

Wallenpaupack Area School District

COURSE: Power Mechanics II

GRADE LEVEL: 11

LENGTH OF COURSE: 180 days

TEXT: Automotive Electricity and Electronics – 3rd edition

PUBLISHER: Barry Hollembeak

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COURSE DESCRIPTION:

This course provides instruction in Automotive Electricity and Electronics. A specific technical course designed to teach the principles of electricity and electronics and apply them to automotive systems. This course builds on the essential concepts and measurement of electrical parameters, such as voltage, current, resistance, power, magnetism, electromagnetism, and magnetic induction that the student has learned in earlier courses. Students will learn the concept of Ohm's law in both application and mathematical theory. Detailed topics include the use of a digital multi-meter (DMM) for the analysis of series, parallel, and series-parallel circuits. Specific automotive systems covered include batteries, charging and starting systems, lighting, gauges, accessories, electronics, automotive computers and solid-state devices, and communication systems. Students will learn how to apply electrical/electronic principles to repair car and truck electrical systems using a scientific process of elimination diagnostic strategy.

CURRICULUM WRITING TEAM:

Mark C. Watson, Ph.D.

DATE OF REVISION:

2007

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Course: Power Mechanics II

Grade Level: Grade 11

Unit: Electrical / Electronics

PA Standards: 13.1.11

13.2.11

13.3.11

13.4.11

Topics:	Skills:
Safety <ul style="list-style-type: none">• Personal Safety• Tool and Equipment Safety• Work Area Safety• Manufacturer's Warnings and Government Regulations	Active listening strategies Drawing inferences Following directions Demonstrate knowledge of safety practices in the use of hand tools, power equipment, and in performing job tasks and procedures
Activities:	Performance Assessments:
Lecture <ul style="list-style-type: none">• Power Point• Smart board interaction• Student presentations Shop demonstration	Quizzes Oral questioning Written test Shop assessment through observation <ul style="list-style-type: none">• weekly grade

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Topics:	Skills:
Basic Theories <ul style="list-style-type: none"> • Basics of electron flow • Electricity defined • Electrical laws • Types of current • Electrical circuits • Semiconductors • Magnetism principles • Theory of induction • EMI suppression 	Active listening strategies Drawing inferences Following directions Explain the theories and laws of electricity Describe the difference between insulators, conductors, and semiconductors. Define voltage, current, and resistance Define and use Ohm's Law correctly Explain the basic concepts of capacitance Explain the difference between AC and DC current Define and illustrate series, parallel, and series-parallel circuits and the electrical laws that govern them. Explain the basic theory of electromagnetism Explain the principles of induction
Activities:	Performance Assessments:
Lecture <ul style="list-style-type: none"> • Power Point • Smart board interaction • Student presentations Shop demonstration	Quizzes Oral questioning Written test Shop assessment through observation <ul style="list-style-type: none"> • weekly grade

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Topics:	Skills:
Electrical components <ul style="list-style-type: none"> • Electrical Components • Electronic components • Circuit protection devices • Circuit defects 	Active listening strategies Drawing inferences Following directions Describe the common types of electrical system components used and how they affect the electrical system. Explain the operation of the electrical controls, including switches, relays, and variable resistors. Describe the basic operating principles of electronic components. Explain the use of electronic components in the circuit. Explain the purpose of a circuit protection device. Define circuit defects including opens, shorts, grounds, and excessive resistance. Explain the effects that each type of circuit defect has on the operation of the electrical system.
Activities:	Performance Assessments:
Lecture <ul style="list-style-type: none"> • Power Point • Smart board interaction • Student presentations Shop demonstration	Quizzes Oral questioning Written test Shop assessment through observation <ul style="list-style-type: none"> • weekly grade

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Topics:	Skills:
Automotive Batteries	Active listening strategies Drawing inferences Following directions Identify the purpose of the automotive battery Analyze the internal parts, construction, and operation of the battery, including chemical action Identify the methods used to test and maintain a battery
Activities:	Performance Assessments:
Lecture View Smart board presentation Board demonstrations Open discussion Class debate Guided practice Shop demonstration Supervised shop work Group projects and individual projects Cooperative learning groups Homework	Quizzes Oral questioning Written test Shop assessment through observation <ul style="list-style-type: none"> • weekly grade

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Topics:	Skills:
Direct Current Motors and the Starting System <ul style="list-style-type: none"> • Safety • Starter Drives • Starter Systems Circuits • Starter Control Circuit Components • Cranking Motor Designs 	Active listening strategies Drawing inferences Following directions Identify principles of starter motors List the parts of the starter motor and purpose various problems, diagnosis and services tips and procedures.
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Topics:	Skills:
Charging Systems <ul style="list-style-type: none"> • Safety • Principals of Operation • AC Generator Circuits and Operation • AC Generator Design Variations • Regulation and Indication 	Active listening strategies Drawing inferences Following directions. Identify the purpose of the charging system State the operation of solid-state electronic and computerized regulation systems purpose of alternators
Activities:	Performance Assessments:
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Topics:	Skills:
Ignition Systems <ul style="list-style-type: none"> • Safety • Purpose of the Ignition System • Ignition Timing • Basic Circuitry • Ignition Components • Spark Timing Systems • Switching Systems • Distributor Ignition System Operation • Electronic Ignition System Operation 	Cognitive and Manipulative Development Active listening strategies Drawing inferences Following directions Identify the parts and operation of the conventional ignition system that uses contact points Define operation of the primary and secondary circuit Examine advance mechanisms Identify spark plug design and operation Analyze the electronic spark control systems Define the parts and operation of a distributorless ignition systems
Activities:	Performance Assessments:
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Course: Power Mechanics III

Grade Level: Grade 11

Unit: Electrical / Electronics

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13.2.11
13.3.11
13.4.1

Topics:	Skills:
Ignition System Service <ul style="list-style-type: none"> • Combustion • General Ignition System Diagnosis • Visual Inspection of Ignition Systems • No-Start Diagnosis • General Testing • Testing with a Scope • Effects of Improper Timing • Setting Ignition Timing • DI and EI Systems • Primary Circuit Components • Distributor Service • Secondary Component Tests and Service • Specific EI System Service 	Cognitive and Manipulative Development Active listening strategies Drawing inferences Following directions. Identify the parts and operation of the conventional ignition system that uses contact points Define operation of the primary and secondary circuit Examine advance mechanisms Identify spark plug design and operation Analyze the electronic spark control systems Define the parts and operation of a distributorless ignition systems
Activities:	Performance Assessments:
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Topics:	Skills:
Lighting Circuits <ul style="list-style-type: none"> • Headlights and Lighting Devices • Switches • Interior and Exterior Lights • Lighting Complexities 	Active listening strategies Drawing inferences Following directions. Explain the operating principles of the various lighting systems Describe the different types of headlights and how they are controlled. Understand the functions of turn, stop, and hazard warning lights. Know how backup lights operate Replace headlights and other burned-out bulbs. Explain how to aim headlights. Explain the purpose of auxiliary automotive lighting. Describe the operation and construction of the various automotive lamps. Diagnose lighting problems.
Activities:	Performance Assessments:
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Topics:	Skills:
<p>Conventional Analog Instrumentation, Indicator Lights, and Warning Devices</p> <ul style="list-style-type: none"> • Odometers, Speedometers and Tachometers • Gauges and Sending Units • Warning Devices <ul style="list-style-type: none"> ○ Visual ○ Audio 	<p>Active listening strategies Drawing inferences Following directions. Know the purpose of the various designs of gauges How they function. Describe the operation of the various gauges used In an instrument cluster. Describe the two types of instrument panel displays. Know the basic operation of electric windshield wiper and washer systems. Explain the operation of power door locks, power windows, and power seats. Determine how well the defroster system performs. Understand how cruise control works. Consider the use and value of engine cooling fans.</p>
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Topics:	Skills:
Automotive Computer Systems <ul style="list-style-type: none"> • Safety • Analog and Digital Principles • Central Processing Unit • Computer Memory • Inputs and Outputs • Multiplexing and High/Low Side Drivers 	Cognitive and Manipulative Development Active listening strategies Drawing inferences Following directions. Describe the principle of analog and digital voltage Signals. Explain the principle of computer communications. Describe the basic function of the central processing unit (CPU). Explain the basic method by which the CPU is able to make determinations. List and describe the differences in memory types. List and describe the differences in memory types. List and describe the functions of the various sensors used by the computer. List and describe the operation of output actuators. Explain the principle of multiplexing.
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Topics:	Skills:
Passive Restraint Systems <ul style="list-style-type: none"> • Introduction • Passive Seat Belt Systems • Air Bag Systems <ul style="list-style-type: none"> ○ Deployment ○ Warning Lamps and Devices ○ Pass. / Driver ○ Multi-Stage Deployment 	Cognitive and Manipulative Development Active listening strategies Drawing inferences Following directions. Explain the purpose and operation of the passive restraint systems. Describe the common components of an air bag System. List the components and explain the function of the air bag module. Explain the functions of the diagnostic module used in air bag systems. Describe normal operation of the air bag system Warning light. Explain and discuss the different types of air bag Systems and the location of their modules. Describe the operation and purpose of factory installed air bag on/off switches.
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