

Heartland Community College

Master Course Syllabus

Division Name: CTE
Course Prefix and Number: MAIN 202
Course Title: Fluid Power and Mechanical Systems

DATE PREPARED: August 25, 1994
DATE REVIEWED: November 2019
DATE REVISED: November 2019

PCS/CIP/ID NO: 12-470303
IAI NO. (if available):
EFFECTIVE DATE OF FIRST CLASS: Spring 2020

CREDIT HOURS: 3
CONTACT HOURS: 4
LECTURE HOURS: 2
LABORATORY HOURS: 2

PREREQUISITE(S):
Completion of MATH 091 OR
Placement at MATH 092 or higher

CATALOG DESCRIPTION:

Fluid Power and Mechanical Systems examines basic fluid power theories and advantages, schematic reading and development, equipment specification and installation, and maintenance and rebuilding of individual components. You will learn about fundamental mechanical principles. Additionally, you will also learn about troubleshooting techniques.

TEXTBOOKS:

Instructors for this class should use the following textbooks or comparable text that addresses at a minimum the topics listed in the Course Outline and that provides students with the opportunity to achieve the learning outcomes for this course:

Amatrol Learning Content (available via activation codes)

Eaton. (2012). *Industrial Hydraulics Manual, 5th edition*. Eden Prairie, MN: Eaton Hydraulics Training Services.

Hooper, Jay, F. (2003). *Basic Pneumatics: An Introduction to Industrial Compressed Air Systems and Components*. Durham, NC: Carolina Academic Press.

Kemp, Albert. (2012) *Industrial Mechanics, 3rd edition*. Orland Park, IL: American Technical Publisher.

Kemp, Albert. (2012) *Industrial Mechanics, 3rd edition Workbook*. Orland Park, IL: American Technical Publisher.

RELATIONSHIP TO ACADEMIC DEVELOPMENT PROGRAMS AND TRANSFERABILITY:

MAIN 202 was designed to meet the specific needs of an Associate of Applied Science degree and not necessarily as a transfer course, particularly in relation to the Illinois Articulation Initiative. This course may transfer to various institutions in a variety of ways. Please see an academic advisor for an explanation concerning transfer options.

LEARNING OUTCOMES:

Course Outcomes	Essential Competencies	Range of Assessment Methods
1. Identify basic components of a fluid power schematic (pneumatic and hydraulic systems)	PS/CT	Assignments Exams/Quizzes Labs
2. Physically demonstrate an understanding of proper safety used while working on fluid power devices (pneumatic and hydraulic systems)	T	Labs
3. Demonstrate the proper use of measurement devices to correctly measure pressure, volume and flow of a fluid power system (pneumatic and hydraulic systems)	T	Assignments Exams/Quizzes Labs
4. Correctly implement control of a pneumatic actuator using meter-in or meter-out depending on the situation in which the actuator will be used	T	Assignments Exams/Quizzes Labs
5. Apply general principles of mechanical systems (force, motion, and/or simple machines) to the work environment	PS/CT	Assignments Exams/Quizzes Labs
6. Research and apply, along with reflect and share, in written form, information about industrial technology as it relates to the student's field of study	C	Assignments Final Project

ESSENTIAL COMPETENCIES:

Problem Solving/Critical Thinking (PS/CT) - Students think critically to solve problems or explore issues.

Technology (T) - Students appropriately utilize technology.

PROGRAM OUTCOME(S):

- Troubleshoot and repair electronic and mechanical systems. (MAIN 101, MAIN 202)
- Develop specialized technical skills in one or more areas (Design & Fabrication, Construction, Electronics, Renewable Energy, Facilities Maintenance, Industrial Maintenance, and/or Welding).

COURSE OUTLINE:

1. Understand basic pneumatics
2. Describe directional control valves
3. Understand pneumatic pressure control valves
4. Describe and maintain pneumatic cylinders
5. Describe and maintain pneumatic motors and actuators
6. Troubleshoot pneumatic systems
7. Understand basic hydraulics
8. Describe hydraulic pumps
9. Describe directional control valves
10. Hydraulic pressure control valve operation
11. Describe hydraulic cylinders
12. Install and maintain hydraulic systems
13. Troubleshoot hydraulic systems
14. Understand basic mechanics

METHOD OF EVALUATION (Tests/Exams, Grading System):

Assessment Method	% of Final Grade
Exams/Quizzes	20-40%
Labs	20-40%
Assignments (may include a Final Project)	20-40%
TOTAL	100%

Course grades will be determined by the use of the following grading scale:

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|---|-----------|
| A | 90-100% |
| B | 80-89% |
| C | 70-79% |
| D | 60-69% |
| F | Below 60% |

REQUIRED WRITING AND READING:

Documentation is an important part of this course. All labs are to include descriptive comments within the write-up/answer section relating to each lab. Students will be expected to read assigned selections from the textbook and or labs, articles or other course related materials, at a minimum of 25 pages per week. Estimate is based on a 16-week course schedule. Please note if your class is not a 16-week class your weekly reading assignment will be increased. There is no formal research or writing assignments in this course. However, discipline specific writing and documentation is an important part of these courses, therefore discipline appropriate writing/reading methods will be taught and used in this course.

SAMPLE COURSE CALENDAR:

This sample course calendar is provided to guide instructors; each instructor will modify to suit.

Module #	Module Topic(s)
#1	Course Introduction Fluid Power Principles
#2	Basic Pneumatics Fluid Power Principles
#3	Valves & Graphic Symbols Directional Control Valves Pressure Regulators / Check a Regulator
#4	Valves & Circuits Algebraic Functions, Pneumatic Logic
#5	Circuit Reading Distribution & Treatment
#6	Air Cylinders and Metering Cylinder Principals Parts Ordering
#7	Review Air Cylinders, Metering, Air Compressors, Air Dryers Cylinder Selection ARO Guide
#8	Midterm Exam
#9	Introduction to Hydraulics Hydraulic Fluid Principals
#10	Hydraulic Fluids
#11	Hydraulic Pumps
#12	Hydraulic Pumps, Continued Contamination Control
#13	Pressure Controls
#14	Directional Valves
#15	Cartridge & Stack Valves Proportional Valves Electrohydraulic Devices Final Exam Review
#16	Course Wrap Up Final Exam