



**Wright Technical Center**

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## **Course Syllabus 2024-2025**

### **Program**

Automotive Technology I - Electrical / Electronics Systems

### **Instructor**

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### **Course Description**

A specific technical course designed to teach the principles of electricity and electronics and apply them to automotive systems. This course builds on the essential concepts and measurement of electrical parameters, such as voltage, current, resistance, power, magnetism, electromagnetism, and magnetic induction that the student has learned in earlier physics courses. Students will learn the concept of Ohm's law in both application and mathematical theory. Detailed topics include the use of a digital multimeter (DMM) for the analysis of series, parallel, and series-parallel circuits. Specific automotive systems covered include batteries, charging and starting systems, lighting, gauges, accessories, electronics, automotive computers and solid-state devices, and communication systems. Students will learn how to apply electrical/electronic principles to repair car and truck electrical systems using a scientific process-of-elimination diagnostic strategy. The student will apply this knowledge to accurately diagnose and service cars and trucks with electrical/electronic systems.

### **Textbook & Classroom Resources**

Van Gelder, Kirk. *Fundamentals of Automotive Maintenance and Light Repair - Second Edition*. Burlington, MA: Jones & Bartlett Learning – CDX Automotive. (2020)

### **Course Goals**

#### **Engine Repair**

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
2. Verify operation of the instrument panel engine warning indicators.
3. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.

#### **Suspension & Steering Systems**

4. Remove, inspect, replace, and adjust power steering pump drive belt.

#### **Electrical / Electronic Systems**

5. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.

### **Course Goals - Continued**

6. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
7. Use wiring diagrams to trace electrical/electronic circuits.
8. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
9. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
10. Check operation of electrical circuits with a test light.
11. Check operation of electrical circuits with fused jumper wires.
12. Measure key-off battery drain (parasitic draw).
13. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
14. Perform solder repair of electrical wiring.
15. Replace electrical connectors and terminal ends.
16. Perform battery state-of-charge test; determine necessary action.
17. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
18. Maintain or restore electronic memory functions.
19. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
20. Perform slow/fast battery charge according to manufacturer's recommendations.
21. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
22. Perform starter current draw test; determine necessary action.
23. Perform starter circuit voltage drop tests; determine necessary action.
24. Inspect and test starter relays and solenoids; determine necessary action.
25. Remove and install starter in a vehicle.
26. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.
27. Perform charging system output test; determine necessary action.
28. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
29. Remove, inspect, and re-install generator (alternator).
30. Perform charging circuit voltage drop tests; determine necessary action.

### **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.

## **Skills Needed for Success**

- Must be able to work independently
- Mechanical aptitude
- Good problem solving skills
- Detail oriented
- Manual dexterity
- Strong technical reading, writing, math and computer skills
- Team player, responsible, and good communicator

**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:

| Evaluation Criteria          | Method of Evaluation                                                                                                                      | Percentage |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 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**

| Level | Description                                                         |
|-------|---------------------------------------------------------------------|
| 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)