Odessa College
Technical Studies Division
Industrial Engines and Transportation Maintenance Technology

Course Syllabus

COURSE NUMBER: **DEMR 2432 (Under NATEF review)**

COURSE TITLE: **Electronic Controls**

CREDIT HOURS: **4** **LECTURE HOURS:** **2** **LAB HOURS:** **6**

PREREQUISITE: **DEMR 1405, consent of department chair or instructor.**

CATALOG DESCRIPTION:

Advanced skills in diagnostic and programming techniques of electronic control systems. After verifying customer complaints, student teams will perform preventive and predictive maintenance, system analysis and correct repair procedures. Theory and application of basic hardware, tools, safety, practices and repair of wiring circuits on all types of electrical components will be emphasized. Lab fee required. (SCANS 2, 4, 5, 6, 7, 8, 9, 10, 11)
Prerequisite: DEMR 1405 and consent of department chair or instructor.

COURSE LEARNING OUTCOMES:

Utilize specialized tools to diagnose or change parameters; read and interpret technical manuals; and identify and test sensors and actuator circuits.

COMPETENCIES:

After completing this course, the student should be able to demonstrate automotive competency in:

V. ELECTRICAL/ ELECTRONIC SYSTEMS

TEXTBOOK

Classroom Manual: Automotive Brake Systems, Clifton E. Owen, 4th Edition, Thomson Delmar Learning, 2008

SUPPLIES:

Students will need course textbook, job sheets, paper, notebook, pen and pencils.

COURSE GRADE EVAULATION:

25% Professionalism (*A grade will be assessed using the following guide lines.)*
- Punctuality
- Desire to learn
- Appropriate appearance
- Quality workmanship
- Ability to work with others
- Safe working habits (*Students will be graded in all areas of shop safety.)*
- Positive attitude
- Work ethics
- Integrity
- Attendance

25% Research Paper and/or Final Exam
25% Lab Participation
25% Quizzes and/or Daily

Also see instructor information sheet:

ATTENDANCE POLICY:

YOUR attendance is the greatest predictor of your success. **Student attendance at EVERY class is expected.** You should expect that each absence will adversely affect your course grade. Please see the instructor regarding anticipated absences or conflicts due to college sponsored activities.

ACADEMIC ETHICS:

You are expected to participate and contribute as a group in the labs and classroom; test will be taken without notes or other outside-assistance. If unethical behavior is detected, all parties involved will be denied credit for that project or exam. The questioned material and report of the ethics violation will be submitted to the department chair for further action if deemed necessary.

STUDENT ASSISTANCE:

- Admissions: 432-335-6443
- Book Store: 432-335-6654
- Cafeteria: 432-335-6435
- Career Services: 432-335-6835
- Cashier's: 432-335-6600
- Counseling: (Help center) 432-335-6346
- Auto/Diesel Department Chair: 432-335-6633
- .edu: (Student Service Center) 432-335-6833
- Financial Services: 432-335-6429
- Housing/Judicial Affairs: 432-335-6300
- Learning Resources Center: 432-335-6641
- Registrar: 432-335-6443
- Student Learning Center:
  Peer tutoring available
  PLATO: Computer tutoring available
  (LRC 300) 432-335-6878
- Student Support Services: 432-335-6868
- Technical Studies Dean: 432-335-6686
- Testing Center: 432-335-6834
- Vice President Instruction: 432-335-6413
- Vice President for Student Services: 432-335-6683
- Wi-Fi Java, Cyber Café: 432-335-6509

FACULTY:

James McCutcheon, chair;	Office Dm102	432-335-6633	jmccutcheon@odessa.edu
Jerry Griffith	Office Dm101	432-335-6632	jgriffith@odessa.edu
Perry Griffith	Office Dm105A	432-335-6603	pgriffith@odessa.edu

LAB REQUIREMENTS:

General Shop Practices and Procedures

- **Safety requirements will 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 in accordance with local, state, and federal environmental regulations.**
- Proper **Personal Protection Equipment** (PPE) will be used in all required areas.
- **Safety Glasses** must be worn **at all times** in the **lab/shop area**. No exceptions!
- **Adhere to all Safety signs** posted on equipment, fire extinguishers, tool groups, vehicle lifts, support stands, grinders, drill presses, or any other equipment or areas marked with Safety signage.
- Do not restrict the passage of any marked walkway.
- **Safety is paramount** and you are responsible for your work area and your safe work habits! **Therefore, do not leave fluid spills on floor and keep your area free of clutter!**
- Equipment use is limited to those knowledgeable enough to operate the equipment safely; otherwise the equipment is **OFF LIMITS! (Consult your instructor).**
- Tools and equipment **will not be loaned** or taken from the Odessa College premises.
- Students **MUST** sign out for any specialty tool needed and will only be issued by an instructor or designated person. The student will be **responsible for safety and care of those tools, when finished or at the end of each lab period,** return all tools to the checkout person so they can sign the tool back in.
- NATEF job sheets will be filled out for each lab assignment. When finished, give completed job sheets to the instructor and those will be recorded on your progress report.
- All vehicles are to be treated as customer vehicles. As a student **YOU ARE TO RESPECT THIS,** do not sit in, lean on, or handle any vehicle that has not been specifically assigned to you by your instructor.
- Any time a vehicle hood is open, fender covers must be in place on the fenders at all times.
- Students must get approval from the instructor **before** bringing vehicles in the shop. **Only certain vehicles qualify for NATEF required tasks.**
- **V**isitors are not allowed in the lab/shop area, however they may be escorted through the lab/shop area by approved personal.

COURSE COMPETENCIES:

NATEF RECOMMENDED TASKS FOR INDUSTRIAL ENGINES AND TRANSPORTATION MAINTENANCE (DIESEL) TECHNOLOGY

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 in accordance with local, state, and federal safety and environmental regulations.

V. ELECTRICAL/ELECTRONIC SYSTEMS

For every task in Electrical systems, the following task must be strictly enforced as a number 1 priority: Comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and handling, storage and disposal of chemicals in accordance with local, state, and federal safety and environmental regulations, listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

V.A General Electrical System Diagnosis

Task	Job Sheet	Priority	
A.1	**?**	**P1**	Read, interpret, and diagnose electrical /electronic circuits using wiring diagrams.
A.2		**P1**	Check continuity in electrical/electronic circuits using appropriate test equipment.
A.3		**P1**	Check applied voltages circuit voltages & voltage drop in electrical/electronic circuits using a digital multimeter (DMM
A.4		**P1**	Check current flow in electrical/electronic circuits & components using a digital multimeter (DMM) clamp-on ammeter
A.5		**P1**	Check resistance in electrical/electronic circuits and components using a digital multimeter (DMM).
A.6		**P1**	Find shorts, grounds, and opens in electrical/ electronic circuits.
A.7		**P1**	Diagnose parasite (key-off) battery drain problems.
A.8		**P1**	Inspect and test fusible links, circuit breakers, and fuses; replace as needed.
A.8		**P3**	Inspect and test spike suppression diodes/ resistors; replace as needed.
A.9		**P3**	Inspect and test spike suppression diodes /resistors; replace as needed.
A.10		**P3**	Check frequency and pulse width in electrical/electronic circuits using appropriate test equipment.

V.B Battery Diagnosis and Service

B.1	**?**	**P1**	Perform battery load test; determine needed service.
B.2		**P1**	Determine battery state of charge by using an open circuit voltage test.
B.3		**P1**	Inspect, clean, and service battery; replace as needed.
B.4		**P1**	Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.
B.5		**P1**	Charge battery using slow or fast charge method as appropriate.
B.6		**P1**	Inspect, test, and clean battery cables and connectors; repair or replace as necessary.
B.7		**P1**	Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.
B.8		**P2**	Perform battery capacitance test; determine needed action.

V.C Starting System Diagnosis and Repair

C.1	**?**	**P1**	Perform starter circuit cranking voltage drop tests; determine needed repairs.
C.2		**P2**	Inspect and test components (key switch, push button and/or magnetic switch) and wires in the starter control circuit; replace as needed.
C.3		**P2**	Inspect and test, starter relays and solenoids/switches; replace as needed.
C.4		**P2**	Remove and replace starter; inspect flywheel ring gear or flex plate.

V.D Charging System Diagnosis and Repair

V.D.1	**?**	**P1**	Diagnose instrument panel mounted volt meters and/or indicator lights that show a no charge, low charge/overcharge condition; determine needed repairs.
V.D.2		**P1**	Diagnose the cause of a no charge, low charge, or overcharge condition; determine needed repairs.
V.D.3		**P1**	Inspect/replace alternator drive belts, pulleys, fans, tensioners, & mounting brackets; adjust drive belts &check alignment
V.D.4		**P1**	Perform charging system voltage and amperage output tests; determine needed repairs.
V.D.5		**P1**	Perform charging circuit voltage drop tests; determine needed repairs.
V.D.6		**P2**	Remove and replace alternator.
V.D.7		**P2**	Inspect, repair, or replace connectors and wires in the charging
V.D.8		**P1**	Diagnose AC voltage leakage (failed rectifier) at alternator output; determine needed action.
V.D.9			

V.E.1 Headlights, Parking, Clearance, Tail, Cab, and Instrument Panel Lights

E.1.1	**?**	**P1**	Diagnose the cause of brighter than normal, intermittent, dim, or no headlight & daytime running light (DRL) operation
E.1.2		**P1**	Test, aim, and replace headlights.
E.1.3		**P1**	Test headlight & dimmer switch, relay, wire, terminal, connector, socket & control component repair/replace as needed.
E.1.4		**P1**	Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays and wires of parking, clearance, and taillight circuits; repair or replace as needed.
E.1.5		**P2**	Inspect and test instrument panel light circuit switches, relays, bulbs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.
E.1.6		**P2**	Inspect & test interior cab light circuit switches, bulbs, sockets, connectors, terminals, & wires; repair/replace as needed.
E.1.7		**P1**	Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.

V.E.2 Stoplights, Turn Signals, Hazard Lights, and Back-up Lights

E.2.1	**?**	**P1**	Inspect, test, & adjust stop light circuit switch, bulbs/LEDs, socket, connector, terminal, & wire; repair/replace as needed
E.2.2		**P1**	Inspect and test turn signal and hazard flasher(s) switches, relays, bulbs/LEDs, sockets, connectors, terminals, and wires; repair or replace as needed.
E.2.3		**P2**	Inspect, test, and adjust back-up lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, and wires; repair or replace as needed.

V.F Gauges and Warning Devices Diagnosis and Repair

Task	Job Sheet	Priority	
F.1	**?**	**P1**	Interface with vehicle's on-board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
F.2		**P2**	Diagnose the cause of intermittent, high, low, or no gauge readings; determine needed action.
F.3		**P3**	Diagnose the cause of data bus-driven gauge malfunctions; determine needed action.
F.4		**P2**	Inspect and test gauge circuit sending units, gauges, connectors, terminals and wires; repair or replace as needed.
F.5		**P2**	Inspect and test warning light circuit sending units, bulbs, sockets, connectors, wires, and printed circuits/control modules; repair or replace as needed.
F.6		**P2**	Inspect, test, replace, and calibrate electronic speedometer, odometer, and tachometer systems.

V.G Related Electrical Components

G.1	**?**	**P2**	Diagnose the cause of constant, intermittent, or no horn operation; determine needed action
G.2		**P2**	Inspect and test horn circuit relays, horns, switches, connectors, and wires; repair or replace as needed.
G.3		**P2**	Diagnose the cause of constant, intermittent/ no wiper operation; diagnose the cause of wiper speed control/park problems; determine needed action.
G.4		**P2**	Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, and wires; repair/ replace as needed.
G.5		**P2**	Inspect and replace wiper motor transmission linkage, arms, and blades; adjust or replace as needed.
G.6		**P2**	Inspect and test windshield washer motor or pump/ relay assembly, switches, connectors, terminals, and wires; repair or replace as needed.
G.7		**P3**	Inspect and test side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, and wires; repair or replace as needed.
G.8		**P3**	Inspect and test heater and A/C electrical components including: A/C clutches motors, resistors, relays, switches, connectors, terminals, and wires; repair or replace as needed.
G.9		**P3**	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, and wires; repair or replace as needed.
G.10		**P3**	Diagnose the cause of slow, intermittent, or no power side window operation; determine needed action.
G.11		**P3**	Inspect & test motors switch relays connectors terminals & wires of power side window circuits repair/replace as needed
G.12		**P2**	Inspect block heaters; determine needed repairs.
G.13		**P3**	Inspect and test cruise control electrical components; repair or replace as needed.
G.14		**P2**	Inspect and test engine cooling fan electrical control components; repair or replace as needed.
G.15		**P3**	Diagnose the cause of data buss communication problems; determine needed action.