# Wallenpaupack Area School District
# Planned Course Curriculum Guide

## Career & Technical Education

## Automotive Technology II

**Course Description:**

This course provides foundational instruction in automotive electricity and electronics, focusing on the principles of electrical theory and their application to modern vehicle systems. Students will build on prior knowledge of electrical parameters—including voltage, current, resistance, power, magnetism, electromagnetism, and magnetic induction—and apply these concepts to diagnose and repair automotive electrical systems.

Key topics include the use of Ohm's Law in both mathematical and practical applications, and the operation of series, parallel, and series-parallel circuits. Students will gain hands-on experience using a digital multimeter (DMM) to measure and analyze electrical values and troubleshoot circuit behavior.

The course covers a wide range of automotive electrical systems, including:

- Battery, charging, and starting systems
- Lighting, gauges, and accessories
- Automotive computers and solid-state devices
- Communication systems and onboard diagnostics

Students will learn to apply a scientific process of elimination to diagnose electrical faults, interpret customer concerns, and verify system performance. Emphasis is placed on safe practices, accurate testing, and the use of modern diagnostic tools to service both car and truck electrical systems.

**Initial Creation Date:**
**2004**
**Revision Dates:**
**2007,2014,2025**

| Wallenpaupack Area School District Curriculum | |
|---|---|
| **COURSE:** Automotive Technology 2 | **GRADE:** 11 |
| **UNIT 1:** Safety Review | **TIMEFRAME:** 1-2 Weeks |

**PA COMMON CORE/NATIONAL STANDARDS:**

**ELA:**

CC.1.2.11–12.F Evaluate how words and phrases shape meaning and tone in texts.

CC.1.2.11–12.J Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**Math:**

CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.

CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Career Education:**

13.2.11.D Analyze, revise, and apply an individualized career portfolio to chosen career path.

13.3.11.A Evaluate personal attitudes and work habits that support career retention and advancement.

**Science:**

3.1.12. A. Apply concepts of systems, subsystems, feedback, and control to solve complex technological problems.

Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems.

Apply systems analysis to predict results.

Analyze and describe the function, interaction and relationship among subsystems and the system itself.

Compare and contrast several systems that could be applied to solve a single problem.

Evaluate the causes of a system's inefficiency.

3.2.12. A. Evaluate the nature of scientific and technological knowledge.

Know and use the ongoing scientific processes to continually improve and better understand how things work.

**UNIT OBJECTIVES (SWBATS):**

Students will be able to:

- Identify and demonstrate proper use of personal protective equipment (PPE).
- Interpret and apply information from Safety Data Sheets (SDS).
- Recognize and respond to common shop hazards.

- Understand and follow OSHA and school safety regulations.
- Demonstrate safe behavior in the use of tools, equipment, and chemicals.

Explain emergency procedures including fire safety, first aid, and evacuation protocols.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Safety demonstrations
- SDS analysis and hazard identification exercises
- Shop safety scavenger hunt
- Group discussion on real-world safety incidents and prevention strategies
- Interactive safety quizzes and games

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

- Diagnostic: Safety knowledge pre-assessment
- Formative: Daily safety checks and behavior logs
- Summative: Written safety exam and hands-on safety demonstration
- Benchmark: Completion of OSHA 10 Safety Certification

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

- Advanced students lead safety briefings or assist in demonstrations
- Enrichment: Create a safety training video or digital presentation
- Visual aids, simplified instructions, and peer support for students with learning needs

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

- OSHA website
- *Modern Automotive Technology* textbook
- Safety Data Sheets (SDS)
- Fire extinguisher and first aid kit demonstrations

**KEY VOCABULARY:**

- PPE (Personal Protective Equipment)
- SDS (Safety Data Sheet)
- OSHA (Occupational Safety and Health Administration)
- Hazard
- Lockout/Tagout
- Evacuation
- First Aid
- Fire Safety
- Chemical Safety

| Wallenpaupack Area School District Curriculum | |
|---|---|
| **COURSE:** Automotive Technology II | **GRADE:** 11 |
| **UNIT 2:** Electrical and Electronic Fundamentals | **TIMEFRAME:** 10-12 weeks |

**PA COMMON CORE/NATIONAL STANDARDS:**

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**Math:**

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**Career Education:**

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**Science:**

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3.2.12. A. Evaluate the nature of scientific and technological knowledge.

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**Competency Task List:**

713 Repair wiring harness and solder repair

**UNIT OBJECTIVES (SWBATS):**

Students will be able to:

- Explain basic electrical principles including voltage, current, resistance, and power.
- Apply Ohm's Law to calculate electrical values in series, parallel, and series-parallel circuits.
- Identify and describe the function of common electric and electronic components.
- Safely use electrical tools and test equipment, including digital multimeters (DMMs).
- Read and interpret basic automotive wiring diagrams.

- Perform basic electrical tests and wiring repairs.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Interactive lectures and demonstrations on electrical theory
- Hands-on labs building and testing simple circuits
- Component identification and function exercises
- DMM usage practice and safety walkthroughs
- Wiring diagram interpretation and mock repair activities
- Group problem-solving using Ohm's Law and circuit analysis

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

- Diagnostic: Pre-assessment on electrical knowledge and tool familiarity
- Formative: Daily lab logs, circuit worksheets, and DMM practice
- Summative: Written exam and hands-on circuit testing assessment
- Benchmark: Completion of a wiring diagram interpretation and repair project

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

- Advanced students assist with circuit troubleshooting or lead DMM demonstrations
- Enrichment: Research and present on solid-state components or emerging automotive electronics
- Visual aids, simplified notes, and peer support for students with learning needs

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

- *Automotive Electricity and Electronics* textbook
- Digital multimeters and circuit boards
- Wiring diagram software or printed schematics
- Online simulations and tutorials on circuit theory
- ASE and manufacturer training materials

**KEY VOCABULARY:**

- Voltage
- Current
- Resistance
- Power
- Ohm's Law
- Series Circuit
- Parallel Circuit
- Multimeter (DMM)
- Resistor
- Diode
- Wiring Diagram

| Wallenpaupack Area School District Curriculum | |
|---|---|
| **COURSE:** Automotive Technology II | **GRADE:** 11 |
| **UNIT 3:** Computer Control Technology | **TIMEFRAME:** 3-4 Weeks |

**PA COMMON CORE/NATIONAL STANDARDS:**

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**Math:**

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CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Career Education:**

13.2.11.D Analyze, revise, and apply an individualized career portfolio to chosen career path.

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**Science:**

3.1.12. A. Apply concepts of systems, subsystems, feedback, and control to solve complex technological problems.

Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems.

Apply systems analysis to predict results.

Analyze and describe the function, interaction and relationship among subsystems and the system itself.

Compare and contrast several systems that could be applied to solve a single problem.

Evaluate the causes of a system's inefficiency.

3.2.12. A. Evaluate the nature of scientific and technological knowledge.

Know and use the ongoing scientific processes to continually improve and better understand how things work.

**UNIT OBJECTIVES (SWBATS):**

Students will be able to:

- Explain the fundamentals of automotive computer systems and their role in vehicle operation.
- Identify key components of computer-controlled systems, including sensors, actuators, and control modules.
- Access and interpret data using on-board diagnostic (OBD) systems and scan tools.
- Perform basic diagnostic procedures using scan tools and service information.

- Service and verify the operation of computer-controlled systems using proper testing methods.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Interactive lectures on computer system architecture and function
- Hands-on labs using scan tools to retrieve and interpret diagnostic trouble codes (DTCs)
- Component identification and system mapping exercises
- Guided practice using electronic service information (ESI) platforms
- Group discussions on the evolution of automotive electronics and future trends

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

- Diagnostic: Pre-assessment on computer system knowledge
- Formative: Daily scan tool usage logs and DTC interpretation worksheets
- Summative: Written exam and hands-on diagnostic assessment using scan tools
- Benchmark: Completion of a mock diagnostic and service report for a computer-controlled system

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

- Advanced students assist with scan tool demonstrations or lead diagnostic walkthroughs
- Enrichment: Research and present on emerging vehicle technologies (e.g., ADAS, EV control systems)
- Visual aids, simplified notes, and peer support for students with learning needs

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

- *Automotive Electricity and Electronics* textbook
- Scan tools (OBD-II compliant) and diagnostic software
- OEM service information systems (e.g., ALLDATA, Mitchell1)
- Online tutorials and simulations of computer-controlled systems
- ASE and manufacturer training materials

**KEY VOCABULARY:**

- ECU (Electronic Control Unit)
- PCM (Powertrain Control Module)
- Sensor
- Actuator
- OBD-II
- DTC (Diagnostic Trouble Code)
- Scan Tool
- CAN Bus
- ESI (Electronic Service Information)
- Diagnostic Strategy

| Wallenpaupack Area School District Curriculum | |
|---|---|
| **COURSE:** Automotive Technology II | **GRADE:** 11 |
| **UNIT 4:** Electrical and Electronic Systems | **TIMEFRAME:** 6-8 Weeks |

**PA COMMON CORE/NATIONAL STANDARDS:**

**ELA:**

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**Math:**

CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.

CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Career Education:**

13.2.11.D Analyze, revise, and apply an individualized career portfolio to chosen career path.

13.3.11.A Evaluate personal attitudes and work habits that support career retention and advancement.

**Science:**

3.1.12. A. Apply concepts of systems, subsystems, feedback, and control to solve complex technological problems.

Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems.

Apply systems analysis to predict results.

Analyze and describe the function, interaction and relationship among subsystems and the system itself.

Compare and contrast several systems that could be applied to solve a single problem.

Evaluate the causes of a system's inefficiency.

3.2.12. A. Evaluate the nature of scientific and technological knowledge.

Know and use the ongoing scientific processes to continually improve and better understand how things work.

**Competency Task List:**

702 Identify and interpret electrical/electronic system concerns.

705 Use wiring diagrams during diagnosis of electrical circuit problems.

706 Check electrical circuits with a test light.

707 Check electrical circuits using fused jumper wires.

708 Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits.

709 Measure and diagnose the cause(s) of excessive parasitic draw.

710 Inspect and test fusible links, circuit breakers, and fuses.

711 Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits.

712 Remove and replace terminal end from connector, replace connectors, and terminal ends.
715 Identify location of electric hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.
735 Inspect, replace, and aim headlights and bulbs.
739 Diagnose the cause of incorrect operation of warning devices and other driver information systems.
740 Diagnose incorrect horn operation.
741 Diagnose incorrect wiper operation and diagnose wiper speed control and park problems.
742 Diagnose incorrect washer operation.
743 Diagnose incorrect operation of motor-driven accessory circuits.
746 Remove and reinstall door panel.
747 Use a digital multimeter (DMM).
748 Demonstrate knowledge of an automatic idle start/stop system.

**UNIT OBJECTIVES (SWBATS):**

Students will be able to:

- Explain the fundamentals of hybrid drive technology and its role in modern vehicles.
- Diagnose and repair hybrid drive systems using appropriate tools and procedures.
- Identify and service 12-volt and high-voltage (HV) battery systems.
- Understand and test 12-volt and HV engine starting and charging systems.
- Diagnose, test, and repair charging systems in both conventional and hybrid vehicles.
- Describe ignition system components and their operation.
- Perform ignition system diagnostics, testing, and repairs.
- Service lighting systems, instrumentation, wipers, and horns.
- Identify and service power accessories and sound systems.
- Understand and troubleshoot security, navigation, and advanced driver assistance systems (ADAS).

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Hands-on labs with hybrid system simulators and battery service tools
- Scan tool diagnostics on ignition and charging systems
- Wiring diagram interpretation and component tracing exercises
- Group discussions on emerging vehicle technologies and ADAS
- Multimedia presentations on hybrid architecture and safety protocols
- Troubleshooting activities for lighting, accessories, and infotainment systems

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

- Diagnostic: Pre-assessment on hybrid and electrical systems
- Formative: Daily lab logs, component identification, and system walkthroughs
- Summative: Written exam and hands-on service assessment of electrical systems
- Benchmark: Completion of a hybrid/electrical system diagnostic and service report

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

- Advanced students assist with or lead ADAS discussions
- Enrichment: Research and present on EV systems, autonomous tech, or infotainment integration
- Visual aids, simplified notes, and peer support for students with learning needs

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

- *Automotive Electricity and Electronics* textbook
- *Modern Automotive Technology* textbook
- Hybrid and EV training modules
- Scan tools and diagnostic software
- OEM service information systems (e.g., ALLDATA, Mitchell1)
- ADAS and infotainment system simulators or videos

**KEY VOCABULARY:**

- Hybrid Drive
- HV Battery
- 12-Volt System
- Charging System
- Ignition Coil
- Spark Plug
- ADAS (Advanced Driver Assistance Systems)
- Infotainment
- BCM (Body Control Module)
- Security System
- Navigation System

| Wallenpaupack Area School District Curriculum | |
|---|---|
| **COURSE:** Automotive Technology II | **GRADE:** 11 |
| **UNIT 5:** Emissions Control Systems | **TIMEFRAME:** 1-2 weeks |

**PA COMMON CORE/NATIONAL STANDARDS:**

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**Math:**

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CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Career Education:**

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**Science:**

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3.2.12. A. Evaluate the nature of scientific and technological knowledge.

Know and use the ongoing scientific processes to continually improve and better understand how things work.

**Competency Task List:**

835 Inspect, test, service, and replace components of the EGR system, including electrical/electronic sensors, controls, and wiring, EGR tubing, exhaust passages, vacuum/pressure controls, filters, and hoses.

837 Inspect and test mechanical components of secondary air injection systems.

838 Inspect and test electrical/electronically operated components and circuits of air injection systems.

839 Inspect and test catalytic converter efficiency.

841 Inspect and test components and hoses of the evaporative emissions control system.
842 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems.

**UNIT OBJECTIVES (SWBATS):**

Students will be able to:

- Explain the purpose and function of automotive emission control systems.
- Identify major emission control components and describe their operation.
- Perform visual inspections and functional tests of emission control systems.
- Diagnose and repair common emission system faults using scan tools and service information.
- Understand the environmental impact of vehicle emissions and the importance of compliance with regulations.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Interactive lectures on emission system types and functions
- Hands-on labs inspecting and testing emission components (e.g., EGR valves, catalytic converters, oxygen sensors)
- Scan tool diagnostics and DTC interpretation related to emissions
- Group discussions on EPA regulations and environmental responsibility
- Case studies of emission-related drivability concerns

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

- Diagnostic: Emission system knowledge quiz
- Formative: Daily lab logs and component identification worksheets
- Summative: Written exam and hands-on emission system service assessment
- Benchmark: Completion of an emission system diagnostic and repair report

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

- Advanced students assist with scan tool diagnostics or lead component testing
- Enrichment: Research and present on alternative emission technologies (e.g., EVs, hydrogen fuel cells)
- Visual diagrams, simplified notes, and peer support for students with learning needs

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

- *Automotive Electricity and Electronics* textbook
- OEM service manuals and emission system schematics
- Scan tools and diagnostic software
- EPA and CARB websites for emissions standards
- Online tutorials and animations of emission system operation

**KEY VOCABULARY:**

- Emission Control
- Catalytic Converter
- Oxygen Sensor
- EGR Valve
- EVAP System
- DTC (Diagnostic Trouble Code)
- HC (Hydrocarbons)

- CO (Carbon Monoxide)
- NOx (Nitrogen Oxides)
- EPA Compliance

| Wallenpaupack Area School District Curriculum | |
|---|---|
| **COURSE:** Automotive Technology II | **GRADE:** 11 |
| **UNIT 6:** Battery, Starting, and Charging Systems | **TIMEFRAME:** 3-4 Weeks |

**PA COMMON CORE/NATIONAL STANDARDS:**

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**Career Education:**

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**Competency Task List:**

716 Perform battery state-of-charge test.

717 Perform battery capacity test and confirm proper battery capacity for vehicle application.

718 Maintain and restore electronic memory functions.

719 Inspect, clean, fill, and replace battery, battery cables, connectors, clamps, and hold-downs.

720 Perform battery charge.

721 Start a vehicle using jumper cables or an auxiliary power supply.

722 Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry following battery disconnect.

723 Perform starter current draw tests.

724 Perform starter circuit voltage drop tests.
725 Inspect and test starter relays and solenoids.
726 Remove and install starter in a vehicle.
727 Inspect and test switches, connectors, and wires of starter control circuits and perform necessary action.
728 Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.
729 Perform charging system output test and determine necessary action.
730 Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions.
732 Remove, inspect, and install generator (alternator).

**UNIT OBJECTIVES (SWBATS):**

Students will be able to:

- Identify the components and functions of automotive battery, starting, and charging systems.
- Perform battery testing, charging, and replacement procedures.
- Diagnose and service starting system components including starters, solenoids, and relays.
- Test and repair charging system components including alternators, voltage regulators, and drive belts.
- Use diagnostic tools such as multimeters and scan tools to evaluate system performance.
- Understand the relationship between battery condition, starting performance, and charging efficiency.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Hands-on labs testing batteries, starters, and alternators
- Demonstrations of proper battery charging and jump-start procedures
- Wiring diagram analysis and system tracing exercises
- Scan tool diagnostics and voltage drop testing
- Group discussions on battery types and charging system evolution

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

- Diagnostic: Battery and charging system knowledge quiz
- Formative: Daily lab logs and component identification worksheets
- Summative: Written exam and hands-on service assessment of battery, starting, and charging systems
- Benchmark: Completion of a diagnostic and repair report for a simulated system fault

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

- Advanced students assist with voltage drop testing or lead system walkthroughs
- Enrichment: Research and present on lithium-ion and AGM battery technologies
- Visual aids, simplified notes, and peer support for students with learning needs

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

- *Automotive Electricity and Electronics* textbook
- Battery testers, multimeters, and scan tools
- OEM service manuals and wiring diagrams
- Online tutorials and animations of system operation
- ASE and manufacturer training materials

**KEY VOCABULARY:**

- Battery
- Starter
- Solenoid
- Alternator
- Voltage Regulator
- State of Charge (SOC)
- Cranking Amps
- Voltage Drop
- Charging System
- Multimeter