

COURSE TITLE AND NO.: AUT 240 - 6 Engine Management Systems I

COURSE DESCRIPTION:

Course consists of a specialized study of automotive computerized engine control electronics and electrical circuits. Lectures will focus on the operational characteristics, application, and diagnosis of electronic and computerized engine control systems. Particular emphasis will be placed on electronic components and operation for the diagnosis of engine performance problems. Discussion topics will include operational strategies, sensor inputs, actuators, ignition systems, and fuel injection systems. Laboratory experience will provide the opportunity to use standard electronic diagnostic tools, specialized equipment, and computerized diagnostic tools used for engine performance diagnosis. Prerequisite: AUT 120, AUT 150, and AUT 170

PREREQUISITE TO: AUT 250, AUT 340

COURSE MEETINGS: As per the published SIUC course schedule.

COURSE OBJECTIVES:

Will provide the student with the opportunity to:

1. Study the principles and application of computerized engine control devices and electronic fuel and ignition management systems in the modern automobile.
2. The student will be introduced to computerized testing and diagnosis procedures for various manufactures of engine control systems.

COURSE OUTLINE:

I. COURSE INTRODUCTION AND LABORATORY SAFETY

- A. Course Overview and Grading
- B. Laboratory Safety
- C. Emergency Procedures

II. COMPUTERIZED ELECTRONIC FUEL INJECTION

- A. Theory of Operation
 1. Analog & Digital Signals
 2. Binary Numbers & Memories
 3. Data Links & Multiplex Communication
 4. Types of Fuel Injection
 5. Common Components

B. Engine Input Sensors

1. Coolant & Intake Temperature
2. Crankshaft Position
3. Camshaft Position
4. Manifold Absolute Pressure
5. Throttle Position
6. Oxygen
7. Air/Fuel Ratio
8. Knock
9. Speed & Distance
10. Battery & Switches

C. Output Devices

1. Relays
2. Injector Sequencing & Management
3. Ignition Operation
4. Idle Air Control
5. EGR, EVAP, Wastegate Solenoids
6. Torque Converter & Speed Control
7. Malfunction Indicator Light

D. Speed Density/Mass Air Flow Fuel Management Strategies

1. Key ON Mode
2. Crank Mode
3. Open & Closed Loop
4. Wide-Open Throttle
5. Adaptive Memory Cells
6. Cruise & Decel
7. Wide-Open Throttle
8. Key OFF Mode

III. FUEL INJECTION SYSTEMS

A. Electronic Fuel Systems

B. Computer Self-Diagnostic Circuits

C. Electronic Throttle Actuator Control Systems

D. Fuel Control

E. Fuel Supply System Control

F. Injection System Inspection and Maintenance

G. Engine Diagnostic Procedures

1. Fuel System testing
2. On Board Diagnostics
3. Monitored & Non Monitored Circuits
4. Diagnostic Trouble Codes

COURSE MATERIALS:

Required Textbook:

Halderman, J. & Linder, J. (2012). *Automotive Fuel and Emissions Control Systems (3rd Edition)* Upper Saddle River, NJ: Pearson Education. [ISBN 13:978-0-13-254292-0]

Reference Textbooks:

Halderman, J. D. (2011). *Diagnosis & Troubleshooting of Automotive Electrical, Electronic, & Computer Systems (6th Edition)* Upper Saddle River, NJ: Pearson Education. [ISBN 13:978-0132551557]

Supplemental Materials:

Instructor prepared study guide, laboratory worksheets, and informative handouts.

COURSE GRADING PROCEDURE:

- Tests can be made-up within one week at the convenience of the professor.
- Quizzes are given without prior notification and *cannot* be taken at a later date.
- Laboratory Worksheets will be used as a record of laboratory projects, should be kept current, and submitted as part of the final grade.
- Laboratory Practical Evaluations may be given at various times throughout the course and cannot be made-up.

CONTACT INFORMATION:

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Emergency Procedures:

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on the BERT's website at www.bert.siu.edu, Department of Public Safety's website www.dps.siu.edu (disaster drop down) and in the Emergency Response Guidelines pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. **It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency.** The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.

Student Guidelines, Expectations and Department Standards

Attendance & Scholastics

- Class attendance is required. One (1) absence can potentially lower your grade 2.5% and three (3) tardies count as one (1) absence. After three (3) absences, you will be required to have a conference with the instructor before returning to class.
- The Automotive Technology program maintains the following scholastic standards for grades:

<u>Percentage</u>	<u>Letter Grade</u>
100-93	A
92-87	B
86-76	C
75-70	D
69 and lower	F

Attire

Attire and conduct should reflect the students' respect to themselves, their peers, our customers, our industry and this institution. Clothing should provide maximum safety protection and reflect professionalism. The dress requirements below are for students in all automotive technology courses:

- A clean and professional shirt such as the Department's uniform shirt, dress shirt, or polo shirt is required.
- Students will be provided a single Department uniform shirt, and we recommend the purchase of additional shirts if needed. Additional uniform shirts can be purchased at the Automotive Technology Parts Store.
- Full length pants are required to be worn while in all automotive classes. Uniform pants, dress pants, or neat blue jean style pants are acceptable. Sweat, workout, or pajama styles are not acceptable.
- No hats, oversize, or loose fitting clothing is to be worn while in automotive classes.
- Closed toe shoes are required in all automotive classes and laboratories.
- Wearing jewelry may pose a safety hazard. We strongly discourage the wearing of any jewelry.
- Safety glasses must be worn in the laboratories while lab activities are in session or you are performing any actions that may cause an eye hazard. Safety glasses may be purchased at the Automotive Technology Parts Store.

Food and Drink

No food or drink is allowed to be brought in to the computer lab and automotive service or component laboratories.

Workspace Cleaning

Each student is expected to keep his/her work area orderly and clean at all times. The labs are provided with various drain pans and cleaning products. Students are expected to use them to keep their work area clean.

Parking

Students are to park in the lots to the east or south of the TEC building. Parking on the west side of the TEC is restricted to Automotive Technology fleet and customer vehicles. Unauthorized vehicles will be towed at the owner's expense.

Outside Student Space

Outdoor gathering space is available at either the northeast, northwest or south entrance of the TEC. There is to be no outdoor gathering on the west side of the TEC. This area is restricted.

Electronic Devices

Personal cell phones are not to be used during class time. Placing such devices on vibrate rather than ring is not sufficient since many have an aggressive vibrate that will still disrupt the student and/or class. Cell phones should be either shut off or not taken into class. Please practice professional courtesy in utilizing such electronic devices.

Smoking and Tobacco Products

Smoking is not allowed in or within 15 feet of any campus building. There is absolutely no smoking allowed in the lot on the west side of the TEC building. Smokeless tobacco is not permitted in the TEC.

Laboratory Activities

- Students are expected to follow all safety guidelines in the use of all equipment. If proper guidelines are not known, students are to contact their supervising instructor.
- Fender covers and other protection and safety items are to be used as needed.
- Each student must provide their own required tools for use in the laboratory with their name clearly visible on the outside of the toolbox. If two students are sharing the same tools, each must have a key. Tool sets can be purchased through the Automotive Parts Store.
- **All** test drives **must be** performed with an instructor on board. SIU laboratory training vehicles are not allowed to be driven.
- All vehicles brought in for work **must be** scheduled through the instructor; this includes personal vehicles. No vehicles are to be jacked up outside of the TEC buildings or in the parking lots.
- Students can purchase repair parts at discount through the Automotive Parts Store. Other local parts stores may also provide discounts to SIU Automotive students. Discount information can be obtained at the SIU Automotive Parts Store. All purchases will be handled on a cash basis only.
- In general, students are not allowed to work in the labs unsupervised.

Supplementary Assistance:

With the cooperation of SIU's Disability Support Services (DSS), each student who qualifies for reasonable supplementary assistance has the right to receive it. Students requesting supplementary assistance must first register with DSS in Woody Hall B-150, (453-5738) or <http://disabilityservices.siu.edu/>

Notice: If you have any type of special need(s) or disability for which you require accommodations to promote your learning in this class, please contact me as soon as possible. The Office of Disability Support Services (DDS) offers various support services and can help you with special accommodations. You may wish to contact DDS at 453-5738 or go to Room 150 at Woody Hall to verify your eligibility and options for accommodations related to your special need(s) or disability.

SIU Policy on "Incomplete" as a Course Grade:

An *INC* is assigned when, for reasons beyond their control, students *engaged in passing work* are unable to complete all class assignments. An *INC* must be changed to a completed grade within a time period designated by the instructor but not to exceed one year from the close of the term in which the course was taken, *or graduation*, whichever occurs first. Should the student fail to complete the course within the time period designated, not to exceed one year, or graduation, whichever comes first, the incomplete will be converted to a grade of *F* and the grade will be computed in the student's grade point average. Students should not reregister for courses in which an *INC* has been assigned with the intent of changing the *INC* grade. Re-registration will not prevent the *INC* from being changed to an *F*.