

EL CAMINO COLLEGE

COURSE OUTLINE OF RECORD

I. Course Information

Course Acronym:*

A TEC

Course Number:* 42

Descriptive Title:* Engine Repair

Division: Industry and Technology

Department:*

Automotive Technology

Course Disciplines: Automotive Technology

Catalog Description:*

This course covers the study of automotive engine construction and operation, diagnosis, and repair procedures of the following: cylinder head removal and valve grinding, camshaft and timing gear replacement, water pump replacement, oil, coolant and manifold (intake and exhaust) leaks, engine maintenance and the installation of long or short blocks. Replace pistons and/or connecting rods, piston rings, engine bearings, crankshaft seals, camshaft seals, oil pan gasket, valve/camshaft cover gaskets, flywheel, pulleys, crankshaft balancer and other engine repair items that would need to be replaced or repaired. Laboratory activities stress the proper use of equipment utilized in the field.

Conditions of Enrollment:

Prerequisite:

Co-requisite:

Recommended Preparation: Automotive Technology 1 or equivalent

Enrollment Limitation:

Course Length: Full Term

Hours Lecture (per week): 5

Hours Laboratory (per week): 10

Outside Study Hours:* 10

Total Course Hours:* 270

Course Units:* 8

Grading Method: Letter Grade only

Credit Status: Credit, degree applicable

Transfer CSU: Yes

Effective Date: Prior to July 1992

Transfer UC: No

Effective Date:

General Education:
ECC

Term:

Other:

CSU GE:

Term:

Other:

IGETC:

Term:

Other:

II. Outcomes and Objectives

A. Student Learning Outcomes (SLOs) (The course student learning outcomes are listed below.)
SLO revisions are completed via the SLO Change Form available on the College Curriculum Committee website.

Student Learning Outcomes:

SLO #1 Safety Exam

Given an in class exam, based on readings, classroom discussions and demonstrations, the student will be able to work in the Automotive Shop safely and pass the Automotive Safety Exam with 100% accuracy.

SLO #2 Engine Analysis

The student will perform an analysis of an engine to manufacturer specifications and complete Automotive Compression/ Cylinder Leakage Test/ Vacuum and Oil Pressure lab worksheets.

SLO #3 Cooling System Analysis

The student will test and analyze an automotive engine cooling system using manufacturer procedures and specifications, then complete a lab sheet.

B. Course Objectives (The major learning objective for in this course are listed below.)

Course Objectives:

1. Score 100% accuracy on a safety test.
2. Select and use the proper tools and equipment safely and efficiently.
3. Remove a cylinder head, recondition valves and seats and reinstall based upon manufacturers specifications and automotive industry standards.
4. Measure and inspect engine components with precision instruments based upon manufacturers specifications and automotive industry standards.
5. Remove and replace water pumps based upon automotive industry standards.
6. Remove and replace soft core plugs based upon automotive industry standards.
7. Remove and replace camshaft based upon manufacturers specifications and automotive industry standards.
8. Remove and replace timing chain or belt and gears based upon manufacturers specifications and automotive industry standards.
9. Diagnose an engine condition based upon manufacturers specifications and automotive industry standards.

III. Outline of Subject Matter

(Topics should be detailed enough to enable an instructor to determine the major areas that should be covered to ensure consistency from instructor to instructor and semester to semester.)

Example:

I. Main Topic (3 hours, lecture)

A. Sub topics

B. Sub topics

1. Super sub topic

2. Super sub topic

Major Topics:

I. ENGINE REPAIR OVERVIEW (10 hours, lecture)

1. Safety information and test
2. Four stroke cycle
3. Engine construction and design
4. Materials and manufacturing processes

II. ENGINE REPAIR OVERVIEW (20 hours, lab)

1. Safety tour of shop
2. Tool room requirements
3. Four stroke cycle
4. Engine construction and design
5. Materials and manufacturing processes

III. ENGINE DIAGNOSIS (10 hours, lecture)

1. Compression/cylinder leakage test
2. Vacuum testing
3. Revolutions Per Minute (RPM) drop test
4. Engine noises/vibrations
5. Oil pressure test
6. External fluid leakage detection procedures

IV. ENGINE DIAGNOSIS (20 hours, lab)

1. Compression/cylinder leakage test
2. Vacuum testing
3. RPM drop test
4. Engine noises/vibrations
5. Oil pressure test
6. External fluid leakage detection procedures

V. CYLINDER HEAD (20 hours, lecture)

1. Removal procedures
2. Disassembly procedures
3. Cleaning, inspection and crack detection
4. Use of measuring instruments
5. Recondition valves, seats and guides
6. Assembly procedures
7. Installation procedures
8. Valve adjustment

VI. CYLINDER HEAD (40 hours, lab)

1. Disassembly procedures
2. Cleaning, inspection and crack detection
3. Use of measuring instruments

4. Recondition valves, seats and guides
5. Assembly procedures

6. Installation procedures
7. Valve adjustment

VII. CAMSHAFT AND TIMING CHAIN/BELT/GEARS (5 hours, lecture)

1. Construction and design
2. Diagnostic procedures
3. Removal and replacement procedures

VIII. CAMSHAFT AND TIMING CHAIN/BELT/GEARS (10 hours, lab)

1. Construction and design
2. Diagnostic procedures
3. Removal and replacement procedures

IX. ENGINE REMOVAL AND INSTALLATION (15 hours, lecture)

1. Safety precautions
2. Motor mount replacement
3. Removal procedures
4. Cleaning procedures
5. Installation procedures

X. ENGINE REMOVAL AND INSTALLATION (30 hours, lab)

1. Safety precautions
2. Motor mount replacement
3. Removal procedures
4. Cleaning procedures
5. Installation procedures

XI. COOLING SYSTEM (5 hours, lecture)

1. Construction and operation
2. Inspection and testing procedures
3. Servicing procedures
4. Radiator repairing
5. Soft core plug replacement procedures
6. Water pump replacement procedures

XII. COOLING SYSTEM (10 hours, lab)

1. Construction and operation
2. Inspection and testing procedures
3. Servicing procedures
4. Radiator repairing
5. Soft core plug replacement procedures
6. Water pump replacement procedures

XIII. ENGINE DISASSEMBLY AND REASSEMBLY (20 hours, lecture)

1. Symptom/cause
2. Diagnosis of identifying signs of wear and leakage
3. Sequence of organized disassembly of engine
4. Ridge removal and removing the harmonic balancer
5. Marking bearing caps and piston removal
6. Pressing piston pins
7. Crankshaft storage
8. Camshaft bearing, soft core plug and oil gallery plug removal and installation
9. Block and crankshaft preparation - cleanliness
10. Tightening and torqueing procedures
11. Crankshaft installation procedures - checking for binding and clearances
12. Camshaft bearing installation procedures
13. Piston and piston ring installation procedures - ring gap and placement
14. Degreeing the camshaft and crankshaft
15. Cylinder head and valve train installation
16. Installation of the oil pump and drive, manifolds, oil pan and timing covers
17. Ignition and timing procedures

XIV. ENGINE DISASSEMBLY AND REASSEMBLY (40 hours, lab)

1. Symptom/cause
2. Diagnosis of identifying signs of wear and leakage
3. Sequence of organized disassembly of engine
4. Ridge removal and removing the harmonic balancer
5. Marking bearing caps and piston removal
6. Pressing piston pins
7. Crankshaft storage
8. Camshaft bearing, soft core plug and oil gallery plug removal and installation
9. Block and crankshaft preparation - cleanliness
10. Tightening and torqueing procedures
11. Crankshaft installation procedures - checking for binding and clearances
12. Camshaft bearing installation procedures
13. Piston and piston ring installation procedures - ring gap and placement
14. Degreeing the camshaft and crankshaft
15. Cylinder head and valve train installation
16. Installation of the oil pump and drive, manifolds, oil pan and timing covers
17. Ignition and timing procedures

XV. UNUSUAL ENGINE PROBLEMS (5 hours, lecture)

1. Symptoms and cause
2. Diagnosis and repair

XVI. UNUSUAL ENGINE PROBLEMS (10 hours, lab)

1. Symptoms and cause
2. Diagnosis and repair

Total Laboratory Hours: 180

Total Hours: 270

IV. Primary Method of Evaluation and Sample Assignments

A. Primary Method of Evaluation (choose one):

- 1) Substantial writing assignments
- 2) Problem solving demonstrations (computational or non-computational)
- 3) Skills demonstrations

Primary Method of Evaluation: 3) Skills demonstration

B. Typical Assignment Using Primary Method of Evaluation

Typical Assignment Using Primary Method of Evaluation: Remove the cylinder head/heads from an engine and then remove valves from the cylinder head/heads. Clean, measure and inspect valves and cylinder head, and record data to a one-page cylinder head lab sheet. Analyze data using the manufacturer's specifications to determine the serviceability of valves and cylinder head. Set up valve grinder, install the valves in valve grinder, and resurface valves and valve seats in accordance with manufacturer's specifications. Consult instructor for evaluation.

C. College-level Critical Thinking Assignments

Critical Thinking Assignment 1: Perform a valve spring pressure test and record data to a one-page cylinder head lab sheet. Analyze data from a valve spring pressure test using manufacturer's specifications to determine the serviceability of valve springs. Submit lab sheet to the instructor.

Critical Thinking Assignment 2: Perform an engine RPM test and record data to a one-page engine performance lab sheet. Analyze data using manufacturer's specifications to determine serviceability of automotive engine to include recommended service and/or repairs and parts required. Submit lab sheet to the instructor.

D. Other Typical Assessment and Evaluation Methods

Examples: Class Performance, Objective Exam, Clinical Evaluation, Oral Exams, Completion, Other Exams, Embedded Questions, Performance Exams, Essay Exams, Presentation, Fieldwork, Quizzes, Homework Problems, Reading Reports, Journal kept throughout course, Term or Other Papers, Laboratory Reports, True/False, Matching Items, Written Homework, Multiple Choice, Other (specify)

- Other Evaluation Methods:**
- Other exams
 - Quizzes
 - Laboratory reports
 - Class Performance
 - Homework Problems
 - Multiple Choice
 - Completion
 - Matching Items
 - True/False

V. Instructional Methods

Examples: Lecture, Group Activities, Lab, Role play/simulation, Discussion, Guest Speakers, Multimedia presentations, Field trips, Demonstration, Other (specify)

- Instructional Methods:**
- Demonstration
 - Discussion
 - Group Activities
 - Laboratory
 - Lecture
 - Multimedia presentations

If other: Workbooks
Collaborative learning

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. Work Outside of Class

- Work Outside of Class:**
- Study
 - Skill practice
 - Required reading
 - Problem solving activities
 - Written work

If Other:

VII. Texts and Materials

A. Up-to-date Representative Textbooks: Please use the following format(s):

Printed Text - Author, Title, Edition, Publisher, Year.

Digital Text (OER Text) - Author (last name first). Title. Edition or Version (if beyond 1st). Publisher, Publication year or Revision date. URL. License.

Sample: Dillon, Dave. *Blueprint for Success in College and Career. Version 1.3.* Rebus Community, 2018. press.rebus.community/blueprint2/. Licensed under CC BY 4.0.

If you wish to list a text that is more than 5 years old, please annotate it as a “discipline standard”.

***Multiple textbooks may be listed.**

Up-To-Date Representative Textbooks: James Halderman, [AUTOMOTIVE ENGINES: THEORY AND SERVICING](#), 9th edition, Pearson, 2018

B. Alternative Textbooks: Please use the following format(s): if applicable

Printed Text - Author, Title, Edition, Publisher, Year.

Digital Text (OER Text) - Author (last name first). Title. Edition or Version (if beyond 1st). Publisher, Publication year or Revision date. URL. License.

Sample: Dillon, Dave. *Blueprint for Success in College and Career. Version 1.3.* Rebus Community, 2018. press.rebus.community/blueprint2/. Licensed under CC BY 4.0.

If you wish to list a text that is more than 5 years old, please annotate it as a “discipline standard”.

***Multiple textbooks may be listed.**

Alternative Textbooks:

C. Required Supplementary Readings

Required Supplementary Readings:

D. Other Required Materials

Other Required Materials: Three ring binder notebook and paper
 Pen and pencil
 Safety glasses Required
 Shop safe clothing and shoes
 Tools (optional)
 Recording device with permission (optional)

VIII. Conditions of Enrollment

A. Requisites (Course Prerequisites and Corequisites) Skills needed without which a student would
Page 9 of 12

be highly unlikely to succeed.

Requisite:

Category:

Requisite course(s):

List both prerequisites and corequisites in this box.

Requisite and Matching skill(s): **Bold the requisite skill.**

List the corresponding course objective under each skill(s).

B. Requisite Skills: (Non-Course Prerequisite and Corequisites) Skills needed without which a student would be highly unlikely to succeed.

Requisite Skill:

Requisite Skill and Matching Skill(s):
Bold the requisite skill(s). If applicable

C. Recommended Preparations (Course) (Skills with which a student's ability to succeed will be strongly enhanced.)

Requisite course: Automotive Technology 1

Requisite and Matching skill(s): **Bold the requisite skill. List the corresponding course objective under each skill(s).**

Knowledge of safety procedures in the shop.

ATEC 1 - Complete a safety test with 100% accuracy.

Ability to perform an under the hood inspection.

ATEC 1 - Service, test and evaluate a lead-acid battery.

Ability to perform an under the vehicle inspection.

ATEC 1 - Inspect and evaluate tire wear.

ATEC 1 - Inspect and maintain drive line components and fluid levels.

ATEC 1 - Perform chassis lubrication and "top off" fluid levels for steering and suspension.

Safe use of hand and power tools.

ATEC 1 - Select and use the proper tools.

D. Recommended Preparation (Non-Course) (Skills with which a student's ability to succeed will be strongly enhanced.)

Requisite Skill: or equivalent

Requisite Skill and Matching skill(s): **Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable**

If students have not taken Auto Technology 1 but have taken a similar course at another college, they will have the recommended skills to enroll in this course. Also, if students have basic automotive understanding or have worked in the field, they automotive will have the recommended skills to take this course. It is highly recommended that students have some form of automotive knowledge to enhance their success in this course.

E. Enrollment Limitations

Enrollment Limitations and Category:

Enrollment Limitations Impact:

Course Created by: Hiram T. Hironaka

Date: 10/20/1985

Last Reviewed and/or Ed Matykiewicz
Revised by:

Date: 03/03/2022

Last Board Approval
Date: