



South Portland, Maine 04106

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Title: **Automatic Transmissions & Transaxles**

Catalog Number: **AUTO-265**

Credit Hours: **4**

Lecture (or Lab): **2 hours lecture / 2 hours lab**

Instructor: **Doug Arnold**

Total Contact Hours: **30 / 60**

Office: **207-741-5924**

E-mail: **darnold@smcme.edu**

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## Course Syllabus

### Course Description

This course will cover automatic transmission theory, diagnosis, and repair. Students will perform full in-vehicle and off-vehicle transmission inspection, and apply critical thinking skills, utilizing service information, to diagnose problems and determine necessary corrective action. Students will disassemble an automatic transmission, inspect for failed parts and rebuild transmission to operating condition. Prerequisites: AUTO-205, AUTO-215.

### Course Objectives

After completing this course, the student will be familiar with all tasks listed below. He or she must perform all high priority tasks to manufacturer's specifications and document the completion of each task.

### NATEF 2013 Standards tasks for this course:

#### II. AUTOMATIC TRANSMISSION AND TRANSAXLE

**For every task in Automatic Transmission and Transaxle, the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.**

#### A. General: Transmission and Transaxle Diagnosis

1. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action. P-1
2. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
3. Diagnose fluid loss and condition concerns; determine necessary action. P-1
4. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1
5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1
6. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action. P-1

7. Diagnose noise and vibration concerns; determine necessary action. P-2
8. Perform stall test; determine necessary action. P-3
9. Perform lock-up converter system tests; determine necessary action. P-3
10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1
11. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-1
12. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-2

#### B. In-Vehicle Transmission/Transaxle Maintenance and Repair

1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2
2. Inspect for leakage; replace external seals, gaskets, and bushings. P-2
3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses. P-1
4. Drain and replace fluid and filter(s). P-1
5. Inspect, replace and align powertrain mounts. P-2

#### C. Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-1
2. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings. P-1
3. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2
4. Describe the operational characteristics of a continuously variable transmission (CVT). P-3
5. Describe the operational characteristics of a hybrid vehicle drive train. P-3
6. Disassemble, clean, and inspect transmission/transaxle. P-2
7. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, checkvalves/balls, screens, spacers, and gaskets). P-2
8. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action. P-2
9. Assemble transmission/transaxle. P-2
10. Inspect, measure, and reseal oil pump assembly and components. P-2
11. Measure transmission/transaxle end play or preload; determine necessary action. P-1
12. Inspect, measure, and replace thrust washers and bearings. P-2
13. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls. P-2
14. Inspect bushings; determine necessary action. P-2
15. Inspect and measure planetary gear assembly components; determine necessary action. P-2
16. Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action. P-2
17. Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action. P-2
18. Inspect, measure, repair, adjust or replace transaxle final drive components. P-2

19. Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates, bands and drums; determine necessary action. P-2
20. Measure clutch pack clearance; determine necessary action. P-1
21. Air test operation of clutch and servo assemblies. P-1
22. Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, retainers; determine necessary action. P-2

### **Topical Outline of Instruction**

- Driveline overview
- Automatic Fluids
- Planetary Gear Assemblies
- Electrical / Hydraulic controls
- Torque Converter
- Pump Assemblies

### **Course Requirements**

- Students will develop a three-ring binder / portfolio of all hand outs, quizzes and tests.
- Students will successfully complete homework, quizzes, and tests.
- Students will successfully complete shop projects as assigned and approved by instructor and maintain documentation of completion.

### **ASE Student Certification Test**

The final week of this course will consist of an ASE Student Certification Test. It will be administered by the Testing Center, located in the Campus Center building. Students will be responsible for taking the test at their convenience during the normal operating hours of the Testing Center. A photo ID is required. For information about the Testing Center, please see [www.smccme.edu/tests](http://www.smccme.edu/tests)

### **Student Evaluation and Grading**

- 10%: Attendance and Participation
- 10%: Homework
- 20%: Quizzes
- 30%: Tests and Portfolio
- 30%: Practice of Safety and Shop Participation

### **Attendance Grade**

Out of 100 possible points, 10 points will be deducted for each class absence and 5 points will be deducted for each time tardy.

### **Department Attendance Policy**

**Students missing 15% of the total hours for the course, tardy or absent, will result in an administrative failure for the class. This equals 13.5 hours for this 4 credit course. This is a “no fault” policy, which means the reason(s) for absence are not considered in implementation of the policy.**

## **Texts, Tools, and/or Supplies**

- Automatic Transmissions and Transaxles with NATEF Correlated Task Sheets (6th Edition) by James Halderman and Tom Birch (ISBN # 9781269941716)
- Electude Argo E Learning Software subscription
- Each student must supply and maintain his or her own set of tools as listed on the “SMCC Automotive Technology Required Student Tool List.”
- Personal protective equipment must be worn at all times in lab. Leather, steel-toe work boots; clear safety glasses with side shields; and a uniform are required for this course.

## **Telephones and Computers**

The use of computers, cell phones, smart phones, or other mobile communication devices is prohibited during lecture, unless the instructor indicates a special circumstance. In case of emergency, phones should be silenced, and answered outside the classroom. Special requests to use a computer for note taking will be considered by the instructor on a case by case basis. Violations of this policy will result in dismissal from the class period and an absence recorded. Repeat problems may result in a sanction from the Dean of Students.

## **Office Hours**

Appointments can be made to accommodate student needs. Please email for an appointment.

## **Learning Outcomes**

1. When necessary, utilize information-literacy skills, including evaluation of information from a variety of media and proper MLA and/or APA documentation.
2. Use critical thinking and listening skills in written and oral communication as a tool for learning.
3. Read and demonstrate understanding of complex ideas by identifying key concepts.
4. Apply theory to practice using problem solving techniques and data analysis.
5. Solve problems using algebraic techniques.
6. Interpret information presented in charts and graphs or illustrate a scenario using graphic techniques.
7. Utilize quantitative methods to solve and/or assess complex problems to support decision making, forecasting, and recommendations.
8. Participate in a direct experience of scientific inquiry of the natural world using the scientific method.
9. Find and evaluate credible sources of scientific information using a variety of media to support a research need.
10. Demonstrate the capacity to make informed and ethical judgments about the impact of science and technology on the self, the environment, and the practice of sustainability.

## **End-of-Course Evaluation**

In order to gain access to final course grades, students must complete evaluations for each course attended at SMCC. Evaluations are submitted online and can be accessed through the student portal site. Students can access the course evaluation report beginning two weeks before the end of classes. The deadline for submission of evaluations occurs 24 hours after the last day of classes each semester. Instructors will announce when the online course evaluation is available.

### **ADA Syllabus Statement**

Southern Maine Community College is an equal opportunity/affirmative action institution and employer. For more information, please call 207-741-5798. If you have a disabling condition and wish to request accommodations in order to have reasonable access to the programs and services offered by SMCC, you must register with the Disability Services Coordinator, Sandra Lynham, who can be reached at 741-5923. Further information about services for students with disabilities and the accommodation process is available upon request at this number. Course policies about online testing are modified to suit each individual's accommodations.

### **Add-Drop Policy**

Students who drop a course during the one-week "add/drop" period in the fall and spring semesters and the first three days of summer sessions receive a 100% refund of the tuition and associated fees for that course. Please note any course that meets for less than the traditional semester length, i.e., 15 weeks, has a pro-rated add/drop period. There is no refund for non-attendance.

### **Withdrawal Policy**

A student may withdraw from a course only during the semester in which s/he is registered for that course. The withdrawal period is the second through twelfth week of the fall and spring semesters and the second through ninth week of twelve-week summer courses. This period is pro-rated for shorter-length courses. To withdraw from a course, a student must complete and submit the appropriate course withdrawal form, available at the Enrollment Service Center (no phone calls, please). The designation "W" will appear on the transcript after a student has officially withdrawn. A course withdrawal is an uncompleted course and may adversely affect financial aid eligibility. Failure to attend or ceasing to attend class does not constitute withdrawal from the course. There is no refund associated with a withdrawal.

### **Plagiarism Statement**

If an instructor suspects that a student has knowingly committed a violation defined in the Maine Community College System Policy on Student Grade Appeals and Academic Misconduct, the instructor has the authority to review the alleged misconduct and determine the grade that the student should receive for the assignment and the course. The instructor may assign a failing grade for the assignment or course and may require the student to complete additional work for the course. The instructor may consult with the department chair and/or the College's chief academic officer prior to making such decisions. If a student seeks to challenge an instructor's determination, the student should submit a grade appeal. Grade appeal forms are available in the Advising Office on the South Portland Campus or in the administrative offices in the Learning Commons on the Midcoast Campus. An instructor may also refer the matter to the College's disciplinary officer for review under the procedures of the MCCS Student Code of Conduct.

### **Cancellations**

When weather conditions require the College to close, we will:

- Notify you through your SMCC email account and send a text alert
- Post a storm message on the SMCC Storm Line (741-5900)
- Post the closure on a banner at the top of the SMCC website
- Post a message on the SMCC Facebook page
- Notify local media outlets

- Post a message on Twitter

When the weather forces the College to close altogether, open late or close early, the following guidelines are in place:

- When the College closes altogether for the day, all classes are canceled and all offices are closed.
- When the College closes early at a specific time, all classes beginning at that time and later are canceled. All classes beginning before the closure time will be held as scheduled. All offices will close at the closing time.
- When the College opens late, all classes beginning before the specified scheduled opening time are canceled. Classes beginning at the opening time and later will be held as scheduled. All offices will open at the opening time.

## **Student Printing Policy**

### **Per Page Costs**

Each semester students receive a \$20 printing credit. The balance resets at the end of the semester and any remaining credits are removed. The cost varies depending upon page size and whether printing is done in black and white or color.

- a. There is a \$0.10 per page fee for standard 8.5” by 11” black and white documents.
- b. The reverse sides of duplex (double-sided) documents are free.
- c. There is a \$.50 per page fee for standard 8.5” by 11” color documents.
- d. There is a \$.20 per page fee for 8.5” by 14” (legal) or 11” by 17” (tabloid) black and white documents.
- e. There is a \$1.00 per page fee for 8.5” by 14” (legal) or 11” by 17” (tabloid) color documents.

**Duplex charges** (printing on both sides of a page) work in the following fashion: One page is \$0.10, two pages are \$0.10, three pages are \$0.20, and four pages are \$0.20, *etc.* The flipsides are free, but another sheet of paper is \$0.10. Please be aware that a document with any color at all (when printed to a color printer) will by default be printed in color. You are responsible for setting the print job to print black and white if you do not need color. For directions, please go to the IT Help tab in My SMCC.

### **How does it work?**

The College’s pay-for-print system monitors printing on all printers (including those in general access labs, library printers, the Academic Achievement Center, Noisy Lounge and technology labs). Students can check the number of pages they have printed by using the Printing Balance tool available on SMCC computers (located in the lower right corner of the screen, near the clock). Departments with work study students who need to print documents for the department should contact the HelpDesk at 741-5696 to have a special account set up.

### **Refunds**

Print jobs are eligible for a refund in the event of mechanical or electronic error on the part of the printer, print server, or software used to submit the job. Jobs are not eligible for a refund in cases where the job was not set up correctly, was submitted multiple times, or the student is not satisfied with the result. To request a refund, please bring the offending print to the IT Department in the basement of the Ross Technology Center. Refunds will be granted in the form of a credit to the student’s account.

### **Why is SMCC charging for printing?**

The pay-for-print system is an effort to control escalating printing costs. Charging for printing helps offset the increasing cost of supplies and encourages students to conserve resources. To find ways to reduce your printing charges, please go to the IT Help tab on My SMCC. If you have questions about the pay-for-printing policy or your printing charges, please contact the HelpDesk at 741-5696 or send an email to [helpdesk@smccme.edu](mailto:helpdesk@smccme.edu).

*Be sure to log OUT of the system when you’ve finished your printing, to prevent unauthorized access to your account.*