

**STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK**



MASTER SYLLABUS

AUTO 218- Automotive Engine Repair

CIP Code: 47.0604

Created by: Christopher Mayville

Updated by:

**CANINO SCHOOL OF ENGINEERING TECHNOLOGY
AUTOMOTIVE TECHNOLOGY
SPRING 2023**

A. TITLE: Automotive Engine Repair

B. COURSE NUMBER: AUTO 218

C. CREDIT HOURS (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity):

Credit Hours: 3

Lecture Hours 2 per Week

Lab Hours 3 Week

Other per Week

Course Length (# of Weeks): 15

D. WRITING INTENSIVE COURSE: Yes

E. GER CATEGORY: NONE

Does the course satisfy more than one GER (General Education Requirement) category?
If so, which one?

F. SEMESTER(S) OFFERED: Fall

G. COURSE DESCRIPTION:

This course provides instruction regarding the operation of the gasoline internal combustion engine. Instruction will build on the basic engine construction and operation learned in Automotive Service and Engine Performance I with an understanding of the effects of dynamics and engine operation on fluids, metals, combustion, and heat transfer. Students perform repair and maintenance procedures on the various systems and components of automotive engines.

H. PRE-REQUISITES: Yes

AUTO 113, AUTO 114, ENGL 101 or ENGL 102, MATH 101 or higher

CO-REQUISITES:

I. STUDENT LEARNING OUTCOMES:

<u>Course Student Learning Outcome [SLO]</u>	<u>PSLO</u>	<u>GER</u>	<u>ISLO</u>
Demonstrate an understanding of the construction and maintenance of an automotive engine	ALO 1		ISLO 2, ISLO 5
Hypothesize how variables in compression ratio, volumetric efficiency, and fluid dynamics affect the operation of an engine	ALO 1		ISLO 2
Select and accurately read the correct measuring device for inspecting engine components	ALO 2		ISLO 5

Apply knowledge to repair components of an automotive engine	ALO 2		ISLO 1, ISLO 2, ISLO 5
Apply the use of special tools necessary in repairing an automotive engine	ALO 1		ISLO 5
Document and communicate understanding of lab activities effectively through a series of writing assignments	ALO 1		ISLO 1, ISLO 2

KEY	<u>Institutional Student Learning Outcomes</u> <u>[ISLO 1 - 5]</u>
ISLO #	ISLO & Subsets
1	Communication Skills Oral [O], Written [W]
2	Critical Thinking <i>Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS]</i>
3	Foundational Skills <i>Information Management [IM], Quantitative Lit, /Reasoning [QTR]</i>
4	Social Responsibility <i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i>
5	Industry, Professional, Discipline Specific Knowledge and Skills

J. APPLIED LEARNING COMPONENT: Yes x No

If yes, select one or more of the following categories:

Classroom/Lab x
 Internship
 Clinical Practicum
 Practicum
 Service Learning
 Community Service

Civic Engagement
 Creative Works/Senior Project
 Research
 Entrepreneurship
 (Program, class, project)

K. TEXTS:

Automotive Engines: Theory and Servicing, 10th Edition, James D. Halderman, Pearson, 2023

L. REFERENCES: Shop Key Pro, AllData, factory service manuals

M. EQUIPMENT: Standard automotive lab equipment, precision measurement tools, engine repair special tools, engine machining and refurbishing tools

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS: Exams, quizzes, assignments-homework, participation, Final, Midterm, lab tasks

P. DETAILED COURSE OUTLINE:

1. Gasoline engine operation, parts, and specifications

- a. Four-stroke theory review
- b. Displacement
- c. Compression Ratio
- d. Volumetric Efficiency
- e. Metallurgy
- f. Power calculations

2. In-vehicle Engine Service

- a. Determine in-vehicle service vs engine removal requirements
- b. Component access considerations
- b. Cleaning and inspection

3. Engine Removal and Disassembly

- a. Organization
- b. Order of operations
- c. Record keeping
- d. Preventing damage
- e. Use of special tools

4. Measurement and Fasteners

- a. Reading precision measurement tools
- b. Tolerances
- c. Fastener replacement
- d. Fastener loosening and tightening

5. Cylinder Heads

- a. Combustion chamber design
- b. Inspection
- c. Removal and installation

6. Valve train operation and service

- a. Camshaft and valvetrain configurations
- b. Valve and seat geometry
- c. Valve train dimensions
- d. Camshaft, lifter, rocker arm, and follower design
- e. Clearance adjustment
- f. Camshaft and valve train measurement

7. Cleaning, inspection, and crack detection

- a. General parts cleaning procedures and precautions

- b. Visual part inspection**
 - c. Magna-flux**
 - d. Die penetrant**
- 8. Pistons, Rings, and Connecting Rods**
 - a. Piston design**
 - b. Piston ring design**
 - c. Connecting rod design**
 - d. Piston to cylinder clearance**
- 9. Crankshafts and bearings**
 - a. Crankshaft design**
 - b. Plain bearing design**
 - c. Oil clearance**
- 10. Engine Blocks**
 - a. Materials and manufacturing methods**
 - b. Cylinder linings**
 - c. Cylinder measurement and inspection**
 - d. Cylinder boring and honing**
- 11. Cooling and Lubrication**
 - a. Heat transfer**
 - b. Cooling jacket configuration**
 - c. Lubrication system construction**
 - d. Oil characteristics and categorization**
 - d. Oil pressure testing**
- 12. Gaskets and sealing**
 - a. Gasket materials and application**
 - b. Seal design and construction**
 - c. Thread sealants**
- 13. Balancing and Blueprinting**
 - a. Weighing and balancing pistons and rods**
 - b. Discussion of crankshaft balancing**
 - c. Component clearance specifications and tolerances**
- 14. Engine assembly and testing**
 - a. Cleanliness**
 - b. Organization**
 - c. Final inspection**

Q. LABORATORY OUTLINE:

- 1. Precision measurement**
 - a. Dial indicators**
 - b. Calipers**
 - c. Micrometers**
 - d. Telescoping gages**
 - e. Feeler gages**
 - f. Surface plates**
 - g. Plastigage**
- 2. Engine covers, gaskets, seals, and sealers**
 - a. Engine cover removal and installation**
 - b. Gasket surface separation**
 - c. Gasket material removal**
 - d. Sealant selection**
 - e. Seal removal and installation**

- 3. Engine mounts**
 - a. Removal and installation**
 - b. Inspection**
- 4. Harmonic balancer**
 - a. Removal and installation**
 - b. Inspection**
- 5. Intake and exhaust systems**
 - a. Removal and installation**
 - b. In-vehicle service considerations**
- 6. Cylinder head removal, inspection, and installation**
 - a. Loosening sequence**
 - b. In-vehicle service considerations**
 - c. Warpage and crack detection**
 - d. Tightening sequence and torque**
- 7. Valvetrain inspection**
 - a. Valve, seat, and guide inspection and measurement**
 - b. Valve spring inspection**
- 8. Valve Adjustment**
- 9. Camshaft and drive mechanism inspection and timing**
 - a. Camshaft lift and duration measurement**
 - b. Camshaft bearing clearance**
 - c. Chain inspection**
 - d. Chain guide removal, inspection, and installation**
 - e. Mechanical timing**
 - f. Tensioners**
- 10. Pistons, Connecting Rods, and Crankshafts**
 - a. Identification and organization**
 - b. Piston ring removal and installation**
 - c. Measurement and inspection**
- 11. Engine components and configurations**
- 12. Lubrication and cooling systems**
 - a. Cooling and oil passage identification, inspection, and cleaning**
 - b. Water pump removal and installation**
- 13. Oil pressure and temperature**
 - a. Oil pressure test**
 - b. Oil pressure and oil temperature sensor removal and installation**