

## Flow And Measurement Calibration (INTC1358)



**Credit:** 3 semester credit hours (3 hours lecture)

**Prerequisite/Co-requisite:** None required

### Course Description

A study of the practical methods of flow measurements and flow integration. Emphasis on orifice selection and calculation methods in accordance with American Gas Association (AGA) and American Petroleum Institute (API) Standards.

### Required Textbook and Materials

1. Fluid Power Technology by F. Don Norvelle
  - a. ISBN number is 13:978-0-314-01218-0
2. Notebook

### Course Objectives

Upon completion of this course, the student will be able to:

- A. Perform flow calculations.  
(SCANS C5.4, C19.4, C20.3, F1.3, F2.3, F3.4, F4.4, F5.3, F9.4, F12.4)
- B. Select the proper orifice under stated conditions.  
(SCANS C5.4, C19.4, C20.3, F1.3, F2.3, F3.4, F4.4, F5.3, F9.4, F12.4)
- C. Understand basic fluid power concepts, systems and components.  
(SCANS C5.4, C19.4, C20.3, F1.3, F2.3, F3.4, F4.4, F5.3, F9.4, F12.4)

### SCANS Skills and Competencies

Beginning in the late 1980's, the U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS) conducted extensive research and interviews with business owners, union leaders, supervisors, and laborers in a wide variety of work settings to determine what knowledge workers needed in order to perform well on a job. In 1991 the Commission announced its findings in *What Work Requires in Schools*. In its research, the Commission determined that "workplace know-how" consists of two elements: foundation skills and workplace competencies.

### Course Outline

- |   |   |
|---|---|
| <p>A. Introduction</p> <ol style="list-style-type: none"><li>1. Introduction of faculty and students</li><li>2. Review Syllabus</li><li>3. Review Class Policies</li></ol> <p>B. Introduction</p> | <ol style="list-style-type: none"><li>1. A brief history of fluid Power</li><li>2. Fluid power applications</li><li>3. Supporting equipment in a compressor system</li><li>4. Startup, Shutdown, and Troubleshooting of Systems</li></ol> |
|---|---|

Approved 01/2011

INTC 1358  
Course Syllabi

- C. Basic Hydraulic Concepts
  - 1. Pascal's Law
  - 2. Pressure-Force-Area Relationship
  - 3. Multiplication of Force
  - 4. Power and Horsepower
  - 5. Fluid Power Systems
  - 6. Fluid Flow
- D. Hydraulic Fluids
  - 1. Physical Characteristics and Properties of Liquids vs. Gases
  - 2. Viscosity, Viscosity Index, and Pour Point
  - 3. Fluid Analysis
  - 4. Fluid Handling, Storage, Disposal
- E. Hydraulic Pumps
  - 1. Types of Pumps
  - 2. Vane Pumps
  - 3. Effects of Air and Other Gases on Pump Life
  - 4. Troublshooting Tips
- F. Hydraulic Motors
  - 1. Types of Motors
- G. Directional Control Valves
  - 1. Directional Control Valve terminology
  - 2. Check Valves
  - 3. Two-Way Valves
  - 4. Three-Way Valves
  - 5. Four-Way Valves
  - 6. Valve Actuator Symbols
- H. Pressure Control Valves
  - 1. Pressure Relief Valves
  - 2. Pressure Reducing Valves
  - 3. Unloading Valves
  - 4. Counterbalance Valves
  - 5. Brake Valves
  - 6. Sequence Valves
- I. Flow Control valves
  - 1. Flow Restricting Valves
  - 2. Flow Diverting Valves
  - 3. Flow Control Valve Applications
  - 4. Troubleshooting Tips
- J. Pneumatics : Basic Concepts and Air Preparation
  - 1. General Information on Pneumatics
  - 2. Gas Laws
  - 3. Compressors
  - 4. Compressor Types

**Grade Scale**

|          |   |
|----------|---|
| 90 – 100 | A |
| 80 – 89  | B |
| 70 – 79  | C |
| 60 – 69  | D |
| 0 – 59   | F |

**Course Evaluation**

Final grades will be calculated according to the following criteria:

| <i>Activity</i> | <i>Percentage</i> |
|-----------------|-------------------|
| Classwork       | 20%               |
| Quizzes         | 30%               |
| Exams           | 50%               |

Late Penalties will be assessed on all work turned in late. 10 points per day

### **Course Requirements**

1. Explain principles of compression. Identify the basic components of a compressor system.
2. Describe the basic principles of fluid flow inside a heat exchanger.
3. List and describe the basic components of a cooling tower.
4. Describe the basics of boiler operation and responsibilities of a boiler technician.
5. Describe the various types of direct and indirect fired heaters. Describe the basic component of a furnace.
6. Describe the basic components of a steam system. Identify types of steam systems.
7. Describe the function of a reactor. List reaction variables and their effects.
8. Describe the principles of distillation.

### **Attendance Policy**

1. Missing more than 20% of classes will result in an automatic “F” for the course.
2. Absences are counted for unexcused, excused and coming to class late.
3. Missing more than 20% of a class period will count as an absence.
4. Being tardy 3 times equals 1 absence.

### **Course Policies**

1. No food, drinks, or use of tobacco products in class.
2. No foul or harsh language will be tolerated
3. Turn off all Cell Phones during lectures
4. Headphones may be worn only upon Instructor approval
5. Do not bring children to class.
6. No Cheating of any kind will be tolerated. Students caught cheating or helping someone to cheat can and will be removed from the class for the semester. Cheating can result from expulsion from LIT.
7. If you wish to drop a course, the student is responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an ‘F’ in the course.

### **Disabilities Statement**

The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability

requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building.

## Course Schedule

| <b>Week</b> | <b>Topic</b>   | <b>Reference</b> |
|-------------|--|------------------|
| 1           | Course introduction, and policies and Compressors <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Chapter exercises and worksheets</li> </ul>                                   | Handouts         |
| 2           | Introduction <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Chapter exercises and worksheets</li> </ul>  | Chapter 1        |
| 3/4/5       | Basic Hydraulic Concepts <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Test 1</li> </ul>  | Chapter 2        |
| 6/7         | Hydraulic Fluids <ul style="list-style-type: none"> <li>• Lecture</li> <li>• Chapter exercises and worksheets</li> <li>• Chapter exercises and worksheets</li> </ul>                         | Chapter 3        |
| 8/9         | Hydraulic Pumps <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Chapter exercises and worksheets</li> <li>• Review chapters 8 &amp; 9</li> <li>• Test 2</li> </ul>              | Chapter 4        |
| 10          | Hydraulic Motors <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Chapter Exercises and worksheets</li> </ul>  | Chapter 5        |
| 11/12       | Directional Control Valves <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Chapter Exercises and worksheets</li> <li>• Review chapters 10 &amp; 13</li> <li>• Test 3</li> </ul> | Chapters 7       |
| 13          | Pressure Control Valves <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Chapter Exercises and worksheets</li> </ul>   | Chapter 8        |
| 14/15       | Flow Control Valves <ul style="list-style-type: none"> <li>• Lecture:</li> <li>• Chapter Exercises and worksheets</li> <li>• Test 4</li> </ul>   | Chapter 9        |
| 16          | Pneumatics: Basic Concepts and Air Preparation <ul style="list-style-type: none"> <li>• Lecture:</li> </ul>  | Chapter 14       |

- Chapter Exercises and worksheets
  - Review for Final
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### Contact Information

**Instructor:** Mr. Edgar Neely  
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**Telephone:** (409) 839-2057  
**E-mail:** [edgar.neely@lit.edu](mailto:edgar.neely@lit.edu)  
**Office Hours:** 12:30 pm – 4:30 pm M & W  
8:50 am – 10:50 am Friday