I. INTRODUCTION

A. Fundamentals of engine operation, diagnosis and repair including lubrication systems and cooling systems. Emphasis on overhaul of selected engines, identification and inspection, measurements, and disassembly, repair, and reassembly of the engine.

B. Automotive Engine Repair (AUMT 1319) is a required course for the completion of a two year Associate of Applied Science degree in Automotive Mechanic/Technician or a Level I or Level II certificate of completion in the Automotive Technician Program.

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

D. Prerequisites: This course has a prerequisite of AUMT 1405, 2305, and AUMT 2434, 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, Automotive Engine Repair, the student will:

A. Utilizing the appropriate safety procedures, the student will demonstrate engine diagnostic procedures. (C18, 19) (F9)

B. The student will perform cylinder head, valve train, engine block, and lubrication and cooling systems diagnosis and repair. (C18, 19) (F9)

C. Properly and safely use and maintain tools and equipment related to basic engine performance testing, cylinder head service, and short block replacement. (C20)

D. Perform test to determine engine mechanical condition, locate common causes of poor performance and abnormal noise. (C18, 19)

E. Use service publications. (C7) (F1, 6)

F. Perform basic math calculations. (F3, 4)

G. Demonstrate a knowledge of engine systems and theory. (C6) (F7)
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. References: As selected by the instructor.

D. Audio-visual aids: (Recommended)
   1. “Automotive Technician-The Basic Engine”, VOC Media Associates, #2-9999/JHJ4300 (3 parts) (Filmstrip)
   2. “Problems of Internal Compression Engine Explained”, Bergwall Productions #409 (4 parts) (Filmstrip)
   3. “Major Engine Overhaul”, Bergwall #410 (6 parts) (Filmstrip)
   4. “Engine Service”, Assorted Subjects 32, View Tapes A and B (Video)
   5. “How to Properly Build a Small Block Chevy-Racing Head Service”, RHS (Video)
   7. “How to Overhaul an Engine”, Bergwall #410 (6 Filmstrip)
   8. “Cylinder Head Service”, VOC Media Associates, #944/2-30979 (4 Filmstrips)
   9. “Principles of Valve/Valve Seat Reconditioning”, Sioux Tool Cat. No. 007 (Video)
   10. “Engine Service”, Assorted Subjects, Video #2 (Video)

E. 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, audio visual 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, audio visual 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 filmstrips, slides, 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.*

**Certificate Students:** 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 alphanumeric grading system will be graded as outlined for degree students (see below).**

**Degree Students:** Laboratory tasks (performance exam) will be completed on an individual basis except when limited by tools and/or materials. **Each performance exam is worth a maximum of 5.9 points.** The maximum lab grade is 100 points. The instructor will deduct points from each lab task score for failure to follow safety precautions and/or a failure to complete the project to industry standards. The instructor will date, initial, and post the points earned for each performance exam as it is completed.

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 eight (8) written examinations in this course (7 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. **Degree Students should refer to the "grading" section of this outline for guidance.**

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.** Degree students must complete reading and written assignments at home.

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**

**Certificate Students:** 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 satisfactorily complete all written and performance exams to receive a passing grade ("P").

Degree Students: Students will be graded using an "alpha-numeric" system as outlined below. Grades made on performance and written exams will be the grade received, including the exit exam. **Students will not be allowed to retake written exams or redo performance exams.**

A. Written exams: Average of written exams will count 40% of the final grade.

B. Completion of written assignments/activities will count 10% of the students final grade.

C. Performance Exams (Lab work) will count 50% of the final grade.

D. Grade Computations: (Example)
   Written Exam Scores: (There will be 7 written exams)
   Exam 1  90
   Exam 2  80
   Exam 3  70
   240 divided by 3 = 80 (Average Written Exams)

   Written Exam Score Average    80 x 40% = 32 points
   Written Assignments            100 x 10% = 10 points
   Performance Exam Score         80 x 50% = 40 points

   Total = 82 points = B

V. NOTES AND ADDITIONAL INSTRUCTIONS FROM THE COURSE INSTRUCTOR

A. **Course Withdrawal:** It is the student’s 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.

CTC Form 59 will be accepted at any time prior to Friday of the 12th week of classes during the 16-week fall and spring semesters. The deadline for sessions of other lengths is:

   - 10-week session     Friday of the 8th week
   - 8-week session      Friday of the 6th week
   - 5-week session      Friday of the 4th week

The equivalent date (75% of the semester) will be used for sessions of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.

A student who officially withdraws will be awarded the grade of “W” provided the student’s 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 “F”, “N”, “FN”, 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 “I” for Incomplete is recorded. A student who merely fails to show for the final examination will receive a zero for the final and an “F” 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.**

Disability Support Services provides 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. Review 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.
VI. FIRST CLASS MEETING

A. The instructor will introduce the course and show the student the textbook.

B. The instructor will verify the class roster/enrollment form:
   1. Call roll
   2. Have each student verify the spelling of his/her name and the social security number by initialing the class roster/enrollment form.
      NOTE: When a student(s name does not appear on the degree program class roster, they must bring it to the attention of the instructor and must present the instructor with CTC Form 29 (Add/Drop Slip) reflecting that he/she has properly registered for the course.

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
VIII. COURSE OUTLINE

A. Lesson One: Safety, Engine Theory and Systems

1. Learning Outcomes: Upon successful completion of this lesson, the student will:
   a. Demonstrate a knowledge of engine systems and theory. (C6) (F7)

2. Learning Activities:
   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
   e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:
   a. Engine components for display and identification
   b. Reference manuals
   c. Examples of engine systems and emissions controls
   d. TV and VCR or filmstrip projector

4. Audio Visual Aids: (Recommended)
   a. To be selected by the instructor from those listed in Section III D above.
   b. Others as selected by the instructor.

5. Lesson Outline:
   a. Introduction
   b. Safety
   c. Theory of Engine Operation
   d. Engine Systems

B. Lesson Two: Engine Materials, Tools and Equipment

1. Learning Outcomes: Upon successful completion of this lesson, the student will:
   a. Properly and safely use and maintain tools and equipment related to basic engine performance testing, cylinder head service, and short block replacement. (C20)
   b. Use service publications. (C7) (F1, 6)
c. Perform basic math calculations. (F3, 4)

2. Learning Activities:
   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
   e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:
   a. Various operational vehicles for student practical experience.
   b. Common hand tools
   c. Special tools and equipment such as compression gauge, vacuum gauge, timing lights, etc.
   d. TV and VCR or filmstrip projector

4. Audio-Visual Aids: (Recommended)
   a. To be selected by the instructor from those listed in Section III D above.
   b. Others as selected by the instructor.

5. Lesson Outline:
   a. Introduction
   b. Safety
   c. Engine Materials and Fasteners
      (1) Materials
      (2) Manufacturing Processes
      (3) Fasteners
   d. Tools and Equipment

C. Lesson Three: Engine Diagnosis

1. Learning Outcomes: Upon successful completion of this lesson, the student will:
   a. Utilize appropriate safety procedures, the student will demonstrate engine diagnostic procedures. (C18, 19) (F9)
   b. The student will perform cylinder head, valve train, engine block, and lubrication and cooling systems diagnosis and repair. (C18, 19) (F9)
   c. Properly and safely use and maintain tools and equipment related to basic engine performance testing, cylinder head service, and short block
replacement. (C20)
d. Perform test to determine engine mechanical condition, locate common
causes of poor performance and abnormal noise. (C18, 19)
e. Use service publications. (C7) (F1, 6)
f. Perform basic math calculations. (F3, 4)
g. Demonstrate a knowledge of engine systems and theory. (C6) (F7)

2. **Learning Activities:**

   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   b. The student will study the words/terms and complete written assignments
      specified by the instructor. (F1, F11, C5, C6)
   c. The student will attend classroom lectures and participate in classroom
      discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   d. The student will observe demonstrations performed by the instructor. (F5,
      F10, C5, C6, C14)
   e. The student will complete laboratory learning activities assigned by the
      instructor. See the laboratory learning activity list attached. (F1 thru F17,
      C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. **Equipment and Materials:**

   a. Various engine cylinder heads for student practical experience
   b. Common hand tools
   c. Special tools and equipment such as valve and seat grinding equipment,
      spring compressor, spring tester, valve guide service equipment, crack
      detector, straight edge, etc.
   d. Cleaning equipment and materials
   e. Service manuals
   f. TV and VCR or filmstrip projector

4. **Audio-visual Aids:** (Recommended)

   a. To be selected by the instructor from those listed in Section III D above.
   b. Others as selected by the instructor.

5. **Lesson Outline:**

   a. Introduction
   b. Safety
   c. Engine Diagnosis

D. **Lesson Four:** Engine Removal, Disassembly Inspection and Servicing

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will:

   a. Utilize appropriate safety procedures, the student will demonstrate engine
diagnostic procedures. (C18, 19) (F9)
b. The student will perform cylinder head, valve train, engine block, and lubrication and cooling systems diagnosis and repair. (C18, 19) (F9)
c. Properly and safely use and maintain tools and equipment related to basic engine performance testing, cylinder head service, and short block replacement. (C20)
d. Perform test to determine engine mechanical condition, locate common causes of poor performance and abnormal noise. (C18, 19)
e. Use service publications. (C7) (F1, 6)
f. Perform basic math calculations. (F3, 4)
g. Demonstrate a knowledge of engine systems and theory. (C6) (F7)

2. Learning Activities:
   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
   e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:
   a. Various vehicles for student learning experience
   b. Common hand tools
   c. Special tools and equipment such as engine hoist, engine stand, air wrench and sockets, cleaning equipment, etc.
   d. Service manuals
   e. TV and VCR or filmstrip projector

4. Audio-visual Aids: (Recommended)
   a. To be selected by the instructor from those listed in Section III D above.
   b. Others as selected by the instructor.

5. Lesson Outline:
   a. Introduction
   b. Safety
   c. Engine Removal
   d. Engine Disassembly

E. Lesson Five: Intake and Exhaust System, Cylinder Head and Valve Train Service

1. Learning Outcomes: Upon successful completion of this lesson, the student will:
a. Utilize appropriate safety procedures, the student will demonstrate engine diagnostic procedures. (C18, 19) (F9)

b. The student will perform cylinder head, valve train, engine block, and lubrication and cooling systems diagnosis and repair. (C18, 19) (F9)

c. Properly and safely use and maintain tools and equipment related to basic engine performance testing, cylinder head service, and short block replacement. (C20)

d. Perform test to determine engine mechanical condition, locate common causes of poor performance and abnormal noise. (C18, 19)

e. Use service publications. (C7) (F1, 6)

f. Perform basic math calculations. (F3, 4)

g. Demonstrate a knowledge of engine systems and theory. (C6) (F7)

2. **Learning Activities:**

a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)

b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)

c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)

d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)

e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. **Equipment and Materials:**

a. Various vehicles for student learning experience

b. Common hand tools

c. Special tools and equipment such as engine hoist, engine stand, air wrench and sockets, cleaning equipment, etc.

d. Service manuals

e. TV and VCR or filmstrip projector

4. **Audio-visual Aids: (Recommended)**

a. To be selected by the instructor from those listed in Section III D above.

b. Others as selected by the instructor.

5. **Lesson Outline:**

a. Introduction

b. Safety

c. Intake and Exhaust System
   (1) Theory
   (2) Service
d. Cylinder Heads
   (1) Theory
   (2) Service

e. Camshafts and Valve Train
   (1) Theory
   (2) Service

F. **Lesson Six:** Cylinder Block Service and Engine Reassemble and Installation

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will:

   a. Utilize appropriate safety procedures, the student will demonstrate engine diagnostic procedures. (C18, 19) (F9)
   b. The student will perform cylinder head, valve train, engine block, and lubrication and cooling systems diagnosis and repair. (C18, 19) (F9)
   c. Properly and safely use and maintain tools and equipment related to basic engine performance testing, cylinder head service, and short block replacement. (C20)
   d. Perform test to determine engine mechanical condition, locate common causes of poor performance and abnormal noise. (C18, 19)
   e. Use service publications. (C7) (F1, 6)
   f. Perform basic math calculations. (F3, 4)
   g. Demonstrate a knowledge of engine systems and theory. (C6) (F7)

2. **Learning Activities:**
   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
   e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. **Equipment and Materials:**
   a. Various vehicles for student learning experience
   b. Common hand tools
   c. Special tools and equipment such as engine hoist, engine stand, air wrench and sockets, cleaning equipment, etc.
   d. Service manuals
   e. TV and VCR or filmstrip projector

4. **Audio-visual Aids:** (Recommended)
a. To be selected by the instructor from those listed in Section III D above.
b. Others as selected by the instructor.

5. **Lesson Outline:**

   a. Introduction
   b. Safety
   c. Block Assembly
      (1) Theory
      (2) Service
   d. Seals, Sealants and Gaskets
   e. Engine Reassembly and Installation
   f. High Performance Engines