AGEN 161
Basic Hydraulics Syllabus

Course Description:

This course will present the fundamental principles of hydraulic and pneumatic systems on mobile agricultural, construction and on-highway machinery. Disassembly and inspection of the various components in hydraulic systems will be completed throughout the course. Introduction to ISO graphic symbols and how they are represented in actual systems will be stressed. Additionally, diagnostics and testing of equipment will be discussed.

Instructor:
Mr. Cross
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Credits: 3 credit hours

Lecture: Tuesday & Thursday 9:00-9:50 AM Marshall 101

Lab:
Lab 01 Tuesday 2:00-3:50 PM Marshall 117
Lab 02 Tuesday 4:00-5:50 PM Marshall 117
Lab 03 Thursday 4:00-5:50 PM Marshall 117

Prerequisite/Co requisite:
MAGN 100 or permission of instructor

Textbook:
• Hydraulics: Fundamentals of Service: Deere and Company

Objectives:
• To develop an understanding of the basic principles of hydraulics and pneumatics and the various designs and systems used on mobile machinery.

• To provide students with the basic skill necessary to read, interpret, and produce hydraulic schematics utilizing ISO graphic symbols.

• To develop the ability to identify, and properly service common hydraulic fittings, and hydraulic conduits used on mobile machinery.

• To develop a fundamental understanding of the theory and application of the testing of hydraulic systems.
Student Responsibilities:
1. To read the course syllabus and to ask questions if the material is unclear.
2. To attend all classes and labs
3. To attend scheduled lab unless previous arrangements are made with the instructor.
4. To make up any and all class work covered during his/her absence.
5. To complete on time all work including reading, homework, lab write-ups and the term project. Student’s work will show careful, neat, complete and individual effort.

Lab:
1. A lab write-up will be due after each lab. The lab is due at the beginning of the following week’s lab.
2. One late lab will be permitted without penalty. The late lab will only be accepted if it is turned in on or before the next lab is due. Failure to attend a lab or not handing in a lab will result in a 0% for that particular lab
3. Students are required to attend their scheduled lab unless previous arrangements have been made. Due to the fact that labs are balanced, every effort should be made to attend the scheduled lab.
4. Safety is the most important aspect of the lab work. If a student performs in an unsafe manner, he/she will first receive a verbal warning. The second instance the student will receive a written warning and the third instance will mean removal from the lab and course.

Attendance Policy:
- All attendance policies as listed below from the Student Handbook will be followed.
- If a student doesn’t attend a class, then he/she cannot participate.
- The missing of four classes will likely lead to removal from the class.

Excerpts from the student handbook regarding attendance:
   a. Students are expected to attend all scheduled classes and laboratories. However, special circumstances such as illness, religious holidays, travel difficulties, family emergencies and participation in college-sponsored events may make certain absences unavoidable. In such instances, students should notify instructors of these special circumstances.
   b. Although regular class attendance will not guarantee passing grades, irregular attendance will usually have an adverse effect upon them. Because final student evaluation is based upon measurable academic achievement, however, instructors will not lower final grades solely on the basis of attendance.

Testing Accommodations:
If you wish to use test accommodations for an exam or need extra help to be successful in the course please speak with me.
Plagiarism:
- The Student Handbook’s policy on plagiarism will be strictly followed. Students that plagiarize can receive an F for the entire course.

The Code of Academic Honesty from the Student Handbook

Academic honesty promotes continued academic and occupational success. Maintenance of academic honesty and quality education is the responsibility of both faculty and students. Any written assignment (including all electronic media) submitted by a student must be original authorship. Representation of another’s work as his/her own shall constitute plagiarism. Any charge of plagiarism must be substantiated by a direct correlation in wording and organization between the original and plagiarized copy.

Any examinations must be taken according to prescribed procedure, as determined by the faculty member in charge. Any form of unauthorized written material used by a student or evident on his/her person during or directly following an examination shall be deemed a violation of academic honesty. Unauthorized correspondence between students during any examination or preparation of submitted work, which cannot be substantiated by physical proof or eye witness verification, shall be considered an infraction of the code and shall subject involved parties to corrective procedures.

Grading:
- 15% Participation
- 35% Lab work
- 30% Homework, quizzes, tests and the final exam
- 20% Term project and paper

Course Topics:

I) Introduction, History and Development
   a) Overview and course procedures
   b) Advantages and applications of fluid power

II) Fluid Power Principals
   a) Fundamentals
      i) Force, pressure, and area
      ii) Work, horsepower, and torque
      iii) Basic lever principles
   b) Pascal’s Law
      i) Application
      ii) Multiplication of forces
      iii) Fluid properties

III) Open and Closed Center Systems
   Bobcat Handout
   FOS Chapter 1
IV) Hydraulic Pumps
   a) Displacement of pumps
      i) Fixed
   b) Variable
   c) Types of Hydraulic Pumps
      i) Gear pumps
         (1) Internal
         (2) External
      ii) Vane pumps
         (1) Balanced
         (2) Unbalanced
      iii) Piston pumps
         (1) Axial piston
         (2) Radial piston
   d) Pump Malfunctions
      i) Contaminated fluid
      ii) Improper fluid
      iii) Poor operating procedures
      iv) Poor maintenance
      v) Pump Failure analysis

V) Reservoirs Oil Coolers and Filters
   a) Reservoirs
      i) Capacity of reservoirs
      ii) Features of reservoirs
   b) Oil Coolers
      i) Types and locations of oil coolers
   c) Filters

VI) Hoses, Pipes, Couplers and Seals
   a) Hoses
      i) Basic parts
      ii) Types of hoses
      iii) Selection of hoses
      iv) Hose failures
      v) Installing hoses
      vi) Hose fittings
   b) Pipes and Tubing
      i) Application
      ii) Construction of pipes and tubing
      iii) Selection of pipes and tubing
      iv) Installation of pipes and tubing
      v) Tube fittings
   c) Quick Disconnect Couplers
VII) Hydraulic Valves  
   a) Directional  
      i) Rotary  
      ii) Open center spool  
      iii) Closed center spool  
      iv) Flow divider  
   b) Flow Control  
      i) Needle  
      ii) Globe  
      iii) Gate  
      iv) Check  
      v) Relief  
   c) Pressure Control  
      i) Pressure Relief Valve  
      ii) Direct-Acting Pressure Relief Valve  
      iii) Pilot-Operated Pressure Relief Valve  
      iv) Other Pressure Control Valves  
   d) Flow Control  
      i) Needle  
      ii) Globe  
      iii) Gate  
      iv) Check  
      v) Relief  

VIII) Hydraulic Actuators  
   a) Cylinders  
   b) Motors  

IX) Hydraulic Symbols, Diagrams, and Schematics  
   a) J.I.C. and I.S.O. Symbols  
   b) Application of symbols to components  
   c) Reading and interpretation of diagrams, and schematics  

X) Diagnosing and Testing of Tractor Hydraulic Systems  
   a) Use of a Hydraulic Tester  
      i) What a tester does  
      ii) Installing a tester  
      iii) Operating a hydraulic tester
Labs:
1. Lab Safety & Computer Skills
2. Pascal's Law: Vega Experiment 1
3. Force Multiplication: Vega Experiment 2
4. Basic PSI Source: Vega Experiment 3
5. Schematic Drawing I: Backhoe Lab
6. Fittings Lab
7. Bale Wagon Schematics Lab
8. Hampden Meter in/out & Check Balls Lab
9. 248 B Schematic Reading Lab
10. Flow & Velocity Lab (Regenerative Circuit)
11. Flow & Velocity Lab II
12. Vega Efficiency Lab
13. Pump Size Shopping List Lab
14. Powershift Testing Lab