

# AT R113: AUTOMOTIVE ENGINE PERFORMANCE

**Originator**

kevin\_corse1

**College**

Oxnard College

**Discipline (CB01A)**

AT - Automotive Technology

**Course Number (CB01B)**

R113

**Course Title (CB02)**

Automotive Engine Performance

**Banner/Short Title**

Automotive Engine Performance

**Credit Type**

Credit

**Start Term**

Spring 2021

**Formerly**

AT R013L - Automotive Engine Performance Lab

AT R013 - Automotive Engine Performance

AT R033 - Automotive Emission and Fuel Control Systems

**Catalog Course Description**

This course provides state-of-the-art training in automobile emission control systems, fuel injection systems, ignition systems, and engine computer controlled operating systems.

This course fulfills career training as required by the National Automotive Technicians Education Foundation and California State Smog Inspectors License. The goal of this course is to prepare students for Industry accepted ASE (Automotive Service Excellence) certification. This course will provide students with entry-level automotive technician skills necessary for immediate employment.

**Taxonomy of Programs (TOP) Code (CB03)**

0948.00 - \*Automotive Technology

**Course Credit Status (CB04)**

D (Credit - Degree Applicable)

**Course Transfer Status (CB05) (select one only)**

B (Transferable to CSU only)

**Course Basic Skills Status (CB08)**

N - The Course is Not a Basic Skills Course

**SAM Priority Code (CB09)**

C - Clearly Occupational

**Course Cooperative Work Experience Education Status (CB10)**

N - Is Not Part of a Cooperative Work Experience Education Program

**Course Classification Status (CB11)**

Y - Credit Course

**Educational Assistance Class Instruction (Approved Special Class) (CB13)**

N - The Course is Not an Approved Special Class

**Course Prior to Transfer Level (CB21)**

Y - Not Applicable

**Course Noncredit Category (CB22)**

Y - Credit Course

**Funding Agency Category (CB23)**

Y - Not Applicable (Funding Not Used)

**Course Program Status (CB24)**

1 - Program Applicable

**General Education Status (CB25)**

Y - Not Applicable

**Support Course Status (CB26)**

N - Course is not a support course

**Field trips**

May be required

**Grading method**

Letter Graded

**Alternate grading methods**

Credit by exam, license, etc.

**Does this course require an instructional materials fee?**

No

**Repeatable for Credit**

No

**Is this course part of a family?**

No

**Units and Hours**

**Carnegie Unit Override**

No

**In-Class**

**Lecture**

**Minimum Contact/In-Class Lecture Hours**

87.5

**Maximum Contact/In-Class Lecture Hours**

87.5

**Activity**

**Laboratory**

**Minimum Contact/In-Class Laboratory Hours**

52.5

**Maximum Contact/In-Class Laboratory Hours**

52.5

**Total in-Class**

**Total in-Class**

**Total Minimum Contact/In-Class Hours**

140

**Total Maximum Contact/In-Class Hours**

140

**Outside-of-Class**

**Internship/Cooperative Work Experience**

**Paid**

**Unpaid**

**Total Outside-of-Class**

**Total Outside-of-Class**

**Minimum Outside-of-Class Hours**

175

**Maximum Outside-of-Class Hours**

175

**Total Student Learning**

**Total Student Learning**

**Total Minimum Student Learning Hours**

315

**Total Maximum Student Learning Hours**

315

**Minimum Units (CB07)**

6

**Maximum Units (CB06)**

6

**Advisories on Recommended Preparation**

AT R110

**Student Learning Outcomes (CSLOs)**

**Upon satisfactory completion of the course, students will be able to:**

- |   |   |
|---|---|
| 1 | Comprehend simple graphing concepts and common fractions and their decimal equivalents as they apply to automotive diagnosis and repair.  |
| 2 | Comprehend environmental safety rules and regulations, in the following areas. Shop safety, personal safety, hazardous material safety, air bag safety, power tools, and typical equipment safety.  |
| 3 | Upon completion of the automotive technology program, students will be able to improve in their ability to identify, retrieve, comprehend and apply basic automotive technical information including but not limited to online information. |
| 4 | Correctly determine a vehicle has reached proper operating temperature.   |
| 5 | Complete industry standard documents and related paperwork.   |
| 6 | Demonstrate how to verify that a given vehicle has all the required smog control systems as required by the State of California, bureau of automotive repair.   |
| 7 | Improve in their ability to identify, retrieve, comprehend and apply basic automotive technical information including but not limited to online information.  |

**Course Objectives**

**Upon satisfactory completion of the course, students will be able to:**

- |    |   |
|----|---|
| 1  | Identify safety hazards in an automotive shop.                                |
| 2  | Describe and demonstrate proper customer relations.                           |
| 3  | Identify fault code descriptions from computer information systems.           |
| 4  | Perform the proper steps to calibrate shop diagnostic equipment.              |
| 5  | Explain the testing methods involved with fuel injection systems.             |
| 6  | Identify emission system components.  |
| 7  | Identify electronic engine management computer sensors and actuators.         |
| 8  | Explain the primary and secondary ignition systems.                           |
| 9  | Explain the operation of engine subsystem.                                    |
| 10 | Describe and demonstrate proper customer service relations                    |
| 11 | Use a flow chart to successfully repair emission failure vehicles             |
| 12 | Test and diagnose tailpipe emissions in a State of California approved method |
| 13 | Identify which smog systems are required on a specific vehicle                |
| 14 | Identify and test fuel system sensors and actuators.                          |
| 15 | Explain the engine management computer control systems.                       |

**Course Content****Lecture/Course Content**

Lecture will include handling of automotive parts and equipment and becoming familiar with the systems and subsystems located here.

1. Conventional Ignition Systems
  - a. Primary circuit
  - b. Secondary circuit
  - c. Ignition coil saturation
  - d. Distributor ignition systems
  - e. Distributor advances
2. Electronic Engine Management Controls
  - a. Computer control
  - b. Direct ignition
  - c. Distributorless ignition systems (DIS)
  - d. OBD 1 operation
  - e. OBD 2 operation
  - f. CAN monitors operation
  - g. Sensors and actuators
3. Conventional Fuel Systems
  - a. Fuel tank and caps
  - b. Fuel lines and filters
  - c. Conventional fuel pumps
  - d. Intake manifolds
4. Electronic Fuel Injection Management Systems
  - a. Electric fuel pumps
  - b. Electronic fuel Injectors
  - c. Injector spray patterns
  - d. Sequential fuel injection
  - e. Fuel trim interpretation
  - f. Fuel rails
5. Engine Tune-Up
  - a. Visual inspection
  - b. Tune-up diagnosis
  - c. Compression testing

- d. Primary and secondary ignition
- e. Tune-up specifications
- 6. Emission Control
  - a. System inspection
  - b. California regulations
  - c. Infra-red testing equipment
  - d. Crankcase emission controls
  - e. Exhaust emissions controls
  - f. Evaporation emission controls
  - g. Air injection systems
- 7. Engine Performance Testing Equipment
  - a. On-Board computer self-test
  - b. Laboratory – oscilloscope digital (DOS)
  - c. Five gas analyzer
  - d. System scanners
  - e. Fuel injection pressure testers
- 8. Engine Performance Trouble Shooting
  - a. Diagnosis of computer information
  - b. Diagnosis of emission information
  - c. Computer fault code interpretation

#### **Laboratory or Activity Content**

The labs below are hands on practice and each lab has a specific pattern to follow. All labs must be completed in a timely manner and completely filled out and stamped by the instructor or lab tech.

1. Preparing Work Orders
2. OBD II trouble Codes
3. OBD II Connector ID
4. OBD Connector ID #2
5. Retrieving OBD II DTC's
6. DMM Use
7. Measure Voltage w/DMM
8. Measure Amperage w/DMM (>10A)
9. Check Circuit w/DMM
10. Test Light Usage
11. Fused Jumper Circuit Test
12. Key-Off Battery Drain
13. Jump Starting
14. Ignition System ID
15. Spark Plug Specifications
16. Ignition Timing
17. Electronic Ignition Diag.
18. Ignition Scope Analysis
19. Ignition Inspection & Testing
20. Spark Plug Inspection
21. Ignition Coil Test
22. CKP/CMP Sensor
23. CKP/CMP Sensor Waveform
24. Primary Ignition Inspect & Test
25. First Things First (x6) Credit x 2
26. Gasoline Engine ID
27. ECT Sensor DMM
28. Temp Sensor Scan Tool
29. TPS DMM
30. TPS DSO/GMM
31. TPS Voltmeter (10/90 Rule)

32. TPS Scan Tool
33. TPS Resistance Test
34. MAP DMM Test
35. MAF Sensor Diagnosis
36. MAF Scope
37. O2 Sensor Diagnosis
38. Wide Band O2 Sensor
39. Fuel Trim Diagnosis
40. Exhaust Analysis
41. Engine Noise/Vibration Diag.
42. Exhaust/Sound Diag.
43. Vacuum Testing
44. Paper Test
45. Cylinder Power Balance
46. Compression Test (2 Vehicles)
47. Cylinder Leak Down Test
48. Verify Engine Operating Temp
49. Cooling System Inspect
50. Verify Cam/Crank Time (T belt)

## Methods of Evaluation

**Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):**

- Problem solving exercises
- Skills demonstrations
- Written expression

**Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):**

- Group projects
- Individual projects
- Laboratory activities
- Objective exams
- Oral presentations
- Problem-solving exams
- Quizzes
- Skill tests

## Instructional Methodology

**Specify the methods of instruction that may be employed in this course**

- Audio-visual presentations
- Computer-aided presentations
- Class activities
- Class discussions
- Case studies
- Distance Education
- Demonstrations
- Instructor-guided use of technology
- Laboratory activities
- Lecture

**Describe specific examples of the methods the instructor will use:**

- A. Reading assignments: Textbook-reading assignments will be discussed in class to assist students in the duties of an engine performance technician.
- B. Lecture presentation on engine performance diagnosis and testing procedures.
- C. Use of demonstration boards: Showing how systems work with sensors and actuators.
- D. Use of "role play" demonstrations: Showing how technicians should logically repair vehicles.
- E. Students will be guided through proper use of advanced computer systems for programming and diagnosing complex computer systems on board the automobile.

F. Students will observe data blocks and diagnosing of vehicle software.

## Representative Course Assignments

### Writing Assignments

Chapter reading will be reviewed in class with students participating in discussions and selected reading.

1. Students will be required to answer questions at the end of each chapter. All tests will include essay-type questions.
2. Students will be required to read case studies and determine possible diagnostic routines.

### Critical Thinking Assignments

Students will be presented scenarios in automotive performance problems and must decide the proper path or diagnostic routine to follow. These can be in class or lab situations.

### Reading Assignments

1. Students will be required to do outside reading in professional journals such as Motor Service Journal and Motor Age Magazine.
2. Students will be expected to visit internet websites such as the State of California Bureau of Automotive Repair and Department of Consumer Affairs.
3. Students will be using a textbook and reading chapters.
4. Students will be reading repair orders and determining root causes from descriptions.

### Skills Demonstrations

Students will be performing hands-on labs and tasks, demonstrating proper use and care of equipment.

### Other assignments (if applicable)

1. Listing and summarizing fault codes from the automotive computer system.
2. Explaining the testing methods involved with fuel injection systems.
3. Describing the method to maintain electronic management of the engine including sensors and actuators.

## Outside Assignments

### Representative Outside Assignments

1. Students will be required to do outside reading in professional journals such as Motor Service Journal and Motor Age Magazine.
2. Students will be expected to visit internet websites such as the State of California Bureau of Automotive Repair and Department of Consumer Affairs.
3. Students will be required to answer questions at the end of each chapter. All tests will include essay-type questions
4. Students will be completing certificates in safety, handling hazardous waste, care of tools and equipment online.

**District General Education**

**A. Natural Sciences**

**B. Social and Behavioral Sciences**

**C. Humanities**

**D. Language and Rationality**

**E. Health and Physical Education/Kinesiology**

**F. Ethnic Studies/Gender Studies**

**CSU GE-Breadth**

**Area A: English Language Communication and Critical Thinking**

**Area B: Scientific Inquiry and Quantitative Reasoning**

**Area C: Arts and Humanities**

**Area D: Social Sciences**

**Area E: Lifelong Learning and Self-Development**

**CSU Graduation Requirement in U.S. History, Constitution and American Ideals:**

**IGETC**

**Area 1: English Communication**

**Area 2A: Mathematical Concepts & Quantitative Reasoning**

**Area 3: Arts and Humanities**

**Area 4: Social and Behavioral Sciences**

**Area 5: Physical and Biological Sciences**

**Area 6: Languages Other than English (LOTE)**

**Textbooks and Lab Manuals**

**Resource Type**

Other Instructional Materials

**Description**

Automotive Repair – Laws and Regulations, State of California, 2018

---

**Resource Type**

Textbook

**Classic Textbook**

No

**Description**

Halderman (2020) Advance Engine Performance 7th edition Pearson

---

**Resource Type**

Textbook



**Classic Textbook**

No

**Description**

CDX Preferred Automotive MAST - A8: Engine Performance, (2020) First Edition 1-Year

**Resource Type**

Textbook

**Classic Textbook**

No

**Description**

eBook ISBN: 9780134985688 Halderman 7th Edition Advanced Engine Performance

**Library Resources**

**Sufficient Library Resources exist**

Yes

**Distance Education Addendum**

**Definitions**

**Distance Education Modalities**

Hybrid (51%–99% online)

Hybrid (1%–50% online)

100% online

**Faculty Certifications**

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

**Regular Effective/Substantive Contact**

**Hybrid (1%–50% online) Modality:**

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.

E-mail	E-mail, class announcements and various learning management system tools such as “Message Students Who” and “Assignment Comments”, will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.
Face to Face (by student request; cannot be required)	Students will have direct face-to-face contact with instructor during weekly class meetings. This time will provide the opportunity for students to discuss and ask questions about the material to facilitate student learning objectives and course outcomes. The instructor will also hold weekly, scheduled office hours for students to be able to meet and discuss course materials or individual progress. Students can request additional in-person or web conferencing meetings with faculty member as needed. Faculty may encourage online students to form “study groups” in person or online. Note: For hybrid classes, face-to-face class time will provide opportunities for students to discuss amongst themselves (in groups or pairs) and ask questions about the material to facilitate SLOs and course outcomes.
Other DE (e.g., recorded lectures)	Faculty may use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: <ul style="list-style-type: none"> <li>o Recorded Lectures, Narrated Slides, Screencasts</li> <li>o Instructor created content</li> <li>o VC Online Library Resources</li> <li>o Canvas Peer Review Tool</li> <li>o Canvas Student Groups (Assignments, Discussions)</li> <li>o 3rd Party (Publisher) Tools (MyOpenMath)</li> <li>o Websites and Blogs</li> <li>o Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)</li> </ul>
Synchronous Dialog (e.g., online chat)	Instructor may provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
Video Conferencing	Video tools such as ConferZoom can be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Video Conferences will be used to facilitate SLOs and student-to-student group meetings will also be encouraged.
<b>Hybrid (51%–99% online) Modality:</b>	
<b>Method of Instruction</b>	<b>Document typical activities or assignments for each method of instruction</b>
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
E-mail	E-mail, class announcements and various learning management system tools such as “Message Students Who” and “Assignment Comments”, will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.

Face to Face (by student request; cannot be required)	Students will have direct face-to-face contact with instructor during weekly class meetings. This time will provide the opportunity for students to discuss and ask questions about the material to facilitate student learning objectives and course outcomes. The instructor will also hold weekly, scheduled office hours for students to be able to meet and discuss course materials or individual progress. Students can request additional in-person or web conferencing meetings with faculty member as needed. Faculty may encourage online students to form "study groups" in person or online. Note: For hybrid classes, face-to-face class time will provide opportunities for students to discuss amongst themselves (in groups or pairs) and ask questions about the material to facilitate SLOs and course outcomes.
Other DE (e.g., recorded lectures)	Faculty may use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: <ul style="list-style-type: none"> <li>o Recorded Lectures, Narrated Slides, Screencasts</li> <li>o Instructor created content</li> <li>o VC Online Library Resources</li> <li>o Canvas Peer Review Tool</li> <li>o Canvas Student Groups (Assignments, Discussions)</li> <li>o 3rd Party (Publisher) Tools (MyOpenMath)</li> <li>o Websites and Blogs</li> <li>o Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)</li> </ul>
<b>100% online Modality:</b>	
<b>Method of Instruction</b>	<b>Document typical activities or assignments for each method of instruction</b>
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
E-mail	E-mail, class announcements and various learning management system tools such as "Message Students Who" and "Assignment Comments", will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.
Face to Face (by student request; cannot be required)	The instructor will hold weekly, scheduled office hours either in person or via-web conferencing, for students to be able to meet and discuss course materials or individual progress. Students can request additional in-person or web conferencing meetings with faculty member as needed. Faculty may encourage online students to form "study groups" in person or online.
Other DE (e.g., recorded lectures)	Faculty will use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: <ul style="list-style-type: none"> <li>o Recorded Lectures, Narrated Slides, Screencasts</li> <li>o Instructor created content</li> <li>o VC Online Library Resources</li> <li>o Canvas Peer Review Tool</li> <li>o Canvas Student Groups (Assignments, Discussions)</li> <li>o 3rd Party (Publisher) Tools (MyOpenMath)</li> <li>o Websites and Blogs</li> <li>o Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)</li> </ul>
Synchronous Dialog (e.g., online chat)	Instructor will provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
Video Conferencing	Video tools such as ConferZoom can be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Video Conferences will be used to facilitate SLOs and student-to-student group meetings will also be encouraged.

Telephone

Students can request for instructor to call or vice versa in order to answer one-on-one questions about course material or student progress.

## Examinations

### Hybrid (1%–50% online) Modality

On campus

### Hybrid (51%–99% online) Modality

Online

## Primary Minimum Qualification

AUTOMOTIVE TECHNOLOGY

## Review and Approval Dates

### Department Chair

12/02/2020

### Dean

12/02/2020

### Technical Review

12/09/2020

### Curriculum Committee

12/09/2020

### CCCCO

MM/DD/YYYY

### Control Number

CCC000611488

### DOE/accreditation approval date

MM/DD/YYYY