

I. COURSE DESCRIPTION:

This course focuses on engine component failure diagnosis and component reconditioning. The student will disassemble engines and perform component failure analysis. They will also be introduced to engine reconditioning equipment such as hones, boring machine, crankshaft grinding, line boring machine, connecting rod hone and crankshaft polishing equipment. Hybrid engine equipped vehicles will also be discussed at this time to compare the differences in engine design between electric assist and hydrogen fuel cell technology. A comparison of turbochargers and superchargers will be given, focusing on construction, operation and boost control devices. The students will also observe the torque and horsepower testing of a naturally aspirated engine on a fluid dyno.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. *Describe the engine component failure analysis process.***Potential Elements of the Performance:**

- Outline types of engine failures.
- Identify diagnostic procedures to determine primary and secondary causes of component failure.
- Describe four types of engine-related noises.
- Apply compression, cylinder leakage and engine vacuum tests to explain power loss.
- Explain how to test for oil consumption.
- Understand how oil pressure is affected by internal engine wear.

2. *Perform inspection and testing procedures to determine internal engine component failure.***Potential Elements of the Performance:**

- Disassemble an engine.
- Inspect internal components for contact.
- Measure pistons and rings.
- Measure crankshafts and connecting rods.
- Inspect bearings.
- Check valve timing.
- Compare all measurements following manufacturer's specifications.

3. Outline engine design differences to accommodate hybrid technology.

Potential Elements of the Performance:

- Compare and contrast electric assist and hydrogen combustion engines
- Discuss the energy savings and the affects on the environment.

4. Describe the purpose and fundamentals of turbochargers and superchargers.

Potential Elements of the Performance:

- Explain the relationship of turbo charging or supercharging to volumetric efficiency.
- Describe the effects air temperature and flow rates.
- Outline electronic monitoring and boost pressure indicators.

5. Outline the construction and operation of turbo chargers and superchargers.

- Compare and contrast superchargers to turbo chargers.
- Explain the need for an intercooler.
- Describe boost controls.
- Explain the lubrication types and methods for super and turbo chargers.
- Outline service precautions as outlined by manufacturer's recommendations.

6. Describe an engine torque and horsepower test.

Potential Elements of the Performance:

- Calculate horsepower using torque and RPM.
- Explain four types of horsepower ratings.
- Observe the horsepower testing of an engine on a fluid dynamometer.

III. TOPICS:

1. Describe the engine component failure analysis process.
2. Perform inspection and testing procedures to determine internal engine component failure.
3. Outline engine design differences to accommodate hybrid technology.
4. Describe the purpose and fundamentals of turbochargers and superchargers.
5. Outline the construction and operation of turbo chargers and superchargers.
6. Describe an engine torque and horsepower test.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Automotive Technology – Text & Workbook

Pens, pencils, calculator, 3-ring binder

*shop coat or coveralls

*CSA approved steel toe boots (high top)

*CSA approved safety glasses

*these items mandatory for shop

V. EVALUATION PROCESS/GRADING SYSTEM:

The final grade for this course will be based on the results of classroom, assignments and shop evaluations weighed as indicated:

Classroom – 60% of the final grade is comprised of term tests

Assignments – 10% of the final grade is comprised of a number of technical reports

Shop – 30% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude
(Student will be given notice of test and assignment dates in advance)

The following semester grades will be assigned to students:

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	3.00
B	70 - 79%	2.00
C	60 - 69%	1.00
D	50 – 59%	0.00
F (Fail)	49% and below	
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

VI. SPECIAL NOTES:

Disability Services:

If you are a student with a disability (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Disability Services office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

Retention of Course Outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Communication:

The College considers **WebCT/LMS** as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of the **Learning Management System** communication tool.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Code of Conduct*. Students who engage in academic dishonesty will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question.

Credit for prior learning will also be given upon successful completion of a challenge exam or portfolio.