



# Burlington County Institute of Technology

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Westampton Campus

## Career and Technical Programs

Career Cluster: *Transportation, Distribution, and Logistics*

Program Name: *Diesel Mechanics Technology/Technician*

Program Title: *Diesel Technology*

CIP Code: 470605

Board Approval Date: May, 2023



# Program of Study

## → Grade 9

- ◆ Introduction to Diesel Technology
- ◆ Preventative maintenance

## → Grade 10

- ◆ Diesel Technology
- ◆ Principle Operation of Engine Assemblies
- ◆ Principle Operation of Drivetrain Systems

## → Grade 11

- ◆ Electrical Test Equipment
- ◆ Principle operation of Starting and charging systems
- ◆ Suspension and Steering Systems

## → Grade 12

- ◆ Principle Operation of Hydraulic Systems
- ◆ Advanced Service Shop Procedures
- ◆ Advanced Truck Electrical and Electronics
- ◆ Advanced hydraulic systems



### → Program Descriptor

- ◆ A program that prepares individuals to apply technical knowledge and skills to the specialized maintenance and repair of trucks, buses, and other commercial and industrial vehicles. Includes instruction in diesel engine mechanics, suspension and steering, brake systems, electrical and electronic systems, preventive maintenance inspections, drive trains, gasoline engine mechanics, HVAC systems, and auxiliary equipment installation and repair.

### → Program Outcome

- ◆ The Heavy / Diesel Repair program prepares students for an entry-level position in the industry. In addition to acquiring the basic skills necessary, the student becomes knowledgeable in diagnosing and repairing heavy equipment and trucks. Heavy / Diesel technicians who continue to develop their skills have greater opportunities to seek careers in the following areas: heavy truck dealer, service advisor, parts counter person, repair shop owner, shop foreperson/service manager, truck fleet technician, heavy equipment operator just to name a few. Students going on to college may pursue studies in diesel engine design and engineering or take their diesel skill to a higher level such as in the aviation field.

### → Work Based Learning Opportunities

- ◆ School-Based Enterprise: Students will work on vehicles for staff, buildings and grounds, and the community. Tasks could include the following: oil, brakes, tires, batteries, starters, alternators, basic electrical, and fuel supply.
- ◆ Hazardous Career Preparation: Students will work in a variety of locations such as Holman Industries, Miller Ford, Burlington Chevrolet, and Elite Acura as entry level automotive technicians.

### → Industry Valued Credentials

- ◆ ASE Student Certified Diesel Technician
- ◆ OSHA 10



# Course Descriptions

## 1. Grade 9

- a. *Introduction to HEDT*: The goal of this course is to introduce the student to the Heavy /Diesel Repair program and job opportunities. Students will learn essential skills for the vehicle technician including safety, equipment fundamentals, and the proper use of measurement tools such as dial indicators, micrometers, and calipers. The automotive content will be balanced by an emphasis on skills that will enable students to be successful in school and in life. These skills will include time management, financial management, goal setting, learning strategies, career planning, and critical thinking strategies.
- b. *Introduction to Preventative maintenance*: This course is designed to provide the student with the knowledge and skills necessary to perform service, maintenance, and PM Inspection on medium and heavy-duty trucks and trailers. The student will learn the proper procedures that must be taken to perform a PM Inspection including the completion of PM Inspection forms. The student will learn how a well-planned preventive maintenance program can reduce repair cost and increase the life of the truck, trailer, and other associated equipment. The student will also learn how to properly inspect, lubricate, and repair or replace as necessary components of the truck drive line as well as checking for proper driveline angles and balance. The student will learn how to perform the proper service, maintenance, repairs and inspection procedures on the trailer's lighting system, wheels, tires, brakes and other safety related components as required by law. The student will learn how to disassemble, inspect, service, and reassemble the fifth wheel. Students will learn how to properly perform the necessary service and maintenance procedures related to pintle hooks and drawbars. Students will learn how to research vehicle service information with computer and internet based electronic retrieval systems.

## 2. Grade 10

- a. *Introduction to diesel technology*: This course is designed to provide the student with the knowledge and skills necessary to service medium and heavy duty diesel engines. Instructions on the operating



principles, construction, design variations, and applications of the diesel engines are emphasized. The student will learn how to perform a complete disassembly and assembly of the diesel engine, to include the cylinder head, block and timing gears, by using the instructions in the engine's manufacturers service manual. They will also learn the proper methods of inspecting, identifying and naming the components to determine serviceability of the components prior to making a repair. This will include learning how to make all the necessary precision measurements required for diagnosing component failure prior to servicing and repair of the engine. The student will learn how to service, repair and diagnose the cooling and lubricating system of diesel engines. The student will learn the different types of coolants as well as additives and how to test for Supplemental Coolant Additives (SCA) to determine if additions to or replacement is needed. Students will learn how to perform coolant tests with different testing equipment. Students will learn how to research vehicle service information with computer and internet based electronic retrieval systems.

- b. *Principle Operation of Engine Assemblies:* This course is designed to provide the student with the knowledge and skills about the engine assembly and learn about its complex system that is responsible for converting fuel into mechanical energy to power vehicles, generators, and other machinery. The principle operation of engine assemblies involves a series of steps that work together to produce power. Students will learn about the intake process, compression, ignition, power, and exhaust.
- c. *Principle operation of drivetrain systems:* This course is designed to provide the student with the knowledge and skills necessary to service the drive trains found on diesel powered truck tractors. The student will learn how to identify the components of a heavy duty clutch system. Students will learn how to diagnose a clutch system for wear and damage and give the possible causes of specific clutch defects. The student will learn how to remove and replace a heavy duty truck clutch system. The student will learn how to identify and describe the various gear designs and shift mechanisms used in heavy duty trucks. The student will also learn how to calculate both the gear pitch and gear ratios in a heavy duty drive line. The student will learn how to disassemble and reassemble a heavy duty transmission, differential and power divider as well as learning how to service the heavy duty driveline components in maintaining the correct lubricant and the level of lubricant in the system. The student will also learn how to perform basic diagnostic procedures on an automated standard transmission. Students will learn how to research vehicle service information with computer and internet based electronic retrieval systems.



### 3. Grade 11

- a. *Electrical Test equipment:* This course is designed to provide the student with practical theory in basic and solid state circuitry, including body electrical systems, operation and service of automotive storage batteries, automobile charging systems, starting systems, and lighting systems. Students will evaluate components using both conventional and electronic diagnostic equipment. Students will learn how to complete repair orders containing customer and vehicle information and corrective action. Students will learn how to research vehicle service information with computer and internet based electronic retrieval systems. Students will learn how to diagnose basic electrical, charging, starting, and lighting circuits through the use of diagnostic equipment to include test lights, multimeters, and continuity testers..
- b. *Principle Operation of Starting and Charging Systems:* This course is designed to provide the student with the knowledge and skills about the starting system of a vehicle. Students will study all key components of a typical starting system, including the battery, starter motor, ignition switch, and wiring.
- c. *Suspension and Steering Systems:* This course is designed to provide the student with the knowledge and skills necessary to service heavy duty truck steering and suspension systems. The student will learn how to identify, diagnosis, service, repair, and adjust as necessary; the components of a heavy duty truck steering system to include toe-in, camber, caster, axle inclination, turning radius and axle alignment and how they affect tire wear, directional stability and handling. The student will learn how to balance truck tires and wheels, and perform a wheel alignment to include the rear axle(s) by using computerized wheel alignment equipment. The student will learn how to service the major tire and wheel configurations used on heavy duty trucks and how to perform bearing and seal service on both grease lubricated and oil lubricated front and rear hubs. The student will learn how to perform the basic checks for frame alignment and geometry and how the frame and chassis components are repaired. The student will learn how to service, repair and replace, if necessary, the components on the four types of suspension systems as well as how to research vehicle service information with computer and internet based electronic retrieval systems.

### 4. Grade 12

- a. *Principle operation of hydraulic systems:* This course is an introduction to basic hydraulics. The student will learn how to diagnose the basic operation of a hydraulic system to include giving a description of the operation and the diagnostic procedures for all of the components in a hydraulic system. The student



will study Pascal's Law and Bernoulli's Principle of hydraulics as they pertain to the repair industry. The student will learn how to properly repair the basic hydraulic system in a hydraulic shop. Students will also learn how to research vehicle service information with computer and internet based electronic retrieval systems.

- b. *Advanced Service Shop Procedures:* This course is designed to provide the students with exposure to an actual shops' environment, procedures, and protocol by applying prominent skills obtained in previous courses. Emphasis is placed on the removal and replacement of both engines and transaxles. Methods of securing future employment and the preparation of resumes are highlighted. Knowledge testing and skills application are also among the topics. Students will learn how to complete repair orders containing customer and vehicle information and corrective action. Students will learn how to research vehicle service information with computer and internet based electronic retrieval systems.
- c. *Advanced Truck Electrical and Electronics:* This course is designed to provide the student with the necessary skills and knowledge required to identify, service, and repair the different types of electrical and electronic circuits found on late model medium and heavy duty trucks. Operation, diagnosis, and service of the truck's computer systems will be emphasized. The student will learn to apply Ohm's law to series, parallel and series-parallel circuits and how data is transmitted from the various engine, body, and electronic system sensors to onboard computers that control fuel management, driveability performance, and driver comfort systems. The student will learn how to diagnose and service electrical and electronic systems using wiring diagrams, manufacturer service manuals, and specialized diagnostic equipment. The student will learn how to properly identify, disassemble, repair as necessary, and assemble connectors and wiring on medium and heavy duty trucks. Students will learn how to research vehicle service information with computer and internet based electronic retrieval systems.
- d. *Advanced hydraulic systems:* In this class, students will learn how to diagnose and operate a hydraulic system to include giving a description of the operation and the diagnostic procedures for all of the components in a hydraulic system. The student will study Pascal's Law and Bernoulli's Principle of hydraulics as they pertain to the repair industry. The student will learn how to properly repair the basic hydraulic system in a hydraulic shop. Students will learn how to research vehicle service information with computer and internet based electronic retrieval systems.



# Curriculum Maps

Course: Safety

Unit: OSHA 10

Length: 1 Week





## Standards

- 9.3.12.AG-FD.1 Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.
- 9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
- 9.3.12.AR.2 Analyze the importance of health, safety and environmental management systems, policies and procedures common in arts, audio/video technology and communications activities and facilities.
- 9.3.12.ED.4 Evaluate and manage risks to safety, health and the environment in education and training settings.
- 9.3.HT-RFB.2 Demonstrate safety and sanitation procedures in food and beverage service facilities.
- 9.3.HU-ED.5 Evaluate safety and sanitation procedures associated with the early childhood education environment to assure compliance and prevent potential hazards.
- 9.3.LW.4 Conduct law, public safety, corrections and security work tasks in accordance with employee and employer rights, obligations and responsibilities, including occupational safety and health requirements.
- 9.3.LW-ENF.8 Explain the appropriate techniques for managing crisis situations in order to maintain public safety.
- 9.3.MN.3 Comply with federal, state and local regulations to ensure worker safety and health and environmental work practices.
- 9.3.MN-HSE.3 Demonstrates a safety inspection process to assure a healthy and safe manufacturing environment.
- 9.3.MN-HSE.5 Evaluate continuous improvement protocols and techniques in health, safety and/or environmental practices.
- 9.3.12.TD.5 Describe transportation, distribution and logistics employee rights and responsibilities and employers' obligations concerning occupational safety and health.
- 9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.

## Essential Question(s)



- Why is it important to practice safety?
- What do safe practices look like in my industry?
- How can I keep myself and others safe?

## Content

- Walking working surfaces
- Emergency action plans
- Fire protection
- Electrocution hazards
- Personal protective equipment
- Hazard communication
- Materials handling, storage, use and disposal.

## Skills

- Explain why OSHA is important to workers.
- Explain workers rights under OSHA
- Discuss employer responsibilities under OSHA.
- Discuss the use of OSHA standards.
- Explain how OSHA inspections are conducted.
- Utilize helpful worker safety and health resources.
- Identify hazards in the workplace associated with walking and working surfaces.
- Identify best practices for eliminating or controlling hazards associated with walking and working surfaces in the workplace.
- Recognize employer requirements to protect workers from walking and working surface hazards.
- Recognize benefits of an Emergency Action Plan.
- Identify elements of the Fire Protection Plan.
- Identify conditions under which evacuation actions may be necessary in an emergency situation.
- Identify conditions under which shelter-in-place may be necessary in an emergency situation.



- Identify characteristics of an effective emergency escape route.
- Recognize the five types of fire extinguishers, including the types of fires they can extinguish.
- Review requirements for proper maintenance of portable fire extinguishers.
- Identify major electrical hazards.
- Describe types of electrical hazards.
- Describe electrical protection methods.
- Recognize employer requirements to protect workers from electrical hazards.
- Recall employer responsibilities toward affected employees regarding PPE.
- Identify when face and head protection should be used.
- Recall which types of hand and foot protection should be used in a specific situation.
- Recognize the differences between respirator types.
- Identify the differences between full-body protection levels.
- Identify the employer's responsibilities under the HCS, including training requirements.
- Identify components of a Hazard Communication program.
- Describe requirements of the different types of Hazard Communication labels.
- Locate pertinent information about chemicals on labels, including other forms of hazard communication, to ensure "right to understanding" provisions of GHS requirements.
- Identify types of material handling equipment.
- Describe hazards associated with material handling activities (e.g., storage, use, and disposal).
- Identify methods to prevent hazards associated with material handling equipment.
- Recognize employer requirements to protect workers from material handling hazards
- Identify the main causes of machinery accidents.
- Recognize basic machinery parts that expose workers to hazards.
- Recognize workplace situations involving machinery that requires guarding.
- Identify the requirements for safeguards.
- Identify types of machine guards including types of devices used to safeguard machines.
- Identify strategies to control chemical hazards.
- Identify strategies to control biological hazards.
- Identify strategies to control physical hazards.



- Identify strategies to control ergonomic hazards.
- Identify OSHA requirements pertaining to bloodborne pathogens.
- List the potential routes of exposure from bloodborne pathogens.
- Identify the risks associated with Human Immunodeficiency Virus (HIV), Hepatitis B, and Hepatitis C Virus.
- Identify methods of preventing transmission of bloodborne pathogens & managing occupational exposures.
- Restate methods of the safe disposal of sharps.
- Recount steps which should be taken in the event of an exposure to a potential bloodborne pathogen.
- Recognize risk factors associated with work-related musculoskeletal disorders (MSD)s.
- Identify good posture.
- Describe safe lifting techniques.
- Identify ergonomic control methods for eliminating/reducing work-related MSDs.
- Identify the number one cause of death for U.S. teens.
- List eight risk factors for young drivers.
- Identify the biggest risk factor for young drivers.
- Define distracted driving.
- Provide examples and/or causes of distracted driving.
- Identify the biggest risk factor for distracted driving
- Discuss the risk of having other young passengers in the car.
- List some actions employers should take to keep employees safe while driving.
- List some actions employees can take to safely drive on the job.
- Define the term violence.
- Recall who is at risk for encountering workplace violence.
- Describe workplace violence prevention strategies.
- Identify how to StartSafe and StaySafe to prevent or lessen workplace violence.
- Recognize the costs of workplace accidents.
- Recognize the benefits of implementing an effective safety and health program.
- Describe the elements of an effective safety and health program.
- Identify three methods to prevent workplace hazards.



## Assessments

- OSHA 10 Assessment and Certificate

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Course: CTE

Unit: Career Awareness

Length: Woven Throughout

### Standards

- 9.2.12.CAP.1: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
- 9.2.12.CAP.5: Assess and modify a personal plan to support current interests and postsecondary plans. •
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.
- 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
- 9.2.12.CAP.9: Locate information on working papers, what is required to obtain them, and who must sign them.



- 9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans)
- 9.2.12.CAP.11: Demonstrate an understanding of Free Application for Federal Student Aid (FAFSA) requirements to apply for postsecondary education
- 9.2.12.CAP.12: Explain how compulsory government programs (e.g., Social Security, Medicare) provide insurance against some loss of income and benefits to eligible recipients.
- 9.2.12.CAP.13: Analyze how the economic, social, and political conditions of a time period can affect the labor market.
- 9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income
- 9.2.12.CAP.15: Demonstrate how exemptions, deductions, and deferred income (e.g., retirement or medical) can reduce taxable income.
- 9.2.12.CAP.16: Explain why taxes are withheld from income and the relationship of federal, state, and local taxes (e.g., property, income, excise, and sales) and how the money collected is used by local, county, state, and federal governments. •
- 9.2.12.CAP.17: Analyze the impact of the collective bargaining process on benefits, income, and fair labor practice. •
- 9.2.12.CAP.18: Differentiate between taxable and nontaxable income from various forms of employment (e.g., cash business, tips, tax filing and withholding). •
- 9.2.12.CAP.19: Explain the purpose of payroll deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay, including the cost of employee benefits to employers and self-employment income.
- 9.2.12.CAP.20: Analyze a Federal and State Income Tax Return
- 9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.
- 9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
- 9.2.12.CAP.23: Identify different ways to obtain capital for starting a business

Essential Question(s)



- How does one prepare for a career?
- How does one improve marketability?
- Why is career planning important?
- What are the risks in starting a business?

## Content

- There are strategies to improve one's professional value and marketability.
- Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
- An individual's income and benefit needs and financial plan can change over time.
- Securing an income involve an understanding of the costs and time in preparing for a career field, interview and negotiation skills, job searches, resume development, prior experience, and vesting and retirement plans
- Understanding income involves an analysis of payroll taxes, deductions and earned benefits.
- There are ways to assess a business's feasibility and risk and to align it with an individual's financial goals

## Skills

- Act as a responsible and contributing community member and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

## Assessments

- Career Research Project
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- Resume/Cover Letter

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Course: Introduction to Diesel Technology

Length: 1 Semester

Standards

- 9.3.12.TD.1 Describe the nature and scope of the Transportation, Distribution & Logistics Career Cluster and the role of transportation, distribution and logistics in society and the economy.
- 9.3.12.TD.3 Describe the key operational activities required of successful transportation, distribution and logistics facilities.
- 9.3.12.TD.6 Describe career opportunities and means to achieve those opportunities in each of the Transportation, Distribution & Logistics Career Pathways.
- 9.3.12.TD-HSE.2 Develop solutions to improve performance of health, safety and environmental management services.
- 9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
- Career Ready Practices:
  - Work productively in teams while using cultural/global competence.





- Utilize critical thinking to make sense of problems and persevere in solving them.

### Essential Question(s)

- What are safe practices in HEDT?
- What skills help one to be successful in the workplace?
- How can tools be utilized most effectively?

### Content

- Safety fundamentals/Workplace Safety
- Hazardous materials
- Hand tools
- Service Information
- Vehicle systems
- Basic government regulations

### Skills

- Demonstrate appropriate safety procedures
- Identify and use basic shop tools
- Describe government regulations regarding transportation repair facilities
- Demonstrate workplace employability skills

### Assessments

- Written/Oral quizzes
  - Written test
  - Chapter review questions
  - Daily practical
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- Observation practical
- Evaluations

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Course: Preventative Maintenance

Length: 1 Semester

Standards

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.
- WHST.9-10.6. Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- WHST.9-10.9. Draw evidence from informational texts to support analysis, reflection, and research.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Act as a responsible and contributing community member and employee.
  - Consider the environmental, social and economic impacts of decisions.
  - Utilize critical thinking to make sense of problems and persevere in solving them.

Essential Question(s)



- Why is maintenance important?
- How does regular maintenance benefit the machinery?
- What guidelines can we use for preventive maintenance?

## Content

- Preventative maintenance schedules
- Services
- DOT rules and regulations
- Vehicle Inspection
- PM inspection forms

## Skills

- How to properly inspect, lubricate, and repair or replace components
- Evaluating proper driveline angles and balance
- Proper service, maintenance, repairs and inspection procedures:
  - Trailer's lighting system
  - Wheels
  - Tires
  - Brakes
  - Other safety components
- Disassemble, inspect, service and reassemble the fifth wheel
- Service and maintain pintle hooks and drawbars
- Research service information with electronic retrieval systems

## Assessments

- Written/Oral quizzes
  - Written test
-



- Chapter review questions
- Daily practical
- Observation practical
- Evaluations

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Course: Introduction to Diesel Technology

Length: 1 Semester

#### Standards

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Utilize critical thinking to make sense of problems and persevere in solving them.
  - Work productively in teams while using cultural/global competence.

#### Essential Question(s)

- What is a reasonable service plan?



- What makes diesel engines different?
- How is a “good” inspection performed?

## Content

- Service procedures for medium and heavy duty diesel engines
- Operating principles of diesel engines
- Design variations of diesel engines
- Inspection methods
- Component names
- Precision measurements
- Diagnosis strategies
- Types of coolants and additives
- Internet based electronic retrieval systems

## Skills

- Disassemble diesel engine
- Reassemble diesel engine
- Consult service manual
- Inspect, identify, and name parts of the diesel engine
- Determine serviceability of engine components
- Make necessary repairs
- Take precision measurements
- Service, repair, and diagnose the cooling and lubricating system
- Test Supplemental Coolant Additives (SCA)
- Perform coolant tests
- Research vehicle service information

## Assessments



- Written/Oral quizzes
- Written test
- Chapter review questions
- Daily practical
- Observation practical
- Evaluations

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Course: Principal Operation of Engine Assemblies

Length: 1 Semester

Standards

- 9.3.12.TD-OPS.2 Analyze performance of transportation operations in order to improve quality and service levels and increase efficiency.
- 9.3.12.TD-OPS.3 Comply with policies, laws and regulations in order to maintain safety, security and health and mitigate the economic and environmental risk of transportation operations.
- 9.3.12.TD.2 Describe the application and use of new and emerging advanced techniques to provide solutions for transportation, distribution and logistics problems.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Consider the environmental, social and economic impacts of decisions.
  - Demonstrate creativity and innovation.
  - Work productively in teams while using cultural/global competence.



## Essential Question(s)

- How do engines create power?
- What are alternatives to diesel power?
- How does one assemble an engine?

## Content

- Converting fuel into mechanical energy
- Principle operation of engine assembly steps
- Test equipment
- Component functions
- Intake process
- Compression
- Ignition
- Power
- Exhaust

## Skills

- Diagnose and service fuel systems
- Explain proper safety procedures on fuel systems
- Describe the conversion of fuel into mechanical energy
- List the engine assembly steps
- Utilize test equipment
- Perform maintenance on intake, ignition, and exhaust systems

## Assessments

- Written/Oral quizzes
  - Written test
-



- Chapter review questions
- Daily practical
- Observation practical
- Evaluations

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Course: Principle Operation of Drivetrain Systems

Length: 1 Semester

Standards

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance
- 9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative
- career plans based on those skills.
- WHST.9-10.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Consider the environmental, social and economic impacts of decisions.

Essential Question(s)

- How is basic maintenance performed?





- How does one know the steps to follow in servicing an engine?
- How can correct calculations be ensured?

## Content

- Components of a drivetrain
- Components of a heavy clutch system
- Steps to remove and replace a clutch system
- Shift mechanisms

## Skills

- Identify the components of a heavy duty clutch system.
- Diagnose a clutch system for wear and damage
- Evaluate causes of clutch defects
- Remove and replace a heavy duty truck clutch system
- Identify gear designs and shift mechanisms
- Calculate gear pitch
- Calculate gear ratios
- Disassemble and reassemble a heavy duty transmission and differential and power divider
- Service heavy duty driveline components
- Maintain correct lubricant levels
- Perform basic diagnostic procedures
- Research vehicle information

## Assessments

- Written/Oral quizzes
  - Written test
  - Chapter review questions
-



- Daily practical
- Observation practical
- Evaluations

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Course: Electrical Test Equipment

Length: 1 Semester

Standards

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Utilize critical thinking to make sense of problems and persevere in solving them.
  - Use technology to enhance productivity, increase collaboration and communicate effectively.

Essential Question(s)

- How is Ohm's Law applied in diesel technology?
- How does one know the correct diagnostic equipment to use?
- Why is it important to follow repair orders?

Content



- Electrical theory
- Automotive storage batteries
- Solid state circuitry
- Wiring diagrams
- Test equipment
- Diagnosis, repair, and replacement of batteries, starters, and alternators
- Ohm's Law
- Circuit Construction
- Basic Troubleshooting

### Skills

- Evaluate components using conventional and electronic diagnostic equipment
- Complete repair orders containing customer and vehicle information and corrective action
- Research vehicle service information
- Diagnose basic electrical, charging, starting and lighting circuits
- Use diagnostic equipment: test lights, multimeters, and continuity testers

### Assessments

- Written/Oral quizzes
  - Written test
  - Chapter review questions
  - Daily practical
  - Observation practical
  - Evaluations
-



Course: Principle Operation of Starting and Charging Systems

Length: 1 Semester

### Standards

- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs
- WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Utilize critical thinking to make sense of problems and persevere in solving them.
  - Act as a responsible and contributing community member and employee.

### Essential Question(s)

- What is the importance of different engine components?
- What are the key components of a starting system?

### Content

- Starting systems
- Batteries
- Starter motors
- Ignition switches
- Wiring
- Alternators



- Voltage regulator

## Skills

- Identify battery components
- Describe battery operation
- Identify starting system components and explain system operation
- Explain voltage regulator operations
- Identify electronic modules
- Inspect the battery and connections
- Perform a battery OCV test, capacity and state of charge test, load test, and specific gravity test
- Perform starter current draw and voltage drop tests
- Trace, inspect, and test starter control circuits
- Remove starter and bench test
- Perform charging system output test
- Diagnose the charging system
- Perform battery charge, replace if needed

## Assessments

- Written/Oral quizzes
  - Written test
  - Chapter review questions
  - Daily practical
  - Observation practical
  - Evaluations
-



Course: Suspension and Steering Systems

Length: 1 Semester

### Standards

- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs
- WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- Career Readiness, Life Literacies, and Key Skills Practices
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Act as a responsible and contributing community member and employee.

### Essential Question(s)

- How does the steering system affect a vehicle?
- What are the steps to diagnosing issues in steering and suspension?
- How can technology assist the mechanic?

### Content

- Components of steering and suspension systems
  - Toe in
  - Camber
  - Caster
  - Axle Inclination



- Turning radius
- Axle alignment
- Directional stability
- Handling
- Wheel and tire problems
- Frame members
- Fifth wheel
- Bearings
- Coupling systems

## Skills

- Identify, diagnose, service, repair, and adjust suspension and steering systems
- Balance truck tires and wheels
- Perform a wheel alignment to include real axles
- Utilize computerized wheel alignment equipment
- Service major tire and wheel configurations
- Perform bearing and seal service on both grease lubricated and oil lubricated front and rear hubs
- Perform the basic checks for frame alignment and geometry
- Service, repair and replace, if necessary, the components on the four types of suspension systems
- Research vehicle service information with computer and internet based electronic retrieval systems

## Assessments

- ASE assessment
  - Written/Oral quizzes
  - Written test
  - Chapter review questions
  - Daily practical
  - Observation practical
-



- Evaluations

Course: Principle Operation of Hydraulic Systems

Length: 1 Semester

### Standards

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance
- 9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative
- career plans based on those skills.
- WHST.9-10.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- Career Readiness, Life Literacies, and Key Skills Practices
- Consider the environmental, social and economic impacts of decisions.

### Essential Question(s)

- How do principles and laws affect the mechanic?
- What are the steps to diagnosing hydraulic issues?
- How can technology assist the mechanic?





## Content

- Components of a hydraulic system
- Pascal's Law
- Bernoulli's Principle of Hydraulics
- Pumps, motors, valves, cylinders, filters, lines, and fittings

## Skills

- Diagnose basic operations of hydraulics
- Perform diagnostic procedures for all components in the hydraulic system
- Repair hydraulic systems
- Research vehicle service information with retrieval systems
- Identify, diagnose, test, and repair hydraulic systems using schematics and technical manuals

## Assessments

- Written/Oral quizzes
- Written test
- Chapter review questions
- Daily practical
- Observation practical
- Evaluations

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Course: Advanced Service Shop Procedures

Length: 1 Semester

## Standards



- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
- 9.2.12.CAP.13: Analyze how the economic, social, and political conditions of a time period can affect the labor market.
- WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.9-10.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- WHST.9-10.6. Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Act as a responsible and contributing community member and employee.
  - Attend to financial well-being.
  - Model integrity, ethical leadership and effective management.
  - Plan education and career paths aligned to personal goals.
  - Use technology to enhance productivity, increase collaboration and communicate effectively.

### Essential Question(s)

- How does one make themselves marketable?
- How can I best interact with customers?



- How does one plan for the future?

## Content

- Career skills
- Shop environment and protocol
- Engines
- Transaxles
- Employment
- Resumes
- Repair orders
- Customer service

## Skills

- Demonstrate appropriate customer service skills
- Remove and replace engines
- Remove and replace transaxles
- Prepare a viable resume
- Complete repair orders
- Research vehicle service information

## Assessments

- Written/Oral quizzes
  - Written test
  - Chapter review questions
  - Daily practical
  - Observation practical
  - Evaluations
-



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Course: Advanced Truck Electrical and Electronics

Length: 1 Semester

### Standards

- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Utilize critical thinking to make sense of problems and persevere in solving them.
  - Work productively in teams while using cultural/global competence.

### Essential Question(s)

- How do vehicles transmit data?
- What function do sensors have?
- What affects drivability performance?

### Content

- Electrical and electronics circuits
- Computer systems



- Ohm's law
- Data transmission
- Sensors
- Onboard computers
- Fuel management
- Drivability performance
- Driver comfort systems
- Service manuals
- Diagnostic equipment

### Skills

- Identify, service, and repair electrical and electronic circuits on medium and heavy duty trucks
- Diagnose truck computer systems
- Apply Ohm's law to service, parallel and series-parallel circuits
- Analyze how data is transmitted from electronic system sensors to onboard computers
- Use wiring diagrams, manufacturer service manuals, and diagnostic equipment
- Identify, disassemble, repair as necessary, and assemble connectors and wiring
- Research vehicle service information

### Assessments

- Written/Oral quizzes
  - Written test
  - Chapter review questions
  - Daily practical
  - Observation practical
  - Evaluations
-



Course: Advanced Hydraulic Systems

Length: 1 Semester

### Standards

- 9.3.12.TD-SAL.1 Analyze the ongoing performance of transportation, logistics and distribution-related sales and service operations.
- 9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and mobile equipment inventory in operation.
- 9.3.12.TD-MTN.2 Design ways to improve facility and equipment system performance.
- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs
- WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- Career Readiness, Life Literacies, and Key Skills Practices
  - Utilize critical thinking to make sense of problems and persevere in solving them.
  - Act as a responsible and contributing community member and employee.

### Essential Question(s)

- How does one become a master technician?
- What skills are considered advanced?

### Content

- Hydraulic system diagnosis
- Hydraulic system operation
- Diagnostic procedures



- Pascal's Law
- Bernoulli's Principle of Hydraulics

### Skills

- Apply advanced diagnosis techniques on hydraulic systems
- Apply Pascal's Law to hydraulics
- Apply Bernoulli's Principle of Hydraulics
- Properly repair hydraulic systems
- Research vehicle service information with electronic retrieval systems

### Assessments

- Written/Oral quizzes
- Written test
- Chapter review questions
- Daily practical
- Observation practical
- Evaluations

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## Resources



### → Course Resources

- ◆ Wright, Gus (2015). *Fundamentals of Medium/Heavy Duty Diesel Engines*. Jones and Bartlett Learning, LLC.
- ◆ Duffy, O, Heard, S & Wright, G (2019). *Fundamentals of Mobile Heavy Equipment*. Jones and Bartlett Learning, LLC.