Course Title: Automotive Engine Machining

Subject Area/Course Number: AUTO-037

Units: 4.0

Catalog Description: The course teaches students how to diagnose, rebuild and machine a modern automotive engine. This course is designed for students seeking a career as an automotive technician. It prepares students for the A.S.E. M1, M2 and M3 Examination.

Schedule Description: If you are seeking a career as an automotive engine machinist, this course is for you! This course will give you an introduction to disassembling, cleaning, inspecting, measuring, and machining an automotive engine. The course will prepare you to take the A.S.E. M1, M2 and M3 examination.

Hours/Mode of Instruction: Lecture 36 Lab 108 Total Hours 144

Credit: Credit Degree Applicable (DA)
Credit Non-Degree (NDA)
(If Non-Credit desired, contact Dean.)

Grading: Pass/No Pass (P/NP)
Letter (LR)
Student Choice (SC)

Repeatability: 0

Credit Non-Degree (NDA)
Letter (LR)
Student Choice (SC)

Please apply for:

LMC General Education Requirement and/or Competency & Graduation Requirement(s): None

Transfer to: CSU UC IGETC LDTP Course is Baccalaureate Level: Yes No
Course Outline of Record

Los Medanos College       2700 East Leland Road       Pittsburg CA 94565       (925) 439-2181

Course Title: Automotive Engine Machining       Subject Area/Course Number: AUTO-037

Signatures:

Department Chair ___________________________ Date ____________

Librarian ___________________________ Date ____________

Dean/Sr. Dean ___________________________ Date ____________

Curriculum Committee Chair ___________________________ Date ____________

President/Designee ___________________________ Date ____________

CCCD Approval Date (Board or Chancellor's Office) ___________________________ Date ____________

For Curriculum Committee Use only:

STAND ALONE COURSE: YES NO

FOR OFFICE OF INSTRUCTION ONLY. DO NOT WRITE IN THE SECTION BELOW.

Begin in Semester ________________

Dept. Code/Name: ___________________________ T.O.P.s Code: ________________

Class Max: ___________________________ Crossover course 1/2: ___________________________

ESL Class: ________Yes / No___________ DSPS Class: ________Yes / No___________

Coop Work Exp: ________Yes / No___________ Remediation Level ___________________________

Class Code

- A Liberal Arts & Sciences
- B Developmental Preparatory
- C Adult/Secondary Basic Education
- D Personal Development/Survival
- E For Substantially Handicapped
- F Parenting/Family Support
- G Community/Civic Development
- H General and Cultural
- I Career/Technical Education
- J Workforce Preparation Enhanced
- K Other non-credit enhanced
- L Not eligible for enhanced

Course approved by Curriculum Committee as Baccalaureate Level: ________Yes / No___________

LMC GE or Competency Requirement Approved by the Curriculum Committee: ___________________________
Institutional Student Learning Outcomes

☐ General Education SLOs (Recommended by GE Committee)
At the completion of the LMC general education program, a student will:
1. Read critically and communicate effectively as a writer and speaker.
2. Understand connections among disciplines and apply interdisciplinary approaches to problem solving.
3. Think critically and creatively
4. Consider the ethical implications inherent in knowledge, decision-making and action.
5. Possess a worldview informed by diverse social, multicultural and global perspectives.

☒ Occupational Education SLOs (Recommended by Occupational Education Committee)
At the completion of the LMC occupational certificate or degree, a student will:
1. Be academically prepared to obtain an entry-level or a mid-level position in their industry.
2. Apply critical thinking to research, evaluate, analyze and synthesize information.
3. Demonstrate strong communication skills (written and/or oral) and interpersonal skills (customer service and team work).
4. Appropriately apply industry materials and technology.
5. Demonstrate the skills and knowledge necessary to take and pass certification exams for career advancement in their industry.

☐ Developmental Education SLOs (Recommended by Developmental Education Committee)
At the completion of the LMC Developmental Education Program, a student will:
1. Demonstrate the skills necessary for the first transfer level courses in English and Math or for the English and Math competencies for the Certificate of Achievement.
2. Think critically to construct meaning and solve problems.
3. Read with comprehension.
4. Communicate effectively both in writing and orally.
5. Demonstrate the characteristics, habits, and attitudes of an effective learner.

☐ Student Services SLOs
1. LMC students will demonstrate proficiency in the use of college on-line services.
2. LMC students will demonstrate proficiency in self-advocacy.

☐ Library and Learning Support Services SLOs
LMC students utilizing various Library and Learning Support Services will:
1. Access and effectively utilize available campus Library and Learning Support Services.
2. Apply knowledge learned and competencies gained from using Library and Learning Support Services to academic coursework and assignments.
3. Demonstrate information competency skills needed to meet the research demands of academic course work and life long learning.

☐ None of the Above
Program-Level Student Learning Outcomes (PSLOs)

Automotive Technology Program-Level Student Learning Outcomes:

1. Be prepared to enter the automotive field, as a general repair technician at all general service and repair stations, or apprentice level at the dealership level (manufacture level). (OESLO 1, 3, 4 & 5)

2. Have the ability to locate the appropriate information in repair manuals or online resources necessary to properly diagnose and repair system failures. (OESLO 1, 2, 4 & 5)

3. Demonstrate the ability to understand and use the repair information found in both repair manuals and online resources including wiring diagrams, trouble trees, torque specs, and all other necessary information. (OESLO 1, 2, 4 & 5)

4. Properly diagnose all major automotive systems using manufactures recommended procedures. (OESLO 1, 2, 3, 4 & 5)

5. Demonstrate the ability to properly adjust and repair all major automotive systems. Meet or exceed all manufacture specifications. (OESLO 1, 4 & 5)

6. Be prepared to take and pass all ASE examinations A1 – A8 and the L1 advanced ASE examination. (OESLO 1, 2 & 5)

7. Clearly explain and practice all safety standards with regard to lifting equipment, shop machinery (brake lathe, strut compressor, machining equipment), chemicals, tool usage, and proper procedures regarding oil and chemical disposal. (OESLO 1,3)

Course-Level Student Learning Outcomes (CSLOs):

At the end of the course students will be able to:

1. Perform standard industry shop practices safely and responsibly in preparation for employment. (PSLO 7)

2. Clean, measure and machine engine block, pistons, crankshaft, camshafts, cylinder head, valve, valve guides and springs using tools and machining equipment. (PSLO 1, 5)

3. Use critical thinking to apply engine theory to the analysis, diagnosis, disassembly, reassembly, repair of the engine, the effect on emissions and diesel engines. (PSLO 1,4, 5)

4. Use computer technology and industry materials, procedures, and specifications to diagnose and repair an engine. (PSLO 1, 2, 3)

5. Take the ASE exam M1, M2 and M3. (PSLO 1,7)

Assessments:

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CSLO 1:

Lab assignment: As students complete lab projects they are evaluated for properly using tools safely, maintaining a safe work environment and keeping tools clean and organized
CSLO 2:

Lab assignment: Assignments in the Machining lab will include cleaning, measuring of engine blocks, pistons, crankshafts, camshafts, cylinder heads, valves, and valve guides and springs. The instructor will assess the students’ ability to complete lab assignments within the manufacture specifications.

CSLO 3:

Midterms and Final: Exams will follow ASE format (industry test standards). Midterm and Final exams will be used to assess the student’s knowledge regarding applying engine theory to the analysis, diagnosis, disassembly, reassembly, repair of the engine, the effect on emissions and diesel engines.

Homework: Homework assignments are assigned from required reading within the courses textbook regarding repair information found in both repair manuals and online resources including wiring diagrams, trouble trees, torque specs, and all other necessary information. Assignments may be based in short quiz format or written question format dependent upon the content of the chapter. 

Example: When removing, cleaning, and inspecting aluminum cylinder heads, some special precautions must be observed. Give two of these precautions and explain why they are important.

CSLO 4:

Homework: Homework assignments are assigned from required reading within the courses textbook regarding using computer technology and industry materials, procedures, and specifications to diagnose and repair an engine. Assignments may be based in short quiz format or written question format dependent upon the content of the chapter.

Lab assignment: lab assignments, including the proper completion in the rebuild according to manufacturers’ procedures.

CSLO 5:

Midterms and Final: (ASE exam M1, M2 and M3prep): Exams will follow ASE format (industry test standards). Exams will assess the students’ knowledge of machining processes and ability to rebuild engines to like new conditions according to industry standards.

Method of Evaluation/Grading

A level student work is characterized by: exams that name the tooling components, the proper use of machining systems and identify all engine machining processes at 90% or above; lab assignments that perform all engine machining processes (engine boring, cylinder honing, block and head resurfacing, valve guide and seat servicing, piston and rod servicing) with minimal guidance; and in detail clearly and accurately communicate verbally and in written form the cause and required repair for block and head failure.
C level student work: exams that name the tooling components, the proper use of machining systems and identify all engine machining processes at 70% to 79.9%; lab assignments that perform all engine machining processes (engine boring, cylinder honing, block and head resurfacing, valve guide and seat servicing, piston and rod servicing) with guidance; and accurately communicate verbally and in written form the cause and required repair for block and head failure with guidance.

Student progress in this course will be evaluated through written examinations covering required text materials, and lab projects required for all students. The evaluation will consist of:

- Homework: 60 points
- 2 Midterm exams: @ 100 points = 200 points
- 1 final exam: @ 100 points = 100 points
- Total: 360 points

Lab Projects:
- Block Servicing: 80 points
- Head Servicing: 80 points
- Engine assemble: 80 points
- Total: 240 points

Grades will be assigned based on student performance and total points accumulated. The general grading scale, which will be applied, is as follows:

- A = 540 — 600 points
- B = 480 — 539 points
- C = 420 — 479 points
- D = 360 — 419 points
- F = Below 359 points

CSLO Weighting:
- CSLO 1 = 10%
- CSLO 2 = 20%
- CSLO 3 = 30%
- CSLO 4 = 20%
- CSLO 5 = 20%

Course Content:
Lab and lecture content is the same.

UNIT I: Introduction:
- A. Orientation
- B. Safety
- C. Course Objectives
- D. Shop Orientation
- E. Demonstration of machining equipment

UNIT II: Hand tools and Measuring Instruments:
- A. Hand tools
- B. Micrometers
- C. Dial Bore Gauge
- D. Precision Straightedge
UNIT III: Disassemble and Engine Cleaning:
A. Hand Cleaning
B. Jet Washer
C. Glass Bead Blasting
D. Hazardous Waste Disposal

UNIT IV: Measurement Inspection:
A. Piston and Cylinder Wall
B. Crankshaft and Connecting Rod
C. Valve Guide and Valve Stem
D. Camshaft and Camshaft Accessories
E. Valve Spring
F. Main Bearing
G. Cylinder Head and Manifold Warpage

UNIT V: Locating Cracks and Repair:
A. Pressure Testing
B. Submerge Testing
C. Magnetic Testing
D. Dye Penetrate testing
E. Cast Iron Pinning
F. Welding

UNIT VI: Block Reconditioning:
A. Cylinder Wall
B. Connecting Rods
C. Crankshaft
D. Piston and Rings
E. Cam and Lifters

UNIT VII: Cylinder Head Reconditioning:
A. Cylinder Head
B. Valve Guide
C. Valve Spring
D. Rocker Arm
E. Valve Face and Seat
F. Camshaft and Camshaft Accessories

UNIT VIII: Oil Pumps:
A. Construction
B. Operation
C. Regulation

UNIT IX: Engine Assembling and Break-In:
A. Block Assembling
B. Head Assembling
C. Engine Sealing
D. Engine Balancing

UNIT X: Emissions And Diesels
A. Emissions
B. Diesels
Instructional Methods:

- Lecture
- Lab
- Activity
- Problem-based Learning/Case Studies
- Collaborative Learning/Peer Review
- Demonstration/Modeling
- Role-Playing
- Discussion
- Computer Assisted Instruction
- Other (explain) ________________________________

Textbooks:
Automotive Engines: Theory and Servicing, 7th ed.
By James D. Halderman