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:
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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 Tuesday 10:00-11:50 PM Marshall 117

Prerequisite/Co requisite:
MAGN 101

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. 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.
3. 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:
- 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.
- 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

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 and selection of hoses
       iii) Hose failures
       iv) Installing hoses
       v) 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
   FOS Chap. 5
   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
      FOS Chap. 6 – 7
   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