Las Positas College
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Course Outline for NAUT A7

AUTOMOTIVE HEATING AND AIR CONDITIONING

Effective: Fall 2021

I. CATALOG DESCRIPTION:
NAUT A7 — Noncredit

Diagnosing, evaluation, testing, adjustment, and repair of heating, ventilation and air conditioning (HVAC). Includes heat and energy, psychometrics, air flow, refrigerant recycling, equipment and controls. Student will be prepared to pass a nationally recognized HVAC certificate program, required by all California HVAC repair shops. Students are strongly recommended 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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
5. Discuss braking systems, perform a brake inspection, identify parts;
6. Identify different transmissions, understand theory of operation of both manual and automatic transmissions and fluid requirements;

B. NAUTINTR
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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
5. Discuss braking systems, perform a brake inspection, identify parts;
6. Identify different transmissions, understand theory of operation of both manual and automatic transmissions and fluid requirements;

C. AUTOINTL
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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
5. Discuss braking systems, perform a brake inspection, identify parts;
6. Identify different transmissions, understand theory of operation of both manual and automatic transmissions and fluid requirements;

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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
4. Discuss braking systems, perform a brake inspection, identify parts;
5. Identify different transmissions, understand theory of operation of both manual and automatic transmissions and fluid requirements;

III. MEASURABLE OBJECTIVES:

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

A. Obtain and interpret Service Information, Tools, Safety;
B. Diagnose the causes of HVAC system concerns resulting from malfunctions in the computerized HVAC control system with or without diagnostic trouble codes;
C. Chart, inspect, and test computerized HVAC control system sensors, HVAC control module, actuators, and circuits using a digital-multi-meter (DMM) on board diagnostic scan tool, and perform necessary action;
D. Access and use service information to perform step-by-step diagnosis;
E. Evaluate and adjust HVAC system controls;
F. Assess cooling system performance;
G. Outline common repairs to the engine cooling systems;
H. Perform Air conditioning (AC) evacuation and recharge;
I. Diagnose malfunctions of vacuum and motor driven mode door;
J. Pass HVAC certification test;
K. Outline hazardous waste handling;
L. Distinguish safe shop environment.

IV. CONTENT:

A. Service Information, Tools and Safety
1. Interpretation of information
a. Factory set procedures
b. Develop own diagnostic procedures
B. Environmental and Hazardous Materials
C. Heating and Air Conditioning Principles
D. HVAC Parts and Operation
E. A/C Compressors and Clutches
F. Refrigerant and Oil Types and Handling
G. A/C System Components and Operation
H. Air Flow Management System
I. HVAC Electrical Circuits and Schematics
J. Advanced Electrical HAVC systems
K. Engine Cooling System Parts and Operation
L. Heater System Operation and Diagnosis
M. Automatic Temperature Control Systems
N. Hybrid Electric Vehicle HVAC Systems
O. Maintenance and Light Repair HVAC Inspection
P. Refrigerant Recovery, Recycling and Handling
Q. A/C System Diagnosis and Service
R. Nationally Recognized HAVC Certification Test
1. IMACA
2. ASE

V. LAB CONTENT:

A. Service Information, Tools and Safety
1. Interpretation of information
a. Factory set procedures
b. Develop own diagnostic procedures
B. Environmental and Hazardous Materials
C. Heating and Air Conditioning Principles
D. HVAC Parts and Operation
E. A/C Compressors and Clutches
F. Refrigerant and Oil Types and Handling
G. A/C System Components and Operation
H. Air Flow Management System
I. HVAC Electrical Circuits and Schematics
J. Advanced Electrical HAVC systems
K. Engine Cooling System Parts and Operation
L. Heater System Operation and Diagnosis
M. Automatic Temperature Control Systems
N. Hybrid Electric Vehicle HVAC Systems
O. Maintenance and Light Repair HVAC Inspection
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R. Nationally Recognized HAVC Certification Test
1. IMACA
2. ASE

VI. METHODS OF INSTRUCTION:

A. **Lecture** -
B. **Lab** - Student Hands-on laboratory activities and assignments
C. **Audio-visual Activity** - PowerPoint presentations, Mockup parts from automotive

VII. TYPICAL ASSIGNMENTS:

A. Lecture based assignments
    1. Text reading
    2. Oral presentation
    3. Class discussion
B. Lab based assignments:
    1. Completion of applied activities
    2. Lab activity worksheet
    3. Diagnosis and debugging
    4. Student Lab work sheets with emphasis on Hands-on applications
    5. Review of Lab sheets in both Lab and class settings
C. Text reading assignments
    1. Class discussions of reading assignments
    2. Demonstrations pertaining to reading assignments

VIII. EVALUATION:
Methods/Frequency

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

IX. TYPICAL TEXTS:
1. Johanson, Chris. *Auto Heating and Air Conditioning.* 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