2011 Mississippi Curriculum Framework

Postsecondary Diesel Equipment Technology
(Program CIP: 47.0605 – Diesel Mechanics Technology/Technician)

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Itawamba Community College Diesel Equipment Advisory Committee

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 Standards - 2007 Medium/Heavy Truck Certifications (Brakes, Diesel, Steering and Suspension, Electrical), 101 Blue Seal Drive, Suite 101 Leesburg, VA 20175, www.natef.org

Related Academic Standards

21st Century Skills
Reproduced with permission of the Partnership for 21st Century Skills. Further information may be found at www.21stcenturyskills.org
Preface

Postsecondary Diesel Equipment Technology Research Synopsis

Articles, books, Web sites, and other materials listed at the end of each course were considered during the revision process. *ASE Blue Seal Tech News, Automotive Inc.*, *Shoptalk*, and *Tomorrow’s Technician* 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 included positive attitude, being at work every day and on time, and having reading and writing skills to complete work orders and other forms. Occupation-specific skills stated included fundamentals of mechanics, mechanical reasoning, identification of basic parts, operation, and troubleshooting. Safety practices emphasized included aligning the curriculum to current industry standards.

Instructors from colleges throughout the state were also asked to give input on changes to be made to the curriculum framework. Changes suggested for the curriculum included aligning the curriculum to current industry standards.

Needs of the Future Workforce

The number of jobs for diesel mechanics is projected to grow 5% in the United States and 9% in Mississippi which is slower than the average growth of most occupations (EMSI, 2010). However job prospects will be good due to replacement jobs as experienced technicians retire or seek other employment. Due to higher fuel efficiency requirements for automakers, diesel engines are expected to be used in a small but increasing number of cars and light trucks. This will create additional jobs for diesel service technicians, specifically in the automotive repair and maintenance and automobile dealer industries. Job prospects will be best for people with strong technical skills and who complete formal postsecondary training in diesel mechanics. Individuals without formal training will face strong competition for jobs (US Bureau of Labor Statistics, 2011).

<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>2,392</td>
<td>2,596</td>
<td>204</td>
<td>9%</td>
<td>784</td>
<td>$14.87</td>
</tr>
<tr>
<td>National Total</td>
<td>258,239</td>
<td>271,987</td>
<td>13,748</td>
<td>5%</td>
<td>77,442</td>
<td>$18.76</td>
</tr>
</tbody>
</table>

Source: EMSI Complete Employment - 2011.2

Curriculum

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

- CTB/McGraw-Hill LLC *Tests of Adult Basic Education, Forms 9 and 10 Academic Standards*
- *21st Century Skills*
• 2007 Medium/Heavy Truck Certifications (Brakes, Diesel, Steering and Suspension, Electrical)

Industry and instructor comments, along with current research, were considered by the curriculum revision team during the revision process; 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 November 3, 2010, curriculum revision meeting included:

• The curriculum was aligned with the 2007 Medium/Heavy Truck Certifications (Brakes, Diesel, Steering and Suspension, Electrical).

• Competencies and objectives were reviewed to ensure accuracy and appropriateness. Some were rewritten to provide broader competencies and more specific, measurable objectives. Where appropriate, competencies were combined to ensure clarity and minimize repetition.

• The integration of workplace and academic skills including reading, math, language, and science was also documented.

• The Recommended Tools and Equipment list was updated.

Assessment
Students will be assessed using the Diesel Equipment 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 Manufacturing Instructional Design Specialist at the Research and Curriculum Unit at 662.325.2510.

Or

Upon completion of this program, students should be prepared to sit for the national or international assessment aligned with this curriculum or to take another alternative assessment approved by MCCB Office of Career and Technical Education. Make sure to check the MCCB site for the latest approved alternate assessments.

There are currently no approved alternative assessments.

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

• 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.

• Computer skills for college credit – To learn more about computer skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to http://msvcc.blackboard.com/webapps/portal/frameset.jsp.

• Computer skills for CEU credit – To learn more about computer skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to https://cia.rcu.msstate.edu/OnlinePD/.
- Keyboarding skills – To learn to keyboard, please go to http://www.learn2type.com/ for a free typing tutor.
- Blackboard® training – To learn more about Blackboard® training, please go to https://cia.rcu.msstate.edu/OnlinePD/.
- Multiple learning styles inventory training – To learn more about multiple learning styles inventory training, please go to:
  - http://eduscapes.com/tap/topic68.htm (Technology and Multiple Intelligences)
  - http://www.plsweb.com/graduate_courses/full_course_listing/online/miol/ (Purposeful Learning Through Multiple Intelligences® Online)

Program Exceptions
No program exceptions exist at this time.

Articulation
Articulation credit from Secondary Automotive Service Technology and Secondary Diesel Service Technology to Postsecondary Diesel Equipment Technology will be awarded upon implementation of this curriculum by the college. The course to be articulated is Fundamentals of Equipment Mechanics (DET 1114) 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] Automotive Service Technology (CIP: 47.0604)</td>
<td>Fundamentals of Equipment Mechanics (DET 1114)</td>
</tr>
<tr>
<td>[S] Diesel Service Technology (CIP: 47.0605)</td>
<td>Fundamentals of Equipment Mechanics (DET 1114)</td>
</tr>
</tbody>
</table>

Statewide Guidelines on Articulated Credit

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

Postsecondary Diesel Equipment Technology
**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 twelve (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

The Diesel Equipment Technology Program is an instructional program that provides students with competencies required to maintain and repair a variety of industrial diesel equipment, including agricultural tractors, commercial trucks, and construction equipment. The program includes instruction in inspection, repair, and maintenance of engines, power trains, hydraulic systems, and other components.

Diesel Equipment Technology is an articulated certificate or technical program designed to provide advanced skills to its students. Baseline competencies, taken from the secondary Diesel Service Technology, serve as a foundation for the competencies and objectives taught in the courses of the program. Students who do not possess these competencies will be allowed to acquire them during the program. Students who can document mastery of these baseline competencies will not be required to repeat these competencies.

The curriculum utilized the Automotive Service Excellence (ASE) 2007 Medium/Heavy Truck standards. These documents serve as national standards for certification of medium/heavy truck technician programs.

The tasks described in the document are based on a number of assumptions which also apply to the competencies and objectives in the Career Technical courses of this program. These assumptions include:

1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each objective including the identification and safe use of tools and testing and measuring equipment, and the use of reference materials and technical manuals.
2. All diagnostic and repair tasks are performed in accordance with manufacturer’s recommended procedures and to manufacturer’s specifications.

A one year certificate requires successful completion of a minimum of 34 semester credit hours (sch) of required courses.

The two year certificate requires successful completion of a minimum of 52 semester credit hours (sch) of required courses.

The technical program requires successful completion of a minimum of 64 semester credit hours (sch) with 15 semester credit hours of academic core courses included.

Articulation

Articulation credit from Secondary Automotive Service Technology or Secondary Diesel Service Technology to Postsecondary Diesel Equipment Technology will be awarded upon implementation of this curriculum by the college. The course to be articulated is Fundamentals of Equipment Mechanics (DET 1114) with the stipulation of passing the MS-CPAS2 according to State Board for Community and Junior Colleges (SBCJC) guidelines.
### Suggested Course Sequence*
#### Diesel Equipment Technology
#### One Year Technical Certificate

**FIRST YEAR**

<table>
<thead>
<tr>
<th>Sch.</th>
<th>Course Description</th>
<th>Sch.</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Fundamentals of Equipment Mechanics (DET 1114)</td>
<td>4</td>
<td>Diesel Systems I (DET 1364)</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulic Brake Systems (DET 1213)</td>
<td>4</td>
<td>Preventive Maintenance and Service (DET 1614)</td>
</tr>
<tr>
<td>3</td>
<td>Electrical/Electronic Systems I (DET 1223)</td>
<td>3</td>
<td>Advanced Brake Systems (Air) (DET 2623)</td>
</tr>
<tr>
<td>3</td>
<td>Power Trains (DET 1713)</td>
<td>3</td>
<td>Electrical/Electronic Systems II (DET 1263)</td>
</tr>
<tr>
<td>3</td>
<td>Approved Elective</td>
<td>3</td>
<td>Approved Elective</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

* Students who lack entry level skills in math, English, science, etc. will be provided related studies.

#### APPROVED ELECTIVES

- Hydraulics (DET 1513)
- Steering and Suspension Systems (DET 2253)
- Air Conditioning and Heating Systems (DET 2813)
- Special Project in Diesel Equipment Technology (DET 291(1-3))
- Supervised Work Experience in Diesel Equipment Technology (DET 292(1-3))
- Welding for Diesel Equipment Technology (DET 2113)
- Fluid Power Trains (DET 2523)
- 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)]

Or other instructor-approved electives

#### COMPUTER RELATED ELECTIVE

- Fundamentals of Microcomputer Applications (CPT 1113)
- Introduction to Computer Concepts (CSC 1113)
- Any other computer related technical or academic course as approved by the instructor.

Or other instructor-approved electives
# Suggested Course Sequence*
## Diesel Equipment Technology
### Two Year Technical Certificate

**FIRST YEAR**

<table>
<thead>
<tr>
<th>Sch</th>
<th>Course</th>
<th>Sch</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Fundamentals of Equipment Mechanics (DET 1114)</td>
<td>4</td>
<td>Diesel Systems I (DET 1364)</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulic Brake Systems (DET 1213)</td>
<td>4</td>
<td>Preventive Maintenance and Service (DET 1614)</td>
</tr>
<tr>
<td>3</td>
<td>Electrical/Electronic Systems I (DET 1223)</td>
<td>3</td>
<td>Advanced Brake Systems (Air) (DET 2623)</td>
</tr>
<tr>
<td>3</td>
<td>Power Trains (DET 1713)</td>
<td>3</td>
<td>Electrical/Electronic Systems II (DET 1263)</td>
</tr>
<tr>
<td>13</td>
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<td>14</td>
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</tr>
</tbody>
</table>

**SECOND YEAR**

<table>
<thead>
<tr>
<th>Sch</th>
<th>Course</th>
<th>Sch</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Diesel Systems II (DET 2374)</td>
<td>3</td>
<td>Steering and Suspension Systems (DET 2253)</td>
</tr>
<tr>
<td>3</td>
<td>Air Conditioning and Heating Systems (DET 2813)</td>
<td>3</td>
<td>Hydraulics (DET 1513)</td>
</tr>
<tr>
<td>3</td>
<td>Electrical/Electronic Systems III (DET2273)</td>
<td>3</td>
<td>Approved Elective</td>
</tr>
<tr>
<td>3</td>
<td>Approved Elective</td>
<td>3</td>
<td>Approved Elective</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

* Students who lack entry level skills in math, English, science, etc. will be provided related studies.
APPROVED ELECTIVES

Introduction to Computer or Computer course
3 sch  Diesel Systems III (DET 2383)
1-3 sch  Special Project in Diesel Equipment Technology [DET 291(1-3)]
1-3 sch  Supervised Work Experience in Diesel Equipment Technology [DET 292(1-3)]
3 sch  Welding for Diesel Equipment Technology (DET 2113)
3 sch  Fluid Power Trains (DET 2523)
1-6 sch  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)]
Or other instructor-approved elective(s)

COMPUTER RELATED ELECTIVE

Fundamentals of Microcomputer Applications (CPT 1113)
Introduction to Computer Concepts (CSC 1113)
Any other computer related technical or academic course as approved by the instructor.
Or other instructor-approved elective(s)
# Suggested Course Sequence*

**Diesel Equipment Technology**  
**Associate of Applied Science Degree**

## FIRST YEAR

<table>
<thead>
<tr>
<th>4 sch</th>
<th>Fundamentals of Equipment Mechanics (DET 1114)</th>
<th>4 sch</th>
<th>Diesel Systems I (DET 1364)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 sch</td>
<td>Hydraulic Brake Systems (DET 1213)</td>
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<td>Preventive Maintenance and Service (DET 1614)</td>
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<tr>
<td>3 sch</td>
<td>Electrical/Electronic Systems I (DET 1223)</td>
<td>3 sch</td>
<td>Advanced Brake Systems (Air) (DET 2623)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Power Trains (DET 1713)</td>
<td>3 sch</td>
<td>Electrical/Electronic Systems II (DET 1263)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Math/Science Elective</td>
<td>3 sch</td>
<td>Oral Communications Elective</td>
</tr>
<tr>
<td>16 sch</td>
<td></td>
<td></td>
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</table>

## SECOND YEAR

<table>
<thead>
<tr>
<th>4 sch</th>
<th>Diesel Systems II (DET 2374)</th>
<th>3 sch</th>
<th>Steering and Suspension Systems (DET 2253)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 sch</td>
<td>Air Conditioning and Heating Systems (DET 2813)</td>
<td>3 sch</td>
<td>Hydraulics (DET 1513)</td>
</tr>
<tr>
<td>3 sch</td>
<td>Electrical/Electronic Systems III (DET 2273)</td>
<td>3 sch</td>
<td>Approved Elective</td>
</tr>
<tr>
<td>3 sch</td>
<td>Written Communications Elective</td>
<td>3 sch</td>
<td>Humanities/Fine Arts Elective</td>
</tr>
<tr>
<td>3 sch</td>
<td>Approved Elective</td>
<td>3 sch</td>
<td>Social/Behavioral Science Elective</td>
</tr>
<tr>
<td>16 sch</td>
<td></td>
<td>15 sch</td>
<td></td>
</tr>
</tbody>
</table>

* Students who lack entry level skills in math, English, science, etc. will be provided related studies.
APPROVED ELECTIVES

Introduction to Computer or Computer course
3 sch Diesel Systems III (DET 2383)
1-3 sch Special Project in Diesel Equipment Technology [DET 291(1-3)]
1-3 sch Supervised Work Experience in Diesel Equipment Technology [DET 292(1-3)]
3 sch Welding for Diesel Equipment Technology (DET 2113)
3 sch Fluid Power Trains (DET 2523)
1-6 sch 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)]
Or other instructor-approved elective(s)

COMPUTER RELATED ELECTIVE
Fundamentals of Microcomputer Applications (CPT 1113)
Introduction to Computer Concepts (CSC 1113)
Any other computer related technical or academic course as approved by the instructor.
Or other instructor-approved elective(s)
### Diesel Equipment Technology Courses

**Course Name:** Fundamentals of Equipment Mechanics

**Course Abbreviation:** DET 1114

**Classification:** Career Technical Core

**Description:** Review and update of safety procedures; tools and equipment usage; handling, storing, and disposing of hazardous materials; and operating principles of diesel engines. (4 sch: 4 hr. lecture)

**Prerequisite:** None

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<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe general safety rules for working in a shop/lab and industry. (DOK2, MTB1, MTE2, MTS3, MTD4, MPM5, MDT6, MAC7, MHD8)</td>
</tr>
<tr>
<td>a. Describe how to avoid on-site accidents. (DOK1)</td>
</tr>
<tr>
<td>b. Explain the relationship between housekeeping and safety, the importance of following all safety rules and company safety policies, the importance of reporting all on-the-job injuries and accidents, the need for evacuation policies and the importance of following them, the employer’s substances abuse policy and how it relates to safety. (DOK1)</td>
</tr>
<tr>
<td>c. Explain the safety procedures when working near pressurized or high temperature. (DOK1)</td>
</tr>
<tr>
<td>2. Use proper safety practices when performing diesel repair operations. (DOK1)</td>
</tr>
<tr>
<td>a. Recognize, inspect, and explain personal protective equipment. (DOK2)</td>
</tr>
<tr>
<td>3. Identify and explain the procedures for lifting heavy objects. (DOK1)</td>
</tr>
<tr>
<td>4. Explain the Material Safety Data Sheet (MSDS). (DOK1)</td>
</tr>
<tr>
<td>a. Explain the function of the MSDS. (DOK1)</td>
</tr>
<tr>
<td>b. Interpret the requirements of the MSDS. (DOK2)</td>
</tr>
<tr>
<td>5. Explain fires. (DOK1, MTB1, MTE2, MTS3, MPM5, MDT6, MAC7, MHD8)</td>
</tr>
<tr>
<td>a. Explain the process by which fires start. (DOK1)</td>
</tr>
<tr>
<td>b. Explain fire prevention of various flammable liquids. (DOK1)</td>
</tr>
<tr>
<td>c. Explain the classes of fire and the types of extinguishers. (DOK1)</td>
</tr>
<tr>
<td>6. Explain electrical safety hazards, injuries, and precautions in and around diesel repair. (DOK1)</td>
</tr>
<tr>
<td>7. Identify and properly use hand and power tools related to diesel equipment repair. (DOK1, MTB1, MTE2, MTD4, MTS3, MPM5, MDT6, MAC7, MHD8)</td>
</tr>
<tr>
<td>8. Demonstrate the proper use and interpretation of precision measurement instruments. (DOK2, MTB1, MTE2, MTS3, MTD4, MPM5, MDT6, MAC7, MHD8)</td>
</tr>
</tbody>
</table>
For every task in Brake course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Electrical/Electronic Systems course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Suspension and Steering course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Diesel course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Preventive Maintenance course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Drive Train course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Heating, Ventilation, & Air Conditioning course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Hydraulics course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
**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)  
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**

CS2 Financial, Economic, Business and Entrepreneurial Literacy  
CS6 Thinking and Problem Solving  
CS8 Communication and Collaboration  
CS9 Information Literacy

**SUGGESTED REFERENCES**

**Journals**


Texts


**Videos**


BoxWrench Media. (n.d.). *Basic engine rebuilding*. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)


**Web Sites**


**Course Name:** Hydraulic Brake Systems

**Course Abbreviation:** DET 1213

**Classification:** Career Technical Core

**Description:** Diagnosis and repair of hydraulic brake systems, includes instruction in hydraulic and mechanical systems, power assist units, and antilock braking systems. (3 sch: 2 hr. lecture, 2 hr. lab)

**Prerequisite:** None

**Competencies and Suggested Objectives**

1. Explore and perform hydraulic brakes diagnosis and repair. (DOK3, MTB1, MTE2, MTS3, MPM5, MHD8)
   - a. Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action. (DOK2)
   - b. Check brake pedal pushrod length; adjust as needed. (DOK3)
   - c. Inspect and test master cylinder for internal/external leaks and damage; replace as needed. (DOK2)
   - d. Inspect hydraulic system, brake lines, flexible hoses, and fittings for leaks and damage; replace as needed. (DOK2)
   - e. Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed. (DOK3)
   - f. Inspect disc brake caliper assemblies; replace as needed. (DOK2)
   - g. Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type. (DOK2)

2. Perform diagnosis and repair of mechanical/foundation systems. (DOK2, MTB1, MTE2, MTS3, MPM5, MHD8)
   - a. Identify poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action. (DOK2)
   - b. Inspect and measure rotors; perform needed action. (DOK2)
   - c. Inspect and measure disc brake pads; inspect mounting hardware; perform needed action. (DOK2)
   - d. Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed. (DOK2)

3. Discuss and perform power assist units diagnosis and repair. (DOK3, MTB1, MTE2, MTS3, MPM5, MHD8)
   - a. Identify stopping problems caused by the brake assist (booster) system; determine needed action. (DOK3)
   - b. Inspect, test, repair, or replace hydraulic power brake assist (booster), hoses, and control valves; determine proper fluid type. (DOK3)
   - c. Check emergency (back-up, reserve) brake assist system. (DOK3)

4. Discuss and perform hydraulic antilock brake systems (ABS) and automatic traction control (ATC) diagnosis and repair. (DOK3, MTB1, MTE2, MTS3, MPM5, MHD8)
   - a. Observe antilock brake system (ABS) warning light operation (includes dash mounted trailer ABS warning light); determine needed action. (DOK1)
b. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action. *(DOK1)*

c. Identify poor stopping and wheel lock-up problems caused by failure of the antilock brake system (ABS); determine needed action. *(DOK1)*

d. Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action. *(DOK1)*

e. Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed. *(DOK1)*

f. Bleed the ABS hydraulic circuits following manufacturers’ procedures. *(DOK2)*

g. Observe automatic traction control (ATC) warning light operation; determine needed action. *(DOK3)*

h. Diagnose automatic traction control (ATC) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action. *(DOK3)*

5. Discuss and perform inspection, lubrication, and replacement of wheel bearings. *(DOK3, MTB1, MTE2, MTS3, MPM5, MHD8)*

   a. Clean, inspect, lubricate and replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings. *(DOK1)*

   b. Inspect or replace extended service wheel bearing assemblies. *(DOK3)*

**STANDARDS**

2007 ASE/NATEF Medium/Truck Technician Standards

**MTB1**  For every task in Brake course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

**MTE2**  For every task in Electrical/Electronic Systems course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

**MTS3**  For every task in Suspension and Steering course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

**MPM5**  For every task in Preventive Maintenance course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
For every task in Hydraulics course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

**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)
**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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**S1** Vowel (short, long)
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**21st Century Skills**

**CS2** Financial, Economic, Business and Entrepreneurial Literacy
**CS7** Thinking and Problem Solving
**CS8** Communication and Collaboration
**CS9** Information Literacy

Postsecondary Diesel Equipment Technology
SUGGESTED REFERENCES

Journals


Texts


Videos


BoxWrench Media. (n.d.). Basic engine rebuilding. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)

Cleveland Institute of Electronics. (2005). Diesel cylinder head service DVD course. (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)


**Web Sites**


Course Name: Electrical/Electronic Systems I

Course Abbreviation: DET 1223

Classification: Career Technical Core

Description: Diagnosis, service, and repair of electrical and electronic systems on diesel engines, includes instruction in general systems diagnosis, starting and charging systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore general electronic and electrical systems. (DOK1, MTE2)</td>
</tr>
<tr>
<td>a. Read and interpret electrical/electronic circuits using wiring diagrams. (DOK1)</td>
</tr>
<tr>
<td>b. Check continuity in electrical/electronic circuits using appropriate test equipment. (DOK1)</td>
</tr>
<tr>
<td>c. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment. (DOK1)</td>
</tr>
<tr>
<td>d. Check current flow in electrical/electronic circuits and components using appropriate test equipment. (DOK1)</td>
</tr>
<tr>
<td>e. Check resistance in electrical/electronic circuits and components using appropriate test equipment. (DOK1)</td>
</tr>
<tr>
<td>f. Locate shorts, grounds, and opens in electrical/electronic circuits. (DOK1)</td>
</tr>
<tr>
<td>g. Identify parasitic (key-off) battery drain problems; perform tests; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>h. Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed. (DOK1)</td>
</tr>
<tr>
<td>i. Inspect and test spike suppression devices; replace as needed. (DOK3)</td>
</tr>
<tr>
<td>2. Discuss and perform battery diagnosis and repair. (DOK1, MTE2)</td>
</tr>
<tr>
<td>a. Perform battery load test; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>b. Determine battery state of charge using an open circuit voltage test. (DOK1)</td>
</tr>
<tr>
<td>c. Inspect, clean, and service battery; replace as needed. (DOK1)</td>
</tr>
<tr>
<td>d. Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>e. Charge battery using slow or fast charge method as appropriate. (DOK1)</td>
</tr>
<tr>
<td>f. Inspect, test, and clean battery cables and connectors; repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>g. Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures. (DOK1)</td>
</tr>
<tr>
<td>h. Perform battery capacitance test; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>3. Discuss and perform starting system diagnosis and repair. (DOK1, MTE2)</td>
</tr>
<tr>
<td>a. Perform starter circuit cranking voltage and voltage drop tests; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>b. Inspect and test components (key switch, push button and/or magnetic switch) and wires in the starter control circuit; replace as needed. (DOK2)</td>
</tr>
<tr>
<td>c. Inspect and test starter relays and solenoids/switches; replace as needed. (DOK2)</td>
</tr>
</tbody>
</table>
d. Remove and replace starter; inspect flywheel ring gear or flex plate. (DOK2)

4. Discuss and perform charging system diagnosis and repair. (DOK2, MTE2)
   a. Test instrument panel mounted volt meters and/or indicator lamps; determine needed action. (DOK1)
   b. Identify causes of a no charge, low charge, or overcharge problems; determine needed action. (DOK1)
   c. Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment. (DOK1)
   d. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action. (DOK1)
   e. Perform charging circuit voltage drop tests; determine needed action. (DOK1)
   f. Remove and replace alternator. (DOK2)
   g. Inspect, repair, or replace cables, wires, and connectors in the charging circuit. (DOK2)

STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTE2 For every task in Electrical/Electronic Systems course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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)
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)
SUGGESTED REFERENCES

**Journals**


**Texts**


**Videos**

Bennett Marine Video. (2000). *Caterpillar 3208.* (Available from Bennett Marine Video, 2321 Abbot Kinney Blvd., Top Floor, Venice, CA 90291, 800-733-8862)


BoxWrench Media. (n.d.). *Basic engine rebuilding.* (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)

Cleveland Institute of Electronics. (2005). *Diesel cylinder head service DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

Cleveland Institute of Electronics. (2005). *Diesel engine operation DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)


Cleveland Institute of Electronics. (2005). *Diesel engine teardown DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

**Web Sites**


Course Name: Electrical/Electronic Systems II

Course Abbreviation: DET 1263

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

Description: Diagnosis, service, and repair of electrical and electronic systems on diesel engines, includes instruction on lighting systems, gauges and warning devices, and related electrical systems. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>1. Explore headlights, daytime running lights, parking, clearance, tail, cab, and instrument panel lights. (DOK2, MTE2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation. (DOK1)</td>
</tr>
<tr>
<td>b. Test, aim, and replace headlights. (DOK1)</td>
</tr>
<tr>
<td>c. Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets and control components; repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>d. Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, wires, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>e. Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>f. Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed. (DOK2)</td>
</tr>
<tr>
<td>g. Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed. (DOK1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Discuss and perform stoplight, turn signal, hazard light, and back-up light diagnosis and repair. (DOK2, MTE2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>b. Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>c. Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed. (DOK2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Discuss and perform gauge and warning device diagnosis and repair. (DOK2, MTE2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Interface with vehicle’s on-board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action. (DOK1)</td>
</tr>
<tr>
<td>b. Identify causes of intermittent, high, low, or no gauge readings; determine needed action. (DOK2)</td>
</tr>
</tbody>
</table>
### 4. Discuss and perform related electrical system diagnosis and repair. \(\text{(DOK3, MTE2)}\)

a. Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action. \(\text{(DOK1)}\)

b. Identify causes of constant, intermittent, or no horn operation; determine needed action. \(\text{(DOK2)}\)

c. Inspect and test horn circuit relays, horns, switches, connectors, wires, and control components/modules; repair or replace as needed. \(\text{(DOK2)}\)

d. Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action. \(\text{(DOK2)}\)

e. Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed. \(\text{(DOK2)}\)

f. Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed. \(\text{(DOK2)}\)

g. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed. \(\text{(DOK3)}\)

h. Inspect and test sideview mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires and control components/modules; repair or replace as needed. \(\text{(DOK3)}\)

i. Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed. \(\text{(DOK3)}\)

j. Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed. \(\text{(DOK3)}\)

k. Identify causes of slow, intermittent, or no power side window operation; determine needed action. \(\text{(DOK3)}\)

l. Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repair or replace as needed. \(\text{(DOK3)}\)

m. Inspect and test block heaters; determine needed repairs. \(\text{(DOK2)}\)

n. Inspect and test cruise control electrical components; repair or replace as needed. \(\text{(DOK3)}\)

o. Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits \(\text{(DOK3)}\)

p. Check operation of keyless and remote lock/unlock devices; determine needed action. \(\text{(DOK3)}\)

q. Inspect and test engine cooling fan electrical control components/modules; repair or replace as needed. \(\text{(DOK2)}\)

r. Identify causes of data bus communication problems; determine needed action. \(\text{(DOK2)}\)
STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTE2 For every task in Electrical/Electronic Systems course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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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)
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

CS2  Financial, Economic, Business and Entrepreneurial Literacy
CS7  Thinking and Problem Solving
CS8  Communication and Collaboration
CS9  Information Literacy

SUGGESTED REFERENCES

Journals


Texts


Videos


BoxWrench Media. (n.d.). Basic engine rebuilding. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)

Cleveland Institute of Electronics. (2005). Diesel cylinder head service DVD course. (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

Cleveland Institute of Electronics. (2005). Diesel engine operation DVD course. (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

Cleveland Institute of Electronics. (2005). Diesel engine reassembly DVD course. (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

Cleveland Institute of Electronics. (2005). Diesel engine teardown DVD course. (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

Web Sites


Course Name: Diesel Systems I

Course Abbreviation: DET 1364

Classification: Career Technical Core

Description: Diagnosis, service, and repair of basic engine operating principles, with an emphasis on cylinder head and valve train engine block. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Review operating principles of gasoline and diesel engines used in commercial/industrial equipment. (DOK1, MTD4)</td>
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<tr>
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<tr>
<td>2. Explore cylinder head and valve train diagnosis and repair. (DOK3, MTD4)</td>
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<tr>
<td>3. Discuss and perform engine block diagnosis and repair. (DOK3, MTD4)</td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>
|   | c. Disassemble, clean, and inspect engine block for cracks/damage; measure mating
surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action. (DOK2)

d. Inspect cylinder sleeve counter-bore and lower bore; check bore distortion; determine needed action. (DOK2)

e. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action. (DOK2)

f. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion). (DOK2)

g. Inspect in-block camshaft bearings for wear and damage; determine needed action. (DOK3)

h. Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play. (DOK3)

i. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action. (DOK2)

j. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play. (DOK2)

k. Inspect, install, and time gear train; measure gear backlash; determine needed action. (DOK2)

l. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action. (DOK2)

m. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons. (DOK3)

n. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances. (DOK2)

o. Check condition of piston cooling jets (nozzles); determine needed action. (DOK2)

p. Inspect and measure crankshaft vibration damper; determine needed action. (DOK3)

q. Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action. (DOK3)

r. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action. (DOK2)

STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTD4 For every task in Diesel course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
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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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)
L2 Sentence Formation (fragments, run-on, clarity)
L3 Paragraph Development (topic sentence, supporting sentence, sequence)
L4 Capitalization (proper noun, titles)
L5 Punctuation (comma, semicolon)
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21st Century Skills

CS2 Financial, Economic, Business and Entrepreneurial Literacy
CS7 Thinking and Problem Solving
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SUGGESTED REFERENCES

Journals


**Texts**


**Automotive technology curriculum—Basic automotive.** (2003). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

**Automotive technology curriculum—Brakes.** (2003). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

**Automotive technology curriculum—Electrical/electronics.** (2003). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)

**Automotive technology curriculum—Steering and suspension.** (2003). Columbia, MO: Instructional Materials Laboratory. (Instructor guide, student guide, workbook, CD-ROM, student task list, and transparencies available)


**Videos**

Bennett Marine Video. (2000). *Caterpillar 3208.* (Available from Bennett Marine Video, 2321 Abbot Kinney Blvd., Top Floor, Venice, CA 90291, 800-733-8862)


BoxWrench Media. (n.d.). *Basic engine rebuilding.* (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)

Cleveland Institute of Electronics. (2005). *Diesel cylinder head service DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

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Cleveland Institute of Electronics. (2005). *Diesel engine teardown DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)
Web Sites


Course Name: Hydraulics

Course Abbreviation: DET 1513

Classification: Technical Core

Description: Basic operation and maintenance of hydraulic systems associated with diesel powered equipment, includes instruction in safety, system components, operation, and repair. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>Competency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Explore general hydraulic system operation. (DOK2, MHD8)</td>
</tr>
<tr>
<td>a.</td>
<td>Identify system type (closed and open) and verify proper operation. (DOK1)</td>
</tr>
<tr>
<td>b.</td>
<td>Read and interpret system diagrams, schematics, and symbols. (DOK1)</td>
</tr>
<tr>
<td>c.</td>
<td>Perform system temperature, pressure, flow, and cycle time tests; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>d.</td>
<td>Verify placement of equipment /component safety labels and placards; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>2.</td>
<td>Discuss and perform pump operation, diagnosis, and repair. (DOK2, MHD8)</td>
</tr>
<tr>
<td>a.</td>
<td>Verify proper fluid type. (DOK1)</td>
</tr>
<tr>
<td>b.</td>
<td>Identify causes of pump failure, unusual pump noises, temperature, flow, and leakage problems; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>c.</td>
<td>Determine pump type, rotation, and drive system. (DOK2)</td>
</tr>
<tr>
<td>d.</td>
<td>Remove and install pump; prime and/or bleed system. (DOK2)</td>
</tr>
<tr>
<td>e.</td>
<td>Inspect pump inlet and outlet for restrictions and leaks; repair as needed. (DOK2)</td>
</tr>
<tr>
<td>3.</td>
<td>Discuss filtration/ reservoirs (tanks). (DOK2, MHD8)</td>
</tr>
<tr>
<td>a.</td>
<td>Identify type of filtration system; verify filter application and flow direction. (DOK1)</td>
</tr>
<tr>
<td>b.</td>
<td>Service filters and breathers. (DOK1)</td>
</tr>
<tr>
<td>c.</td>
<td>Identify causes of system contamination; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>d.</td>
<td>Take a hydraulic oil sample. (DOK2)</td>
</tr>
<tr>
<td>e.</td>
<td>Check reservoir fluid level and condition; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>f.</td>
<td>Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines. (DOK2)</td>
</tr>
<tr>
<td>4.</td>
<td>Discuss hoses, fittings, and connections. (DOK2, MHD8)</td>
</tr>
<tr>
<td>a.</td>
<td>Diagnose causes of component leakage, damage, and restriction; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>b.</td>
<td>Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>c.</td>
<td>Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers’ specifications; use proper procedures to avoid contamination. (DOK2)</td>
</tr>
<tr>
<td>d.</td>
<td>Inspect and replace fitting seals and sealants. (DOK2)</td>
</tr>
<tr>
<td>5.</td>
<td>Discuss and perform control valve diagnosis and repair. (DOK2, MHD8)</td>
</tr>
<tr>
<td>a.</td>
<td>Pressure test system safety relief valve; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>b.</td>
<td>Perform control valve operating pressure and flow tests; determine needed action.</td>
</tr>
</tbody>
</table>
c. Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic). (DOK2)
d. Identify causes of control valve leakage problems (internal/external); determine needed action. (DOK2)
e. Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed. (DOK1)

6. Discuss actuators. [Comply with manufacturers’ and industry accepted safety practices associated with equipment lock out/tag out; pressure line release; implement/support (blocked or resting on ground); and articulated cylinder devices/machinery safety locks.] (DOK2, MHD8)

   a. Identify actuator type (single/double acting, multi-stage/telescopic, and motors. (DOK1)
   b. Identify the cause of seal failure; determine needed repairs. (DOK2)
   c. Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs. (DOK2)
   d. Inspect actuator mounting brackets and plates, frame components, and hardware for looseness, cracks, and damage; determine needed action. (DOK2)
   e. Remove, repair, and/or replace actuators in accordance with manufacturers’ recommended procedures. (DOK2)
   f. Inspect actuators for dents, cracks, damage, and leakage; determine needed action. (DOK2)
   g. Purge and/or bleed system in accordance with manufacturers’ recommended procedures. (DOK1)

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2007 ASE/NATEF Medium/Truck Technician Standards

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M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
M8 Percents
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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SUGGESTED REFERENCES

Journals


Texts


**Videos**


BoxWrench Media. (n.d.). *Basic engine rebuilding*. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)


**Web Sites**


Course Name: Preventive Maintenance and Service

Course Abbreviation: DET 1614

Classification: Career Technical Core

Description: Practice in the preventive maintenance of diesel powered equipment, includes instruction in general preventive maintenance of vehicles and equipment. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>1. Explore engine systems. (DOK1, MPMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Discuss and perform equipment inspection diagnosis and repair. (DOK1)</td>
</tr>
<tr>
<td>1) Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm. (DOK1)</td>
</tr>
<tr>
<td>2) Inspect vibration damper. (DOK1)</td>
</tr>
<tr>
<td>3) Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment. (DOK1)</td>
</tr>
<tr>
<td>4) Check engine oil level and condition; check dipstick seal. (DOK1)</td>
</tr>
<tr>
<td>5) Inspect engine mounts for looseness and deterioration. (DOK1)</td>
</tr>
<tr>
<td>6) Check engine for oil, coolant, air, fuel, and exhaust leaks (Engine Off and Running). (DOK1)</td>
</tr>
<tr>
<td>7) Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing. (DOK1)</td>
</tr>
<tr>
<td>b. Discuss and perform fuel system diagnosis and repair. (DOK1)</td>
</tr>
<tr>
<td>1) Check fuel tanks, mountings, lines, caps, and vents. (DOK1)</td>
</tr>
<tr>
<td>2) Drain water from fuel system. (DOK1)</td>
</tr>
<tr>
<td>3) Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system. (DOK1)</td>
</tr>
<tr>
<td>c. Discuss and perform air induction and exhaust system diagnosis and repair. (DOK1)</td>
</tr>
<tr>
<td>1) Check exhaust system mountings for looseness and damage. (DOK1)</td>
</tr>
<tr>
<td>2) Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system, and after-treatment devices, if equipped. (DOK1)</td>
</tr>
<tr>
<td>3) Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks. (DOK1)</td>
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<tr>
<td>4) Inspect turbocharger for leaks; check mountings and connections. (DOK1)</td>
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<tr>
<td>5) Check operation of engine compression/exhaust brake. (DOK1)</td>
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<tr>
<td>6) Service or replace air filter as needed; check and reset air filter restriction indicator. (DOK1)</td>
</tr>
<tr>
<td>7) Inspect and service crankcase ventilation system. (DOK1)</td>
</tr>
<tr>
<td>d. Discuss and perform cooling system diagnosis and repair. (DOK1)</td>
</tr>
<tr>
<td>1) Check operation of fan clutch. (DOK1)</td>
</tr>
<tr>
<td>2) Inspect radiator (including air flow restriction, leaks, and damage) and mountings. (DOK1)</td>
</tr>
</tbody>
</table>
3) Inspect fan assembly and shroud.  
4) Pressure test cooling system and radiator cap.  
5) Inspect coolant hoses and clamps.  
6) Inspect coolant recovery system.  
7) Check coolant for contamination, additive package concentration, and protection level (freeze point).  
8) Service coolant filter.  
9) Inspect water pump for leaks and bearing play.

e. Discuss and perform lubrication system diagnosis and repair.  
1) Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.  
2) Take an engine oil sample.

2. Explore the cab and hood.  
a. Discuss and perform instruments and control diagnosis and repair.  
1) Inspect key condition and operation of ignition switch.  
2) Check warning indicators.  
3) Check instruments; record oil pressure and system voltage.  
4) Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable).  
5) Check (HVAC) controls.  
6) Check operation of all accessories.  
7) Using diagnostic tool or on-board diagnostic system; retrieve engine monitoring information; check and record diagnostic codes and trip/operational data (including engine, transmission, ABS, and other systems).

b. Discuss and perform safety equipment diagnosis and repair.  
1) Check operation of electric/air horns and reverse warning devices.  
2) Check condition of spare fuses, triangles, fire extinguisher, and all required decals.  
3) Inspect seat belts and sleeper restraints.  
4) Inspect wiper blades and arms.  
5) Check operation of wiper and washer.  
6) Inspect windshield glass for cracks or discoloration; check sun visor.  
7) Check seat condition, operation, and mounting.  
8) Check door glass and window operation.  
9) Inspect steps and grab handles.  
10) Inspect mirrors, mountings, brackets, and glass.  
11) Record all observed physical damage.  
12) Lubricate all cab and hood grease fittings.  
13) Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.  
14) Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.

c. Discuss and perform heating, ventilation, and air conditioning (HVAC) diagnosis and repair.  
1) Inspect A/C condenser and lines for condition and visible leaks; check mountings.
2) Inspect A/C compressor and lines for condition and visible leaks; check mountings. (DOK1)

3) Check A/C system condition and operation; check A/C monitoring system, if applicable. (DOK1)

4) Check HVAC air inlet filters and ducts; service as needed. (DOK1)

d. Discuss and perform electrical/electronics diagnosis and repair.
1) Inspect battery box(es), cover(s), and mountings. (DOK1)
2) Inspect battery hold-downs, connections, cables, and cable routing; service as needed. (DOK1)
3) Check/record battery state-of-charge (open circuit voltage) and condition. (DOK1)
4) Perform battery test (load and/or capacitance). (DOK1)
5) Inspect starter, mounting, and connections. (DOK1)
6) Engage starter; check for unusual noises, starter drag, and starting difficulty. (DOK1)
7) Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action. (DOK1)
8) Perform alternator output tests. (DOK1)
9) Check operation of interior lights; determine needed action. (DOK1)
10) Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action. (DOK1)
11) Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action. (DOK1)

3. Explore frame and chassis. (DOK1, MPM5)
   
a. Discuss and perform air brake diagnosis and repair.
1) Check operation of parking brake. (DOK1)
2) Record air governor cut-out setting (psi). (DOK1)
3) Check operation of air reservoir/tank drain valve. (DOK1)
4) Check air system for leaks (brakes released). (DOK1)
5) Check air system for leaks (brakes applied). (DOK1)
6) Test one-way and double-check valves. (DOK1)
7) Check low air pressure warning devices. (DOK1)
8) Check air governor cut-in pressure. (DOK1)
9) Check emergency (spring) brake control/modulator valve, if applicable. (DOK1)
10) Check tractor protection valve. (DOK1)
11) Test air pressure build-up time. (DOK1)
12) Inspect coupling air lines, holders, and gladhands. (DOK1)
13) Check brake chambers and air lines for secure mounting and damage. (DOK1)
14) Check operation of air drier. (DOK1)
15) Inspect and record brake shoe/pad condition, thickness, and contamination. (DOK1)
16) Inspect and record condition of brake drums/rotors. (DOK1)
17) Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing. (DOK1)
18) Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke. (DOK1)
19) Lubricate all brake component grease fittings. (DOK1)
20) Check condition and operation of hand brake (trailer) control valve. (DOK1)
21) Perform antilock brake system (ABS) operational system self-test. (DOK1)
22) Drain air tanks and check for contamination. (DOK1)
23) Check condition of pressure relief (safety) valves. (DOK1)

b. Discuss and perform hydraulic brake diagnosis and repair. (DOK1)
   1) Check master cylinder fluid level and condition. (DOK1)
   2) Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage. (DOK1)
   3) Check parking brake operation; inspect parking brake application and holding devices; adjust as needed. (DOK1)
   4) Check operation of hydraulic system: pedal travel, pedal effort, pedal feel (drift). (DOK1)
   5) Inspect calipers for leakage and damage. (DOK1)
   6) Inspect power brake assist system (booster), hoses and control valves; check brake assist reservoir fluid level and condition. (DOK1)
   7) Inspect and record brake lining/pad condition, thickness, and contamination. (DOK1)
   8) Inspect and record condition of brake rotors. (DOK1)
   9) Adjust drum brakes. (DOK1)
  10) Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing. (DOK1)

c. Discuss and perform drive train diagnosis and repair. (DOK1)
   1) Check operation of clutch, clutch brake, and gearshift. (DOK1)
   2) Check clutch linkage/cable for looseness or binding, if applicable. (DOK1)
   3) Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable. (DOK1)
   4) Check clutch adjustment; adjust as needed. (DOK1)
   5) Check transmission case, seals, filter, hoses, and cooler for cracks and leaks. (DOK1)
   6) Inspect transmission breather. (DOK1)
   7) Inspect transmission mounts. (DOK1)
   8) Check transmission oil level, type, and condition. (DOK1)
   9) Inspect U-joints, yokes, driveshaft’s, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing. (DOK1)
  10) Inspect axle housing(s) for cracks and leaks. (DOK1)
  11) Inspect axle breather(s). (DOK1)
  12) Lubricate all drive train grease fittings. (DOK1)
  13) Check drive axle(s) oil level, type, and condition. (DOK1)
  14) Change drive axle(s) oil and filter; check and clean magnetic plugs. (DOK1)
  15) Check transmission wiring, connectors, seals, and harnesses for damage and proper routing. (DOK1)
  16) Change transmission oil and filter; check and clean magnetic plugs. (DOK1)
  17) Check interaxle differential lock operation. (DOK1)
  18) Check range shift operation. (DOK1)

d. Discuss and perform suspension and steering system diagnosis and repair. (DOK1)
   1) Check steering wheel operation for free play or binding. (DOK1)
   2) Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level. (DOK1)
   3) Change power steering fluid and filter. (DOK1)
   4) Inspect steering gear for leaks and secure mounting. (DOK1)
5) Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages. (DOK1)
6) Check kingpin for wear. (DOK1)
7) Check wheel bearings for looseness and noise. (DOK1)
8) Check oil level and condition in all non-drive hubs; check for leaks. (DOK1)
9) Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators. (DOK1)
10) Inspect shock absorbers for leaks and secure mounting. (DOK1)
11) Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage. (DOK1)
12) Check and record suspension ride height. (DOK1)
13) Lubricate all suspension and steering grease fittings. (DOK1)
14) Check toe setting. (DOK1)
15) Check tandem axle alignment and spacing. (DOK1)
16) Check axle locating components (radius, torque, and/or track rods). (DOK1)
e. Discuss and perform tire and wheel diagnosis and repair. (DOK1)
1) Inspect tires for wear patterns and proper mounting. (DOK1)
2) Inspect tires for cuts, cracks, bulges, and sidewall damage. (DOK1)
3) Inspect valve caps and stems; replace as needed. (DOK1)
4) Measure and record tread depth; probe for imbedded debris. (DOK1)
5) Check and record air pressure; adjust air pressure in accordance with manufacturers’ specifications. (DOK1)
6) Check for loose lugs; check mounting hardware condition; service as needed. (DOK1)
7) Re-torque lugs in accordance with manufacturers’ specifications. (DOK1)
8) Inspect wheels for cracks or damage. (DOK1)
9) Check tire matching (diameter and tread) on dual tire installations. (DOK1)
f. Discuss and perform frame and fifth wheel diagnosis and repair. (DOK1)
1) Inspect fifth wheel mounting, bolts, air lines, and locks. (DOK1)
2) Test operation of fifth wheel locking device; adjust if necessary. (DOK1)
3) Check quarter fenders, mud flaps, and brackets. (DOK1)
4) Check pintle hook assembly and mounting. (DOK1)
5) Lubricate all fifth wheel grease fittings and plate. (DOK1)
6) Inspect frame and frame members for cracks and damage. (DOK1)

STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MPM5 For every task in Preventive Maintenance course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
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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M8 Percents
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CS2 Financial, Economic, Business and Entrepreneurial Literacy
CS7 Thinking and Problem Solving
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Web Sites


Course Name: Power Trains

Course Abbreviation: DET 1713

Classification: Career Technical Core

Description: Diagnosis, service, maintenance, and repair of power train units on diesel equipment, includes instruction on clutch, manual transmissions, drive shafts, and drive axles. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

### Competencies and Suggested Objectives

1. Explore clutch diagnosis and repair. (DOK2, MDT6)
   a. Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action. (DOK1)
   b. Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action. (DOK1)
   c. Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system. (DOK2)
   d. Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals. (DOK1)
   e. Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc. (DOK1)
   f. Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs. (DOK1)
   g. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action. (DOK1)
   h. Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms. (DOK1)
   i. Inspect and replace pilot bearing. (DOK2)
   j. Inspect flywheel mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action. (DOK2)
   k. Inspect flywheel, and starter ring gear; measure flywheel face and pilot bore runout; determine needed action. (DOK1)
   l. Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action. (DOK2)

2. Discuss and perform transmission diagnosis and repair. (DOK1, MDT6)
   a. Identify causes of transmission noise, shifting, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action. (DOK1)
   b. Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies. (DOK2)
   c. Inspect and replace transmission mounts, insulators, and mounting bolts. (DOK1)
   d. Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed. (DOK1)
   e. Check transmission fluid level and condition; determine needed service; add proper
f. Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires. (DOK2)

g. Remove and reinstall transmission. (DOK1)
h. Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action. (DOK3)
i. Disassemble, inspect, and replace internal transmission components; such as, sliding clutches, bearings, shafts, as necessary to meet manufacturer’s specifications. (DOK3)
j. Inspect transmission oil filters/coolers; replace as needed. (DOK2)
k. Inspect speedometer components; determine needed action. (DOK2)
l. Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action. (DOK3)
m. Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action. (DOK1)
n. Inspect and test transmission temperature gauge and sensor/sending unit; determine needed action. (DOK2)
o. Inspect and test operation of automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses; determine needed action. (DOK2)
p. Inspect and test operation of automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines; determine needed action. (DOK2)
q. Use appropriate diagnostic tools and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action. (DOK1)
r. Inspect and test operation of automatic transmission electronic shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses. (DOK3)
s. Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses. (DOK3)
t. Use appropriate diagnostic tools and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action. (DOK3)

3. Discuss and perform driveshaft and universal joint diagnosis and repair. (DOK2, MDT6)
a. Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action. (DOK1)
b. Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints, driveshaft boots and seals, and retaining hardware; check phasing of all shafts. (DOK1)
c. Inspect driveshaft center support bearings and mounts; determine needed action. (DOK1)
d. Measure driveline angles; determine needed action. (DOK2)

4. Discuss and perform drive axle diagnosis and repair. (DOK3, MDT16)
a. Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action. (DOK2)
b. Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals. (DOK1)

c. Check drive axle fluid level and condition; determine needed service; add proper type of lubricant. (DOK1)

d. Remove and replace differential carrier assembly. (DOK2)

e. Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings. (DOK3)

f. Inspect and replace components of locking differential case assembly. (DOK3)

g. Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action. (DOK3)

h. Measure ring gear runout; determine needed action. (DOK3)

i. Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings. (DOK3)

j. Measure and adjust drive pinion bearing preload. (DOK3)

k. Measure and adjust drive pinion depth. (DOK3)

l. Measure and adjust side bearing preload and ring gear backlash. (DOK3)

m. Check and interpret ring gear and pinion tooth contact pattern; determine needed action. (DOK3)

n. Inspect, adjust, or replace ring gear thrust block/screw. (DOK3)

o. Inspect power divider (inter-axle differential) assembly; determine needed action. (DOK3)

p. Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls. (DOK2)

q. Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters. (DOK3)

r. Inspect and replace drive axle shafts. (DOK1)

s. Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action. (DOK1)

t. Identify causes of drive axle wheel bearing noise and check for damage; perform needed action. (DOK1)

u. Inspect and test drive axle temperature gauge and sending unit/sensor; determine needed action. (DOK2)

v. Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings. (DOK1)
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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Web Sites


Course Name: Welding for Diesel Equipment Technology

Course Abbreviation: DET 2113

Classification: Career Technical Elective

Description: Basic welding and cutting techniques which includes fundamental procedures and safety, oxyacetylene welding and cutting, shielded metal-arc welding, and metal inert gas welding procedures. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives

<table>
<thead>
<tr>
<th>1. Demonstrate fundamental procedures related to welding. (DOK1, MTB1, MTE2, MTS3, MTD4, MPMS, MDT6, MAC7, MHD8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Demonstrate welding safety practices related to personal safety. (DOK1)</td>
</tr>
<tr>
<td>b. Identify and demonstrate the use of hand and shop tools. (DOK1)</td>
</tr>
<tr>
<td>c. Discuss basic principles related to welding. (DOK1)</td>
</tr>
<tr>
<td>2. Demonstrate oxyacetylene welding, brazing, and cutting procedures. (DOK2, MTB1, MTE2, MTS3, MTD4, MPMS, MDT6, MAC7, MHD8)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>a. Set up and adjust oxyacetylene welding and cutting equipment. (DOK2)</td>
</tr>
<tr>
<td>b. Cut mild steel plate. (DOK2)</td>
</tr>
<tr>
<td>c. Weld mild steel plate using a filler rod. (DOK2)</td>
</tr>
<tr>
<td>d. Braze mild steel plate. (DOK2)</td>
</tr>
<tr>
<td>3. Demonstrate shielded metal-arc welding procedures. (DOK2, MTB1, MTE2, MTS3, MTD4, MPMS, MDT6, MAC7, MHD8)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>a. Set up and adjust shielded metal arc welding equipment. (DOK2)</td>
</tr>
<tr>
<td>b. Construct a flat butt weld. (DOK2)</td>
</tr>
<tr>
<td>c. Construct a horizontal butt weld. (DOK2)</td>
</tr>
<tr>
<td>d. Construct a vertical butt weld. (DOK2)</td>
</tr>
<tr>
<td>4. Demonstrate metal inert gas (MIG) welding procedures. (DOK2, MTB1, MTE2, MTS3, MTD4, MPMS, MDT6, MAC7, MHD8)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>a. Set up and adjust MIG welding equipment. (DOK2)</td>
</tr>
<tr>
<td>b. Construct a flat butt weld on mild steel plate. (DOK2)</td>
</tr>
<tr>
<td>c. Construct a horizontal butt weld. (DOK2)</td>
</tr>
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<td>d. Construct a vertical butt weld. (DOK2)</td>
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STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTB1 For every task in Brake course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
For every task in Electrical/Electronic Systems course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Suspension and Steering course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Diesel course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Preventive Maintenance course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Drive Train course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Heating, Ventilation, & Air Conditioning course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

For every task in Hydraulics course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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**Web Sites**


Course Name: Steering and Suspension Systems

Course Abbreviation: DET 2253

Classification: Career Technical Core (Two Year Certificate, Associate Degree); Career Technical Elective (One Year Certificate)

Description: Operation, maintenance, and repair of heavy duty steering and suspension systems, Includes instruction in steering column and steering gear, power steering unit, steering linkage, suspension, wheel alignment, and related components diagnosis and repair. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore steering systems. (DOK3, MTS3)</td>
</tr>
<tr>
<td>a. Discuss and perform steering column diagnosis and repair. (DOK3)</td>
</tr>
<tr>
<td>1) Identify causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>2) Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft. (DOK1)</td>
</tr>
<tr>
<td>3) Check and adjust cab mounting and ride height. (DOK3)</td>
</tr>
<tr>
<td>4) Center the steering wheel as needed. (DOK1)</td>
</tr>
<tr>
<td>5) Disable and enable supplemental restraint system (SRS) in accordance with manufacturers’ procedures. (DOK1)</td>
</tr>
<tr>
<td>b. Discuss and perform steering unit diagnosis and repair. (DOK2)</td>
</tr>
<tr>
<td>1) Identify causes of power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>2) Determine recommended type of power steering fluid; check level and condition; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>3) Flush and refill power steering system; purge air from system. (DOK2)</td>
</tr>
<tr>
<td>4) Perform power steering system pressure, temperature, and flow tests; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>5) Inspect, service, or replace power steering reservoir including filter, seals, and gaskets. (DOK2)</td>
</tr>
<tr>
<td>6) Inspect power steering pump drive gear and coupling; replace as needed. (DOK3)</td>
</tr>
<tr>
<td>7) Inspect, adjust, or replace power steering pump, mountings, and brackets. (DOK3)</td>
</tr>
<tr>
<td>8) Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings. (DOK2)</td>
</tr>
<tr>
<td>9) Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings. (DOK1)</td>
</tr>
<tr>
<td>c. Discuss and perform steering linkage diagnosis and repair. (DOK1)</td>
</tr>
<tr>
<td>1) Inspect and align pitman arm; replace as needed. (DOK1)</td>
</tr>
<tr>
<td>2) Check and adjust steering (wheel) stops. (DOK1)</td>
</tr>
</tbody>
</table>
### 3) Inspect and lubricate steering arms and linkages. (DOK1)

### 2. Discuss and perform suspension systems diagnosis and repair. (DOK3, MTS3)

| a. Inspect front axles and attaching hardware; determine needed action. (DOK1) |
| b. Inspect and service kingpin, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action. (DOK1) |
| c. Inspect shock absorbers, bushings, brackets, and mounts; replace as needed. (DOK1) |
| d. Inspect leaf springs, center bolts, clips, pins and bushings, shackles, slippers, insulators, brackets, and mounts; determine needed action. (DOK1) |
| e. Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action. (DOK1) |
| f. Inspect tandem suspension equalizer components; determine needed action. (DOK3) |
| g. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed. (DOK1) |
| h. Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed. (DOK1) |
| i. Measure ride height; determine needed action. (DOK1) |
| j. Identify rough ride problems; determine needed action. (DOK3) |

### 3. Discuss and perform wheel alignment diagnosis, adjustment, and repair. (DOK3, MTS3)

| a. Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems; adjust or repair as needed. (DOK1) |
| b. Check camber; determine needed action. (DOK2) |
| c. Check caster; adjust as needed. (DOK2) |
| d. Check toe; adjust as needed. (DOK1) |
| e. Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed. (DOK2) |
| f. Identify turning/Ackerman angle (toe-out-on-turns) problems; determine needed action. (DOK3) |
| g. Check front axle alignment (centerline); adjust or repair as needed. (DOK2) |

### 4. Discuss and perform wheels and tires diagnosis and repair. (DOK3, MTS3)

| a. Identify tire wear patterns; check tread depth and pressure; determine needed action. (DOK1) |
| b. Identify wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action. (DOK2) |
| c. Remove and install steering and drive axle wheel/tire assemblies. (DOK1) |
| d. Inspect tire for proper application, (size, load range, position, and tread design); determine needed action. (DOK3) |
| e. Inspect wheel/rims for proper application, load range, size, and design; determine needed action. (DOK3) |
| f. Check operation of tire pressure monitoring system; determine needed action. (DOK3) |

### 5. Discuss and perform frame service and repair. (DOK3, MTS3)

| a. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware. (DOK2) |
| b. Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls. (DOK2) |
| c. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs. (DOK1) |
d. Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers’ recommended procedures. (DOK3)

e. Inspect, repair, or replace pintle hooks and draw bars. (DOK3)

STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTS3 For every task in Suspension and Steering course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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
- 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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Postsecondary Diesel Equipment Technology
CS2  Financial, Economic, Business and Entrepreneurial Literacy
CS7  Thinking and Problem Solving
CS8  Communication and Collaboration
CS9  Information Literacy

SUGGESTED REFERENCES

Journals


Texts


Videos


BoxWrench Media. (n.d.). Basic engine rebuilding. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)

Postsecondary Diesel Equipment Technology
Cleveland Institute of Electronics. (2005). *Diesel cylinder head service DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

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Cleveland Institute of Electronics. (2005). *Diesel engine teardown DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)

**Web Sites**


Course Name: Electrical/Electronic Systems III

Course Abbreviation: DET 2273

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

Description: Diagnosis, service, and repair of electrical and electronic systems on diesel engines, includes instruction in electronic fuel management systems. (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, discuss, and repair electronic fuel management systems. (DOK3, MTE2)</td>
</tr>
<tr>
<td>a. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM); determine needed action. (DOK1)</td>
</tr>
<tr>
<td>b. Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determine needed action. (DOK1)</td>
</tr>
<tr>
<td>c. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis. (DOK1)</td>
</tr>
<tr>
<td>d. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams). (DOK1)</td>
</tr>
<tr>
<td>e. Inspect and replace electrical connector terminals, seals, and locks. (DOK1)</td>
</tr>
<tr>
<td>f. Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed. (DOK1)</td>
</tr>
<tr>
<td>g. Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), access and interpret customer programmable parameters. (DOK2)</td>
</tr>
<tr>
<td>h. Inspect, test, and adjust electronic unit injectors (EUI); determine needed action. (DOK2)</td>
</tr>
<tr>
<td>i. Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable). (DOK2)</td>
</tr>
<tr>
<td>j. Perform cylinder contribution test utilizing recommended electronic diagnostic tool. (DOK1)</td>
</tr>
<tr>
<td>k. Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>l. Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>m. Perform on-engine inspections and tests on common rail type injection systems; determine needed action. (DOK3)</td>
</tr>
<tr>
<td>n. Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action. (DOK3)</td>
</tr>
</tbody>
</table>
2007 ASE/NATEF Medium/Truck Technician Standards

MTE2 For every task in Electrical/Electronic Systems course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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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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
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)
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21st Century Skills

CS2 Financial, Economic, Business and Entrepreneurial Literacy
CS7 Thinking and Problem Solving
CS8 Communication and Collaboration
CS9 Information Literacy

SUGGESTED REFERENCES

Journals


Texts


Videos


BoxWrench Media. (n.d.). Basic engine rebuilding. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)


Web Sites


Course Name: Diesel Systems II

Course Abbreviation: DET 2374

Classification: Technical Core

Description: Diagnosis, service, and repair of lubrication systems, cooling system, and air induction and exhaust systems. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discuss and perform lubrication systems diagnosis and repair.</td>
<td></td>
</tr>
<tr>
<td>a. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor; determine needed action.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>b. Check engine oil level, condition, and consumption; determine needed action.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>c. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.</td>
<td>(DOK3)</td>
</tr>
<tr>
<td>d. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.</td>
<td>(DOK3)</td>
</tr>
<tr>
<td>e. Inspect, clean, and test oil cooler and components; determine needed action.</td>
<td>(DOK3)</td>
</tr>
<tr>
<td>f. Inspect turbocharger lubrication and cooling systems; determine needed action.</td>
<td>(DOK2)</td>
</tr>
<tr>
<td>g. Determine proper lubricant and perform oil and filter change.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>2. Discuss and perform cooling system diagnosis and repair.</td>
<td></td>
</tr>
<tr>
<td>a. Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>b. Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>c. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>d. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.</td>
<td>(DOK2)</td>
</tr>
<tr>
<td>e. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>f. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>g. Inspect water pump and hoses; replace as needed.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>h. Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>i. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>3. Discuss and perform air induction and exhaust systems diagnosis and repair.</td>
<td></td>
</tr>
<tr>
<td>a. Perform air intake system restriction and leakage tests; determine needed action.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>b. Perform intake manifold pressure (boost) test; determine needed action.</td>
<td>(DOK1)</td>
</tr>
<tr>
<td>c. Perform exhaust back pressure test; determine needed action.</td>
<td>(DOK2)</td>
</tr>
<tr>
<td>d. Inspect turbocharger(s), wastegate, and piping systems; determine needed action.</td>
<td>(DOK2)</td>
</tr>
</tbody>
</table>
e. Inspect and test turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators. (DOK3)

f. Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed. (DOK1)

g. Remove and reinstall turbocharger/wastegate assembly. (DOK3)

h. Inspect intake manifold, gaskets, and connections; replace as needed. (DOK3)

i. Inspect, clean, and test charge air cooler assemblies; inspect aftercooler assemblies; replace as needed. (DOK2)

j. Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed. (DOK2)

k. Inspect exhaust after treatment devices; determine necessary action. (DOK3)

l. Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action. (DOK3)

m. Inspect and test exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action. (DOK3)

STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTD4 For every task in Diesel course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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CS7  Thinking and Problem Solving
CS8  Communication and Collaboration
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SUGGESTED REFERENCES

Journals


Texts


**Videos**

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**Web Sites**


Course Name: Diesel Systems III

Course Abbreviation: DET 2383

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

Description: Diagnosis, service, and repair of general engine operations and fuel system operations. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

### Competencies and Suggested Objectives

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Explore and perform general engine diagnosis. (DOK3, MTD4)</td>
</tr>
<tr>
<td>a. Inspect fuel, oil, and coolant levels, and condition; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>b. Identify causes of engine fuel, oil, coolant, air, and other leaks; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>c. Listen for engine noises; determine needed action. (DOK3)</td>
</tr>
<tr>
<td>d. Observe engine exhaust smoke color and quantity; determine needed action. (DOK3)</td>
</tr>
<tr>
<td>e. Identify causes of no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>f. Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>g. Identify engine vibration problems; determine needed action. (DOK2)</td>
</tr>
<tr>
<td>h. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; verify customer programmable parameters; clear codes; determine further diagnosis. (DOK1)</td>
</tr>
<tr>
<td>2. Explore fuel systems. (DOK1, MTD4)</td>
</tr>
<tr>
<td>a. Discuss and perform fuel supply system diagnosis and repair. (DOK1)</td>
</tr>
<tr>
<td>1) Check fuel level and condition; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>2) Perform fuel supply and return system tests; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>3) Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>4) Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action. (DOK1)</td>
</tr>
<tr>
<td>5) Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action. (DOK1)</td>
</tr>
<tr>
<td>6) Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump. (DOK1)</td>
</tr>
</tbody>
</table>

### STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTD4 For every task in Diesel course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with
clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

**Related Academic Standards**

R1 Interpret Graphic Information (forms, maps, reference sources)
R2 Words in Context (same and opposite meaning)
R3 Recall Information (details, sequence)
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M4 Division of Whole Numbers (no remainder, remainder)
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M6 Fractions (addition, subtraction, multiplication, division)
M7 Integers (addition, subtraction, multiplication, division)
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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L1 Usage (pronoun, tense, subject/verb agreement, adjective, adverb)
L2 Sentence Formation (fragments, run-on, clarity)
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BoxWrench Media. (n.d.). Basic engine rebuilding. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)

Cleveland Institute of Electronics. (2005). Diesel cylinder head service DVD course. (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)


**Web Sites**


Course Name: Fluid Power Trains

Course Abbreviation: DET 2523

Classification: Career Technical Elective

Description: Maintenance and repair of fluid power trains used on heavy equipment to include operation and diagnosis and repair of system components. (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. Describe general principles of operation as applied to fluid power transmissions. (DOK1, MTD6, MHD8)</td>
</tr>
<tr>
<td>a. Describe the general principles of operation as applied to fluid power transmissions. (DOK1)</td>
</tr>
<tr>
<td>b. Identify the major components of a fluid power transmission and describe their functions. (DOK1)</td>
</tr>
<tr>
<td>2. Perform diagnosis and repair on torque converters. (DOK3, MTD6, MHD8)</td>
</tr>
<tr>
<td>a. Perform on-vehicle service for a torque converter. (DOK2)</td>
</tr>
<tr>
<td>b. Dismount, disassemble, inspect, and repair torque converters. (DOK3)</td>
</tr>
<tr>
<td>3. Perform diagnosis, service, and repair on power-shift transmissions. (DOK3, MTD6, MHD8)</td>
</tr>
<tr>
<td>a. Perform on-vehicle service for a power-shift transmission. (DOK2)</td>
</tr>
<tr>
<td>b. Dismount, disassemble, inspect, and repair a power-shift transmission.</td>
</tr>
<tr>
<td>4. Perform diagnosis and repair on hydrostatic transmissions. (DOK3, MTD6, MHD8)</td>
</tr>
<tr>
<td>a. Perform on-vehicle service for a hydrostatic transmission. (DOK2)</td>
</tr>
<tr>
<td>b. Dismount, disassemble, inspect, and repair a hydrostatic transmission. (DOK3)</td>
</tr>
</tbody>
</table>

STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MDT6 For every task in Drive Train course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MHD8 For every task in Hydraulics course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
Related Academic Standards

R1 Interpret Graphic Information (forms, maps, reference sources)
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R3 Recall Information (details, sequence)
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M3 Multiplication of Whole Numbers (no regrouping, regrouping)
M4 Division of Whole Numbers (no remainder, remainder)
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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Cleveland Institute of Electronics. (2005). *Diesel engine teardown DVD course.* (Available from CIE Bookstore Offices, 1776 East 17th Street, Cleveland, OH 44114, 800-321-2155)
Web Sites


Course Name: Advanced Brake Systems (Air)

Course Abbreviation: DET 2623

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

Description: Instruction and practice in the maintenance and repair of air brake systems commonly used on commercial diesel powered equipment, includes instruction in maintenance and repair of the air supply system, mechanical system, antilock braking system, and traction control system. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

<table>
<thead>
<tr>
<th>Competencies and Suggested Objectives</th>
<th><em>(DOK1, MTB1, MPM5)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore air brakes diagnosis and repair.</td>
<td><em>(DOK1, MTB1, MPM5)</em></td>
</tr>
<tr>
<td>a. Identify poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>b. Check air system build-up time; determine needed action.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>c. Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>d. Inspect compressor drive gear and coupling; replace as needed.</td>
<td><em>(DOK3)</em></td>
</tr>
<tr>
<td>e. Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.</td>
<td><em>(DOK2)</em></td>
</tr>
<tr>
<td>f. Inspect and test system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; adjust or replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>g. Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>h. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves, manual and automatic drain valves; replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>i. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>j. Inspect and test brake application (foot) valve, fittings, and mounts; check pedal operation; replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>k. Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>l. Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>m. Inspect and test brake relay valves; replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>n. Inspect and test quick release valves; replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>o. Inspect and test tractor protection valve; replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>p. Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>q. Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.</td>
<td><em>(DOK1)</em></td>
</tr>
<tr>
<td>r. Inspect and test air pressure gauges, lines, and fittings; replace as needed.</td>
<td><em>(DOK2)</em></td>
</tr>
</tbody>
</table>
2. Discuss and perform mechanical/foundation diagnosis and repair. *(DOK3, MTB1, MPM5)*
   a. Identify poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action. *(DOK1)*
   b. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed. *(DOK1)*
   c. Inspect and service slack adjusters; perform needed action. *(DOK1)*
   d. Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed. *(DOK1)*
   e. Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs. *(DOK3)*
   f. Inspect and measure brake shoes or pads; perform needed action. *(DOK1)*
   g. Inspect and measure brake drums or rotors; perform needed action. *(DOK1)*

3. Discuss and perform parking brakes diagnosis and repair. *(DOK2, MTB1, MPM5)*
   a. Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations. *(DOK1)*
   b. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed. *(DOK1)*
   c. Inspect and test parking (spring) brake application and release valve; replace as needed. *(DOK2)*
   d. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers’ recommendations. *(DOK1)*
   e. Inspect and test low pressure warning devices, wiring, and connectors; replace as needed. *(DOK2)*
   f. Inspect and test air pressure gauges, lines, and fittings; replace as needed. *(DOK1)*

4. Discuss and perform mechanical foundation system diagnosis and repair. *(DOK3, MTB1, MPM5)*
   a. Diagnose problems caused by foundation brake, slack adjuster, and brake chamber problems; determine needed repairs. *(DOK3)*
   b. Inspect, test, adjust, and service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed. *(DOK3)*
   c. Inspect and service manual and automatic slack adjusters; adjust or replace as needed. *(DOK3)*
   d. Inspect cams, rollers, shafts, bushings, seals, spacers, and retainers; service or replace as needed. *(DOK3)*
   e. Inspect brake spider, shields, anchor pins, bushings, and springs; service or replace as needed. *(DOK3)*
   f. Inspect wedge brake spider, manual and automatic adjuster plungers, housing, and wedge assembly; repair or replace as needed. *(DOK3)*
   g. Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs. *(DOK3)*
   h. Inspect brake shoes or pads; replace as needed. *(DOK1)*
   i. Inspect and measure brake drums or rotors; determine needed repairs. *(DOK2)*

5. Discuss and perform parking brake system diagnosis and repair. *(DOK3, MTB1, MPM5)*
   a. Inspect drive line parking brake drums, rotors, bands, shoes, mounting hardware, and adjusters; adjust, repair, or replace as needed. *(DOK3)*
b. Inspect drive line parking brake application system pedal, cables, linkage, levers, pivots, and springs; adjust, repair, or replace as needed. (DOK3)
c. Check operation of parking (spring) brake chamber; determine needed repairs. (DOK2)
d. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed. (DOK2)
e. Inspect and test parking (spring) brake application and release valve; replace as needed. (DOK2)
f. Manually release and rest parking (spring) brakes in accordance with manufacturer’s recommendations. (DOK2)

6. Discuss and perform antilock brake system (ABS) diagnosis and repair. (DOK2, MTB1, MPM5)
   a. Inspect, test, and service ABS air, electrical/electronic, and mechanical components. (DOK1)
   b. Diagnose poor stopping, wheel lock-up, pulsation, and noise problems caused by the ABS; determine needed repairs. (DOK2)
   c. Observe ABS warning light at startup; determine if further diagnosis is needed. (DOK1)
   d. Diagnose ABS electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine needed repairs. (DOK2)
   e. Service, test, and adjust ABS speed sensors following manufacturer’s recommended procedures. (DOK2)
   f. Discuss the operation of the traction control system as related to ABS and engine controls. (DOK2)

STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MTB1 For every task in Brake course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MPM5 For every task in Preventive Maintenance course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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
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)
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S3 Structural Unit (root, suffix)

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21st Century Skills

CS2 Financial, Economic, Business and Entrepreneurial Literacy
CS7 Thinking and Problem Solving
CS8 Communication and Collaboration
CS9 Information Literacy

SUGGESTED REFERENCES

Journals


Texts


Videos


BoxWrench Media. (n.d.). *Basic engine rebuilding*. (Available from BoxWrench Media, P.O. Box 1855, Venice, CA 90294, 310-301-0252)


Web Sites


Course Name: Air Conditioning and Heating Systems

Course Abbreviation: DET 2813

Classification: Career Technical Core (Two Year Certificate, Associate Degree); Career Technical Elective (One Year Certificate)

Description: Operation, maintenance, and repair of air conditioning and heating systems used in commercial equipment, includes instruction in theories and operating principles, A/C system diagnosis and repair, clutch and compressor repair, evaporator and condenser repair, and heating system repair. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisite: Completion of certification requirements to service and repair air conditioning systems

Competencies and Suggested Objectives

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>All practices and procedures must be performed under the direct supervision of a teacher who has been certified to service air conditioning and refrigeration equipment. All practices and procedures must be performed according to current mandates, standards, and regulations. Competencies 1 through 5 should be accomplished in accordance with published EPA and appropriate SAE “J” standards for R-12, R-134a, and EPA approved refrigerant blends.</td>
</tr>
</tbody>
</table>

1. Identify theories, operating principles, and current regulations related to air conditioner service. (DOK3, MAC7)
   a. Discuss and perform HVAC systems diagnosis, service, and repair. (DOK3)
      1) Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action. (DOK1)
      2) Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action. (DOK1)
      3) Identify system type and components (cycling clutch orifice tube – CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action. (DOK1)
      4) Retrieve diagnostic codes; determine needed action. (DOK3)
   b. Discuss and perform A/C system and component diagnosis, service, and repair. (DOK3)
      1) Identify causes of temperature control problems in the A/C system; determine needed action. (DOK1)
      2) Identify refrigerant and lubricant types; check for contamination; determine needed action. (DOK1)
      3) Diagnose A/C system problems indicated by pressure gauge and temperature readings; determine needed action. (DOK1)
      4) Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action. (DOK1)
      5) Perform A/C system leak test; determine needed action. (DOK1)
      6) Recover, evacuate, and recharge A/C system using appropriate equipment. (DOK1)
      7) Identify contaminated A/C system components and hoses; determine needed action. (DOK1)
2. Explore A/C system and component diagnosis, service, and repair. *(DOK2, MAC7)*
   - Discuss and perform compressor and clutch diagnosis, service, and repair. *(DOK2)*
     1) Identify A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action. *(DOK1)*
     2) Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices. *(DOK2)*
     3) Inspect and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment. *(DOK1)*
     4) Inspect, test, service, or replace A/C compressor clutch components or assembly. *(DOK2)*
     5) Inspect and correct A/C compressor lubricant level (if applicable). *(DOK2)*
     6) Inspect, test, or replace A/C compressor. *(DOK2)*
     7) Inspect, repair, or replace A/C compressor mountings and hardware. *(DOK2)*
   - Identify A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action. *(DOK1)*
   - Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices. *(DOK2)*
   - Inspect and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment. *(DOK1)*
   - Inspect, test, service, or replace A/C compressor clutch components or assembly. *(DOK2)*
   - Inspect and correct A/C compressor lubricant level (if applicable). *(DOK2)*
   - Inspect, test, or replace A/C compressor. *(DOK2)*
   - Inspect, repair, or replace A/C compressor mountings and hardware. *(DOK2)*

3. Explore A/C system and component diagnosis, service, and repair. *(DOK3, MAC7)*
   - Discuss and perform evaporator, condenser, and related components diagnosis, service, and repair. *(DOK3)*
     1) Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses. *(DOK1)*
     2) Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action. *(DOK1)*
     3) Inspect A/C condenser for proper air flow. *(DOK1)*
     4) Inspect and test A/C system condenser and mountings; determine needed action. *(DOK2)*
     5) Inspect and replace receiver/drier or accumulator/drier. *(DOK1)*
     6) Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action. *(DOK3)*
     7) Remove and replace orifice tube. *(DOK1)*
     8) Inspect and test cab/sleeper evaporator core; determine needed action. *(DOK3)*
     9) Inspect, clean, or repair evaporator housing and water drain; inspect and service/replace evaporator air filter. *(DOK1)*
    10) Identify and inspect A/C system service ports (gauge connections); determine needed action. *(DOK1)*
    11) Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action. *(DOK2)*
   - Discuss and perform heating and engine cooling systems diagnosis, service, and repair. *(DOK3)*
     1) Diagnose the cause of outlet air temperature control problems in the HVAC system; determine needed action. *(DOK1)*
     2) Identify window fogging problems; determine needed action. *(DOK2)*
     3) Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action. *(DOK1)*
     4) Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action. *(DOK1)*
     5) Inspect and test radiator, pressure cap, and coolant recovery system (surge tank);
6) Inspect water pump for leaks and bearing play; determine needed action. \(^{(DOK2)}\)

7) Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs. \(^{(DOK2)}\)

8) Recover, flush, and refill with recommended coolant/additive package; bleed cooling system. \(^{(DOK1)}\)

9) Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. \(^{(DOK)}\)

10) Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action. \(^{(DOK2)}\)

11) Inspect and flush heater core; determine needed action. \(^{(DOK3)}\)

4. Explore operating systems and related controls diagnosis and repair. \(^{(DOK3, MAC7)}\)
   a. Discuss and perform electrical diagnosis, service, and repair. \(^{(DOK3)}\)
      1) Identify causes of HVAC electrical control system problems; determine needed action. \(^{(DOK1)}\)
      2) Inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action. \(^{(DOK2)}\)
      3) Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action. \(^{(DOK2)}\)
      4) Inspect and test A/C related electronic engine control systems; determine needed action. \(^{(DOK2)}\)
      5) Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action. \(^{(DOK2)}\)
      6) Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action. \(^{(DOK3)}\)
      7) Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action. \(^{(DOK3)}\)
   b. Discuss and perform air/vacuum/mechanical diagnosis, service, and repair. \(^{(DOK3)}\)
      1) Identify causes of HVAC air, and mechanical control problems; determine needed action. \(^{(DOK3)}\)
      2) Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action. \(^{(DOK3)}\)
      3) Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action. \(^{(DOK3)}\)
      4) Inspect and test HVAC system actuators and hoses; determine needed action. \(^{(DOK3)}\)
      5) Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action. \(^{(DOK3)}\)

5. Explore refrigerant recovery, recycling, and handling diagnosis, service, and repair. \(^{(DOK1), MAC7}\)
   a. Maintain and verify correct operation of certified equipment. \(^{(DOK1)}\)
   b. Identify and recover A/C system refrigerant. \(^{(DOK1)}\)
   c. Recycle or properly dispose of refrigerant. \(^{(DOK1)}\)
   d. Handle, label, and store refrigerant. \(^{(DOK1)}\)
   e. Test recycled refrigerant for non-condensable gases. \(^{(DOK1)}\)
STANDARDS

2007 ASE/NATEF Medium/Truck Technician Standards

MAC7 For every task in Heating, Ventilation, & Air Conditioning course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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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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
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)
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S3 Structural Unit (root, suffix)

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21st Century Skills

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CS8 Communication and Collaboration
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**Web Sites**


**Course Name:** Special Problem/Projects in Diesel Equipment Technology

**Course Abbreviation:** DET 291(1-9)

**Classification:** Career Technical Elective

**Description:** A course to provide students with an opportunity to utilize skills and knowledge gained in other Diesel Equipment Repair and Service courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project. (1-6 sch: 2-12 hr. lab)

**Prerequisite:** Sophomore standing in Diesel Equipment Technology

**Competencies and Suggested Objectives**

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

**STANDARDS**

Specific standards and DOK Level of competence 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 Diesel Equipment Technology

**Course Abbreviation:** DET 292(1-3)

**Classification:** Career Technical Elective

**Description:** A course which 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 and completion of at least one semester of advanced coursework in Diesel Equipment Technology

### Competencies and Suggested Objectives

<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 and DOK Level of competence 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 worksite supervisor/mentor develop and implement an educational training agreement. This course is designed to integrate the student’s academic and technical skills into a work environment, and may include regular meetings and seminars with school personnel and employers for supplemental instruction and progress reviews. (1-3 sch: 3-9 hours 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>
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<tr>
<td>b. Utilize time, materials, and resource management skills.</td>
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<tr>
<td>c. Use critical thinking skills such as problem solving, decision making, and reasoning.</td>
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<tr>
<td>d. Acquire, evaluate, organize, maintain, interpret, and communicate information.</td>
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</table>

STANDARDS

Specific standards and DOK Level of competence 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. Student Tool Kit (1 kit per 2 students)
   a. Adjustable wrenches (6" and 12") (2)
   b. Allen wrench sets, standard (.050" – 3/8") and metric (2mm – 7mm)
   c. Brake spoon
   d. Chisels – cape (5/16") and cold (3/8" & 3/4")
   e. Claw type pickup tool
   f. Combination wrench sets – standard (1/4" – 1") and metric (7mm – 19 mm)
   g. Continuity test light (12v)
   h. Feeler gauge (blade type) (.002" – .040") and (.006 mm – .070 mm)
   i. Hack saw
   j. Hammer – 16 oz. ball peen
   k. Hammer plastic tip
   l. Ignition wrench set – US and metric
   m. Magnetic pickup tool
   n. Pliers, combination 6", locking jaw, needle nose, side cutting, and slip joint (water pump)
   o. Punches, center, brass drift, pin (1/8", 3/16", 1/4", 5/16"), and taper (3/8", 1/2", 5/8")
   p. Scrapers – carbon 1" and gasket 1"
   q. Screwdrivers – standard (stubby, 6", 9", 12", and offset) and Phillips (stubby #1, #2; 6" #1, #2; 12" #3)
   r. Screw starters – standard and Phillips
   s. Socket – set – 1/4" drive: 1/4" – 1/2" standard sockets, 1/4" – 1/2" deep sockets, 6mm – 12mm standard sockets, 6mm – 12mm deep sockets, flex/universal type handle, 3" and 6" extensions, ratchet
   t. Socket set – 3/8" drive: 5/16" – 3/4" standard sockets; 3/8 – "3/4" deep sockets; 9mm – 19mm standard sockets; 9mm – 19mm deep sockets; 3", 6", 12", and 18" extensions; flex head ratchet; ratchet; speed handle; universal joint; spark plug sockets (5/8" and 13/16")
   u. Socket set – 1/2" drive: 7/16" – 1 1/8" standard sockets; 7/16" – 1 1/8" deep sockets; 10mm – 25mm standard sockets; 10mm – 25mm deep sockets; 3", 6", and 12" extensions; flex/universal type handle, ratchet
   v. Spark plug feeler gauge (gap tool)
2. Motorized forklift (Minimum: 5000# lift capacity)
3. Air compressor and hoses (1 per program)
4. Axle stands (6 sets per program)
5. Bench or pedestal grinder (2 per program)
6. Computer scan tool (hand-held) – on-board diagnostics level II (4 per program of various brands)
7. Diesel/gasoline fuel pressure testing gauge set with adaptors (1 per program)
8. Hoist(s), engine (Min. 2 ton) (1 per program)
9. Hydraulic press with adapters (25 ton) (1 per program)
10. Master puller set (1 per program)
11. Microcomputer with monitor, printer (CD-ROM and cables) (6 per program)
12. Microcomputer service information software (CD-ROM) (1 per computer)
13. Parts cleaning tank (Heated and EPA Approved) (1 per computer)
14. Steel top workbenches with vises (1 per 2 students)
15. Tap and die set (US and metric) (2 per program)
16. Tire mounting machine (1 per program)
17. Wheel balancer (1 per program)
18. Brake lathe with disc service attachments with large vehicle attachments (1 per program)
19. Refrigerant recovery/recycling machine (R-12) (1 per program)
20. Refrigerant recovery/recycling machine (HFC-134a) (1 per program)
21. Battery/starter/charging system tester (1 per program)
22. Valve and valve seat resurfacing equipment (1 per program)
23. Valve spring tester (1 per program)
24. Diesel fuel injector nozzle pop tester (1 per program)
25. Arc/MIG welder with all accessories (1 per program)
26. Fuel system pressure testing gauge with adapters (1 per program)
27. Asbestos containment/removal device (1 per program)
28. 2 post above the ground lift (1 per program)
29. 4 post above the ground lift (with front end alignment capability) (1 per program)
30. Axle bearing nut set (2 3/8 – 4 7/8 inch) - (1 per program)
31. Transmission/power steering fluid recovery/recycling machine (1 per program)
32. Antifreeze recovery/recycling machine (1 per program)
33. Asbestos containment/removal device (1 per program)

CAPITALIZED TRAINING EQUIPMENT ITEMS

1. Brake Trainer
   a. Air Brake Trainer
   b. Hydraulic Brake Trainer
   c. Mechanical Brake Trainer
2. Axles
   a. Steer Axle
   b. Drive Axle
3. Diesel Powered Equipment
   a. Power Units with operational software and service data
   b. Agriculture/Construction equipment
   c. Heavy Duty Truck (Semi)
   d. Medium Duty Truck
4. Electrical/Electronic Trainer with software simulator package
5. Engine Trainer with Dynamometer
6. HVAC Trainer with software simulator package
7. Hydraulic/Pneumatic Trainer with software simulator package
8. Transmission Trainer
NON-CAPITALIZED ITEMS

1. Air blow gun (OSHA approved) (2 per program)
2. Battery post cleaner (6 per program)
3. Battery terminal pliers (6 per program)
4. Battery terminal puller (6 per program)
5. Files – coarse 6" and 12", fine 6" and 12", half-round 12", and round 6" and 12" (2 sets per program)
6. Flare nut (tubing wrenches) 3/8" – 3/4" and 10mm – 17mm (1 set per program)
7. Flashlight (1 per tool box)
8. Fuel system pressure gauge with adapters (1 per program)
9. Hammer – dead blow plastic mallet (2 per program)
10. Jumper wire set (2 per program)
11. Pliers – hose clamp (2 per program)
12. Pry bars – rolling head and straight (2 per program)
13. Screwdriver set – Posidrive 7 #1 – #4 (2 sets per program)
14. Screwdriver set – Torx 7 (T-8 – T-55) (2 sets per program)
15. 3/8" drive air ratchet (1 per program)
16. 3/8" drive impact sockets (US and metric) (2 sets per program)
17. 3/8" drive impact wrench (1 per program)
18. 3/8" drive flexible socket set (US and metric) (1 per program)
19. 1/2" drive air impact wrench (2 per program)
20. 1/2" drive impact sockets (US and metric) (2 sets per program)
21. Air chisel with various bits (1 per program)
22. Battery charger/booster starter (2 per program)
23. Belt tensioner gauge (1 per program)
24. Compression tester (3 per program)
25. Cooling system pressure tester (1 per program)
26. Floor creeper (1 per 2 students per class)
27. Cylinder leakage tester (2 per program)
28. Dial indicator with flex arm and clamp base (2 per program)
29. Digital multimeter with various lead sets (1 per 2 students per class)
30. Drain pans (6 per program)
31. Drill – 3/8" variable speed (6 per program)
32. Drill – 1/2" variable speed (2 per program)
33. Extension cords (6 per program)
34. Fender covers (10 per program)
35. Floor jack (1 1/2 ton minimum capacity) (3 per program)
36. Gear lube dispenser (1 per program)
37. Hand held vacuum pump (1 per program)
38. Hot plate (or equivalent) (1 per program)
39. Jumper cables (3 sets per program)
40. Outside micrometers (0 – 1", 1 – 2", 2 – 3", 3 – 4", 4 – 5") (4 sets per program)
41. Oil can – pump type (1 per program)
42. Oil filter wrench(es) various sizes (2 sets per program)
43. Pressure washer (1 per program)
44. Remote starter switch (2 per program)  
45. Screw extractor set (2 per program)  
46. Seat covers (10 per program)  
47. Snap ring pliers set – external and internal (2 set per program)  
48. Soldering gun (4 per program)  
49. Soldering iron (25 watt pencil type) (4 per program)  
50. Sparkplug boot puller (5 per program)  
51. Tach/dwell meter (1 per program)  
52. Thread repair insert kit (1 per program)  
53. Tire inflator chuck (2 per program)  
54. Trouble/work lights (1 per 2 students)  
55. Tube quick disconnect tool set (1 per program)  
56. Tubing cutter and flaring set (2 per program)  
57. Twist steel drill bit set 1/64" – 1/2" (2 sets per program)  
58. Valve core removal tool (2 per program)  
59. Vernier calipers (0 – 6" and 0 – 125mm) (2 sets per program)  
60. Waste oil receptacle (1 per program)  
61. Ball joint press (1 per program)  
62. Bearing packer (2 per program)  
63. Brake pedal holder (1 per program)  
64. Drag link tool (1 per program)  
65. Inner tie rod end tool (1 per program)  
66. Pitman arm puller (1 per program)  
67. Shock absorber tools (1 per program)  
68. Spring/strut compressor tool (1 per program)  
69. Tie rod puller (1 per program)  
70. Wheel weight pliers (1 per program)  
71. Brake bleeder, pressure (1 per program)  
72. Brake cylinder clamps (1 sets per program)  
73. Brake disc micrometer (2 sets per program)  
74. Brake drum micrometer (1 set per program)  
75. Brake shoe adjusting gauge (2 per program)  
76. Brake spring installers (6 per program)  
77. Brake spring pliers (6 per program)  
78. Air conditioner service port adapter set (1 per program)  
79. Manifold gauge set (2 per program)  
80. Antifreeze tester (2 per program)  
81. Carburetor plug and angle gauge set (1 per program)  
82. Computer carburetor tools (1 per program)  
83. Cylinder leakage tester (2 per program)  
84. Oxygen sensor socket (2 sets per program)  
85. Sending unit socket (1 per program)  
86. Sparkplug thread tap (1 per program)  
87. Static strip (4 per program)  
88. Timing advance light (4 per program)  
89. Vacuum/pressure gauge set (2 per program)
90. Transmission jack(s) (1 per program)  
91. Transmission holding fixtures (1 per program)  
92. Transmission special tools set (1 per program)  
93. Alternator service tools (1 per program)  
94. Connector pick tool set (1 per program)  
95. Wire and terminal repair kit (4 per program)  
96. Clutch alignment set (1 per program)  
97. Clutch pilot puller set (1 per program)  
98. Universal joint tools (1 per program)  
99. Valve guide repair unit (1 per program)  
100. Valve spring compressor (1 per program)  
101. Hydraulic pressure testing gauge (1 per program)  
102. Oxyacetylene welding and cutting set (1 per program)  
103. Wheel chocks for heavy trucks (2 sets per program)  
104. Universal joint press for heavy trucks (1 per program)  
105. Twin disk clutch adjustment tool for heavy trucks (1 per program)  
106. Axle thread chaser (2-4¼ inch) (1 per program)  

RECOMMENDED INSTRUCTIONAL AIDS

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

1. Cart, AV (for TV-VCR) (1)  
2. Cart, AV (for overhead projector) (1)  
3. Mylar board (1)  
4. Internet connection (1)  
5. TV – VCR (1)  
6. Video out (Microcomputer to TV monitor) (1)  
7. Smart board  
8. Laptop computer  
9. Microcomputer with monitor, printer (CD-ROM and cables) (Instructor use)  
10. Light box projector (1 per program)  
11. Microsoft Office Software  
12. Training simulation software  

* Additional equipment may be needed as certification requirements change.
Appendix A: 2007 ASE/NATEF Medium/Truck Technician Standards

MTB1 For every task in **Brakes**, the following safety task must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

MTE2 For every task in **Electrical/Electronic Systems**, the following safety task must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

MTS3 For every task in **Suspension and Steering** course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

MTD4 For every task in **Diesel** course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

MPM5 For every task in **Preventive Maintenance** course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MDT6 For every task in **Drive Train** course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

MAC7 For every task in **Heating, Ventilation, & Air Conditioning** course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

MHD8 For every task in **Hydraulics** course(s) the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

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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)

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)

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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