

I COURSE DESCRIPTION:

- A. Department Information:
Division: Technical
Department: Machine Trades
Course ID: MACH 094A
Course Title: Fluid Pump Systems
Units: 2
Lecture: 2 Hours
Laboratory: None
Prerequisite: None
- B. Catalog and Schedule Description:
This course focuses on an introduction to single- and multiple-stage pump operations, pump performance analysis, and pump selection and maintenance.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of this course, students will be able to:

- A. Explain the operations of a centrifugal pump system.
- B. Recognize a centrifugal pump system compared to other pumps.
- C. Demonstrate how to align a pump coupling to motor assembly.
- D. Operate a flow meter when measuring the centrifugal flow rate.
- E. Solve formulas to calculate Mass Flow Rate.
- F. Define how to measure centrifugal pump flow and pressure.
- G. Determine and measure the head capacity of a centrifugal pump system.
- H. Analyze the efficiency of a parallel pump system using a 950-pmi trainer.
- I. Identify the differences between a piston pump and gear pump operation system.

IV. COURSE CONTENT:

- A. Demonstrate Centrifugal Pump Operations
 1. Use a flow meter to measure centrifugal pump flow rate
 2. Measure the horizontal angular misalignment between a pump and motor assembly
 3. Convert between mass and volumetric flow rate
 4. Calculate flow velocity given flow rate
- B. Pump Analysis
 1. Determine the required pump head discharge rate
 2. Use a pressure gage and a vacuum gage to determine suction
 3. Use a pump curve to determine the flow capacity of a centrifugal pump
 4. Use a performance curve to determine the head and capacity of a parallel pump system
- C. Diaphragm Pump Systems
 1. Inspect the diaphragms on the diaphragm pump used on the 950-pmi trainer
 2. Start up and operate a piston pump system
 3. Measure and graph the flow/pressure characteristics of a piston pump
 4. Start up and operate a gear pump
 5. Calculate the flow rate or displacement of a gear pump

V. METHODS OF INSTRUCTION:

This course is designed for a combination of hands-on and lecture components, where skills can be tested and evaluated. The instructional methods to be used include:

- A. Multimedia Curriculum, Student Experimentation
- B. Hands-on Skill Exercises-Authentic Assessment
- C. Fault diagnostics utilizing a 950-pmi trainer

VI. TYPICAL ASSIGNMENTS:

- A. Discussion
 - 1. Discuss the operation of a centrifugal pump system.
 - 2. Demonstrate Mass Flow Rate formulas for determining volumetric flow rate.
 - 3. Discuss various pump systems and their applications.
- B. Hands-on Skill Demonstration
 - 1. Students will demonstrate pump alignment techniques between a pump and motor assembly.
 - 2. Students will utilize a 950-pmi trainer to diagnose pump faults.
- C. Read Amatrol packet on Centrifugal Pump Systems and answer the following questions:
 - 1. What is the operation of a centrifugal pump system?
 - 2. What are Mass Flow Rate formulas for determining volumetric flow rate?
 - 3. Describe various pump systems and their applications to pumping fluids.

VII. EVALUATION(S):

- A. Methods of Evaluation
 - Objective and subjective comprehensive examinations (for lecture and skill exercises)
 - Typical Questions:
 - 1. Using the 950-pmi trainer, use a performance curve to determine the head capacity of a series centrifugal pump system.
 - 2. Calculate the efficiency of a series centrifugal pump system utilizing the following formula: $\text{Efficiency} = \frac{\text{HHP}}{\text{iHP}} \times 100$
- B. Frequency of Evaluations
 - 1. Eight computerized Learning Activity Packets
 - 2. Four hands-on application tests

VIII. TYPICAL TEXT(S):

Integrated Systems Technology, Learning Activity Packets 1-4, Amatrol Corporation, Jeffersonville, Indiana, 2000
Edward Hoffman, Student Shop Reference Handbook, 2nd Edition, Industrial Press, New York, 2000
Weingartner, Machinist Ready Reference, 10th Edition, Prakken Publication, Ann Harbor, Michigan, 2000

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

Calculator