

I. COURSE DESCRIPTION:

In this course the student will gain an understanding of automotive electrical circuits, wiring diagrams, electro-magnetism and the use of applied test equipment. They will also be introduced to semi-conductors, onboard computers, input devices and output actuators. Construction and operating principles of starters and alternators will be discussed along with proper testing equipment and their uses. Electronic ignition system operation and design will be studied including manufacturer maintenance and diagnostic procedures. The students will also study the construction and operating principles of gasoline electronic fuel injection, intake manifold heating systems and emission control devices.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. Outline the fundamentals, operating principles and sources of electricity.
Potential Elements of the Performance:
 - Discuss atomic structure.
 - Describe electro magnetism.
 - Explain Ohm's law.
 - Define: Amps, Ohm's, and Voltage.
 - Outline chemical production of electricity.
 - Describe solar panel operation.
 - Study wiring diagrams and show current flow and voltage needed for circuit operation.
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2. Describe the purpose, types and styles of diagnostic test equipment.
Potential Elements of the Performance:
 - Explain the need for test equipment.
 - List and describe four types of diagnostic test equipment.
 - Describe how a digital meter works and why it's needed for today's sensors and circuits.
3. Connect and operate diagnostic test equipment.
Potential Elements of the Performance:
 - Test a wheel speed sensor using a lab scope.
 - Perform assigned worksheets to measure Amps, Ohm's, and Voltage using a digital multi meter.
 - Retrieve trouble codes using a scan tool.

4. Describe the principles of operation and the construction of starting and charging systems.
Potential Elements of the Performance:
 - List and describe the six major parts of an alternator.
 - Explain full wave rectification.
 - Describe diode operation.
 - Outline electro magnetic induction.
 - Explain the motor principle.
 - Draw and label a simple starting motor circuit.
 - Describe the operation of the starter drive and over running clutch.

5. Test starting and charging system operation.
Potential Elements of the Performance:
 - Test charging system output and compare to manufacturers specifications.
 - Perform starter current draw a RPM test.
 - Disassemble and inspect alternators and starters following manufacturer's procedures and test internal components.

6. Explain the operation and construction of electronic devices.
Potential Elements of the Performance:
 - Explain the operation of a transistor
 - Describe the purpose of a diode.
 - Define RAM, ROM, PROM, EEPROM AND FEPRM.
 - Outline computer operation.
 - Discuss piezoelectric and piezoresistance type sensors.
 - Describe a hall-effect device.

7. Understand the operation of the ignition system.
Potential Elements of the Performance:
 - Draw and label a simple ignition system.
 - Explain magnetic induction.
 - Label a spark plug.
 - Participate in a hands-on demonstration showing the spark generated through the use of a coil, condenser and a battery.
 - Connect an ignition scope to vehicle to show proper operation.

8. Describe the operating principles, purpose, types and styles of gasoline fuel injection systems.
Potential Elements of the Performance:
 - List and describe three types of gasoline fuel injection systems.
 - Compare and contrast fuel injection vehicles to carbureted ones.
 - Explain open and closed loop operation.
 - Describe fuel trim.
 - Outline sensors used in fuel injection systems.
 - View fuel injection parameters using a scan tool and compare to manufacturers specifications.

9. Explain the components and systems used to control emissions on today's vehicles and their testing procedures.
Potential Elements of the Performance:
 - Define HC, CO, CO₂, O₂, and NO X.
 - Explain the cause of photochemical smog.
 - State the sources of vehicle emissions.
 - Outline the systems and components used to control vehicle emissions.
 - Perform on vehicle emission tests using suitable equipment following manufacturer's recommendations.

III. TOPICS:

1. Outline the fundamentals, operating principles and sources of electricity.
2. Describe the purpose, types and styles of diagnostic test equipment.
3. Connect and operate diagnostic test equipment.
4. Describe the principles of operation and the construction of starting and charging systems.
5. Test starting and charging system operation.
6. Explain the operation and construction of electronic devices.
7. Understand the operation of the ignition system.
8. Describe the operating principles, purpose, types and styles of gasoline fuel injection systems.
9. Explain the components and systems used to control emissions on today's vehicles and their testing procedures.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Automotive Technology – Text & Workbook

Pens, pencils, calculator, 3-ring binder

Items mandatory for Shop:

- Shop coat or coveralls
- CSA approved steel toe boots (high top)
- CSA approved safety glasses

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 | Definition | <i>Grade Point Equivalent</i> |
|--------------|--|-------------------------------|
| A+ | 90 – 100% | 4.00 |
| A | 80 – 89% | |
| B | 70 - 79% | 3.00 |
| C | 60 - 69% | 2.00 |
| D | 50 – 59% | 1.00 |
| F (Fail) | 49% and below | 0.00 |
| 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:

Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Special Needs 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:

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

VIII. ADVANCE CREDIT TRANSFER:

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.