Discipline: Manufacturing Technology

Degree Credit [X]
Non Credit [ ]
Nondegree Credit [ ]
Comm Service [ ]

Riverside Community College District
Integrated Course Outline of Record

Manufacturing Technology 60

College: R___ M___ N_X_
Lecture Hours: 40
MAN-60: Hydraulic and Pneumatic Systems Lab Hours: 72
Units: 3.00

COURSE DESCRIPTION

Prerequisite(s): None.

Advisory: ENE 60 or MAT 52
Basics of hydraulic and pneumatic systems including physical properties of liquids under pressure. Pumps, motors, accumulators, valves and drive cylinders are studied. The design and assembly of both high and low pressure fluid control systems from standard components is experienced. Applications of fluids in robotic and industrial equipment systems are presented. 40 hours lecture and 72 hours laboratory. (Letter Grade, or Pass/No Pass option.)

SHORT DESCRIPTION FOR CLASS SCHEDULE

Overview of basic pressurized fluid systems in engineering, manufacturing, robotic and industrial equipment systems are presented.

ENTRY SKILLS

Before entering the course, students will be able to:

1. Solve arithmetic problems dealing with addition, subtraction, multiplication and division.
    - MAT 52 - 1. Perform arithmetic operations on real numbers and polynomial, rational, and radical expressions.
    - ENE 60 - Solve arithmetic problems dealing with addition, subtraction, multiplication and division that are typical to the industrial setting.

2. Solve formulas by using unknowns and apply this knowledge to solve problems encountered in technological areas and engineering fields.

- MAT 52 - 2. Evaluate algebraic expressions.
- ENE 60 - Solve formulas by using unknowns and apply this knowledge to solve problems encountered in technological areas and various fields of engineering.

3. Solve problems by use of a scientific calculator.
   - ENE 60 - Solve problems by use of a scientific calculator.

STUDENT LEARNING OUTCOMES

Upon successful completion of the course, students should be able to:

Demonstrate basic safety procedures when designing and assembling high pressure hydraulic and pneumatic systems.

- Application of Knowledge - Maintain and transfer academic and technical skills to workplace

Use troubleshooting procedures to diagnose and repair hydraulic and pneumatic systems used in automated processes and robotic assemblies.

- Critical Thinking - Analyze and solve complex problems across a range of academic and everyday contexts

Set-up and operate fluid powered valves, cylinders, controls filters, and actuators.

- Application of Knowledge - Maintain and transfer academic and technical skills to workplace

Calculate functions and load requirements then design, select components and test complex fluid powered systems in a robotic or industrial environment.

- Critical Thinking - Integrate knowledge across a range of contexts

Recognize fluid power schematic symbols.

- Information Skills - Locate, evaluate and use information effectively
- Breadth of Knowledge - Understand the basic content and modes of inquiry of the major knowledge fields
- Breadth of Knowledge - Use the symbols and vocabulary of mathematics to solve problems and communicate the results

Explain basic operation, construction and applications of typical industrial hydraulic components.

- Critical Thinking - Integrate knowledge across a range of contexts

Construct typical components using a print, and test run the system.

- Critical Thinking - Analyze and solve complex problems across a range of academic and everyday contexts

COURSE CONTENT

1. Fluid power systems
    a. Safe use of fluid power systems
    b. How a fluid power system works
2. Fundamental laws of fluid mechanics
    a. Pascal's law
    b. Pressure
    c. Force
    d. Transmittal of confined liquids
    e. Area
3. Components of a hydraulic system
    a. Reservoir to hold the fluid
    b. Pump to force the fluid through the system
    c. Valves to control fluid pressure and flow
    d. Actuator to convert the energy of the compressed fluid into mechanical force
4. Applications of fluid power
    a. manufacturing
    b. transportation
    c. construction
    d. agriculture
    e. lumbering
    f. material handling
    g. mining
    h. printing
    i. space exploration
5. Pneumatic vs hydraulic fluid systems
    a. Manufacturing
    b. Transportation
    c. Construction
    d. Agriculture
    e. Lumbering
    f. Material handling
    g. Mining
    h. Printing
    i. Space exploration
6. Fluid Systems

   a. Pneumatic
   b. Hydraulic
7. Industrial drawings and schematics
8. Fabrication and troubleshooting fluid power systems

METHODS OF INSTRUCTION

Methods of instruction used to achieve student learning outcomes may include, but are not limited to:

- Present class lectures/discussions/demonstrations in order to show the students how to design a fluid power circuit to control machinery and robotics.
- Show videos in order to give the students a better understanding of how fluid power mechanisms are used in industry.
- Create and assign pair and small group activities such as designing and connecting a fluid power system to drive different fluid power based machines.
- Develop and assign class exercises such as worksheets that help the students understand various fluid power symbols used in industry.
- Conduct individual conferences in order to help the students understand how fluid power applies to what the students are doing within their job.
- Assign lab projects that help the students' show they can use fluid power concepts to safety construct fluid power mechanisms.
- Industry tours that help the students understand how many different industries are using fluid power to drive automated systems.

METHODS OF EVALUATION

Students will be evaluated for progress in and/or mastery of learning outcomes by methods of evaluation which may include, but are not limited to:

- Lab projects designed to show the student is adept at using fluid power to create automated systems. Drawings and pictures of these lab projects can then be used by the student to show future or current employers what they created during class.
- Quizzes/examinations designed to test the students' understanding of the operation of fluid power systems.
- Written assignments designed to give the students experience in researching some aspect of uses of fluid power within industry.
- Class and individual projects designed to let the students experience creating fluid power systems as a group.
- The portfolio is a collection of printouts showing fluid power systems designed during the class.
- Final examination designed to test the students on their understanding of fluid power systems and symbols.

SAMPLE ASSIGNMENTS

Outside-of-Class Reading Assignments

- Students may be required to read articles and periodicals on hydraulics. For example:
  - Go to the following online article:
    - http://www.amazines.com/article_detail.cfm/653797?articleid=653797
  - Read the article and write an outline of the main points.

Outside-of-Class Writing Assignments

- Research and write a one page report on how fluid power is used in the industry.

Other Outside-of-Class Assignments

- Field trips may be required to view professional hydraulic systems with a subsequent one page report of their trip's findings.

COURSE MATERIALS

All materials used in this course will be periodically reviewed to ensure that they are appropriate for college level instruction. Possible texts include:

Amatrol. Amatrol Learning Systems Manual and Curriculum Guides. Amatrol, Inc., 2004.
www.amatrol.com
Eaton Hydraulics Training Services (Vickers) . Industrial Hydraulics Manual 5th Ed. 2nd Printing. April 1, 2008 ed. Eaton Hydraulics Training Services; 5th edition, 2008.
Esposito, Anthony. Fluid Power with Applications. Prentice Hall, 2003.
Johnson, James. Introduction to Fluid Power. Thomson-Delmar Learning, 2001.

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