Automotive Engine Repair and Performance II

Course Credit	1.0
Grade Levels	10-12
Prerequisites	Automotive Engine Repair and Performance I

Automotive Engine Performance II is designed to equip students with service knowledge and skills regarding safety, engines, and engine performance. Standards are designed to equip students to diagnose and repair systems related to engine performance. This course incorporates standards that address personal and environmental safety practices associated with clothing and eye protection, hand tools, power equipment, ventilation, and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

Content standards are written to meet Automotive Service Excellence (ASE) Education Foundation requirements, which also specify task lists, program hours, and safety standards.

Career and Technical Student Organizations are integral, co-curricular components of each career and technical education course. These organizations enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and access opportunities for personal and professional growth. Students in the Transportation, Distribution and Logistics career cluster affiliate with SkillsUSA.

Foundational standards, shown in the table below, are an important part of every course. Through these standards, students learn and apply safety concepts, explore career opportunities and requirements, practice the skills needed to succeed in the workplace, develop leadership qualities and take advantage of the opportunities afforded by Career and Technical Student Organizations (CTSOs), and learn and practice essential digital literacy skills. The foundational standards are to be incorporated throughout the course.

Each foundational standard completes the stem *"**Students will**..."*

Foundational Standards

1. Incorporate safety procedures in handling, operating, and maintaining tools and machinery; handling materials; utilizing personal protective equipment; maintaining a safe work area; and handling hazardous materials and forces.
2. Demonstrate effective workplace and employability skills, including communication, awareness of diversity, positive work ethic, problem-solving, time management, and teamwork.
3. Explore the range of careers available in the field and investigate their educational requirements, and demonstrate job-seeking skills including resume-writing and interviewing.
4. Advocate and practice safe, legal, responsible, and ethical use of information and technology tools specific to the industry pathway.
5. Participate in a Career and Technical Student Organization (CTSO) to increase knowledge and skills and to enhance leadership and teamwork.
6. Apply literacy, mathematical, and scientific principles and precision measurements when diagnosing problems and making repairs.
7. Work independently, collaboratively, and in teams to explore concerns, find causes, and take appropriate action by applying principles of STEM.

AUTOMOTIVE ENGINE REPAIR AND PERFORMANCE II
CONTENT STANDARDS

Each content standard completes the stem *"**Students will**…"*

Engine Repair	1. Inspect, remove, and replace engine mounts. 2. Remove cylinder head, inspect gasket condition, install cylinder head and gasket, and tighten according to manufacturer's specifications and procedures. 3. Clean and visually inspect a cylinder head for cracks and check gasket surface areas for warpage and surface finish. 4. Inspect pushrods, rocker arms, rocker arm pivots, and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices). 5. Inspect and replace the camshaft and drive belt and chain. 6. Check drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring and tone-wheel, and valve timing components. 7. Verify correct camshaft timing (including VVT systems) using vehicle service information and establish camshaft position sensor indexing. 8. Remove, inspect, and replace crankshaft vibration damper (harmonic balancer).
Engine Cooling	9. Identify and correct causes of engine overheating including inspection and replacement of water pump and radiator as needed. 10. Inspect and correct functions of test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dam issues. 11. Inspect auxiliary coolers to determine needed action. 12. Inspect, test, and replace oil temperature and pressure switches and sensors.

Engine Performance

13. Identify and interpret engine performance concerns, abnormal engine noises, or vibrations to determine needed action.

14. Diagnose the cause of excessive oil and coolant use by identifying abnormal symptoms.
    Examples: unusual exhaust color, odor, or sound

15. Perform active tests of actuators using a scan tool to determine needed action.

16. Diagnose ignition system problems to determine needed action.
    Examples: not starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, emissions concerns

17. Inspect and test crankshaft and camshaft position sensor(s) to determine needed action.

18. Inspect, test, and replace modules and reprogram and initialize as needed.

19. Check fuel for contaminants while inspecting and testing fuel pump(s).
    a. Evaluate pump control system for pressure, regulation, and volume to determine needed action.

20. Inspect throttle body, air induction system, intake manifold, and gaskets for vacuum leaks and unmetered air.

21. Inspect, test, and replace fuel injectors and verify idle control operation.

22. Perform exhaust system back-pressure test to determine needed action.

23. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system to determine needed action.

24. Inspect, test, service and replace electrical or electronic sensors, controls, wiring, tubing, exhaust passages, vacuum and pressure controls, filters, and hoses of exhaust gas recirculation (EGR) system to determine needed action.

25. Inspect and test electrical and electronically-operated components and circuits of secondary air injection systems to determine needed action.

26. Diagnose emissions and driveability concerns caused by the catalytic converter system to determine needed action.

27. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems to determine needed action.