I. INTRODUCTION

A. This course provides the student with advanced concepts and skills required for tune-up and troubleshooting procedures of diesel engines. Emphasis on the science of diagnosis with a common sense approach.

B. Advanced Diesel Tune-Up and Troubleshooting (DEMR 2434) is a required course for the completion of a two-year Associate of Applied Science degree in Diesel Engine Mechanic and Repairer or a Level I or Level II certificate of completion in the Diesel Technician Program.

C. This course is occupationally related and serves as a preparation for a career in the Diesel Service and Repair field.

D. Prerequisites: This course has prerequisites (A.A.S. Degree) of DEMR 1401, 1405, 1406, and 1410 or consent of the Department Chair.

E. Alphanumeric coding used throughout this module book denotes integration of SCANS occupational competencies (C1, etc.) and Foundation skills (F1, etc.).

II. LEARNING OUTCOMES

Upon successful completion of this course, Advanced Diesel Tune-Up and Troubleshooting, the student will:

A. Explain the advantages, functions, and operation of an electronic fuel system. (C7)

B. Explain Cummins CELECT and CELECT PLUS fuel systems functions and characteristics. (C7)

C. Use a computer to diagnose CELECT and CELECT PLUS fuel systems. (C8) (C20)

D. Explain Cummins ISB fuel system functions and characteristics. (C7)

E. Use a computer to diagnose ISB fuel systems. (C8) (C20)

F. Explain Cummins ISX fuel system fuel systems functions and characteristics. (C7)

G. Use a computer to diagnose Cummins ISX fuel systems. (C8) (C20)

H. Explain Detroit Diesel Electronic Control fuel system functions and characteristics. (C7)
I. Use a computer to diagnose Detroit Diesel Electronic Control fuel systems. (C8) (C20)
J. Explain Caterpillar Electronic fuel system functions and characteristics. (C7)
K. Use a computer to diagnose Caterpillar Electronic fuel systems. (C20)
L. Analyze engine malfunctions. (C20)
M. Determine corrective repair. (C20)
N. Perform engine repairs. (C20)
O. Adjust engine tune-up according to engine manuals. (C20)
P. Use tools and equipment. (C18)
Q. Use service manuals. (C18)
R. Practice shop safety. (C19)

III. INSTRUCTIONAL MATERIALS

A. Instructional materials for this course may be found at www.ctcd.edu/books
B. Supplemental Reading: As assigned by the instructor.
C. Audio-visual aids: See resource list at end of module book.
D. Other instructional material: As selected by the instructor.

IV. COURSE REQUIREMENTS

A. This course is being taught in a self-paced mode. It differs from the traditional college course in that you are allowed to work on your own and at your own speed within limitation. This course is 144 clock hours in length. The student may set his/her own schedule within the time frame the course is offered. You must attend class on the days and at the times you selected when you enrolled in the course.

You will have an assigned instructor. If at any time you do not understand a reading assignment, audiovisual presentation or lab work, ask your instructor for assistance. He is there for you!

This module book is designed to inform you of the sequence in which this course will be presented. You must follow this sequence and you must do what the module book says. It contains reading assignments, written assignments, audiovisual presentations and lab assignments that you must complete or watch. Written assignments will be turned in as directed by the instructor. Late assignments will not be accepted. You must let your instructor know when you are ready to do a learning activity, performance exam or take a scheduled exam.

B. The student must take notes when viewing DVDs, CDs, or videos. Exams may be taken from audio visual aids, reading and lab assignments. If instructor notes or handouts are given to you, you must study them; exams may be taken from these
notes also.

C. The instructor may give written assignments or “pop” quizzes as he deems necessary.

D. Performance Exams:
Each student will clean all tools and equipment that they use and properly store them and clean their work area after the completion of each task.

All lab work will be completed on an individual basis. The student will receive a “pass” or “fail” on the task. Students who fail to complete a task correctly to industry standards must repeat the task. The instructor will date and initial each performance exam task as it is satisfactorily completed. **NOTE: Students who have selected the alpha-numeric grading system will be graded as outlined for degree students (see below).**

E. The following is part of the course requirements: Each student will assist in lab clean-up at the close of the evening classes and will assist in unloading and storing supply shipments. Failure to do so will result in a failure to complete all course requirements and the student could receive a “F” or “N” for the course.

F. There will be seven (7) written examinations in this course (6 module/unit exams and an exit exam). **Written exams must be completed before taking the performance exam for each module.** The exit exam is a comprehensive exam that covers the entire course. Certificate students must score 70% on the exit exam. Certificate students will be allowed to take the exit exam a maximum of three (3) times. Failure to achieve a 70% score on the exit exam in three (3) tries will result in an "N" for the course and the student must retake the course.

G. The student must complete the written assignments to receive a grade. **Written assignments for each unit will be turned into the instructor prior to starting performance exams for that module.**

H. If you have special needs because of learning disabilities or other kinds of disabilities, please feel free to discuss this with the instructor. The instructor will attempt to meet your needs with the assistance of counselors, tutors (Project Mainstream), and the assistance of the Disabilities Services Office. Program/course integrity will not be sacrificed. Students must meet all course requirements.

**GRADING**

Students will be graded using the standard Skills Center "Pass-Fail" system used for self-paced programs. To satisfactorily complete the written exams, the student must score 80% on tests (except the exit exam, 70%). Students who fail to make the 80% on any exam (except the exit exam) must retake the exam. The current test re-take policy will apply to all certificate students. The student must satisfactory complete all written and
performance exams to receive a passing grade ("P").

V. NOTES AND ADDITIONAL INSTRUCTIONS FROM THE COURSE INSTRUCTOR

A. Course Withdrawal: It is the students’ responsibility to officially withdraw from a course if circumstances prevent attendance. Any student who desires to, or must, officially withdraw from a course after the first scheduled class meeting must file a Central Texas College Application for Withdrawal (CTC Form 59). The withdrawal form must be signed by the student.

A student who officially withdraws will be awarded the grade of “W” provided the students’ attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the College before they may be considered for withdrawal.

A student may not withdraw from a class for which the instructor has previously issued the student a grade of “n” or “XN” for nonattendance.

B. Administrative Withdrawal: An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. The instructor will assign the appropriate grade on CTC Form 59 for submission to the registrar.

C. Incomplete Grade: The College catalog states, “An incomplete grade may be given in those cases where the student has completed the majority of the coursework but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course…” Prior approval from the instructor is required before the grade of “IP” for Incomplete is recorded. A student who merely fails to show for the final examination will receive a zero for the final and an “N” for the course.

D. Cellular Phones and Beepers: Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

E. American’s With Disabilities Act (ADA): Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

F. Instructor Discretion: The instructor reserves the right of final decision in course
requirements.

G. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.
H. Absence from the class may be unavoidable in some situations. These include illness, military/civilian job requirements, or a death in the immediate family. Documentation is required in the case of excused absences for job requirements. Excuses will be on company letterhead stationary signed by the immediate supervisor stating the reason for the absence for civilian jobs. Excuses for military personnel must be signed by the 1st Sergeant or the Company Commander. **NOTE: This does not apply to VA, VA/Voc, or Financial Aid students. There are no excused absences for these students. Talk to your funding agency if you have questions.**

VI. **FIRST CLASS MEETING**

A. The instructor will introduce the course and ensure that the student has the textbook.

B. The instructor will verify the class roster/enrollment form.

C. The instructor will have the student read and sign the course requirements sheet.

D. The instructor will discuss the following topics with the student:
   1. Course requirements, objectives and how the course works
   2. Policy letters
   3. Student handouts
   4. Lab sheet and lab work (Learning activities, Performance exams, competency profile)
   5. Exam, grading, reading and written assignments.
   6. Absences
   7. Shop/classroom cleanup-tools
   8. Dress code
   9. Parking
   10. Sign-in computer
   11. Course outline/fact sheets/student handouts
   12. Hazardous communications/MSDS information
   13. Shop safety

**COURSE OUTLINE OR SEQUENCE**

1. **Module 2434-01: Electronic Fuel System Theory**

   A. **Time:**
      - Certificate Students: 7 clock hours
      - Degree Students: 1 week

   B. Module Learning Outcomes: Upon completion of this module the student will:
      1. Explain the advantages, functions and operations of an Electronic Fuel System. (C7)
C. Read Fact Sheet 2434-01-02.

D. Read Chapter 30 in DEMR Resource 1401-04. (Textbook)

E. Read Chapter 31 in DEMR Resource 1401-04. (Textbook)

F. Read Chapter 32 in DEMR Resource 1401-04. (Textbook)

G. Read Chapter 33 PGS. 531-540 and PGS. 545-549 in DEMR Resource 1401-04. (Textbook)

H. Read Chapter 35 in DEMR Resource 1401-04. (Textbook)

I. Read Fact Sheet 2434-01-01.

J. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

K. View Audio Visuals (See your instructor) Student must take notes.
   1. There are no Audio-Visuals for this module.

L. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

M. Complete the Learning Activities listed below for this module.
   2. Complete Worksheet 2434-01-02.
   3. Complete Worksheet 2434-01-03.

N. Review for Module 2434-01 Written Exam: Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

O. Module 2434-01 Written Exam: (See your instructor)

P. Critique Module 2434-01 Written Exam (See your instructor)

Q. Performance Exam Module 2434-01: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance exam. (See your instructor)

R. Certificate students must complete this module by the end of the 7th clock hour. Degree students must complete this module by the end of the 1st week.
II. Module 2434-02: Diesel Engine Troubleshooting and Tune-up
– Cummins CELECT PLUS Fuel System

A. Time:
Certificate Students: 25 clock hours
Degree Students: 3 weeks

B. Module Learning Outcomes: Upon completion of this module the student will:

2. Use a computer to diagnose the CELECT PLUS fuel system. (C8)
3. Analyze engine malfunctions. (C20)
4. Determine corrective repair. (C20)
5. Perform engine repairs. (C20)
6. Adjust engine tune-up according to engine manual. (C20)
7. Use service publications. (C18)
8. Use tools and equipment. (C18)
9. Practice shop safety. (C19)

C. Read Chapter 40 in Resource DEMR 1401-04. (Textbook)


E. Read “Pressure Test” pages 5-18 through 5-49 in The Troubleshooting and Repair Manual M11 Series Engines.

F. Read “Injector” pages 6-42 through 6-51 in The Troubleshooting and Repair Manual M11 Series Engines.


H. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

I. View Audio Visuals (See your instructor) students must take notes.

J. See your instructor and ask him if there is any other information that should be viewed or read that pertains to this module.

K. Complete the learning Activities Listed below for this module.
   1. Complete worksheet 2434-02-01
   2. Complete worksheet 2434-02-02
   3. Complete worksheet 2434-02-03
   4. Complete worksheet 2434-02-04

L. Review for Module 2434-02 Written Exam: Study all previous assignments in this module. See your instructor and ask him to explain and are that you do not understand.

M. Module 2434-02 written Exam: (See your instructor)

N. Critique Module Written Exam: (See your instructor)

O. Performance Exam Module 2434-02: Refer to the Laboratory Learning Activities (Lab Sheet) in this module book and complete the Performance exam. (See your instructor)

P. Certificate students must complete this module by the end the 32\textsuperscript{nd} clock hour.
   Degree students must complete this module by the end of the 4\textsuperscript{th} week.

III. Module 2334-03 Diesel Engine troubleshooting and tune-up – Cummins ISB and ISB CM850 Fuel Systems.

A. Time:
   Certificate Students: 30
   Clock Hours
   Degree Students: 3
   Weeks

B. Module Learning Outcomes: Upon completion of this module the student will:
   1. Explain Cummins ISB Fuel System Function and Characteristics (C7).
   2. Use a computer to diagnose ISB and ISB CM850 Fuel Systems (C8)
   3. Analyze engine malfunctions. (C20)
   4. Determine corrective repair. (20)
   5. Perform engine repairs. (20)
   6. Adjust engine tune-up according to engine manual. (C20)
7. Use service publications. (C18)
8. Use tools and equipment (C18)
9. Practice shop safety. (C19)

C. Read Chapter 36 in resource DEMR 1401-04 (Textbook).

D. Read Chapter 45 in resource DEMR 1401-04 (Textbook).

E. Read Chapter 46 in resource DEMR 1401-04 (Textbook).

F. Read Section F-1 pgs. F-1 through F-50 in the troubleshooting and Repair Manual
   Electronic Control System ISB and QSB 5.9 Engines Volume 1 (see your instructor).

G. Read Section 5 pgs. 5-1 through 5-6 in the troubleshooting and Repair Manual ISB and QSB 5.9 Engines. (See your instructor).

H. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

I. View Audio-visuals: (See your instructor) **Student must take notes.**
   Audio-visuals will be viewed as part of the worksheets.

J. See your instructor and ask him if there is any other information that should be viewed or read that which pertains to this module.

K. Complete the learning activities listed below for this module:
   1. Complete worksheet 2434-03-01
   2. Complete worksheet 2434-03-02
   3. Complete worksheet 2434-03-03
   4. Complete worksheet 2434-03-04
   5. Complete worksheet 2434-03-05

L. Review for module 2434-03 Written Exam. Study all previous assignments in third module. See your instructor and ask him to explain any area that you do not understand.

M. Module 2434-03 Written Exam. (See your instructor)

N. Critique Module 2434-03 Written Exam. (See your instructor)

O. Performance Exam module 2434-03: Refer to the Laboratory Learning Activities (Lab sheet) in this module book and complete the performance exam. (See your instructor)
P. Certificate students must complete this module by the end of the 62\textsuperscript{nd} clock hour. Degree students must complete this module by the end of the 7\textsuperscript{th} week.

IV. Module 2434-04  Diesel Engine troubleshooting and tune-up Cummins ISX Fuel System.

A. Time:
Certificate Students  
Hours  
Degree Students  

25  Clock

2 Weeks
B. Module Outcomes: Upon the completion of this module the student will:

1. Explain Cummins ISX fuel system functions and characteristics. (C7)
2. Use a computer to diagnose Cummins ISX fuel systems. (C8) (C20).
3. Analyze engine malfunctions (C20).
4. Determine corrective repairs (20).
5. Perform engine repairs (C20).
6. Adjust engine tune-up according to engine manuals (C20).
7. Use tools and equipment (C18).
8. Use service manuals (C18).
9. Practice shop safety (C19).

C. Read chapter 44 in resource DEMR 1401-04 (textbook).

D. See your instructor and ask him to explain any part or the reading assignment that you do not understand.

E. View audio visuals. (See your instructor). Student must take notes.
   1. Audio visuals for this module will be viewed as part of the worksheets.

F. See your instructor and ask him if there is any other information that should be viewed or read that which pertains to this module.

G. Complete the learning activities listed below for this module.
   1. Complete worksheet 2434-04-01
   2. Complete worksheet 2434-04-02

H. Review for module 2434-04 written exam. Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

I. Module 2434-04 written exam: (See your instructor).

J. Critique module 2434-04 written exam (See your instructor).

K. Performance exam module 2434-04. Refer to the laboratory learning Activities (lab sheet) in this module book and complete the performance Exam (see your instructor).

L. Certificate students must complete this module by the end of the 87th clock hour. Degree students must complete this module by the end of the 9th week.
Module 2434- 05: Diesel Engine troubleshooting and tune-up—Detroit Diesel DDEC Fuel System.

A. Time:
   - Certificate Students: 30 Clock Hours
   - Degree Students: 3 Weeks

B. Module Learning Outcomes: Upon completion of this module the student will:
   1. Explain Detroit Diesel Electronic Control fuel system functions and characteristics. (C7)
   2. Use a computer to diagnose Detroit Diesel Electronic Control fuel systems. (C8) (C20)
   3. Analyze engine malfunctions. (C20)
   4. Determine corrective repair. (C20)
   5. Perform engine repairs. (C20)
   6. Adjust engine tune up according to engine manual. (C20)
   7. Use service publications. (C18)
   8. Use tools and equipment. (C18)
   9. Practice shop safety. (C19)

C. Read Chapter 38 in resource DEMR 1401-04. (Textbook)

D. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

E. View Audio-visuals: (See your instructor) Student must take notes.
   1. View resource 2434-10 on DDEC
   2. View resource 2434-11 on Tune-Up Detroit Diesel Series 60 Engine.
   3. View resource 2434-12 on Troubleshooting Detroit Diesel Series 60 Engine.

G. Complete the learning activities listed below for this module.
   1. Complete worksheet 2434-05-01
   2. Complete worksheet 2434-05-02
   3. Complete worksheet 2434-05-03
   4. Complete worksheet 2434-05-04
   5. Complete worksheet 2434-05-05

H. Review for Module 2434-05 written exam: Study all previous assignments in this module. See your instructor and ask him to explain any area...
that you
do not understand.

I. Module 2434-05 Written Exam: (See your instructor)

J. Critique module 2434-05 written exam: (See you instructor)

K. Performance exam module 2434-05: Refer to the laboratory learning activities (lab sheet) in this module book and complete the performance exam. (See your instructor)

L. Certificate students must complete this exam by the end of the 117th clock hour. Degree students should complete this exam by the end of the 12th week.

VI. Module 2434-06 Diesel Engine troubleshooting and tune-up—Caterpillar Electronic Unit Injection (EUI) and Hydraulic Electronic Unit Infection (HEUI) Fuel Systems.

A. Time
Certificate Students: 25 Clock Hours
Degree Students: 3 Weeks

B. Module learning outcomes: Upon completion of this module the student will:
1. Explain Caterpillar Electronic Fuel System Functions and Characteristics (C7)
2. Analyze engine malfunctions. (20)
3. Determine corrective repair. (C20)
4. Perform engine repairs. (C20)
5. Adjust engine tune-up according to engine manual. (C20)
6. Use service publications (C18)
7. Use tools and equipment. (C18)
8. Practice shop safety. (C19)
9. Use a competent to diagnose Caterpillar Electronic Control Fuel Systems.

C. Read chapter 39 in resource 1401-01. (Textbook)

D. Read chapter 43 in resource 1401-04. (Textbook)

E. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

F. View Audio Visuals: (See your instructor) Student must take notes.
1. View resource 2434-14 on the HEUI Fuel System.
2. View resource 2434-15 on The EUI Fuel System.
G. See your instructor and ask him if there is any other information that should be read or viewed that pertains to this module.

H. Complete the learning activities listed below for this module.
   1. Complete worksheet 2434-06-01
   2. Complete worksheet 2434-06-02
   3. Complete worksheet 2434-06-03
   4. Complete worksheet 2434-06-04
   5. Complete worksheet 2434-06-05
I. Review for module 2434-08 written exam. Study all previous assignments in this module. See your instructor and ask him to explain any area that you do not understand.

J. Module 2434-06 written exam: (See your instructor)

K. Critique module 2434-06 written exam: (See your instructor)

L. Performance exam module 2434-06: Refer to the laboratory learning activities (Lab sheet) in this module book and complete the performance exam. (See your instructor)

M. Certificate students must complete this exam by the end of the 142nd clock hour. Degree students must complete this module by the end of the 15th week.

VII. Module 2434-07: Exit Exam

A. Time
   Certificate Students: 2 Clock Hours
   Degree Students: 1 Week

B. Module learning outcomes: Upon completion of this module the student will:
   1. Complete the Exit Exam.

C. Review all previous assignments in this course.

D. See your instructor and ask him to explain any part of the reading assignment that you do not understand.

E. Module 2434-07 written exam: (See your instructor)

F. Critique Module 2434-07 (exit) exam: (See your instructor)

G. End of course critique and enrollment in the next course. (See your instructor)

H. Certificate students must complete this module by the end of the 144th clock hour. Degree students must complete this module by the end of the 16th week.