Las Positas College
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Course Outline for NAUT A1

ENGINE REPAIR

Effective: Fall 2021

I. CATALOG DESCRIPTION:
NAUT A1 — Noncredit

An in depth study of engines: mechanical, measurement, and assembly. A study of the above mentioned components including theory, teardown, evaluate, qualifying, and rebuilding. This class' emphasis is on engines. Students are encouraged to enroll in Automotive Lab concurrently.

Prerequisite
AUTO INTR - Automotive Service and Introduction
with a minimum grade of C
(May be taken concurrently)
or

NAUT INTR - Automotive Service and Introduction
with a minimum grade of C
(May be taken concurrently)
or

AUTO INTL - Automotive Service and Introduction Hands-On Lab
with a minimum grade of C
(May be taken concurrently)
and

AUTO INTZ - Automotive Service and Introduction Lecture
with a minimum grade of C
(May be taken concurrently)

Grading Methods:
Pass/No Pass

Discipline:
- Automotive Technology

Noncredit Category
J - Workforce Preparation

	MIN
Total Noncredit Hours:	144.00

II. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. AUTOINTR
1. Utilize and apply hazardous waste handling;
2. Identify and describe uses of automotive related tools;
3. Describe the importance of preventative maintenance and inspection procedures as they relate to the automobile;
4. Discuss four stroke engine cycle and identify engine parts;
5. Perform basic engine teardown and reassembly;

B. NAUTINTR
1. Utilize and apply hazardous waste handling;
2. Identify and describe uses of automotive related tools;
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5. Perform basic engine teardown and reassembly;

D. AUTOINTZ

1. Identify and describe uses of automotive related tools;
2. Describe the importance of preventative maintenance and inspection procedures as they relate to the automobile;
3. Discuss four stroke engine cycle and identify engine parts;

III. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Demonstrate the basic safety procedures of handling hazardous waste materials.
B. Explain the history of powertrain evolution.
C. Operate a wide variety of precision measurement equipment.
D. Explain four cycle engine theory and identify key components involved.
E. Teardown typical engine assembly.
F. Take measurements of engine components and compare to specifications.
G. Qualify new and used engine components.
H. Rebuild engine to manufacturer specifications.
I. Explain Ohm's Law.
J. Demonstrate Ohm's Law in practice, series, parallel circuits.
K. Maintain a clean and professional environment.

IV. CONTENT:

A. Safety
    1. Tool usage and nomenclature
    2. Proper disposal procedures
    3. Environmentally conscious decisions
B. Powertrain evolution
    1. The first four cycle engines
    2. Current engines
    3. Horsepower and emission trade offs
    4. Environmental decisions driving design
    5. The first automatic transmissions
    6. Current automatic transmissions
        a. More gear ratios
        b. Different fluids
        c. Internal design improvements
C. Measurement tools
    1. Micrometer
        a. Vernier
        b. Caliper
    2. Dial bore gauge
    3. Snap gauges
    4. Straight edge
    5. Feeler gauges
    6. Hole gauges
D. Four cycle engine theory
    1. Intake, compression, power, exhaust
        a. 360 degrees in one degree intervals
        b. Valve overlap
        c. Timing concerns and tricks
        d. Street vs. racing
    2. DOHV vs. OHV vs. Valve in block design
        a. Pros and cons of each
        b. Current technology
    3. Key Valve train components
    4. Key bottom end components
    5. Camshaft timing
        a. Static camshaft
        b. Dynamic camshaft
        c. Electronic valves
    6. Crankshaft design and balance
    7. Cylinder head design
        a. Single valve
        b. Multiple valve
E. Engine Teardown
    1. Removal and identification of external components
        a. Special procedures
            1. Loosening sequence
    2. Removal and identification of internal components
        a. Special Procedures
            1. Loosening sequence
F. Component measurement
    1. Specification lookup
    2. Comparison
        a. Component diagnosis
            1. Failure analysis
G. Evaluation of replacement components
    1. Correct component?
    2. New and used part comparison
H. Engine rebuilding
    1. Manufacturer Procedures
        a. Component sequence
        b. Torque specifications
        c. Tightening sequences
        d. Special concerns
            1. Assembly lube
            2. Gaskets and sealers
    2. Dynamic engine torque
    3. Proper engine timing
        a. Camshaft to crankshaft
        b. Crankshaft to balance shaft

I. Ohm's Law
    1. Series Circuits
    2. Parallel Circuits
    3. Voltage Drop
    4. Resistance
    5. Amperage draw
J. Professionalism
    1. Safety glasses
    2. Working shop expectations
    3. Attitude
    4. Cleanliness
    5. Maintenance of work areas and tools

V. LAB CONTENT:
A. Safety
    1. Tool usage and nomenclature
    2. Proper disposal procedures
    3. Environmentally conscious decisions
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    1. The first four cycle engines
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    2. Working shop expectations
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VI. METHODS OF INSTRUCTION:
A. **Lab** - Group and individual laboratory activities
B. **Lecture** -

VII. TYPICAL ASSIGNMENTS:
A. Lecture based assignments
    1. Lecture on Engine Construction
B. Lab based assignments
    1. Remove cylinder heads and check for specifications
C. Text reading assignments
    1. Read Chapter One in text

VIII. EVALUATION:
Methods/Frequency

A. Exams/Tests
    monthly
B. Quizzes
    weekly
C. Lab Activities
    weekly

IX. TYPICAL TEXTS:
1. Johanson, Chris. *Auto Engine Repair.* 5 ed., Goodheart Wilcox, 2021.
2. Duffy, James. *Modern Automotive Technology.* 9 ed., Goodheart Wilcox, 2020.

X. OTHER MATERIALS REQUIRED OF STUDENTS:
A. Safety Glasses