

COURSE SYLLABUS

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| LAST REVIEW | Fall 2022 |
| COURSE TITLE | Engine Performance 2 |
| COURSE NUMBER | AUTT-0284 |
| DIVISION | Career and Technical Education |
| DEPARTMENT | AUTT |
| CIP CODE | 47.0604 |
| CREDIT HOURS | 4 |
| CONTACT HOURS/WEEK | Class: 1.5 Lab: 5 |
| PREREQUISITES | AUTT-0103; AUTT-0182 |
| COREQUISITES | None |

COURSE DESCRIPTION

In this course students will study and perform tasks from the National Automotive Technicians Education Foundation's (NATEF) Automobile Service Technology (AST) Program. These studies include engine diagnosis, computerized engine controls, ignition, fuel, intake, and exhaust systems. All students will successfully complete each element of personal safety training before working in the Automotive Laboratory.

PROGRAM ALIGNMENT

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:

https://kansasregents.org/workforce_development/program-alignment

PROGRAM LEARNING OUTCOMES

1. Demonstrate adherence to safety and pollution prevention standards according to OSHA and EPA regulations.
2. Demonstrate the ability to communicate effectively in workplace scenarios with an appropriate level of preparedness for daily tasks and assignments.
3. Demonstrate the ability to diagnose and repair mechanical and electrical damage according to Original Equipment Manufacturer (OEM) specifications and recommendations.

TEXTBOOKS

<http://kckccbookstore.com/>

METHODS OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning,

labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE

- I. Engine Diagnosis
 - A. Engine noise
 - B. Engine vibration
 - C. Oil consumption
 - D. Coolant consumption
 - E. Exhaust color
 - F. Sounds
- II. Base Engine Concerns
 - A. Compression
 - B. Vacuum
 - C. Breathing
 - D. Filtering
 - E. Camshaft timing
- III. Computerized Controls
 - A. Utilizing service information
 - B. Modes
 - C. Codes
 - D. Freeze frame
 - E. Misfire monitors
 - F. Sensor data streams
 - G. Actuator bi-directional controls
 - H. Reprogramming vehicle modules
- IV. Ignition Systems
 - A. No starting
 - B. Hard starting
 - C. Causes of misfire
 - D. Spark knock
 - E. Power loss
 - F. Poor mileage
 - G. Crankshaft and camshaft sensors
 - H. Ignition control modules, PCM ignition drivers
 - I. Coil types and operation
 - J. Firing patterns
- V. Fuel Systems
 - A. Fuel pump
 - B. Relays
 - C. Inertia switch
 - D. Filters
 - E. Switching valves

- F. Circuit tests
- G. Pressure/volume
- H. Fuel injector diagnostics
- I. Fuel injector cleaning
- VI. Intake and Exhaust Systems
 - A. Throttle body
 - B. Air induction
 - C. Idle control
 - D. Intake manifold
 - E. Sealing
 - F. Unmetered air
 - G. Exhaust manifolds
 - H. Exhaust passages, EGR
 - I. Exhaust system
 - J. Hangers
 - K. Backpressure tests
- VII. Emission Control Systems
 - A. Positive Crankcase Ventilation (PVC) systems
 - B. Exhaust Gas Recirculation (EGR) system and controls
 - C. Air injection systems
 - D. Catalytic converters
 - E. Evaporative emission systems
 - F. Interpretation of Diagnostic Trouble Codes (DTC) related to emissions

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

- A. *Describe engine diagnosis.*
 1. Identify and interpret engine performance concerns; determine necessary action.
 2. Diagnose abnormal engine noises or vibration concerns; determine necessary action.
 3. Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine necessary action.
 4. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.
 5. Verify correct camshaft timing.
- B. *Describe computerized controls diagnosis and repair*
 6. Access and use service information to perform step-by-step (troubleshooting) diagnosis.
 7. Perform active tests of actuators using a scan tool; determine necessary action.
- C. *Describe ignition system diagnosis and repair*
 8. Diagnose (troubleshoot) ignition system related problems such as no- starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor

- mileage, and emissions concerns; determine necessary action.
9. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.
 10. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.
- D. *Describe fuel, air induction, and exhaust systems diagnosis and repair.*
11. Check fuel for contaminants; determine necessary action.
 12. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.
 13. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.
 14. Inspect and test fuel injectors.
 15. Verify idle control operation.
 16. Perform exhaust system back-pressure test; determine necessary action.
- E. *Describe emissions control systems diagnosis and repair.*
17. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.
 18. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.
 19. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.
 20. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.
 21. Inspect and test catalytic converter efficiency.
 22. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.
 23. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

College Catalog

<https://www.kckcc.edu/academics/catalog/index.html>

College Policies and Statements

<https://www.kckcc.edu/about/policies-statements/index.html>

Accessibility and Accommodations

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.