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## Course Outline for APAU 97A

### AUTOMOTIVE SERVICE

Effective: Spring 2017

#### I. CATALOG DESCRIPTION:

APAU 97A — AUTOMOTIVE SERVICE — 3.33 units

Bumper to Bumper Automotive Knowledge. Starting with hazardous waste handling, tool identification, maintenance and lubrication, moving into engine mechanical, emissions controls, suspension systems, air conditioning, airbags and safety, transmissions, axles, and finishing off with the future of the automotive industry. This is an introductory class for people who want to know more about their vehicle or who are planning an automotive career. Only students who are part of the automotive apprenticeship may enroll in an APAU class. 2 hours lecture, 3 hours laboratory.

2.33 Units Lecture 1.00 Units Lab

#### Grading Methods:

#### Discipline:

	<b>MIN</b>
<b>Lecture Hours:</b>	41.94
<b>Lab Hours:</b>	54.00
<b>Total Hours:</b>	95.94

#### II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

#### III. PREREQUISITE AND/OR ADVISORY SKILLS:

#### IV. MEASURABLE OBJECTIVES:

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

1. 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. understand four stroke engine cycle and identify engine parts
5. perform basic engine teardown and reassembly
6. apply Ohms law, read basic schematics, test automotive electrical systems
7. identify emissions components, understand 5 gas theory
8. describe heating and cooling systems, perform basic cooling systems tests
9. identify air conditioning systems, understand cycles of refrigerant
10. explain braking systems, perform a brake inspection, identify parts
11. differentiate between suspension and steering system types, inspect and qualify components
12. identify different transmissions, understand theory of operation of both manual and automatic transmissions and fluid requirements
13. identify system identification, know safety concerns of each system and inspection of restraint systems
14. theorize on the future of the automotive industry

#### V. CONTENT:

- A. Safety and Handling of hazardous waste materials
  1. Occupational Safety Health Administration (OSHA) Shop standards applied.
  2. Industry safety standards applied.
  3. Hazardous material handling; waste oil, as well as other chemicals related to the automobile
- B. Tool Identification
  1. Ratchets, Sockets, Wrenches, Screwdrivers
  2. Torque Wrenches
  3. Hammers, Pliers
  4. Specialty Tools
- C. Maintenance and inspection
  1. Manufacturing recommendations.
  2. Periodic inspections for unusual conditions.
  3. Component failure inspections
  4. Chassis lubrication
  5. Engine oil changes
    - a. Oil Types, Conventional and Synthetic
    - b. Oil change intervals
    - c. Theory

- d. On car application
- 6. Fluid inspection and service
  - a. Leaks
  - b. Power steering
  - c. Transmission
  - d. Axles
  - e. Washer
  - f. Coolant/Antifreeze
  - g. On car application
- D. Operational theory Four stroke Engine Cycle
  - 1. Intake
  - 2. Compression
  - 3. Power
  - 4. Exhaust
  - 5. Timing
    - a. Spark
    - b. Camshaft
- E. Gasoline Engine Component Identification and Teardown
  - 1. History of design and metallurgy of engines
  - 2. Engine Block components
  - 3. Cylinder Head components
  - 4. Intake, Exhaust and other major bolt on components
- F. Electrical Systems
  - 1. Ohms law Theory
  - 2. Electrical Schematic Icons and drawings
  - 3. Battery Basics
  - 4. Alternator/Generator Basics
  - 5. Starter Motor Basics
  - 6. Electrical Testing
    - a. Battery
      - 1. Theory
      - 2. On car application
    - b. Alternator
      - 1. Theory
      - 2. On car application
    - c. Starter
      - 1. Theory
      - 2. On car application
- G. Emissions Systems
  - 1. Parts Identification
  - 2. Parts Theory
  - 3. Reading Emissions Labels
  - 4. 5 gas Theory
  - 5. Smog Controls
    - a. California and Federal Requirements
    - b. History of the Smog Program
    - c. Government and Manufacturer laws and regulations
  - 6. Environmental Responsibilities
- H. Heating and Cooling
  - 1. History and current innovations of heating and cooling systems
  - 2. Parts Identification
  - 3. Heating Theory and operation
  - 4. Heating Systems Testing
    - a. Theory
    - b. On car application
  - 5. Coolant Systems Testing
    - a. Theory
    - b. On car application
- I. Air Conditioning Systems
  - 1. Environmental concerns
  - 2. Parts Identification
  - 3. Parts Theory
  - 4. On car Testing and inspection procedures and application
- J. Braking systems
  - 1. Base Systems
    - a. Brake systems history and improvements through time
    - b. Fluid differences and cautions
    - c. Parts Identification
    - d. Parts Theory
    - e. On car inspection procedures
      - 1. Government and Manufacturer laws and regulations
    - f. On car application
  - 2. Antilock Systems
    - a. Differences from base systems
    - b. Theory of operation
    - c. Parts Identification
- K. Steering and Suspension Systems
  - 1. Historical information and current technology
  - 2. Steering
    - a. Fluid usage current and historical
    - b. Different steering systems
    - c. Parts Identification
    - d. Parts theory
    - e. On car inspection procedures and application
      - 1. Government and Manufacturer laws and regulations
  - 3. Steering
    - a. Different suspension systems
    - b. Parts Identification
    - c. Parts theory
    - d. On car inspection procedures and application

- L. Transmissions and Axles
  - 1. History of the transmission
  - 2. Automatic Transmissions
    - a. Fluid Requirements
      - 1. On Car fluid checking
    - b. Operational Theory
    - c. Gears sets
    - d. Clutches, Bands and Sprags
    - e. Torque Converters
  - 3. Manual Transmissions
    - a. Fluid Requirements
    - b. Operational Theory
    - c. Clutch
    - d. Gears
  - 4. Front and Rear Axles
    - a. Fluid Requirements
    - b. Operational Theory
    - c. Ring Gear
    - d. Pinion Gear
    - e. Propshafts
  - 5. Transfer Cases
    - a. Fluid Requirements
    - b. Electronic and Manual
    - c. Operational Theory
    - d. Clutches
    - e. Gears
- M. Safety Restraints
  - 1. Seat Belts
    - a. Installation Concerns
    - b. Inspection and Replacement
  - 2. Airbags
    - a. History of Airbags and current technology
    - b. Parts Identification
    - c. Parts Theory
    - d. Inspection and Replacement
    - e. Current Government Regulations
    - f. Airbag deployment demonstration
- N. Automotive Industry Future
  - 1. Environmental Concerns
  - 2. Oil Supply Concerns
    - a. Middle East Stability
    - b. How much is left?
  - 3. Electronic Integration
    - a. Computers
    - b. Steering
    - c. Braking
    - d. Parking
    - e. Heads up Displays
    - f. Navigation
    - g. Entertainment Systems
    - h. Communication Systems
    - i. Optical Systems
  - 4. Alternative Fuels
    - a. CNG
    - b. Propane
    - c. Bio-Diesel
    - d. E85
    - e. Hydrogen
  - 5. Hybrids
    - a. Gasoline/Electric
    - b. Diesel/Electric
    - c. Hydrogen/Electric

#### VI. METHODS OF INSTRUCTION:

- A. **Discussion** - Group discussions
- B. **Audio-visual Activity** - 1. PowerPoint presentations 2. Mockup parts from automobiles
- C. **Lecture** -
- D. **Lab** - Student Hands-on laboratory activities and assignments
- E. **Lecture** -

#### 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. Demonstrations of skill competences

#### VIII. EVALUATION:

##### A. **Methods**

- 1. Exams/Tests
- 2. Quizzes
- 3. Projects
- 4. Class Participation
- 5. Home Work
- 6. Lab Activities
- 7. Other:
  - a. Class participation
  - b. Performance of Lab projects
  - c. Home work assignment completion

- d. Professionalism of student in shop practices, including safety, maintenance of work areas, and customer service.
- e. Lab assignments from text and instructor
- f. Quizzes: Midterm and Final examination
  - 1. Typical exam questions:
    - a. When should the customer change oil?
      - 1. Only when needed.
      - 2. When the oil life indicator comes on.
      - 3. Every three thousand miles.
      - 4. Manufacturer Specifications.
    - b. On a visual inspection you have found no oil on the index. You should?
      - 1. Add oil.
      - 2. Perform a routine Service.
      - 3. Look for reason no oil was found.
      - 4. Do nothing.

**B. Frequency**

- 1. Weekly Quizzes
- 2. Weekly Lab Assignments
- 3. Midterm
- 4. Final

**IX. TYPICAL TEXTS:**

- 1. Duffy, James *Modern Automotive Technology.*, Goodheart-Wilcox Publishing, 2004.
- 2. Duffy, James *Modern Automotive Technology WORKBOOK.*, Goodheart-Wilcox Publishing, 2004.

**X. OTHER MATERIALS REQUIRED OF STUDENTS:**

- A. Safety glasses