



# Wright Technical Center

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## Course Syllabus 2023 – 2024

### **Program**

Automotive Technology II - Advanced Brakes, Manual & Automatic Drivetrain

### **Instructor**

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### **Course Description**

A specific technical course designed to expand upon the principles of automotive suspension/steering systems and 4-wheel suspension alignment. This expands upon hydraulic brakes into the electrical portion of brakes and vehicle handling with ABS (digital and analog wheel speed sensors) and hall effect sensors with the stability management system. More advanced 4-wheel suspension alignments will be done integrating SAI (steering axis inclination), toe-out-on turns, included angle and how they apply to the diagnosis of vehicle handling concerns and then how to electronically reset the steering wheel angle sensor. Courseware covers the fundamentals of both manual and automatic drive train operation including gear types, gear reduction, planetary gear-set operation, hydraulic principles of a torque converter and how a manual clutch operates. Students will learn strategy-based diagnostic routines, in order to interpret and verify customer concerns and proper operation, and to perform tests and inspection to determine the causes and make corrections related to brakes, suspension/steering/wheel systems and alignment. Through the inspection, testing, or measurement of component processes, students will learn to apply this knowledge to determine needed repairs and correctly repair a vehicle.

### **Textbook**

Van Gelder & Andrew. *Fundamentals of Automotive Maintenance and Light Repair*. Burlington, MA: Jones & Bartlett Learning – CDX Automotive. (2015)

### **Course Goals**

#### **Engine Repair**

1. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.

#### **Automatic Transmission & Transaxle**

2. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
3. Check fluid level in a transmission or a transaxle equipped with a dip-stick.
4. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.
5. Check transmission fluid condition; check for leaks.

### **Course Goals - continued**

6. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
7. Inspect for leakage at external seals, gaskets, and bushings.
8. Inspect, replace and align powertrain mounts.
9. Drain and replace fluid and filter(s).
10. Describe the operational characteristics of a continuously variable transmission (CVT).
11. Describe the operational characteristics of a hybrid vehicle drivetrain.

### **Manual Drivetrain & Axles**

12. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
13. Drain and refill manual transmission/transaxle and final drive unit.
14. Check fluid condition; check for leaks.
15. Check and adjust clutch master cylinder fluid level.
16. Check for system leaks.
17. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.
18. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.
19. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.
20. Clean and inspect differential housing; check for leaks; inspect housing vent.
21. Check and adjust differential housing fluid level.
22. Drain and refill differential housing.
23. Inspect front-wheel bearings and locking hubs.
24. Check for leaks at drive assembly seals; check vents; check lube level.

### **Suspension & Steering Systems**

25. Flush, fill, and bleed power steering system.
26. Inspect for power steering fluid leakage; determine necessary action.
27. Inspect and replace power steering hoses and fittings.
28. Inspect electric power-assisted steering.
29. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
30. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.
31. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

### **Brakes**

32. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).
33. Refinish brake drum and measure final drum diameter; compare with specifications.
34. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
35. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
36. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.
37. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
38. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
39. Retract and re-adjust caliper piston on an integral parking brake system.
40. Identify traction control/vehicle stability control system components.
41. Describe the operation of a regenerative braking system.

### **Electrical / Electronic Systems**

42. Remove and reinstall the door panel.
43. Describe the operation of keyless entry/remote-start systems.
44. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
45. Verify windshield wiper and washer operation; replace wiper blades.

## **Course Goals - continued**

### **Heating & Air Conditioning**

46. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
47. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
48. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.
49. Inspect A/C condenser for airflow restrictions; determine necessary action.
50. Inspect engine cooling and heater systems hoses; perform necessary action.
51. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
52. Identify the source of A/C system odors.

### **Shop & Personal Safety Goals**

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

### **Tools & Equipment**

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

### **Preparing Vehicle for Service & Customer Goals**

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of fender covers, mats.
3. Demonstrate use of the three C's (concern, cause, and correction).
4. Review vehicle service history.
5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
6. Ensure the vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

### **Professional Skills Assessments**

#### **Workplace Employability Skills**

1. Reports to school daily on time; able to take directions and motivated to accomplish the task at hand.
2. Dresses appropriately and uses language and manners suitable for the workplace.

3. Maintains appropriate personal hygiene.
4. Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.
5. Demonstrates honesty, integrity and reliability.

### **Work Habits / Ethics**

1. Complies with workplace policies/laws.
2. Contributes to the success of the team, assists others and requests help when needed.
3. Works well with all customers and coworkers.
4. Negotiates solutions to interpersonal and workplace conflicts.
5. Contributes ideas and initiative.
6. Follow directions.
7. Communicates (written and verbal) effectively with customers and coworkers.
8. Reads and interprets workplace documents; writes clearly and concisely.
9. Analyzes and resolves problems that arise in completing assigned tasks.
10. Organizes and implements a productive plan of work.
11. Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.
12. Identifies and addresses the needs of all customers, providing helpful, courteous and knowledgeable service and advice as needed.

### **Evaluation of Learning**

Student performance will be evaluated using multiple assessments involving assigned program activities. Student's course grades will be based on the following:

<b>Evaluation Criteria</b>	<b>Method of Evaluation</b>	<b>Percentage</b>
Tests	<ul style="list-style-type: none"> <li>Quizzes and tests</li> </ul>	33.4%
Classroom and Lab Activities	<ul style="list-style-type: none"> <li>Manipulative skills assessments</li> <li>Lab assignments</li> <li>Classroom assignments</li> </ul>	33.3%
Professional Skills	<ul style="list-style-type: none"> <li>Workplace employability skills</li> <li>Work habits/ethics</li> </ul>	33.3%

### **Task Performance Rubric**

<b>Level</b>	<b>Description</b>
5	Mastered the competency (Exemplary)
4	Performs the competency satisfactorily (Proficient)
3	Capable of the competency but needs further practice
2	Applies the competency but only mastered a few essential attributes
1	Demonstrated exposure and has observed the competency

## **Grading Scale**

Grade	Percentage
A+	100% – 98%
A	97% – 92%
A-	91% – 90%
B+	89% – 88%
B	87% – 82%
B-	81% – 80%

Grade	Percentage
C+	79% – 78%
C	77% – 72%
C-	71% – 70%
D+	69% – 68%
D	67% - 62%
D-	61% - 60%
F	59% - Below

## **Late Assignments**

You may earn half credit for late assignments that have been turned in within a week of their due date. All assignments more than one week late will be zeros.

## **Program Safety:**

Students will complete industry and shop specific safety training before being allowed to participate in lab activities.

Safety training in the Automotive Technology program includes:

- PPE - Personal Protective Equipment Training
- Lift Training
- Use of S/P2 Online Training program
- Career Speakers focusing on site specific safety requirements and topics.

## Career Information

MN Program of Study	
<b>Career Field</b>	Engineering, Manufacturing & Technology
<b>Career Cluster</b>	Transportation, Distribution & Logistics
<b>Career Pathway</b>	Facility and Mobile Equipment Maintenance
<b><i>Related occupations requiring additional education, training and/or certifications:</i></b>	
<ul style="list-style-type: none"><li>• Aerospace Operations Technician</li><li>• Aircraft Mechanic</li><li>• Service Technician Automotive</li><li>• Service Technician</li><li>• Avionics Technician</li><li>• Bus and Truck Mechanic</li><li>• Collision Repair Technician</li></ul>	<ul style="list-style-type: none"><li>• Off-Road Equipment Technician</li><li>• Rail Locomotive Mechanic</li><li>• Automobile Mechanic</li><li>• Repairer Service Manager</li><li>• Service Writer</li><li>• Ship Mechanic and Repairer</li></ul>
<b>Career Outlook</b>	<i>information available @ <a href="http://www.iseek.org/careers">www.iseek.org/careers</a></i>

## College Credit Opportunities & Professional Certifications

In the Automotive Technology course, you can earn ASE certifications and articulated college credits. Students will need to earn a “B” or better grade in their course work. College credits are available at the following schools:

- Anoka Technical College
- Dunwoody College of Technology
- Hennepin Technical College
- MN West Community & Technical College
- Ridgewater Community College
- Riverland Community College
- Rochester Community & Technical College
- St. Cloud Community & Technical College
- St. Cloud State University

Visit the following website for specific articulated college courses - [www.ctecreditmn.com](http://www.ctecreditmn.com)

The **WRIGHT** path for High School