

Course Title: Fundamentals of Instrumentation; ELT 1343

Name of Instructor: Jerry Clark

Course Description: A course designed to provide the student with a general knowledge of instrumentation principles as they relate to the electrical industry. This course includes instruction in the basis of hydraulics and pneumatics and the use of electrical circuits in the instrumentation process.

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**Section I. Syllabus:**

1. **Policies:**
   1. ADA:

Students with a disability who are accepted for admission are advised to contact the Office of Disability Services as soon as possible regarding disabilities accommodations.  Students with disabilities must provide documentation of their disability.

* 1. Honesty Policy:

Both cheating and plagiarism are prohibited. Plagiarism is the presentation of another person’s ideas, words, or work as one’s own. Alleged violations involving cheating, plagiarism, and other academic misconduct will be handled according to the procedures outlined in the NWCC Student Guide. These procedures are as follows: Students involved in cheating or plagiarizing will be reported to a five-member Ad Hoc Committee on Cheating and Plagiarism. The chairman of this committee will be the Academic or Career-Technical Dean as determined by the student’s major. Other committee members will be the division director/chairman of the department in which the alleged dishonesty occurred, the student’s faculty advisor, and two SGA members. The committee will review the alleged act and may assign sanctions ranging from imposing a failing grade in the course to withdrawal from the College.

* 1. Attendance Policy:

Failure to submit assignments and/or participate in team activities will jeopardize your grade. Life does get in the way sometimes. If you have extraordinary events that may interfere with performing the course activities, be sure to inform the instructor. If you drop out of sight (figuratively or literally), course activities will proceed without you and unless you have made alternate arrangement with the faculty member, expect to fail the course.

* 1. Drop Policy:

A student may withdraw from a class passing or failing through the ninth week of school. This does not apply to courses with “F” based on attendance policy. After the ninth week, the student

must be passing the course to withdraw from that course.

* 1. Make up Policy:

Each student must complete ALL course assignments. All make-up work is the responsibility of the student. Make-up tests will be in an essay format and will differ significantly from regular tests. A conference with the instructor will establish the type, amount, and time limit for the make-up work. The instructor will NOT seek out a student to make-up class work.

* 1. Materials use Policy:

All material included in this form has no copyright or privilege restrictions.

* 1. Code of conduct/accountability Policy:

Both cheating and plagiarism are prohibited. Plagiarism is the presentation of another person’s ideas, words, or work as one’s own. Alleged violations involving cheating, plagiarism, and other academic misconduct will be handled according to the procedures outlined in the NWCC Student Guide.

* 1. Student Rights/Responsibilities Policy:

Students have the right to appeal any decision regarding grading or attendance during this course. It is up to the student to initiate any appeal following the rules within the NWCC Student Guide.

* 1. Communication with instructor Policy:

Students are allowed and encouraged to contact the instructor for any questions regarding the course. Students can use the instructor's school email address or through Canvas.

1. **Grading Scale/System:**

Grades will be assigned based on performance on weekly homework assignments, Blackboard postings, the lesson tests, and the midterm and final exams. You must show your work or logical steps in the solution process to receive full credit.

1. Weekly assignment/Discussions – (30% of total grade)

2. Exams - (40%)

3. Labs - (30%)

The grade scale is:

A 93% - 100%

B 83% - 92%

C 73% - 82%

D 65% - 72%

F 64% and Below

1. **Learning objectives or Course Competencies:**
   1. Cognitive Domain (knowledge)

Each student will master the following course competencies:

1. Demonstrate a working knowledge of instrumentation as it pertains to the electrical industry.

2. Identify the type of instrumentation input and output devices, and describe their applications.

3. Identify the types of electrical signals used in instrumentation.

4. Describe fundamentals of electrical and electronic process controls.

5. Design a preventive maintenance program for instrumentation systems.

* 1. Psychomotor Domain (Lab)

1. Demonstrate the ability to duplicate the applications covered within lectures.

2. Apply techniques covered within lectures to real-world applications.

1. **Calendar or Course Schedule:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Materials** | **Assignments** | **Points** |
| Student Orientation | Canvas Supplied | Canvas Student Assignment | 0 |
| Module 1 | Ch. 1 & ppt.  Ch. 2 & ppt.  Ch. 3 & ppt. & Handout 01 | Module 1 Discussion | 25 |
| Module 1 Weekly Quiz | 100 |
| Module 2 | Ch. 4 & ppt.  Ch. 5 & ppt.  Ch. 6 & ppt. | Module 2 Discussion | 25 |
| Module 2 Weekly Quiz | 100 |
| Module 3 | Ch. 8 & ppt.  Lab Safety Guide  Handout 02 | Module 3 Weekly Quiz | 100 |
| Test 01 | 75 |
| Practical 01 | 25 |
| Module 4 | Ch. 9 & ppt.  Ch. 10 & ppt.  Ch. 11 & ppt. | Module 4 Discussion | 25 |
| Module 4 Weekly Quiz | 100 |
| Module 5 | Ch. 12 & ppt. | Module 5 Discussion | 25 |
| Module 5 Weekly Quiz | 100 |
| Module 6 |  | Test 02 | 75 |
| Practical 02 | 25 |
| Midterm |  | Midterm | 100 |
| Module 7 | Ch. 13 & ppt.  Ch. 14 & ppt.  Ch. 15 & ppt. | Module 7 Discussion | 25 |
| Module 7 Quiz | 100 |
| Module 8 | Ch. 17 & ppt. | Module 8 Discussion | 25 |
| Module 8 Quiz | 100 |
| Module 9 |  | Test 03 | 75 |
| Practical 03 | 25 |
| Module 10 | Ch. 18 & ppt.  Ch. 19 & ppt.  Ch. 20 & ppt. | Module 10 Discussion | 25 |
| Module 10 Weekly Quiz | 100 |
| Module 11 | Ch. 17 & ppt. | Module 11 Discussion | 25 |
| Module 11 Weekly Quiz | 100 |
| Module 12 |  | Test 04 | 75 |
| Practical 04 | 25 |
| Final |  | Final Exam | 100 |

1. **Other: Textbooks**

1. Kirk, F., Weedon, T., & Kirk, P. (2010), Instrumentation, Fifth Edition, Homewood, Illinois:

American Technical Publishers, INC.

2. PowerPoint Slides for Instrumentation, Fifth Edition, Homewood, Illinois: American Technical Publishers, INC.

**Section II. Content:**

1. Student Orientation:

During the orientation week, students are required to purchase all course literature. Each student must also email a single page bio to the instructor.

1. Module 1 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and view the corresponding PowerPoint.

Chapter 1 - Instrumentation Overview

View Chapter 1 PowerPoint file - INSRG01.pps

Chapter 2 - Fundamentals of Process Control

View Chapter 2 PowerPoint file - INSRG02.pps

Chapter 3 - Piping and Instrumentation Diagrams

View Chapter 3 PowerPoint file - INSRG03.pps

Part 2: Discussion

Module 1 Discussion Board: Describe the difference between open loop and closed loop control and list a real world example of each type.

Part 3: Quiz

20 Questions pulled from the Textbook Quiz Generator on covered chapters.

1. Module 2 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 4 - Temperature, Heat, and Energy

View Chapter 4 PowerPoint file - INSRG04.pps

Chapter 5 - Thermal Expansion Thermometers

View Chapter 5 PowerPoint file - INSRG05.pps

Chapter 6 - Electrical Thermometers

View Chapter 6 PowerPoint file - INSRG06.pps

Part 2: Discussion

Answer the question listed in the Module 2 Discussion Board: Identify the different characteristics that separate the RTD, the thermistor, and the thermocouple.

Part 3: Quiz

20 Questions pulled from the Textbook Quiz Generator on covered chapters.

1. Module 3 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 8 - Practical Temperature Measurement and Calibration

View Chapter 8 PowerPoint file - INSRG08.pps

Part 2: Quiz

10 Questions pulled from the Textbook Quiz Generator on covered chapter.

Part 3: Test & Practical

Part 3 consists of a lab exercise and a section test covering the chapters in Module 1, Module 2, and Module 3. The chapter questions are worth 75% and the practical lab is worth 25% of the total test grade.

Test 01 must be completed before the assigned lab time and consists of 50 questions taken from the book's test generator on the covered chapters.

Practical Exercise - To be completed at the college during the assigned time.

Information on the specifics of each actual lab assignment are taken from the LabVolt Instrumentation & Process Control training system at the college.

Lab Exercise 01

1. Module 4 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 9 - Pressure and Force

View Chapter 9 PowerPoint file - INSRG09.pps

Chapter 10 - Mechanical Pressure Instruments

View Chapter 10 PowerPoint file - INSRG10.pps

Chapter 11 - Electrical Pressure Instruments

View Chapter 11 PowerPoint file - INSRG11.pps

Part 2: Discussion

Answer the question listed in the module 4 discussion board: In your own words, Define pressure and describe its relationship between force and area.

Part 3: Quiz

20 Questions pulled from the Textbook Quiz Generator on covered chapters.

1. Module 5 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 12 - Practical Pressure Measurement and Calibration

View Chapter 12 PowerPoint file - INSRG12.pps

Part 2: Discussion

Answer the question listed in the Module 5 Discussion Board: List at least three things that a pressure gauge must be protected from, and explain the effects each has on the pressure gauge.

Part 3: Quiz

10 Questions pulled from the Textbook Quiz Generator on covered chapter.

1. Module 6 (with study materials, graded assignments):

Part 1: Test & Practical

Part 1 consists of a lab exercise and a section test covering the chapters in Module 4 and Module 5. The chapter questions are worth 75% and the practical lab is worth 25% of the total test grade.

Test 02 must be completed before the assigned lab time and consists of 50 questions taken from the book's test generator on the covered chapters.

Practical Exercise - To be completed at the college during the assigned time.

Information on the specifics of each actual lab assignment are taken from the LabVolt Instrumentation & Process Control training system at the college.

Lab Exercise 02

Lab Exercise 03

1. Midterm Exam:

The Midterm Exam consists of all information covered in Modules 2, 3, 4, 5, and 6. A two hour time limit has been established to complete the exam, and the exam cannot be stopped once it has started. The Midterm consists of 60 questions taken from the textbook generator.

1. Module 7 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 13 - Mechanical Level Instruments

View Chapter 13 PowerPoint file - INSRG13.pps

Chapter 14 - Electrical Level Instruments

View Chapter 14 PowerPoint file - INSRG14.pps

Chapter 15 - Ultrasonic, Radar, and Laser Level Instruments

View Chapter 15 PowerPoint file - INSRG15.pps

Part 2: Discussion

Answer the question listed in the module 7 discussion board: Compare and contrast a capacitance probe with an inductive probe.

Part 3: Quiz

20 Questions pulled from the Textbook Quiz Generator on covered chapter.

1. Module 8 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 17 - Practical Level Measurement and Calibration

View Chapter 17 PowerPoint file - INSRG17.pps

Part 2: Discussion

Answer the question listed in the Module 8 Discussion Board: Describe the differences between the buoyancy method of level detection and the displacement method of level detection, and explain how each is capable of detecting level.

Part 3: Quiz

10 Questions pulled from the Textbook Quiz Generator on covered chapter.

1. Module 9 (with study materials, graded assignments):

Part 1: Test & Practical

Part 1 consists of a lab exercise and a section test covering the chapters in Module 7 and Module 8. The chapter questions are worth 75% and the practical lab is worth 25% of the total test grade.

Test 03 must be completed before the assigned lab time and consists of 50 questions taken from the book's test generator on the covered chapters.

Practical Exercise - To be completed at the college during the assigned time.

Information on the specifics of each actual lab assignment are taken from the LabVolt Instrumentation & Process Control training system at the college.

Lab Exercise 04

Lab Exercise 05

1. Module 10 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 18 - Fluid Flow

View Chapter 18 PowerPoint file - INSRG18.pps

Chapter 19 - Differential Pressure Flowmeters

View Chapter 19 PowerPoint file - INSRG19.pps

Chapter 20 - Mechanical Flowmeters

View Chapter 20 PowerPoint file - INSRG20.pps

Part 2: Discussion

Answer the question listed in the module 10 discussion board: Compare the cost and energy efficiency of orifice plates, venturi tubes, and low-loss tubes.

Part 3: Quiz

20 Questions pulled from the Textbook Quiz Generator on covered chapters.

1. Module 11 (with study materials, graded assignments):

Part 1: Information

Read each Chapter and the view the corresponding PowerPoint.

Chapter 22 - Practical Flow Measurement

View Chapter 22 PowerPoint file - INSRG22.pps

Part 2: Discussion

Answer the question listed in the Module 11 Discussion Board: What is the purpose of the Reynolds Number used in flow control? List the four factors that influence this number.

Part 3: Quiz

10 Questions pulled from the Textbook Quiz Generator on covered chapter.

1. Module 12 (with study materials, graded assignments):

Part 1: Test & Practical

Part 1 consists of a lab exercise and a section test covering the chapters in Module 10 and Module 11. The chapter questions are worth 75% and the practical lab is worth 25% of the total test grade.

Test 03 must be completed before the assigned lab time and consists of 50 questions taken from the book's test generator on the covered chapters.

Practical Exercise - To be completed at the college during the assigned time.

Information on the specifics of each actual lab assignment are taken from the LabVolt Instrumentation & Process Control training system at the college.

Lab Exercise 07

Lab Exercise 08

1. Final Exam

The Final Exam consists of all information covered in Modules 7, 8, 9, 10, and 11, and 12. A two hour time limit has been established to complete the exam, and the exam cannot be stopped once it has started. The Final consists of 60 questions taken from the textbook generator.

**Section III. Labs, Discussions, other:**

All Practical Exercises were taken from the LabVolt Instrumentation Training System and are to be completed at the college during assigned times.

All discussion questions are to be answered by each student in the discussion board. These questions can be found under the corresponding module.