

**Course Outline for NAUT A2**  
**AUTOMATIC TRANSMISSION/TRANSAXLE**

**Effective: Fall 2021**

**I. CATALOG DESCRIPTION:**  
 NAUT A2 — Noncredit

An in depth study of engine, transmission, transaxles: mechanical, measurement, and assembly. An in-depth study of the above mentioned components including theory, teardown, evaluate, qualifying, and rebuilding. 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

	<b>MIN</b>
<b>Total Noncredit Hours:</b>	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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
4. Discuss heating and cooling systems, perform basic cooling systems tests;
5. 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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
4. Discuss heating and cooling systems, perform basic cooling systems tests;
5. 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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
4. Discuss heating and cooling systems, perform basic cooling systems tests;

5. 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. Apply Ohm's law, read basic schematics, test automotive electrical systems;
  3. Discuss heating and cooling systems, perform basic cooling systems tests;
  4. 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. 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 transmission gear ratio and hydraulic theory.
- E. Teardown typical transmission assembly.
- F. Take measurements of transmission components and compare to specifications.
- G. Qualify new and used transmission components
- H. Rebuild transmission to manufacturer specifications.
  - I. Maintain a clean and professional environment.
- J. Demonstrate Ohm's law in practice
- K. Test transmission valve bodies and diagnose issues

### IV. CONTENT:

- A. Safety
  1. Tool usage and nomenclature
  2. Proper disposal procedures
  3. Environmentally conscious decisions
- B. Powertrain evolution
  1. Horsepower and emission trade offs
  2. Environmental decisions driving design
  3. The first automatic transmissions
  4. 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. Automatic Transmission Theory
  1. Gear Ratios
    - a. Shift Points
    - b. Planetary gear sets
    - c. Valves
    - d. Clutches
    - e. Sprags
  2. Hydraulics
    - a. Basic and advanced hydraulics
    - b. Hydraulic control components
    - c. Fluid pressures
      1. Line
      2. Apply
      3. Release
      4. Clutch
      5. Accumulator
      6. Torque
      7. Servo
      8. D4, D3, D2, D1
  3. Other Components
    - a. Final Drives
    - b. Torque converters
    - c. Apply systems
    - d. Differential components
    - e. Electrical components
      1. TCM, THECM, PCM
      2. Fluid temperature sensor
      3. TISS and TOSS
      4. TCC
      5. PRNDL
- E. Transmission Teardown
  1. Removal and identification of FWD
    - a. Special procedures
  2. Removal and identification of RWD
    - a. Special procedures
- F. Component measurement
  1. Specification lookup
  2. Comparison
    - a. Component diagnosis
      1. Failure analysis
- G. . Qualification of replacement components
  1. Correct component?
  2. New and used part comparison

- H. Transmission rebuilding
  - 1. Manufacturer Procedures
    - a. Component sequence
    - b. Torque specifications
    - c. Tightening sequences
    - d. Special concerns
  - 2. Assembly lube
  - 3. Gaskets and sealers
- I. Ohm's law
- J. Valve body diagnosis
- K. 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
- B. Powertrain evolution
  - 1. Horsepower and emission trade offs
  - 2. Environmental decisions driving design
  - 3. The first automatic transmissions
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  - 3. Other Components
    - a. Final Drives
    - b. Torque converters
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      - 1. TCM, THECM, PCM
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- 3. Gaskets and sealers
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  - 4. Cleanliness
  - 5. Maintenance of work areas and tools

VI. METHODS OF INSTRUCTION:

- A. **Lab** - Group and individual laboratory activities
- B. **Lecture** -

VII. TYPICAL ASSIGNMENTS:

- A. Lecture based assignments
  - 1. Lecture on Automatic transmission clutch packs
- B. Lab based assignments
  - 1. Remove and measure clutch pack travel, reassemble.
- C. Text reading assignments
  - 1. Read Chapter One.

VIII. EVALUATION:

**Methods/Frequency**

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

IX. TYPICAL TEXTS:

- 1. Johanson, Chris. *Automatic Transmissions and transaxles*. 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