

Diesel Equipment Technology Mississippi Curriculum Framework

Program CIP:

47.0605 – Diesel Mechanics Technology/Technician (Transportation option)

47.0302 – Heavy Equipment Maintenance Technology/Technician (Heavy Equip. option)

2021



Published by:

Mississippi Community College Board
Division of Workforce, Career, and Technical Education
3825 Ridgewood Road
Jackson, MS 39211
Phone: 601-432-6155
Email: curriculum@mccb.edu

FACULTY WRITING TEAM MEMBERS

Steven Esch, Copiah-Lincoln Community College
Dale Henry, East Mississippi Community College
Tim Lamb, East Mississippi Community College
Jeffery D. Kohl, Hinds Community College
Jason Gholston, Itawamba Community College
Barry Bradshaw, Jones County Junior College
Robert Gentry, Mississippi Gulf Coast Community College
Lamont Davis, Mississippi Gulf Coast Community College
Jonathan Alexander, Northeast Mississippi Community College
Kevin Bennett, Southwest Mississippi Community College

ADMINISTRATOR WRITING TEAM MEMBERS

Dr. Sharolyn Magee, Assistant Dean of Career/Technical Education, Copiah-Lincoln Community College, Wesson
Joe Cook, Assistant Dean of Career/Technical Education, East Mississippi Community College
Cindy West, Dean of Career/Technical Education, Hinds Community College-Raymond
Lee Douglas, Director, of Diesel Technology Academy, Hinds Community College
Addie Boone, Vice President for Career/Technical Education, Southwest Mississippi Community College
Jason Mattox, Northeast Mississippi Community College Associate Vice President for Career and Technical Education.
Lori Smith, Meridian Community College, Dean, Workforce Education
Millie Bordelon, Center Director, Mississippi Gulf Coast Community College

BUSINESS AND INDUSTRY WRITING TEAM MEMBERS

Jerry Swanson, Owner, Empire Truck & Stribling Equipment, Jackson, MS*
Bob Bullard, Empire Truck, Jackson, MS*
Bradly Cade, Empire Truck, Jackson, MS*
Robin Keen, Empire Truck, Jackson, MS *
Lonnie Cook, Empire Truck, Jackson, MS*
Todd Martin, Stribling/Empire Truck, Jackson, MS *
Brent Johnson, Stribling/Empire Truck, Jackson, MS *

OFFICE OF CURRICULUM AND INSTRUCTION TEAM MEMBERS

Scott Kolle, Ph.D., Director of Curriculum and Instruction, Mississippi Community College Board
LaToya Rembert- Sterling, Ph.D., Curriculum Specialist, Office of Curriculum and Instruction,
Mississippi Community College Board
Sheriece Robinson, Ed.D. Curriculum Specialist, Office of Curriculum and Instruction,
Mississippi Community College Board

The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), which serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

Copyright© 2021 by Mississippi Community College Board
For information, please contact curriculum@mccb.edu.

CONTENTS

RESEARCH ABSTRACT	6
RECENT REVISION HISTORY:	6
ADOPTION OF NATIONAL CERTIFICATION STANDARDS	7
ARTICULATION	11
TECHNICAL SKILLS ASSESSMENT	11
PROGRAM DESCRIPTION.....	13
SUGGESTED COURSE SEQUENCE	14
Accelerated Transition Pathway.....	14
Career Certificate Required Courses.....	15
Technical Certificate Required Courses (Transportation Option)	17
Technical Electives	20
REQUIRED COURSES	21
DET 1114 Fundamentals of Equipment Mechanics	21
DET 1213 Hydraulic Brake Systems	22
DET 1223 Electrical/Electronic Systems I	24
DET 1263 Electrical/Electronic Systems II.....	26
DET 1364 Diesel Systems I.....	28
DET 1374 Diesel Systems II.....	30
DET 1513 Hydraulics I.....	32
DET 1614 Preventive Maintenance and Service	34
DET 1713 Transportation Power Train	38
DET 1813 Air Conditioning and Heating Systems.....	41
DET 2113 Welding for Diesel Equipment Technology.....	44
DET 2253 Steering and Suspension Systems	45
DET 2273 Electrical/Electronic Systems III.....	47
DET 2383 Diesel Systems III—Compare to Preventive Maintenance & DS II.....	48
DET 2513 Hydraulic/Hydrostats II.....	49
DET 2523 Heavy Equipment Power Trains	51
DET 2623 Advanced Brake Systems (Air).....	52
DET 291(1-6) Special Problem/Projects in Diesel Equipment Technology	54
DET 292(1-6) Supervised Work Experience in Diesel Equipment Technology	55
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) Work-Based Learning I, II, III, IV, V, and VI.....	56

Appendix A Recommended Tools and Equipment	57
Appendix B Curriculum Definitions and Terms.....	61
Appendix C: Recommended Diesel Equipment Technology Text Book List.....	63
Appendix D: Course Crosswalk:	64

RESEARCH ABSTRACT

This curriculum was revised in 2021. The Office of Curriculum and Instruction (OCI) met with several different business and industries . An industry questionnaire was used to gather feedback concerning the trends and needs, both current and future, of their field.

RECENT REVISION HISTORY:

2007-Research & Curriculum Unit, Mississippi State University

2011-Research & Curriculum Unit, Mississippi State University

2015-Office of Curriculum & Instruction, Mississippi Community College Board

2021- Office of Curriculum & Instruction, Mississippi Community College Board

ADOPTION OF NATIONAL CERTIFICATION STANDARDS

The ASE Entry-Level Certification program is specially designed to evaluate and certify students who are near the end of their studies in the areas of Automobile Service, Collision Repair & Refinishing, and M/H Truck. The National Institute for Automotive Service Excellence (ASE) developed the exams in partnership with the ASE Education Foundation and Skills USA.

The testing program Certification program is specially designed to evaluate and certify students who are near the end of their studies in the area's increasing demands for measurable outcomes and accountability.

For students, ASE Entry-Level Certification can be thought of as the first step in building a career as a service professional by providing them with their first industry-recognized certification through ASE.

There are no work experience requirements for Entry-Level Certification; the student simply needs to pass one or more of the certification tests. Upon successful completion of a test, the school prints the certificate, has it signed by the school principal or proctor for validation, and then awards it to the student. Entry-Level Certification is valid for two years from the date the test was taken.

All diesel technology programs may use the ASE Entry-Level Certification program, regardless of their accreditation status or involvement with ASE, the ASE Education Foundation, or Skills USA. The tests are available year-round.

All tests are administered at the school through a secure computer-based testing (CBT) platform delivered via the internet. A proctor, who is a staff person other than an automotive instructor, enables the test for students and monitors their test sessions.

For more information about the program, including testing details, scoring criteria, and more, please visit www.ase.com/Entry-Level

ADOPTION OF NATIONAL CERTIFICATION STANDARDS

The AED Foundation, through its committed industry volunteers, is improving the quality of the equipment industry's workforce by publishing and maintaining the "Standards for Construction Equipment Technology." The goal is to help post-secondary institutions prepare students with the knowledge and skills they need to embark on successful careers as equipment service technicians. The contents are regularly reviewed and updated by The AED Foundation's Technical Training Committee in response to changes in technology and learning requirements.

Established in 1991, The AED Foundation is the educational affiliate of Associated Equipment Distributors (AED), an international association of the construction equipment industry representing over 700 independent distributors, manufacturer and related firms. AED was established in 1919. The National Center on Education and the Economy (NCEE), Washington, DC provided guidance for the development of the original standards. For more information or for additional copies, contact:

The AED Foundation
600 Hunter Drive, Suite 220
Oak Brook, IL 60523
Phone: 630-574-0650 Fax: 630-574-0132

Permission to copy this document for personal use by business and educational personnel is granted by The AED Foundation. This publication is available on-line at: <http://www.aedfoundation.org> <http://www.aedworkforce.com>

ADOPTION OF NATIONAL CERTIFICATION STANDARDS

NOCTI

The Diesel Technology industry-based credential is included in NOCTI's Job Ready assessment battery. Job Ready assessments measure technical skills at the occupational level and include items that gauge factual and theoretical knowledge. Job Ready assessments typically both a written and performance component and can be used at the secondary and post-secondary levels. Job Ready assessments can be delivered in an online or paper/pencil format.

INDUSTRY JOB PROJECTION DATA

Bus and truck mechanics and diesel engine specialists' occupations require an education level of a postsecondary career and technical certificate. A summary of occupational data from the [Mississippi Occupational Employment Projections](#) is displayed below:

Standard Occupational Classification (SOC)		2016 Employment	2026 Projected Employment	Projected Employment Growth 2016-2026		Total Projected Avg. Annual Job Openings
Code	Occupation			Number	Percent	
49-3031	Bus and Truck Mechanics and Diesel Engine Specialist	3,150	3,400	250	7.9%	315

ARTICULATION

Based on the complexity of the Diesel Equipment Technology, articulation will not be granted at the postsecondary level. Dual credit and partnerships are encouraged at the local level.

TECHNICAL SKILLS ASSESSMENT

Technical Skills Assessment

Colleges should report the following for students who complete the program with a career certificate, technical certificate, or an Associate of Applied Science Degrees for technical skills attainment

CIP Code	Program of Study	
CIP 47.0605 CIP 47.0302	Diesel Mechanics Technology/Technician (Transportation option) Heavy Equipment Maintenance Technology/Technician (Heavy Equip. option)	
Level	Standard Assessment	
Accelerated /15 Hour	Forklift, AND/OR S/P2 OSHA AND/OR NOCTI Safety Shop Practices Tools and Equipment Per local community college requirements	
Level	Standard Assessment	
Career	<p>For ASE four areas are required plus MACS 609 is required</p> <ul style="list-style-type: none"> • ASE-Brakes • ASE-Diesel Engines • ASE- Inspection Maintenance and Minor Repair • ASE- Steering and Suspension Systems • MACS Section 609 Certification <p>ASE-Electrical/Electronic Systems (DET 1263) (Optional) per local community college</p> <p>Per local community college requirements</p> <p>OR</p> <p>For NOCTI all 5 NOCTI area are required plus MACS 609 is required</p> <p>NOCTI Electrical/Electronic Systems NOCTI Brakes NOCTI Diesel Engine NOCTI-Preventative Maintenance NOCTI Drive Trains</p>	
Level	Standard Assessment	
Technical/AAS	<p>ASE Certification may be offered at the Career or Technical Certificate</p> <p>For ASE four areas are required plus MACS 609 is required</p> <p>ASE Electrical/Electronic Systems ASE- Steering and Suspension Systems ASE-Brakes ASE- Electrical/Electronic Systems, ASE-Diesel Engines plus, MACS 609 is required</p> <p>OR</p> <p>Associated Equipment Distributors (AED) for Heavy Equipment Option</p>	

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 program offers an accelerated transition pathway of 15 semester credit hours, a career certificate at 30 semester credit hours, a technical certificate at 45 semester credit hours for transportation (medium to heavy trucks) option, a technical certificate at 45 semester credit hours for a heavy equipment option, and an Associate of Applied Science degree at 60 semester credit hours.

The curriculum utilized both the Automotive Service Excellence (ASE) *2014 Medium/Heavy Truck standards* and the *2014 Standards for Construction Equipment Technology* (AED). These documents serve as national standards for certification of medium/heavy truck and construction equipment technician programs.

The tasks described in the document are based on a number of assumptions that 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, whether electronic or paper-based.
2. All diagnostic and repair tasks are performed in accordance with manufacturer's recommended procedures and to manufacturer's specifications.

SUGGESTED COURSE SEQUENCE

Accelerated Transition Pathway

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Contact Hours	Contact Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	
DET 1114	Fundamentals of Equipment Mechanics	4	3	2	75	45	30	Forklift, AND/OR S/P2 OSHA AND/OR NOCTI Safety Shop Practices Tools and Equipment
DET 1614	Preventive Maintenance and Service	4	2	4	90	30	60	
	Electives	7						
	TOTAL	15						

Career Certificate Required Courses

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Contact Hours	Contact Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	
DET 1223	Electrical/Electronic Systems I	3	2	2	60	30	30	ASE-Electrical/Electronic Systems NOCTI Electrical/Electronic Systems
DET 1513 OR DET 1213	Hydraulics I Hydraulic Brake Systems	3	1	4	75	15	60	ASE-Brakes NOCTI Brakes
DET 1364	Diesel Systems I	4	2	4	90	30	60	ASE-Diesel Engines NOCTI Diesel Engine
DET 1614	*Preventive Maintenance and Service	4	2	4	90	30	60	ASE-Inspection Maintenance and Minor Repair (Optional) per local community college NOCTI-Preventative

								Maintenance
DET 1263 OR DET 1713	Electrical/Electronic Systems II or Transportation Power Train	3/3	1/2	4/2	75/60	15/30	60/30	ASE-Electrical/Electronic Systems (DET 1263) / NOCTI Drive Trains
DET 1813	Air Conditioning and Heating Systems	3	1	4	75	15	60	ASE MACS Section 609 Certification,
DET 1374 OR DET 2623	Diesel Systems II or Advanced Brake Systems	4/3	2/2	4/2	90/60	30/30	60/30	ASE-Diesel Engine and Brakes NOCTI Brakes
	Approved electives per Instructor at local community college level	6						
TOTAL		30			555	255	300	

Technical Certificate Required Courses (Transportation Option)

Course Number	Course Name	Semester Credit Hours	SCH Breakdown	
			Lecture	Lab
DET 2273	Electrical/Electronic Systems III	3	1	
DET 2253	Steering and Suspension Systems	3	2	
DET 1713	Transportation Power Train	3	2	
DET 2623	Advanced Brake Systems (Air)	3	2	
	Instructor Approved Electives	3		
TOTAL		15		

Note: Courses required under the Transportation Option MAY be used as electives for the Heavy Equipment Option.

Technical Certificate Required Courses (Heavy Equipment Option)

Course Number	Course Name	Semester Credit Hours	SCH Breakdown	
			Lecture	Lab
DET 2273	Electrical/Electronic Systems III	3	1	
DET 2523	Heavy Equipment Power Train	3	1	
DET 2513	Hydraulic/Hydrostats II	3	2	
DET 2383	Diesel Systems III	3	2	
	Instructor Approved Electives	3		
TOTAL		15		

Note: Courses required under the Heavy Equipment Option MAY be used as electives for the Transportation Option.

General Education Core Courses

To receive the Associate of Applied Science degree, a student must complete all of the required coursework found in the Career Certificate option, Technical certificate option, and a minimum of 15 semester hours of General Education core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science degree at their college. The Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) Section 9 Standard 3 of the *Principles of Accreditation: Foundations for Quality Enhancement*¹ describes the general education core.

Section 9 Standard 3:

3. The institution requires the successful completion of a general education component at the undergraduate level that
 - a) is based on a coherent rationale.
 - b) is a substantial component of each undergraduate degree program. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours of the equivalent; for baccalaureate programs, a minimum of 30 semester hours or the equivalent.
 - c) ensures breadth of knowledge. These credit hours include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. These courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession.

<<<Add any additional general education standards as required for programmatic accreditation here and footnote below.>>>

General Education Courses

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Contact Hours	Contact Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	Certification Name
	Humanities/Fine Arts	3						
	Social/Behavioral Sciences	3						
	Math/Science	3						
	Academic electives	6						
	TOTAL	15						

¹ Southern Association of Colleges and Schools Commission on Colleges. (2017). *The Principles of Accreditation: Foundations for Quality Enhancement*. Retrieved from <http://www.sacscoc.org/2017ProposedPrinc/Proposed%20Principles%20Adopted%20by%20BOT.pdf>

REQUIRED COURSES

Course Number and Name: DET 1114 Fundamentals of Equipment Mechanics

Description: This is a course designed to provide review and update of safety procedures; tools and equipment usage; handling, storing, and disposing of hazardous materials; and operating principles of diesel engines.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
4	3	2	75

Prerequisite: None

Student Learning Outcomes:

1. Describe general safety rules for working in a shop/lab and industry. NOCTI Shop Practices, Tools and Equipment
 - a. Describe how to avoid on-site accidents. (AED 1.12a, AED 1a.12b) NOCTI, Shop Practices, Tools and Equipment
 - 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. (AED 1a.6a-e)
 - c. Explain the safety procedures when working near pressurized fluids or high temperature. (AED 1a.2d)
2. Use proper safety practices when performing diesel repair operations.
 - a. Recognize, inspect, and explain personal protective equipment.
3. Identify and explain the procedures for lifting heavy objects.
4. Explain the Material Safety Data Sheet (MSDS).
 - a. Explain the function of the MSDS. (AED 1a.12d)
 - b. Interpret the requirements of the MSDS. (AED 1a.6e)
5. Explain fires. NOCTI Safety; NOCTI Diesel Engines
 - a. Explain the process by which fires start.
 - b. Explain fire prevention of various flammable liquids.
 - c. Explain the classes of fire and the types of extinguishers.
6. Explain electrical safety hazards, injuries, and precautions in and around diesel repair. (AED 1a. a-d)
7. Demonstrate the proper use and interpretation of precision measurement instruments. (AED 5.2 c)
8. Introduce programs that promote continuous improvement of efficiencies in the workplace. (AED 1b.1 (a-d), 1b.2 (a-d))

Course Number and Name: DET 1213 Hydraulic Brake Systems

Description: This is a course designed to provide diagnosis and repair of hydraulic brake systems, includes instruction in hydraulic and mechanical systems, power assist units, and antilock braking systems.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore and perform hydraulic brakes diagnosis and repair. ^{NOCTI Brakes}
 - a. Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action.
 - b. Check brake pedal pushrod length; adjust as needed.
 - c. Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
 - d. Inspect hydraulic system, brake lines, flexible hoses, and fittings for leaks and damage; replace as needed.
 - e. Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
 - f. Inspect disc brake caliper assemblies; replace as needed.
 - g. Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.
2. Perform diagnosis and repair of mechanical/foundation systems.
 - a. Identify poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.
 - b. Inspect and measure rotors; perform needed action.
 - c. Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
 - d. Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.
3. Discuss and perform power assist units diagnosis and repair.
 - a. Identify stopping problems caused by the brake assist (booster) system; determine needed action.
 - b. Inspect, test, repair, or replace hydraulic power brake assist (booster), hoses, and control valves; determine proper fluid type.
 - c. Check emergency (back-up, reserve) brake assist system.
4. Discuss and perform hydraulic antilock brake systems (ABS) and automatic traction control (ATC) diagnosis and repair. ^{NOCTI Brakes}
 - a. Observe antilock brake system (ABS) warning light operation (includes dash mounted trailer ABS warning light); determine needed action.
 - 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.
 - c. Identify poor stopping and wheel lock-up problems caused by failure of the antilock brake system (ABS); determine needed action.
 - d. Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.
 - e. Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed.

- f. Bleed the ABS hydraulic circuits following manufacturers' procedures.
 - g. Observe automatic traction control (ATC) warning light operation; determine needed action.
 - 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.
5. Discuss and perform inspection, lubrication, and replacement of wheel bearings.
- 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.
 - b. Inspect or replace extended service wheel bearing assemblies.
6. Discuss and perform hydraulic brake diagnosis and repair. NOCTI Brakes
- 1) Check master cylinder fluid level and condition.
 - 2) Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.
 - 3) Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.
 - 4) Check operation of hydraulic system: pedal travel, pedal effort, pedal feel (drift).
 - 5) Inspect calipers for leakage and damage.
 - 6) Inspect power brake assist system (booster), hoses and control valves; check brake assist reservoir fluid level and condition.
 - 7) Inspect and record brake lining/pad condition, thickness, and contamination.
 - 8) Inspect and record condition of brake rotors.
 - 9) Adjust drum brakes.
 - 10) Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.

Course Number and Name: DET 1223 Electrical/Electronic Systems I

Description: This is a course designed to provide diagnosis, service, and repair of electrical and electronic systems on diesel engines, includes instruction in general systems diagnosis, starting and charging systems.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore general electronic and electrical systems. NOCTI Electrical and Electronic Systems
 - a. Read and interpret electrical/electronic circuits using wiring diagrams. (ASE V.A.5, ASE V.A.11)
 - b. Check continuity in electrical/electronic circuits using appropriate test equipment. (ASE V.A9, ASE V.A3)
 - c. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment. (AED 2.1e, ASE v.a3)
 - d. Check current flow in electrical/electronic circuits and components using appropriate test equipment. (ASE v.a3)
 - e. Check resistance in electrical/electronic circuits and components using appropriate test equipment. (AED 2.1 c)
 - f. Locate shorts, grounds, and opens in electrical/electronic circuits. (AED 2.2b, ASE v.a4)
 - g. Identify parasitic (key-off) battery drain problems; perform tests; determine needed action. (ASE v.a6)
 - h. Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed. (ASE v.a7)
 - i. Inspect and test spike suppression devices; replace as needed.

2. Discuss and perform battery diagnosis and repair. (AED 2.1i) NOCTI Electrical and Electronic Systems
 - a. Perform battery load test; determine needed action. (AED 2.1i, ASE v.b2)
 - b. Determine battery state of charge using an open circuit voltage test.
 - c. Inspect, clean, and service battery; replace as needed. (ASE v.b3)
 - d. Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed. (ASE v.b3)
 - e. Charge battery using slow or fast charge method as appropriate. (ASE v.b4)
 - f. Inspect, test, and clean battery cables and connectors; repair or replace as needed. (ASE b.b7)
 - g. Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures. (ASE v.b5)
 - h. Perform battery capacitance test; determine needed action. (ASE v.b2)

3. Discuss and perform starting system diagnosis and repair. (AED 2.3a) NOCTI Electrical and Electronic Systems
 - a. Perform starter circuit cranking voltage and voltage drop tests; determine needed action. (AED 2.3c, ASE v.c2)
 - b. Inspect and test components (key switch, push button and/or magnetic switch) and wires in the starter control circuit; replace as needed. (AED 2.3b, ASE v.c.3)
 - c. Inspect and test starter relays and solenoids/switches; replace as needed. (AED 2.3 d)
 - d. Remove and replace starter; inspect flywheel ring gear or flex plate. (AED 2.3d, ASE v.c6)

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

5. Discuss digital multi-meter usage and operation. NOTI 2.1, ASE 2.2a AED 2.2c

Course Number and Name: DET 1263 Electrical/Electronic Systems II

Description: This is a course designed to provide 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.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore headlights, daytime running lights, parking, clearance, tail, cab, and instrument panel lights.
 - a. Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation. (ASE v. e1) NOCTI Electrical and Electronic Systems
 - b. Test, aim, and replace headlights. (ASE v. e2)
 - c. Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets and control components; repair or replace as needed. (AED 2.5 a &b)
 - 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. (ASE v. f2, AED 2.5 a &b)
 - 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. (ASE v. f2)
 - f. Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed. (ASE v.3 6, AED 2.5c &d)
 - g. Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed. (ASE v. e5&7)
2. Discuss and perform stoplight, turn signal, hazard light, and back-up light diagnosis and repair. (AED 2.5d)
 - a. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed. (ASE v. e5)
 - 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. (ASE v. e5)
 - 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. (ASE v. e5)
3. Discuss and perform gauge and warning device diagnosis and repair.
 - 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.
 - b. Identify causes of intermittent, high, low, or no gauge readings; determine needed action.
 - c. Identify causes of gauge malfunctions; determine needed action.
 - d. Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.

- e. Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed. ^(ASE v.g2)
 - f. Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems. ^(ASE v.e3)
4. Discuss and perform related electrical system diagnosis and repair. ^{NOCTI Electrical and Electronic Systems}
- 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. ^(ASW v.a.13)
 - b. Identify causes of constant, intermittent, or no horn operation; determine needed action. ^(ASE v. g1)
 - c. Inspect and test horn circuit relays, horns, switches, connectors, wires, and control components/modules; repair or replace as needed.
 - d. Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action. ^(ASE v.1)
 - e. Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed. ^(ASE v.v.1)
 - f. Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed. ^(ASE v.v.1)
 - g. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed. ^(ASE v.v1)
 - h. Inspect and test sideview mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires and control components/modules; repair or replace as needed.
 - 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.
 - j. Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.
 - k. Identify causes of slow, intermittent, or no power side window operation; determine needed action.
 - l. Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repair or replace as needed.
 - m. Inspect and test block heaters; determine needed repairs. ^(ASE c.v7)
 - n. Inspect and test cruise control electrical components; repair or replace as needed. ^(ASE v.v3)
 - o. Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits ^(ASE v.v3)
 - p. Check operation of keyless and remote lock/unlock devices; determine needed action. ^(ASE v.v3)
 - q. Inspect and test engine cooling fan electrical control components/modules; repair or replace as needed.
 - r. Identify causes of data bus communication problems; determine needed action. ^(ASE v.a10)

Course Number and Name: DET 1364 Diesel Systems I

Description: This is a course designed to provide diagnosis, service, and repair of basic engine operating principles, with an emphasis on cylinder head and valve train engine block.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Discuss and perform lubrication systems diagnosis and repair. ^(ASE 1d)
 - 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. ^(ASE 1.d1)
 - b. Check engine oil level, condition, and consumption; determine needed action. ^(ASE 1.d2)
 - c. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action. ^(ASE 1.d6)
 - d. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action. ^(ASE 1.d7)
 - e. Inspect, clean, and test oil cooler and components; determine needed action. ^(ASE 1.d4)
 - f. Inspect turbocharger lubrication and cooling systems; determine needed action. ^(ASE 1.d5)
 - g. Determine proper lubricant and perform oil and filter change. ^(ASE 1.d3)
2. Discuss and perform cooling system diagnosis and repair. ^(ASE 1.e, AED 5.5.5a&b)
 - a. Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action. ^(ASE1.e2)
 - b. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment. ^(ASE 1)
 - c. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
 - d. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
 - e. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
 - f. Inspect water pump and hoses; replace as needed.
 - g. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
3. Discuss and perform air induction and exhaust systems diagnosis and repair. ^{NOCTI Diesel Engines}
 - a. Perform air intake system restriction and leakage tests; determine needed action.
 - b. Perform intake manifold pressure (boost) test; determine needed action.
 - c. Perform exhaust back pressure test; determine needed action.
 - d. Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
 - e. Inspect and test turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.
 - f. Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed.
 - g. Remove and reinstall turbocharger/wastegate assembly.
 - h. Inspect intake manifold, gaskets, and connections; replace as needed.
 - i. Inspect, clean, and test charge air cooler assemblies; inspect aftercooler assemblies; replace as needed.

- j. Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
- k. Inspect exhaust after treatment devices; determine necessary action.
- l. Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.
- m. Inspect and test exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.

Course Number and Name: DET 1374 Diesel Systems II

Description: This is a course designed to provide skills and knowledge related to the diagnosis, service, and repair of lubrication systems, cooling system, and air induction and exhaust systems.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore cylinder head and valve train diagnosis and repair. ^(ASE 1b)
 - a. Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
 - b. Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
 - c. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action. ^(ASE 1b.2)
 - d. Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action. ^(ASE 1.b7)
 - e. Measure valve head height relative to deck and valve face-to-seat contact; determine needed action. ^(ASE 1.b8)
 - f. Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; determine needed action. ^(ASE 1.b3)
 - g. Inspect and adjust valve bridges (crossheads) and guides; perform needed action. ^(ASE 1.b6)
 - h. Reassemble cylinder head. ^(ASE 1.b9)
 - i. Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash. ^(ASE 1.b5-10)
 - j. Inspect pushrods, rocker arms, rocker arm shafts, electronic wiring harness, and brackets for wear, bending, cracks, looseness, and blocked oil passages; determine needed action.
 - k. Inspect cam followers; determine needed action.
 - l. Adjust valve bridges (crossheads); adjust valve clearances and injector settings.
2. Discuss and perform engine block diagnosis and repair. ^(ASE I.C)
 - a. Perform crankcase pressure test; determine needed action.
 - b. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
 - 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.
 - d. Inspect cylinder sleeve counter-bore and lower bore; check bore distortion; determine needed action.
 - e. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
 - f. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
 - g. Inspect in-block camshaft bearings for wear and damage; determine needed action.
 - h. Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.
 - 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.
 - j. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.
 - k. Inspect, install, and time gear train; measure gear backlash; determine needed action.

- l. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
 - m. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.
 - n. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
 - o. Check condition of piston cooling jets (nozzles); determine needed action.
 - p. Inspect and measure crankshaft vibration damper; determine needed action.
 - 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.
 - r. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.
3. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action. NOCTI Diesel Engines

Course Number and Name: DET 1513 Hydraulics I

Description: This is a course designed to provide knowledge of basic operation and maintenance of hydraulic systems associated with diesel powered equipment, includes instruction in safety, system components, operation, and repair.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore general hydraulic system operation.
 - a. Identify system type (closed and open) and verify proper operation.
 - b. Read and interpret system diagrams, schematics, and symbols. (ASE VIII.A.7, AED 3.1a)
 - c. Perform system temperature, pressure, flow, and cycle time tests; determine needed action. (ASE VII. A7, ASE 3.1a)
 - d. Verify placement of equipment /component safety labels and placards; determine needed action. (ASE VIII. A2, AED 3.1c)
2. Discuss and perform pump operation, diagnosis, and repair. (ASE VII.B)
 - a. Verify proper fluid type.
 - b. Identify causes of pump failure, unusual pump noises, temperature, flow, and leakage problems; determine needed action. (ASE VIII.B.1)
 - c. Determine pump type, rotation, and drive system.
 - d. Remove and install pump; prime and/or bleed system.
 - e. Inspect pump inlet and outlet for restrictions and leaks; repair as needed.
3. Discuss filtration/ reservoirs (tanks). (ASE VIII.C)
 - a. Identify type of filtration system; verify filter application and flow direction.
 - b. Service filters and breathers.
 - c. Identify causes of system contamination; determine needed action.
 - d. Take a hydraulic oil sample.
 - e. Check reservoir fluid level and condition; determine needed action.
 - f. Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.
4. Discuss hoses, fittings, and connections. (ASE VIII.D) NOCTI Shop Practices, Tools and Equipment
 - a. Diagnose causes of component leakage, damage, and restriction; determine needed action. (ASE VIII.D)
 - b. Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed. (ASE VIII.D2)
 - c. Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination. (ASE VIII. D3)
 - d. Inspect and replace fitting seals and sealants.
5. Discuss and perform control valve diagnosis and repair. (ASE VIII.E)
 - a. Pressure test system safety relief valve; determine needed action. (ASE VIII.E)
 - b. Perform control valve operating pressure and flow tests; determine needed action. (ASE VII.E2)

- c. Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic). (ASE VIII.E3)
 - d. Identify causes of control valve leakage problems (internal/external); determine needed action. (ASE VIII.E4)
 - e. Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed. (ASE VIII.E5)
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.]
- a. Identify actuator type (single/double acting, multi-stage/telescopic, and motors). (ASE VIII.F1)
 - b. Identify the cause of seal failure; determine needed repairs. (ASE VIII.F2)
 - c. Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs. (ASE VIII.F3)
 - d. Inspect actuator mounting brackets and plates, frame components, and hardware for looseness, cracks, and damage; determine needed action. (ASE VIII.F4)
 - e. Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures. (ASE VIII.F5)
 - f. Inspect actuators for dents, cracks, damage, and leakage; determine needed action.
 - g. Purge and/or bleed system in accordance with manufacturers' recommended procedures.

Course Number and Name: DET 1614 Preventive Maintenance and Service

Description: This is a course designed to provide practice in the preventive maintenance of diesel powered equipment, includes instruction in general preventive maintenance of vehicles and equipment.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore engine systems.
 - a. Discuss and perform equipment inspection diagnosis and repair. NOCTI Preventive Maintenance
 - 1) Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.
 - 2) Inspect vibration damper, belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.
 - 4) Check engine oil level and condition; check dipstick seal.
 - 5) Inspect engine mounts for looseness and deterioration.
 - 6) Check engine for oil, coolant, air, fuel, and exhaust leaks (Engine Off and Running).
 - 7) Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.
 - b. Discuss and perform fuel system diagnosis and repair.
 - 1) Check fuel tanks, mountings, lines, caps, and vents.
 - 2) Drain water from fuel system, service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.
 - c. Discuss and perform air induction and exhaust system diagnosis and repair. NOCTI Preventive Maintenance
 - 1) Check exhaust system mountings for looseness and damage and 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.
 - 3) Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.
 - 4) Inspect turbocharger for leaks; check mountings and connections.
 - 5) Check operation of engine compression/exhaust brake.
 - 6) Service or replace air filter as needed; check and reset air filter restriction indicator.
 - 7) Inspect and service crankcase ventilation system.
 - 8) Check DEF (Diesel Exhaust Fluid) systems for leaks and fluid levels.
 - d. Discuss and perform cooling system diagnosis and repair.
 - 1) Check fan operation and inspect fan assembly and shroud.
 - 2) Inspect radiator (including air flow restriction, leaks, and damage) and mountings.
 - 4) Pressure test cooling system and radiator cap.
 - 5) Inspect coolant hoses and clamps and 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 and 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 and check seat condition, operation, and mounting.
 - 4) Inspect wiper blades and arms and check operation of wiper and washer.
 - 6) Inspect windshield glass for cracks or discoloration; check sun visor.
 - 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 and 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, compressor and lines for condition and visible leaks; check mountings.
 - 3) Check A/C system condition and operation; check A/C monitoring system, if applicable.
 - 4) Check HVAC air inlet filters and ducts; service as needed.
 - d. Discuss and perform electrical/electronic diagnosis and repair.
 - 1) Inspect battery box(es), cover(s), and mountings and inspect battery hold-downs, connections, cables, and cable routing; service as needed.
 - 3) Check/record battery state-of-charge (open circuit voltage) and condition.
 - 4) Perform battery test (load and/or capacitance).
 - 5) Inspect starter, mounting, and connections and engage starter; check for unusual noises, starter drag, and starting difficulty.
 - 7) Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action and perform alternator output tests.
 - 9) Check operation of interior lights; determine needed action.
 - 10) Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.
 - 11) Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.
3. Explore frame and chassis. NOCTI Preventive Maintenance
- a. Discuss and perform air brake diagnosis and repair.
 - 1) Check operation of parking brake.
 - 2) Record air governor cut-out setting (psi) and check air governor cut-in pressure.

- 3) Check operation of air reservoir/tank drain valve.
 - 4) Check air system for leaks (brakes released, then brakes applied).
 - 6) Test one-way and double-check valves.
 - 7) Check low air pressure warning devices.
 - 9) Check emergency (spring) brake control/modulator valve, if applicable.
 - 10) Check tractor protection valve.
 - 11) Test air pressure build-up time.
 - 12) Inspect coupling air lines, holders, and gladhands.
 - 13) Check brake chambers and air lines for secure mounting and damage.
 - 14) Check operation of air drier.
 - 15) Inspect and record brake shoe/pad condition, thickness, and contamination and inspect record condition of brake drums/rotors.
 - 17) Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.
 - 18) Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.
 - 19) Lubricate all brake component grease fittings.
 - 20) Check condition and operation of hand brake (trailer) control valve.
 - 21) Perform antilock brake system (ABS) operational system self-test.
 - 22) Drain air tanks and check for contamination.
 - 23) Check condition of pressure relief (safety) valves.
- c. Discuss and perform drive train diagnosis and repair. NOCTI Preventive Maintenance
- 1) Check operation of clutch, clutch brake, and gearshift.
 - 2) Check clutch linkage/cable for looseness or binding, if applicable.
 - 3) Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.
 - 4) Check clutch adjustment; adjust as needed.
 - 5) Check transmission case, seals, filter, hoses, and cooler for cracks and leaks.
 - 6) Inspect transmission breather.
 - 7) Inspect transmission mounts.
 - 8) Check transmission oil level, type, and condition.
 - 9) Inspect U-joints, yokes, driveshaft's, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.
 - 10) Inspect axle housing(s) for cracks and leaks.
 - 11) Inspect axle breather(s).
 - 12) Lubricate all drive train grease fittings.
 - 13) Check drive axle(s) oil level, type, and condition.
 - 14) Change drive axle(s) oil and filter; check and clean magnetic plugs.
 - 15) Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.
 - 16) Change transmission oil and filter; check and clean magnetic plugs.
 - 17) Check interaxle differential lock operation.
 - 18) Check range shift operation.
 - 19) Check swing bearing gearbox.
- d. Discuss and perform suspension and steering system diagnosis and repair.
- 1) Check steering wheel operation for free play or binding.
 - 2) Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.
 - 3) Change power steering fluid and filter.
 - 4) Inspect steering gear for leaks and secure mounting and inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.
 - 6) Check kingpin for wear.
 - 7) Check wheel bearings for looseness and noise.
 - 8) Check oil level and condition in all non-drive hubs; check for leaks.

- 9) Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.
 - 10) Inspect shock absorbers for leaks and secure mounting.
 - 11) Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.
 - 12) Check and record suspension ride height.
 - 13) Lubricate all suspension and steering grease fittings.
 - 14) Check toe setting.
 - 15) Check tandem axle alignment and spacing.
 - 16) Check axle locating components (radius, torque, and/or track rods).
- e. Discuss and perform tire and wheel diagnosis and repair.
- 1) Inspect tires for wear patterns and proper mounting and inspect tires for cuts, cracks, bulges, and sidewall damage.
 - 3) Inspect valve caps and stems; replace as needed.
 - 4) Measure and record tread depth; probe for imbedded debris.
 - 5) Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.
 - 6) Check for loose lugs; check mounting hardware condition; service as needed.
 - 7) Re-torque lugs in accordance with manufacturers' specifications.
 - 8) Inspect wheels for cracks or damage.
 - 9) Check tire matching (diameter and tread) on dual tire installations.
 - 10) Adjust track tension.
- f. Discuss and perform frame and fifth wheel diagnosis and repair. NOCTI Preventive Maintenance
- 1) Inspect fifth wheel mounting, bolts, air lines, and locks and test operation of fifth wheel locking device; adjust if necessary.
 - 3) Check quarter fenders, mud flaps, and brackets.
 - 4) Check pintle hook assembly and mounting.
 - 5) Lubricate all fifth wheel grease fittings and plate.
 - 6) Inspect frame and frame members for cracks and damage.

Course Number and Name: DET 1713 Transportation Power Train

Description: This is a course designed to provide diagnosis, service, maintenance, and repair of power train units on transportation equipment, includes instruction on clutch, manual transmissions, drive shafts, and drive axles.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore clutch diagnosis and repair. ^(ASE IIB)
 - a. Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action. ^(ASE II, B.10)
 - 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. ^(ASE II, B1)
 - c. Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system. ^(ASE II, B3)
 - d. Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals. ^(ASE II, B4)
 - e. Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc. ^(ASE II, B5)
 - f. Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs. ^(ASE II, B6)
 - g. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action. ^(ASE II, B7)
 - h. Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms. ^(ASE II, B8)
 - i. Inspect and replace pilot bearing. ^(ASE II, B9)
 - j. Inspect flywheel mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action. ^(ASE II, B11)
 - k. Inspect flywheel, and starter ring gear; measure flywheel face and pilot bore runout; determine needed action. ^(ASE II, B12)
 - l. Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action. ^(ASE II, B13)

2. Discuss and perform transmission diagnosis and repair. ^{(ASE II C) NOCTI Drivetrains}
 - a. Identify causes of transmission noise, shifting, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action. ^(ASE II C9)
 - b. Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies. ^(ASE II C 11)
 - c. Inspect and replace transmission mounts, insulators, and mounting bolts. ^(ASE IIC1)
 - d. Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed. ^(ASE II C3)
 - e. Check transmission fluid level and condition; determine needed service; add proper type of lubricant. ^(ASE II C4)
 - f. Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires. ^(ASE II C8)
 - g. Remove and reinstall transmission. ^(ASE II C11)
 - h. Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action. ^(ASE II C12)

- i. Disassemble, inspect, and replace internal transmission components; such as, sliding clutches, bearings, shafts, as necessary to meet manufacturer's specifications. (ASE II C12)
 - j. Inspect transmission oil filters/coolers; replace as needed. (ASE II C5)
 - k. Inspect speedometer components; determine needed action. (ASE II C6)
 - l. Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action. (ASE II C13)
 - m. Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action. (ASE II C7)
 - n. Inspect and test transmission temperature gauge and sensor/sending unit; determine needed action. (ASE II C14)
 - 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. (ASE II C16)
 - 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. (ASE II C16)
 - 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. (ASE II C16)
 - 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. (ASE II C15)
 - s. Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses. (ASE II C15)
 - 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. (ASE II C15)
3. Discuss and perform driveshaft and universal joint diagnosis and repair. (NOCTI Drivetrains)
- a. Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action. (ASE II D2)
 - 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. (ASE II.D1)
 - c. Inspect driveshaft center support bearings and mounts; determine needed action. (ASE II.D3)
 - d. Measure driveline angles; determine needed action. (ASE II D4)
4. Discuss and perform drive axle diagnosis and repair. (ASE II.E) (NOCTI Drivetrains)
- a. Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action. (ASE II.E7)
 - b. Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals. (ASE II.E1)
 - c. Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.
 - d. Remove and replace differential carrier assembly. (ASE II.E2)
 - e. Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings. (ASE II.E11)
 - f. Inspect and replace components of locking differential case assembly. (ASE II.E12)
 - g. Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action. (ASE II.E13)
 - h. Measure ring gear runout; determine needed action. (ASE II.E15)
 - i. Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.
 - j. Measure and adjust drive pinion bearing preload. (ASE II.E16)
 - k. Measure and adjust drive pinion depth. (ASE II.E 17)

- l. Measure and adjust side bearing preload and ring gear backlash. (ASE II.E18)
- m. Check and interpret ring gear and pinion tooth contact pattern; determine needed action. (ASE II.E)19
- n. Inspect, adjust, or replace ring gear thrust block/screw. (ASE II.E20)
- o. Inspect power divider (inter-axle differential) assembly; determine needed action. (ASE II.E3)
- 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. (ASE II.E3)
- q. Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters. (ASE II.E6)
- r. Inspect and replace drive axle shafts. (ASE II.E4)
- s. Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action. (ASE II.E5)
- t. Identify causes of drive axle wheel bearing noise and check for damage; perform needed action. (ASE II.E7)
- u. Inspect and test drive axle temperature gauge and sending unit/sensor; determine needed action. (ASE II.E8)
- v. Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings. (ASE II.E1,E5)

Course Number and Name: DET 1813 Air Conditioning and Heating Systems

Description: This is a course designed to provide skills and knowledge related to the 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.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

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-1234 YF, R-134a, and EPA approved refrigerant blends.

1. Identify theories, operating principles, and current regulations related to air conditioner service.
 - a. Discuss and perform HVAC systems diagnosis, service, and repair.
 - 1) Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.
 - 2) Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action. (ASE VI. A5)
 - 3) Identify system type and components (cycling clutch orifice tube – CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action. (ASE VI.A4, AED 6.3)
 - 4) Retrieve diagnostic codes; determine needed action. (ASE VI. A4)
 - b. Discuss and perform A/C system and component diagnosis, service, and repair.
 - 1) Identify causes of temperature control problems in the A/C system; determine needed action. (ASE VI A.4)
 - 2) Identify refrigerant and lubricant types; check for contamination; determine needed action. (ASE VI.A.5)
 - 3) Diagnose A/C system problems indicated by pressure gauge and temperature readings; determine needed action. (ASE VI. A4, AED 6.3A)
 - 4) Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action. (ASE VI. AS4)
 - 5) Perform A/C system leak test; determine needed action. (ASE VI. A7)
 - 6) Recover, evacuate, and recharge A/C system using appropriate equipment. (ASE VI. A6)
 - 7) Identify contaminated A/C system components and hoses; determine needed action.
2. Explore A/C system and component diagnosis, service, and repair.
 - a. Discuss and perform compressor and clutch diagnosis, service, and repair.
 - 1) Identify A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action. (ASE VI. B2)
 - 2) Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices. (ASE VI. B2)

- 3) Inspect and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment. (ASE VI.B1, AED 6.4 a 3)
 - 4) Inspect, test, service, or replace A/C compressor clutch components or assembly. (ASE VI.VI.B4, AED 6.4g)
 - 5) Inspect and correct A/C compressor lubricant level (if applicable). (ASE VI. A9)
 - 6) Inspect, test, or replace A/C compressor. (ASE VI.B1)
 - 7) Inspect, repair, or replace A/C compressor mountings and hardware. (ASE VI.B1)
3. Explore A/C system and component diagnosis, service, and repair.
- a. Discuss and perform evaporator, condenser, and related components diagnosis, service, and repair.
 - 1) Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses. (ASE VI.A9, AED 6.2)
 - 2) Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action. (ASE VI.B5)
 - 3) Inspect A/C condenser for proper air flow. (ASE VI. B3)
 - 4) Inspect and test A/C system condenser and mountings; determine needed action. (ASE VI. B11)
 - 5) Inspect and replace receiver/drier or accumulator/drier. (ASE VI. B6)
 - 6) Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action. (ASE VI.B7)
 - 7) Remove and replace orifice tube.
 - 8) Inspect and test cab/sleeper evaporator core; determine needed action. (ASEVI.B8)
 - 9) Inspect, clean, or repair evaporator housing and water drain; inspect and service/replace evaporator air filter. (ASE VI.B8, AED 6.7b)
 - 10) Identify and inspect A/C system service ports (gauge connections); determine needed action.
 - 11) Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.
 - b. Discuss and perform heating and engine cooling systems diagnosis, service, and repair.
 - 1) Diagnose the cause of outlet air temperature control problems in the HVAC system; determine needed action. (ASE VI.C.1)
 - 2) Identify window fogging problems; determine needed action. (ASE VI.C4)
 - 3) Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action. (ASE VI.C.1)
 - 4) Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action. (ASE VI.C1)
 - 5) Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action. (ASE V1C1)
 - 6) Inspect water pump for leaks and bearing play; determine needed action. (ASE V1C1)
 - 7) Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs. (ASE V1C1)
 - 8) Recover, flush, and refill with recommended coolant/additive package; bleed cooling system. (ASE V1C5)
 - 9) Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
 - 10) Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action. (ASE V1C5)
 - 11) Inspect and flush heater core; determine needed action. (ASE V1C5)
4. Explore operating systems and related controls diagnosis and repair.
- a. Discuss and perform electrical diagnosis, service, and repair.
 - 1) Identify causes of HVAC electrical control system problems; determine needed action.
 - 2) Inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.

- 3) Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.
 - 4) Inspect and test A/C related electronic engine control systems; determine needed action.
 - 5) Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.
 - 6) Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.
 - 7) Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.
- b. Discuss and perform air/vacuum/mechanical diagnosis, service, and repair.
- 1) Identify causes of HVAC air, and mechanical control problems; determine needed action.
 - 2) Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.
 - 3) Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.
 - 4) Inspect and test HVAC system actuators and hoses; determine needed action.
 - 5) Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.
5. Explore refrigerant recovery, recycling, and handling diagnosis, service, and repair. ,
- a. Maintain and verify correct operation of certified equipment.
 - b. Identify and recover A/C system refrigerant.
 - c. Recycle or properly dispose of refrigerant.
 - d. Handle, label, and store refrigerant.
 - e. Test recycled refrigerant for non-condensable gases.
6. Complete the requirements for Section 609 Certification.

Course Number and Name: DET 2113 Welding for Diesel Equipment Technology

Description: This is a course designed to provide 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.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Demonstrate fundamental procedures related to welding.
 - a. Demonstrate welding safety practices related to personal safety.
 - b. Identify and demonstrate the use of hand and shop tools.
 - c. Discuss basic principles related to welding.
2. Demonstrate oxyacetylene welding, brazing, and cutting procedures.
 - a. Set up and adjust oxyacetylene welding and cutting equipment.
 - b. Cut mild steel plate.
 - c. Weld mild steel plate using a filler rod.
 - d. Braze mild steel plate.
3. Demonstrate shielded metal-arc welding procedures.
 - a. Set up and adjust shielded metal arc welding equipment.
 - b. Construct a flat butt weld.
 - c. Construct a horizontal butt weld.
 - d. Construct a vertical butt weld.
4. Demonstrate metal inert gas (MIG) welding procedures.
 - a. Set up and adjust MIG welding equipment.
 - b. Construct a flat butt weld on mild steel plate.
 - c. Construct a horizontal butt weld.
 - d. Construct a vertical butt weld.

Course Number and Name: DET 2253 Steering and Suspension Systems

Description: This is a course designed to provide advanced skills and knowledge related to the 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..

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore steering systems. NOCTI Suspension and steering
 - a. Discuss and perform steering column diagnosis and repair.
 - 1) Identify causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.
 - 2) Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft.
 - 3) Check and adjust cab mounting and ride height.
 - 4) Center the steering wheel as needed.
 - 5) Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.
 - b. Discuss and perform steering unit diagnosis and repair.
 - 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.
 - 2) Determine recommended type of power steering fluid; check level and condition; determine needed action. (ASE IV. C3)
 - 3) Flush and refill power steering system; purge air from system. (ASE IV. C2)
 - 4) Perform power steering system pressure, temperature, and flow tests; determine needed action.
 - 5) Inspect, service, or replace power steering reservoir including filter, seals, and gaskets. (ASE IV. C4)
 - 6) Inspect power steering pump drive gear and coupling; replace as needed. (ASE IV. C6)
 - 7) Inspect, adjust, or replace power steering pump, mountings, and brackets. (ASE IV. C1)
 - 8) Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings. (ASE IV. C5)
 - 9) Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings. (ASE IV. C6)
 - c. Discuss and perform steering linkage diagnosis and repair. (ASE IV. D1)
 - 1) Inspect and align pitman arm; replace as needed.
 - 2) Check and adjust steering (wheel) stops.
 - 3) Inspect and lubricate steering arms and linkages.
2. Discuss and perform suspension systems diagnosis and repair. NOCTI Suspension and steering
 - a. Inspect front axles and attaching hardware; determine needed action.
 - b. Inspect and service kingpin, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.

- c. Inspect shock absorbers, bushings, brackets, and mounts; replace as needed. (ASE IV. E1)
 - d. Inspect leaf springs, center bolts, clips, pins and bushings, shackles, slippers, insulators, brackets, and mounts; determine needed action. (ASE IV. E3)
 - e. Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action. (ASE IV. E4)
 - f. Inspect tandem suspension equalizer components; determine needed action. (ASE IV. E6)
 - g. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed. (ASE IV. E5)
 - h. Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed. (ASE IV. E8)
 - i. Measure ride height; determine needed action. (ASE IV. E9)
 - j. Identify rough ride problems; determine needed action.
3. Discuss and perform wheel alignment diagnosis, adjustment, and repair. (ASE IV.F)
- a. Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems; adjust or repair as needed. (ASE IV.F2)
 - b. Check camber; determine needed action. (ASE IV.F3)
 - c. Check caster; adjust as needed. (ASE IV.F3)
 - d. Check toe; adjust as needed. (ASE IV.F35)
 - e. Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed. (ASE IV.F6)
 - f. Identify turning/Ackerman angle (toe-out-on-turns) problems; determine needed action. (ASE IV.F7)
 - g. Check front axle alignment (centerline); adjust or repair as needed. (ASE IV.F8) NOCTI Suspension and steering
4. Discuss and perform wheels and tires diagnosis and repair. (ASE IV.G) NOCTI Suspension and steering
- a. Identify tire wear patterns; check tread depth and pressure; determine needed action. (ASE IV.G1)
 - b. Identify wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action. (ASE IV.G2)
 - c. Remove and install steering and drive axle wheel/tire assemblies. (ASE IV.G13)
 - d. Inspect tire for proper application, (size, load range, position, and tread design); determine needed action. (ASE IV.G4)
 - e. Inspect wheel/rims for proper application, load range, size, and design; determine needed action. (ASE IV.G4)
 - f. Check operation of tire pressure monitoring system; determine needed action. (ASE IV.G4)
5. Discuss and perform frame service and repair.
- a. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware. (ASE IV.H)
 - b. Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls. (ASE IV.H1)
 - c. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs. (ASE IV.H2)
 - d. Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures. (ASE IV.H3)
 - e. Inspect, repair, or replace pintle hooks and draw bars. (ASE IV.H4)

Course Number and Name: DET 2273 Electrical/Electronic Systems III

Description: This course is designed to provide advanced skills and knowledge associated with the diagnosis, service, and repair of electrical and electronic systems on diesel engines, includes instruction in electronic fuel management systems.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore, discuss, and repair electronic fuel management systems. ^(ASE VII)
 - a. 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. ^(ASE VII A.2)
 - b. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis. ^(ASE VII A1)
 - c. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams). ^(ASE VII A.6)
 - d. Inspect and replace electrical connector terminals, seals, and locks. ^(ASE VII A8)
 - e. Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed. ^(ASE V A7, 11, 12)
 - f. Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), access and interpret customer programmable parameters. ^(ASE V A9, 10, 13)
 - g. Inspect, test, and adjust electronic unit injectors (EUI); determine needed action.
 - h. Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
 - i. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
 - j. Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determine needed action.
 - k. Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems; determine needed action.
 - l. Perform on-engine inspections and tests on common rail type injection systems; determine needed action.
 - m. Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action.

Course Number and Name: DET 2383 Diesel Systems III—Compare to Preventive Maintenance & DS II

Description: A basic course to provide students with an opportunity to diagnose, service, and repair of general engine operations and fuel system operations.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore and perform general engine diagnosis. ^(ASE 1.A.2)
 - a. Inspect fuel, oil, and coolant levels, and condition; determine needed action.
 - b. Identify causes of engine fuel, oil, coolant, air, and other leaks; determine needed action. ^(ASE 1.A.3)
 - c. Listen for engine noises; determine needed action. ^(ASE 1.A.4)
 - d. Observe engine exhaust smoke color and quantity; determine needed action. ^(ASE 1.A.4)
 - 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. ^(ASE 1.A.7)
 - f. Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action. ^(ASE 1.A.8)
 - g. Identify engine vibration problems; determine needed action. ^(ASE 1.A.7)
 - h. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; verify customer programmable parameters; clear codes; determine further diagnosis. ^(ASE 1.A.5)
2. Explore fuel systems. ^{NOCTI Diesel Engines}
 - a. Discuss and perform fuel supply system diagnosis and repair.
 - 1) Check fuel level and condition; determine needed action. ^(ASE 1.G1)
 - 2) Perform fuel supply and return system tests; determine needed action. ^(ASE 1.G.7)
 - 3) Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action. ^(ASE 1.G2)
 - 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. ^(ASE 1.G3)
 - 5) Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action. ^(ASE 1.G3)
 - 6) Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump. ^(ASE 1.G4)
3. Discuss EPA Requirements.
 - a. Discuss history of the impact that EPA Requirements have on industry.
 - b. Discuss the pollutants that are regulated.
 - c. Discuss fuel and lubricant differences.
 - d. Understand the penalties for noncompliance of EPA Requirements.
 - e. Understand the role of DEF (Diesel Exhaust Fluid) in emissions compliance.
 - f. Understand the differences in operation and maintenance

Course Number and Name: DET 2513 Hydraulic/Hydrostats II

Description: This is a course designed to provide diagnosis and repair of hydraulic brake systems, includes instruction in hydraulic and mechanical systems, power assist units, and antilock braking systems.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Understand hydrostatic theory. (AED 3.1. a, g, l, k)
2. Discuss pump identification and operation. (AED 3.1 a)
 - a. Gear
 - b. Vain
 - c. Piston fixed displacement
 - d. Piston variable displacement
3. Understand motor identification and operation. (AED 3.b a, b, c, d, e)
4. Understand the function and operation of hydraulic valves.
 - a. System relief (AED 3.1 c., B.2)
 - b. Circuit relief (AED 3.1 c, b)
 - c. Anti-cavitation
 - d. Lift check (AED 3.13 d. 1)
5. Discuss the function and operation of control valves. (AED 3. B, a. b.c. d. e)
6. Discuss cylinder identification and operation. (AED .1. d, c, a, b, c)
7. Understand accumulator identification and operation. (AED 3.1e. a, b, c, d)
8. Identify fluid transfer components and filtering. (AED 3.1b)
9. Demonstrate how to use the following test equipment:
 - a. Analog gauge
 - b. Digital gauge
 - c. Differential pressure gauge
 - d. Hydraulic flow meter
10. Understand the load sensing systems and operation.
11. Discuss maintenance procedures.
12. Understand component repair and replacement.
13. Understand how to read hydraulic schematics. (AES 3.1 d, e, f. AED 3.1)

- a. Identify symbols
- b. Follow oil path through valves
- c. Identify if can open center or closed loop system

14. Discuss the following diagnostics:

- a. Check for hop spots.
- b. Listen for high pressure leaks.
- c. Test pump and motor for internal leakage and low charge pressure
- d. Understand null adjustments.

Course Number and Name: DET 2523 Heavy Equipment Power Trains

Description: A basic course to provide students with maintenance and repair of fluid power and hydrostat transmissions used on heavy equipment to include operation and diagnosis and repair of system components.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe general principles of operation as applied to fluid power transmissions.
 - a. Describe the general principles of operation as applied to fluid power transmissions.
 - b. Identify the major components of a fluid power transmission and describe their functions.
2. Perform diagnosis and repair on torque converters.
 - a. Perform on-vehicle service for a torque converter. (AED 4.1.i, h)
 - b. Dismount, disassemble, inspect, and repair torque converters. (AED 4.1 g)
3. Perform diagnosis, service, and repair on power-shift transmissions.
 - a. Perform on-vehicle service for a power-shift transmission.
 - b. Dismount, disassemble, inspect, and repair a power-shift transmission. (AED 4.1 f, e, d, c)
4. Perform diagnosis and repair on hydrostatic transmissions.
 - a. Perform on-vehicle service for a hydrostatic transmission.
 - b. Dismount, disassemble, inspect, and repair a hydrostatic transmission.

Course Number and Name: DET 2623 Advanced Brake Systems (Air)

Description: A basic course to provide students with instruction and practice in the maintenance and repair of air brake systems commonly used on commercial diesel powered transportation and heavy equipment, includes instruction in maintenance and repair of the air supply system, mechanical system, antilock braking system, and traction control system.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Explore air brakes diagnosis and repair.
 - a. Read, analyze and interpret air system diagrams. (ASE 3a.1)
 - b. Identify poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action. (ASE 3a.3)
 - c. Check air system build-up time; determine needed action. (ASE 3b.2)
 - d. Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action. (ASE 3b.3)
 - e. Inspect compressor drive gear and coupling; replace as needed. (ASE 3b.5)
 - f. Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed. (ASE 3b.5)
 - g. Inspect and test system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; adjust or replace as needed.
 - h. Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.
 - i. 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. (ASE 3b.6)
 - j. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed. (ASE 3b.7)
 - k. Inspect and test brake application (foot) valve, fittings, and mounts; check pedal operation; replace as needed. (ASE 3-b.8)
 - l. Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.
 - m. Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed. (ASE III.B1)
 - n. Inspect and test brake relay valves; replace as needed. (ASE III.B1)
 - o. Inspect and test quick release valves; replace as needed. (ASE III.B1)
 - p. Inspect and test tractor protection valve; replace as needed. (ASE III.B1, ASE III. B6)
 - q. Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed. (ASE III.B2)
 - r. Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed. (ASE 3b.1)
 - s. Inspect and test air pressure gauges, lines, and fittings; replace as needed. (ASE 3b.1)
2. Discuss and perform mechanical/foundation diagnosis and repair.
 - 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.
 - b. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.

- c. Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed. ^(ASE 3c.3)
 - d. Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs ^(ASE 3.c.5)
 - e. Inspect and measure brake shoes or pads; perform needed action. ^(ASE 3c.5-6)
 - f. Inspect and measure brake drums or rotors; perform needed action. ^(ASE 3c.4-6)
 - g. Diagnose problems caused by foundation brake, slack adjuster, and brake chamber problems; determine needed repairs.
 - h. Inspect and service manual and automatic slack adjusters; adjust or replace as needed.
 - i. Inspect cams, rollers, shafts, bushings, seals, spacers, and retainers; service or replace as needed.
 - j. Inspect brake spider, shields, anchor pins, bushings, and springs; service or replace as needed.
 - k. Inspect wedge brake spider, manual and automatic adjuster plungers, housing, and wedge assembly; repair or replace as needed.
 - l. Inspect brake shoes or pads; replace as needed. ^(ASE 3c.5-6)
3. Discuss and perform parking brakes diagnosis and repair.
- 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. ^(ASE 3d.1)
 - b. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed. ^(ASE 3d.2)
 - c. Inspect and test parking (spring) brake application and release valve; replace as needed. ^(ASE3d.3)
 - d. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations. ^(ASE 3d.4)
 - e. Inspect and test low pressure warning devices, wiring, and connectors; replace as needed.
 - f. Inspect and test air pressure gauges, lines, and fittings; replace as needed.
 - g. Inspect drive line parking brake drums, rotors, bands, shoes, mounting hardware, and adjusters; adjust, repair, or replace as needed.
 - b. Inspect drive line parking brake application system pedal, cables, linkage, levers, pivots, and springs; adjust, repair, or replace as needed.
 - c. Check operation of parking (spring) brake chamber; determine needed repairs.
 - d. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
 - e. Inspect and test parking (spring) brake application and release valve; replace as needed. ^(ASE 3b.2)
 - f. Manually release and rest parking (spring) brakes in accordance with manufacturer's recommendations.
4. Discuss and perform antilock brake system (ABS) diagnosis and repair.
- a. Inspect, test, and service ABS air, electrical/electronic, and mechanical components. ^(ASE 3 1-5)
 - b. Diagnose poor stopping, wheel lock-up, pulsation, and noise problems caused by the ABS; determine needed repairs. ^(ASE 3 1-3)
 - c. Observe ABS warning light at startup; determine if further diagnosis is needed. ^(ASE 3 1-1)
 - d. Diagnose ABS electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine needed repairs. ^(ASE 3 1-2)
 - e. Service, test, and adjust ABS speed sensors following manufacturer's recommended procedures. ^(ASE 3 1-6)
 - f. Discuss the operation of the traction control system as related to ABS and engine controls. ^(ASE 3-1-2)
 - g. Explore and discuss collision mitigation systems.

Course Number and Name: DET 291(1-6) Special Problem/Projects in Diesel Equipment Technology

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.

Hour Breakdown:

Semester Hours	Lecture	Lab	Contact Hours
1		2	30
2		4	60
3		6	90
4		8	120
5		10	150
6		12	180

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Develop a written plan which details the activities and projects to be completed.
 - a. Use a written plan which details the activities and projects to be completed.
 - b. Perform written occupational objectives in the special problem.
2. Assess accomplishment of objectives.
 - a. Prepare daily written assessments of accomplishment of objectives.
 - b. Present weekly written reports to the instructor of activities performed and objectives accomplished.
3. Use and follow a set of written guidelines for the special problem.
 - a. Develop and follow a set of written guidelines for the special problem.

Course Number and Name: DET 292(1-6) Supervised Work Experience in Diesel Equipment Technology

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.

Hour Breakdown:

Semester Hours	Lecture	Externship	Contact Hours
1		3	45
2		6	90
3		9	135
4		12	180
5		15	225
6		18	270

Prerequisite: Instructor Approved

Student Learning Outcomes:

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

Course Number and Name: 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) Work-Based Learning I, II, III, IV, V, and VI

Description: A structured work-site learning experience in which the student, program area teacher, work-based learning coordinator, and work-site supervisor/mentor develop and implement an educational training agreement. This site 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 for supplemental instruction and progress reviews.

Hour Breakdown:

Semester Hours	Lecture	Externship	Contact Hours
1		3	45
2		6	90
3		9	135

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply technical skills and related academic knowledge needed to be a viable member of the workforce.
 - a. Demonstrate technical skills necessary to complete job requirements.
 - b. Demonstrate academic skills necessary to complete job requirements.
 - c. Perform tasks detailed in an educational training agreement at the work setting.

2. Apply general workplace skills to include positive work habits necessary for successful employment.
 - a. Demonstrate appropriate human relationship skills in the work setting to include conflict resolution, team participation, leadership, negotiation, and customer/client service.
 - b. Utilize time, materials, and resource management skills.
 - c. Use critical thinking skills such as problem solving, decision making, and reasoning.
 - d. Acquire, evaluate, organize, maintain, interpret, and communicate information.

Appendix A 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 program)
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. Hydraulic flow meter (1 per program)
103. Oxyacetylene welding and cutting set (1 per program)
104. Wheel chocks for heavy trucks (2 sets per program)
105. Universal joint press for heavy trucks (1 per program)
106. Twin disk clutch adjustment tool for heavy trucks (1 per program)
107. Axle thread chaser (2- 4¼ inch) (1 per program)

RECOMMENDED INSTRUCTIONAL AIDS

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

1. Smart TV or Projector Screen
2. Laptop computer
3. Training simulation software

“Other equipment items can be added when deemed appropriate by the community college industry craft committee or by industry/business training requirements.”

Appendix B Curriculum Definitions and Terms

- Course Name – A common name that will be used by all community 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 Certificate Required Course – A required course for all students completing a career certificate.
 - Technical Certificate Required Course – A required course for all students completing a technical certificate.
 - Technical Elective – Elective courses that are available for colleges to offer to students.
- Description – A short narrative that includes the major purpose(s) of the course
- 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
- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) 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:
 - 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
 - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
 - 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
 - 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 college. 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 all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

- In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:
 - Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
 - Revising or extending the student learning outcomes
 - 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)

Appendix C: Recommended Diesel Equipment Technology Text Book List

Recommended Diesel Equipment Technology Text Book List CIP: 47.0605 Diesel Mechanics Technology/Technician (Transportation Option) 47.0302- Heavy Equipment Maintenance Technology/Technician (Heavy Equip. option)		
Book Title	Author (s)	ISBN
Autodesk Revit Structure 2020 Fundamentals	Ascent	97816302572907
Autocad 2020 Tutorial Second Level: 3D Modeling	Shih	9781630572709
Autodesk Fusion 360: Intro to Parametric Modeling		9781951139247
Modern Diesel Technology Preventative Maintenance	Dixon	9781418053918
Modern Diesel Technology Electricity & Electronics	Bell	978113949800
Hydraulics	John Deere	9780866913713
Hydraulics Student Guide	John Deere	9780866913751
Air Conditioning	John Deere	9780866914079
Fund. Medium/Heavy Duty Commercial Vehicle Workbook	CDX Automotive	9781284091489
Fund. Medium/Heavy Duty Commercial Vehicle Workbook	CDX Automotive	9781284091670
Power Train Student Guide	John Deere	0866913793
Heavy Duty Truck Systems	Sean Bennett	9781337787109
Medium Duty Engines and Systems	Sean Bennett	9780357358542

Appendix D: Course Crosswalk:

<p align="center">Course Crosswalk CIP: 47.0605 Diesel Mechanics Technology/Technician (Transportation Option) 47.0302- Heavy Equipment Maintenance Technology/Technician (Heavy Equip. option)</p>					
<p align="center"><i>Note: Courses that have been added or changed in the 2021 curriculum are highlighted.</i></p>					
Existing			Revised		
2015 MS Curriculum Framework			2021 MS Curriculum Framework		
Course Number	Course Title	Hours	Course Number	Course Title	Hours
DET 1114	Fundamentals of Equipment Mechanics	4	DET 1114	Fundamentals of Equipment Mechanics	4
DET 1223	Electrical/Electronic Systems I	3	DET 1223	Electrical/Electronic Systems I	3
DET 1513 OR DET 1213	Hydraulics I Hydraulic Brake Systems	3	DET 1513 OR DET 1213	Hydraulics I Hydraulic Brake Systems	3
DET 1364	Diesel Systems I	4	DET 1364	Diesel Systems I	4
DET 1614	Preventive Maintenance and Service	4	DET 1614	Preventive Maintenance and Service	4
DET 1263 or DET 1713	Electrical/Electronic Systems II or Transportation Power Train	3/3	DET 1263 or DET 1713	Electrical/Electronic Systems II or Transportation Power Train	3/3
DET 1813	Air Conditioning and Heating Systems	3	DET 1813	Air Conditioning and Heating Systems	3
DET 1374 or DET 2623	Diesel Systems II or Advanced Brake Systems	4/3	DET 1374 or DET 2623	Diesel Systems II or Advanced Brake Systems	4/3
DET 2273	Electrical/Electronic Systems III	3	DET 2273	Electrical/Electronic Systems III	3
DET 2253	Steering and Suspension Systems	3	DET 2253	Steering and Suspension Systems	3
DET 1713	Transportation Power Train	3	DET 1713	Transportation Power Train	3
DET 2623	Advanced Brake Systems (Air)	3	DET 2623	Advanced Brake Systems (Air)	3
DET 2513	Hydraulic/Hydrostats II	3	DET 2513	Hydraulic/Hydrostats II	3
DET 2383	Diesel Systems III	3	DET 2383	Diesel Systems III	3