

ARIZONA WESTERN COLLEGE
SYLLABUS

EVT 150 EV MOTORS, MAINTENANCE AND REPAIRS

Credit Hours: 4 Lec 2 Lab 4

PREREQUISITE or COREQUISITE: EVT 100, EVT 101, and EVT 102

COURSE DESCRIPTION

Electric vehicle motors and powertrains are explored in-depth in this course, with emphasis on maintenance and repair. Students will gain practical experience diagnosing and troubleshooting both DC and AC motor systems used in EVs.

1. COURSE GOAL

- 1.1. Develop Foundational Knowledge of EV Motors: Provide students with a comprehensive understanding of both DC and AC electric vehicle motor systems, including their fundamental principles and differences.
- 1.2. Promote Practical Skills in EV Maintenance and Repair: Equip students with the hands-on skills needed to maintain, troubleshoot, and repair electric vehicle motor systems using advanced diagnostic tools and equipment.
- 1.3. Enhance Problem-Solving and Critical Thinking: Foster students' ability to apply theoretical knowledge to real-world situations by diagnosing and resolving issues related to EV motors, powertrains, communication, and control systems.
- 1.4. Emphasize Safety in High-Voltage Environments: Cultivate a strong understanding of the safety procedures and protocols necessary when working with high-voltage electric vehicle systems.
- 1.5. Prepare Students for Careers in EV Technology: Prepare students to enter the electric vehicle industry with the technical expertise and confidence needed to thrive in EV maintenance, repair, and diagnostics roles.

2. OUTCOMES

Upon satisfactory completion of this course, students will be able to:

- 2.1. Identify and Explain EV Motor Components: Name and describe the main components of DC and AC motors used in EVs, including the operating principles of induction and synchronous motors.
- 2.2. Calculate Key Motor Parameters: Accurately calculate motor torque, speed regulation, and step angles for DC motors, and analyze the torque development in 3-phase induction motors.
- 2.3. Implement Motor Control Techniques: Explain and apply control methods such as pulse-width modulation (PWM), dynamic and regenerative braking, and four-quadrant operation in DC motors.
- 2.4. Differentiate Powertrain Components: Distinguish between powertrain, drivetrain, and driveline components and understand their roles in EV operation, including the function of EV transmissions and differentials.
- 2.5. Troubleshoot Communication Systems: Identify and troubleshoot issues in EV communication systems, including CAN bus, Ethernet, and various communication topologies used in automotive applications.

- 2.6. Ensure Safety in EV Maintenance: Demonstrate a strong understanding of safety protocols when working with high-voltage EV systems, including the identification and use of essential PPE, and the application of active and passive safety systems.
 - 2.7. Execute EV Maintenance Procedures: Perform standard maintenance procedures on EVs, understand diagnostic trouble codes (DTCs), and implement maintenance schedules.
 - 2.8. Utilize Advanced Diagnostic Tools: Apply advanced diagnostic techniques and tools, including the Electric Vehicle System Panel Trainer, to real-world scenarios involving EV motor and system troubleshooting.
 - 2.9. Understand the Role of Communication and Control Systems: Explain the purpose and operation of various communication and control systems in EVs, including the differences between VCUs and ECUs, and the benefits of automotive Ethernet.
 - 2.10. Perform a Vehicle Multi-Point Inspection: Conduct a thorough inspection and create a report to document existing vehicle conditions.
 - 2.11. Demonstrate Understanding of Commissioning Processes: Understand and perform startup and commissioning procedures for EV systems, including setting charge limits and cutoffs.
 - 2.12. Prepare for Industry Careers: Demonstrate readiness for careers in EV maintenance and repair, with a comprehensive understanding of EV systems, safety practices, and industry-standard tools and equipment.
3. METHODS OF INSTRUCTION
 - 3.1 Lecture
 - 3.2 Multi-media Presentations
4. LEARNING ACTIVITIES
 - 4.1 Lectures
 - 4.2 Demonstrations
 - 4.3 Hands-on lab work
 - 4.3 Exams
5. EVALUATION
 - 5.1 Quizzes/Exams
 - 5.2 Assignments
 - 5.3 Participation
6. STUDENT RESPONSIBILITIES
 - 6.1 Under AWC Policy, students are expected to attend every session of class in which they are enrolled.
 - 6.2 Classroom Assignments: Students are responsible for work missed and for completing all work before the next class meeting. Students are responsible for participating in all oral drills and for taking all exams.
 - 6.3 If a student is unable to attend the course or must drop the course for any reason, it will be the responsibility of the student to withdraw from the course. Students who are not attending as of the 45th day of the course may be withdrawn by the instructor. If the student does not withdraw from the course and fails to complete the requirements of the course, the student will receive a failing grade.
 - 6.4 Americans with Disabilities Act Accommodations: Arizona Western College provides academic accommodations to students with disabilities through AccessABILITY Resource Services (ARS). ARS provides reasonable and appropriate accommodations to students who have documented disabilities. It is the responsibility of the student to make

the ARS Coordinator aware of the need for accommodations in the classroom prior to the beginning of the semester. Students should follow up with their instructors once the semester begins. To make an appointment call the ARS front desk at (928) 344-7674 or ARS Coordinator at (928) 344-7629, in the College Community Center (3C) building, next to Advising.

6.5 Academic Integrity: Any student participating in acts of academic dishonesty including, but not limited to, copying the work of other students, using unauthorized “crib notes”, plagiarism, stealing tests, or forging an instructor’s signature—will be subject to the procedures and consequences outlined in AWC’s Student Code of Conduct.

6.6 Textbooks and materials: Students are required to bring notebook or looseleaf book, pens, pencils, dictionaries, and purchase textbook required for class.

6.7 Arizona Western College students are expected to attend every class session in which they are enrolled. To comply with Federal Financial Aid regulations (34 CFR 668.21), Arizona Western College (AWC) has established an Attendance Verification process for "No Show" reporting during the first 10 days of each semester.

Students who have enrolled but have never attended class may be issued a “No Show” (NS) grade by the professor or instructor and receive a final grade of “NS” on their official academic record. An NS grade may result in a student losing their federal financial aid.

For online classes, *student attendance in an online class is defined as the following* (FSA Handbook, 2012, 5-90):

- Submitting an academic assignment
- Taking an exam, an interactive tutorial or computer-assisted instruction
- Attending a study group that is assigned by the school
- Participating in an online discussion about academic matters
- Initiating contact with a faculty member to ask a question about the academic subject studied in the course