



Course Syllabus

DEMR 1316 - Basic Hydraulics

Revision Date: 01/11/2017

Catalog Description: This course teaches the fundamentals of hydraulics including components and related systems.

Lecture hours = 2, Lab hours = 3

Prerequisites: None

Semester Credit Hours: 3

Lecture Hours per Week: 2

Lab Hours per Week: 3

Contact Hours per Semester: 80

State Approval Code: 47.0605

Instructional Goals and Purposes: The purpose of this course is to identify various components used in hydraulic systems; evaluate hydraulic components by inspection and testing; and explain hydraulics, theory, circuits, and application.

Learning Outcomes:

1. Define hydraulics and give an application.
2. Describe the operation of a hydraulic power unit.
3. Discuss function of a hydraulic schematic.
4. Describe basic hydraulic cylinder circuits and their application.
5. Discuss the principles of hydraulic pressure and flow.
6. Define pneumatics and give an application.
7. Explain six pneumatic safety rules.
8. List types of pneumatic circuit connections.
9. Describe basic pneumatic cylinder circuits and give applications.
10. Discuss the principles of pneumatic pressure and flow.

Specific Course Objectives (includes SCANS):

After studying all materials and resources presented in the course, the student will be able to:

1. **Define hydraulics and give an application.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Describe the five basic components of a hydraulics system.
 - b. Define hydraulic pressure and give its units of measure.
2. **Describe the operation of a hydraulic power unit.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

- a. Demonstrate the operation of a hydraulic power unit with startup and shutdown procedures.
 - b. Demonstrate how to set system pressure at the main relief valve.
- 3. Discuss the function of a hydraulic schematic.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Describe the eight basic rules for drawing a hydraulic schematic.
 - b. Demonstrate how to properly draw a hydraulic schematic.
- 4. Describe basic hydraulic cylinder circuits and their application.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Define hydraulic pumps
 - b. Define hydraulic motors
 - c. Define hydraulic cylinders single and double acting.
- 5. Discuss the principles of hydraulic pressure and flow.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Calculate the force output of an extending cylinder.
 - b. Calculate the retraction force of an cylinder.
 - c. State Pascal's law and explain its importance to hydraulics
- 6. Define pneumatics and give an application.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Describe the functions of basic components of a pneumatic system.
 - b. Define pneumatic pressure and give its unit of measure.
 - c. Describe the function of a pneumatic schematic.
- 7. Explain six pneumatic safety rules.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Demonstrate the proper safety precautions to use around pneumatics.
 - b. Demonstrate proper PPE to wear around pneumatics.
 - c. Describe the importance of a pressure regulator in pneumatics.
- 8. List the types of pneumatic circuit connections.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Describe the function of a pneumatic quick-connect fitting and give its application.
 - b. Describe the function of a tee connection and a cross connection.
 - c. Demonstrate how to hook up a pneumatic circuit with quick-connect fitting safely.
- 9. Describe basic cylinder circuits and give applications.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Describe the function of a pneumatic cylinder and give an application.
 - b. Describe the operation of a double acting pneumatic cylinder.
 - c. Describe the operation for a five way three position DCV.
- 10. Discuss the principles of pneumatic pressure and flow.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- a. Describe how to calculate the force output of an extending cylinder.
 - b. Describe how to calculate the force output of a retracting cylinder.

Course Content:

A general description of lecture/discussion topics included in this course is listed in the Learning Objectives / Specific Course Objectives sections of this syllabus.

Students in all sections of this course will be required to do the following:

1. Attend scheduled classes regularly and be on time for every class period. Students can be dropped from a class due to excessive absences. More than **two** (2) unexcused absences are considered to be excessive.
2. Study the assigned materials, complete and submit homework assignments on time, complete quizzes and exams to assess understanding and comprehension of the material presented.
3. Complete any scheduled lab assignments. Personal Protective Equipment (PPE) is required to be worn in lab.

Methods of Instruction/Course Format/Delivery:

Students will have access to this course in Canvas and will meet regularly for class each week. Classes will consist of lecture and lab exercises as appropriate. Quizzes and exams may be administered by the Instructor or by an approved testing facility.

The following will be used to calculate the student's final grade:

Attendance and Participation

Students are expected to attend face to face classes and be on time. Students are required to participate in class discussions and work with other students during class exercises.

Attendance is based on the student missing no more than 10% out of the semester without a valid excuse, at which point, the instructor may withdraw the student at their discretion. Any student thirty or more minutes late may be counted absent. Students that leave before class is dismissed will be counted absent. The Instructor reserves the right to deduct points on any makeup work resulting from an unexcused absence.

Lab Exercises

Students will complete lab assignments designed to teach them how to apply knowledge gained from the textbook to actual hydraulic and pneumatic circuits.

Quizzes

Upon completion of each major assignment, students will take online quizzes over the material covered. Quizzes will generally contain true/false, multiple choice, matching or fill In-the-blank questions.

Midterm and Final Exams

There will be two major exams consisting of a Midterm Exam and a Final Exam. The Final Exam will be cumulative.

Grading Notes

Missed quizzes or exams due to legitimate reasons should be taken prior to the reporting of mid-term or final grades as applicable. It is the responsibility of the student to reschedule the makeup with the instructor, who reserves the right to change the test format of any makeup quiz or exam. Instructor is not required to makeup work for an unexcused class absence. The Instructor also reserves the right to give full or partial credit for any makeup work that is allowed and that resulted from an unexcused absence.

Attendance is based on the student missing no more than 10% out of the semester without a valid excuse, at which point, the instructor may withdraw the student at their discretion. Any student thirty or more minutes late may be counted absent. Students that leave before class is dismissed will be counted absent. The Instructor reserves the right to dock points on any makeup work resulting from an unexcused absence.

Scholastic dishonesty is treated with the utmost seriousness by the Instructor and Panola College. Academic dishonesty includes, but is not limited to, the willful attempt to misrepresent one's work, cheat, plagiarize, or impede other students' scholastic progress.

Grading Scale: A=90-100, B=80-89, C=70-79, D=60-69, F=69 and below

Major Assignments / Assessments:

The following items will be assigned and assessed during the semester and used to calculate the student's final grade.

Assignments

1. LAP 1: Hydraulic Power Systems
2. LAP 2: Basic Hydraulic Circuits
3. LAP 3: Principles of Hydraulic Pressure and Flow
4. LAP 4: Hydraulic Speed Control
5. LAP 5: Hydraulic Pressure Control Circuits
6. LAP 1: Pneumatic Power Systems
7. LAP 2: Basic Pneumatic Circuits
8. LAP 3: Principles of Pneumatic Pressure and Flow
9. LAP 4: Pneumatic Speed Control Circuits

Assessment(s):

1. Quiz 1: Hydraulic Power Systems
2. Quiz 2: Basic Hydraulic Circuits
3. Quiz 3: Principles of Hydraulic Pressure and Flow
4. Quiz 4: Hydraulic Speed Control
5. Quiz 5: Hydraulic Pressure Control Circuits
6. Quiz 6: Pneumatic Power Systems
7. Quiz 7: Basic Pneumatic Circuits
8. Quiz 8: Principles of Pneumatic Pressure and Flow
9. Quiz 9: Pneumatic Speed Control Circuits
10. Midterm Exam
11. Final Exam

Course Grade:

The grading scale for this course is as follows:

- Attendance – 10%
- Lab Exercises – 20%
- Quizzes – 30%
- Exams – 40%

Texts, Materials, and Supplies:

- *Basic Hydraulics: Printed Material available from College Bookstore*
- *Basic Pneumatics: Printed Material available from College Bookstore*
- Notebook and a Pen or Pencil
- Calculator (**Do not use your phone as a calculator!**)
- **PPE: Safety Glasses and Hard Hats Required**

Required Readings:

- Printed material from College Store

Recommended Readings:

- None

Other:

- For current texts and materials, use the following link to access bookstore listings:
<http://www.panolacollegestore.com>
- For testing services, use the following link: <http://www.panola.edu/elearning/testing.html>
- If any student in this class has special classroom or testing needs because of a physical learning or emotional condition, please contact the ADA Student Coordinator in Support Services located in the Administration Building or go to <http://www.panola.edu/student-success/disability-support-services/> for more information.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook, *The Pathfinder*:
<http://www.panola.edu/student-success/documents/pathfinder.pdf>

SCANS CRITERIA

- 1) **Foundation skills are defined in three areas: basic skills, thinking skills, and personal qualities.**
 - a) **Basic Skills:** A worker must read, write, perform arithmetic and mathematical operations, listen, and speak effectively. These skills include:
 - i) Reading: locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules.
 - ii) Writing: communicate thoughts, ideas, information, and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flowcharts.
 - iii) Arithmetic and Mathematical Operations: perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.
 - iv) Listening: receive, attend to, interpret, and respond to verbal messages and other cues.
 - v) Speaking: Organize ideas and communicate orally.
 - b) **Thinking Skills:** A worker must think creatively, make decisions, solve problems, visualize, know how to learn, and reason effectively. These skills include:
 - i) Creative Thinking: generate new ideas.
 - ii) Decision Making: Specify goals and constraints, generate alternatives, consider risks, and evaluate and choose the best alternative.
 - iii) Problem Solving: recognize problems and devise and implement plan of action.
 - iv) Visualize ("Seeing Things in the Mind's Eye"): organize and process symbols, pictures, graphs, objects, and other information.
 - v) Knowing How to Learn: use efficient learning techniques to acquire and apply new knowledge and skills.
 - vi) Reasoning: discover a rule or principle underlying the relationship between two or more objects and apply it when solving a problem.
 - c) **Personal Qualities:** A worker must display responsibility, self-esteem, sociability, self-management, integrity, and honesty.
 - i) Responsibility: exert a high level of effort and persevere toward goal attainment.
 - ii) Self-Esteem: believe in one's own self-worth and maintain a positive view of oneself.
 - iii) Sociability: demonstrate understanding, friendliness, adaptability, empathy, and politeness in group settings.
 - iv) Self-Management: assess oneself accurately, set personal goals, monitor progress, and exhibit self-control.
 - v) Integrity and Honesty: choose ethical courses of action.
- 2) **Workplace competencies are defined in five areas: resources, interpersonal skills, information, systems, and technology.**
 - a) **Resources:** A worker must identify, organize, plan, and allocate resources effectively.
 - i) Time: select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - ii) Money: Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.
 - iii) Material and Facilities: Acquire, store, allocate, and use materials or space efficiently.
Examples: construct a decision timeline chart; use computer software to plan a project; prepare a budget; conduct a cost/benefits analysis; design an RFP process; write a job description; develop a staffing plan.
 - b) **Interpersonal Skills:** A worker must work with others effectively.

- i) Participate as a Member of a Team: contribute to group effort.
- ii) Teach Others New Skills.
- iii) Serve Clients/Customers: work to satisfy customer's expectations.
- iv) Exercise Leadership: communicate ideas to justify position, persuade and convince others, responsibly challenge existing procedures and policies.
- v) Negotiate: work toward agreements involving exchange of resources, resolve divergent interests.
- vi) Work with Diversity: work well with men and women from diverse backgrounds.

Examples: collaborate with a group member to solve a problem; work through a group conflict situation, train a colleague; deal with a dissatisfied customer in person; select and use appropriate leadership styles; use effective delegation techniques; conduct an individual or team negotiation; demonstrate an understanding of how people from different cultural backgrounds might behave in various situations.

- c) **Information:** A worker must be able to acquire and use information.

- i) Acquire and Evaluate Information.
- ii) Organize and Maintain Information.
- iii) Interpret and Communicate Information.
- iv) Use Computers to Process Information.

Examples: research and collect data from various sources; develop a form to collect data; develop an inventory record-keeping system; produce a report using graphics; make an oral presentation using various media; use on-line computer databases to research a report; use a computer spreadsheet to develop a budget.

- d) **Systems:** A worker must understand complex interrelationships.

- i) Understand Systems: know how social, organizational, and technological systems work and operate effectively with them.
- ii) Monitor and Correct Performance: distinguish trends, predict impacts on system operations, diagnose deviations in systems' performance and correct malfunctions.
- iii) Improve or Design Systems: suggest modifications to existing systems and develop new or alternative systems to improve performance.

Examples: draw and interpret an organizational chart; develop a monitoring process; choose a situation needing improvement, break it down, examine it, propose an improvement, and implement it.

- e) **Technology:** A worker must be able to work with a variety of technologies.

- i) Select Technology: choose procedures, tools or equipment including computers and related technologies.
- ii) Apply Technologies to Task: understand overall intent and proper procedures for setup and operation of equipment.
- iii) Maintain and Troubleshoot Equipment: Prevent, identify, or solve problems with equipment, including computers and other technologies.

Examples: read equipment descriptions and technical specifications to select equipment to meet needs; set up and assemble appropriate equipment from instructions; read and follow directions for troubleshooting and repairing equipment.