1.D.9)(WCS01 module 1).
57. Protect computers and other electronic control modules during welding procedures. (HP-I)(1.D.10)(WCS01 module 1).
58. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required. (HP-I)(1.D.11)(WCS01 module 1).
59. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. (HP-I)(1.D.12)(SPS01 v.3.1 module 1 SPS01 v.3.2 modules 1,2 SPS02 v.3.1 module 1 SPS v.3.2 module 2 SPS03 modules 2,3).
60. Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation. (HP-I)(1.D.13)(SPS01 v.3.1 module 1 SPS01 v.3.2 modules 1,2 SPS02 v.3.1 module 1 SPS v.3.2 module 2 SPS03 modules 2,3).
61. Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and fillet weld. (HP-I)(1.D.14)(WCS01 v.1.2 modules 2,3,4 WCS01 v.1.3 modules 1,2,3,4,5).
62. Perform visual and destructive tests on each weld type. (HP-I)(1.D.15)(WCS01 v.1.2 modules 2,3,4 WCS01 v.1.3 modules 2,3,4,5).
63. Identify the causes of various welding defects; make necessary adjustments. (HP-I)(1.D.16)(WCS01 v.1.2 module 1 WCS01 v.1.3 modules 1,2,3,4,5).
64. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. (HP-I)(1.D.17)(WCS01 module 1).
65. Identify cutting process for different materials and locations; perform cutting operation. (HP-I)(1.D.18)(WCS05 module 4).
66. Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, silicon bronze, etc.) (HP-1.D.19)(ADH01 v.1.2 module 1 ADH01 v.1.3 modules 1,2 SPS01 v.3.1 module 1 SPS01 v.3.2 modules 1,2 SPS03 module 4 WCS04 v.2.1 modules 1,2,3 WCs04 v.2.2 modules 1,2,3,4).

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

College Catalog

<https://www.kckcc.edu/academics/catalog/index.html>

College Policies and Statements

<https://www.kckcc.edu/about/policies-statements/index.html>

Accessibility and Accommodations

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.