DST 120.01: Electrical Systems

James D. Headlee
*University of Montana - Missoula*, jim.headlee@mso.umt.edu

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ELECTRICAL SYSTEMS
DST 120
8 CREDITS
SPRING 2016

COURSE DESCRIPTION:

The theory of AC/DC electricity including Ohm’s Law, Magnetism, Wiring Diagrams, and Circuit analysis. Starting, Charging, and related systems will be covered in depth using test equipment found in the heavy equipment field. Electronic systems are studied including the usage of computers and scan tools for troubleshooting related type systems using manufacture spec software and testing of related typed sensors and their operation.

COURSE OBJECTIVES:

1) Perform electrical and electronic troubleshooting and repair procedures in a safe manner.

2) Explain the principles of electricity as found in heavy equipment electrical systems.

3) Diagnosis and repair a charging system or starting system and related components using the correct test equipment as found in heavy equipment repair facilities.

4) Hook-up and interpret test data using common electrical meters and related test equipment.

5) Explain the common operation of electronic components as applied to the heavy equipment field.

6) Diagnosis and repair of computerized systems using scan type tools and computers including the correct manufactures software when applicable.
REQUIRED TEXTS:

Heavy Duty Truck Systems
5th edition
Sean Bennett

COURSE OUTLINE:

SAFETY
   A) Electrical Safety
   B) General Shop Safety

BASIC THEORIES
   A) Basic Electron Flow
   B) Voltage
   C) Amperage
   D) Resistance
   E) Meter Usage
   F) Circuits

BASIC ELECTRICAL TROUBLESHOOTING
   A) Troubleshooting Techniques
   B) Test Instruments
   C) Component Testing
   D) Testing for Opens, Shorts, Grounds
   E) Voltage Drop Testing

WIRING AND WIRE SCHEMATICS
   A) Wire Size
   B) Wire Repairs
   C) Connector Construction and Repair
   D) Use of Wiring Diagrams

BATTERIES
   A) Battery Construction and Operation
   B) Battery Maintenance
   C) Battery Ratings
   D) Load Testing Batteries
   E) Charging Procedures

STARTING SYSTEMS
   A) Basic Starter Motor Construction and Operation
   B) Starter Motor Diagnosis and Repair
   C) Starter System Check-out
   D) Series Parallel Systems
CHARGING SYSTEMS
A) Basic Charging System Construction and Operation
B) Generator/Alternator Diagnosis and Repair
C) Charging System Check-out
D) Generator/Alternator Bench Testing
E) Regulation of Current and Voltage

LIGHTING SYSTEMS
A) Head Light Circuits
B) Tail Light Circuits
C) Turn Signal/Hazard Circuits
D) Accessory Light Circuits

INSTRUMENTATION AND WARNING SYSTEMS
A) Gauge/Sending Unit Operation
B) Engine Shutdown Systems

ELECTRICAL ACCESSORIES
A) Wiper Motors
B) Blower Motors
C) Jacobs Engine Brakes
D) Thermatic Engine Fans

IGNITION SYSTEMS
A) Basic Ignition Systems
B) Ignition Timing
C) Computer Controlled Timing

DIESEL COMPUTER SYSTEMS
A) Analog and Digital Principles
B) Central Processing Unit
C) Computer Inputs and Outputs
D) ECM Programming
GRADING:

LECTURE: Counts for 50% of your final grade-this will include tests, quizzes, work ethics, attitude, attendance. If you have an overall score of 92% or better in lecture at finals time you do not have to take the final-your lecture grade will be an A for lecture.

LAB: Counts for 50% of your final grade-this will include lab sheets signed off by the instructor at the time of completion-Please do not ask for sigh off’s after the completion of the current project and the start of another, I will not sign the sheet unless prior arrangements have been made!! Attitude, Work Ethics and attendance will also influence your lab grade. Your lab grade can only raise your final grade one letter grade overall.

NOTEBOOK: Each student will be required to keep a three ring type notebook to contain the following: Handouts as given by date, class notes, and lab job sheets signed by the instructor in order of completion.

ATTENDANCE: Each student will have 3 free days during the semester; After the 3 days are used up each unexcused absence after will drop the final grade one letter until a grade of F is reached. Being Late Counts the same of being Absence.

TOOLS: Each student must have a multi meter meeting the EM710 MAC Tools meter specifications. The student is responsible for fuses, meter leads and clips.

CELL PHONE/MUSIC: Cell phones are to be turned off unless you are expecting an emergency type call. Listening to music during class time will not be tolerated!!!
LAB CHECK-OFF SHEET

NAME: ______________________

DATE: ___________

LAB PARTNERS ____________

____________________

____________________

____________________

THIS SHEET WILL BE TURNED IN AT THE END OF THE SEMESTER ALONG WITH ALL JOB SHEETS OR THE LAB GRADE WILL BE F

CIRCUITS
2 series circuits  1______  2______
2 parallel circuits  1______  2______
2 series-parallel circuits  1______  2______
2 wiring schematic drawings  1______  2______

TEST EQUIPMENT
2 analog volt meter usages  1______  2______
2 digital volt meter usages  1______  2______
2 analog amp meter usages  1______  2______
2 digital amp meter usages  1______  2______
2 analog ohm meter usages  1______  2______
2 digital ohm meter usages  1______  2______
2 carbon pile usages  1______  2______

BATTERIES
2 battery clean and test  1______  2______
2 battery cable end repairs  1______  2______

CHARGING SYSTEMS
2 alternator rebuild/test 1______ 2______
2 charging system checkouts 1______ 2______

STARTING SYSTEMS
1 automotive style rebuild 1______
2 heavy duty rebuilds 1______ 2______
2 heavy duty on vehicle tests 1______ 2______

ACCESSORY CIRCUITS
2 lighting systems test/repairs 1______ 2______
2 turn signal test/repairs 1______ 2______
2 trailer test/repairs 1______ 2______

ELECTRONIC ENGINE CIRCUITS
1 Detroit Diesel 60 series checkout 1______
1 Cummins N-14 checkout 1______
1 Cat 3176/3126 checkout 1______
1 Cat C-15 checkout 1______
1 Navistar 466/444 E checkout 1______

LAB GRADING SCALE

42-46=A
37-41=B
32-36=C
27-31=D
0-31=F