# 10/24/2023

# brcc keystone logo

Baton Rouge Community College

*Academic Affairs Master Syllabus*

Date Approved: 11 January 2024

Term and Year of Implementation: Fall 2024

**Course Title:** Instrumentation Level 3 Part 1

**BRCC Course Rubric:** INST 1316

**Previous Course Rubric**: INST 2313 and INST 2323

**Lecture Hours per week-Lab Hours per week-Credit Hours**: 2-8-6

**Per semester: Lecture Hours-Lab Hours-Instructional Contact Hours**: 30-120-150

**Louisiana Common Course Number:**

**CIP Code:** 15.0404

**Course Description:** Covers the National Center for Construction Education and Research (NCCER) Instrumentation Level 3 Modules 1 – 4. Successful completion of this course requires passing the NCCER Level 3 Modules 1 – 4 Exams with a 70% or higher. This course requires both an exam fee and a lab fee.

**Prerequisites:**  INST 1226

**Co-requisites:** None

**Suggested Enrollment Cap:** 20

**Learning Outcomes.** *Upon successful completion of this course, the students will be able to:*

1. Describe the operation of control valves, actuators, and positioners.

2. Describe the first four components common to most process control channel applications and the relevant standards and elements.

3. Point out different actuators and positioners from drawings or a field survey, various thermocouple types using a multifunction calibrator and a calibrated heat source, and different thermocouples by color code.

4. Demonstrate how to connect three resistors in series and three resistors in parallel and how to calculate the total nominal resistance using color bands and the appropriate formula comparing the value to the measurement given by a multimeter.

5. Demonstrate the ability to select and connect various types of relays and timers to create a functional circuit as directed by the instructor.

**Assessment Measures.** Assessment of all learning outcomes will be measured using the following methods:

1. Practical demonstrations and skills performances

2. Quizzes and tests

3. NCCER Instrumentation Level 3 Modules 1 – 4 Exams

**Information to be included on the Instructor’s Course Syllabi:**

* ***Disability Statement*:** Baton Rouge Community College seeks to meet the needs of its students in many ways. See the Office of Disability Services to receive suggestions for disability statements that should be included in each syllabus.
* ***Grading:*** The College grading policy should be included in the course syllabus. Any special practices should also go here. This should include the instructor’s and/or the department’s policy for make-up work. For example in a speech course, “Speeches not given on due date will receive no grade higher than a sixty” or “Make-up work will not be accepted after the last day of class”.
* ***Attendance Policy*:** Include the overall attendance policy of the college. Instructors may want to add additional information in individual syllabi to meet the needs of their courses.
* ***General Policies*:** Instructors’ policy on the use of things such as beepers and cell phones and/or hand held programmable calculators should be covered in this section.
* ***Cheating and Plagiarism*:** This must be included in all syllabi and should include the penalties for incidents in a given class. Students should have a clear idea of what constitutes cheating in a given course.
* ***Safety Concerns:*** In some courses, this may be a major issue. For example, “No student will be allowed in the lab without safety glasses”. General statements such as, “Items that may be harmful to one’s self or others should not be brought to class”.
* ***Library/ Learning Resources:*** Since the development of the total person is part of our mission, assignments in the library and/or the Learning Resources Center should be included to assist students in enhancing skills and in using resources. Students should be encouraged to use the library for reading enjoyment as part of lifelong learning.

**Expanded Course Outline:**

I. Control Valves, Actuators, and Positioners

A. Control Valves, Actuators, and Positioners

a. Types of control valves

b. Actuators and their key operating features

c. Positioners

d. Factors related to valve selection

e. Valve markings and nameplate information

II. Detectors, Secondary Elements, Transducers, and Transmitters

A. Process Control Channel Applications

a. First four common instrument and process control channel components

b. Key terms related to instrumentation and process control

c. Measurement standards and elements

B. Detectors

a. Temperature detection devices

b. Pressure detection devices

c. Level detection devices

d. Flow detection devices

C. Transducers

a. I/P (current to pressure) and P/I (pressure to current) transducers

b. Metallic and pressure strain gauges

c. Other types of transducers

D. Transmitters

a. Force-balance differential pressure pneumatic transmitters

b. Force-balance transmitters to temperature, pressure, level, and flow measurement

c. Electronic transmitters

III. Instrumentation Electrical Circuitry

A. Resistive Circuits, Ohm’s Law, and Kirchhoff’s Laws

a. Series, parallel, and series-parallel resistive circuits

b. Ohm’s Law

c. Kirchhoff’s Laws

B. Alternating Current, Resistance, Inductance, Capacitance, and Power Concepts

a. Characteristics of alternating current

b. Alternating-current phase relationships

c. Resistance in alternating-current circuits

d. Inductance in alternating-current circuits

e. Capacitance in alternating-current circuits

f. Power in alternating-current circuits

C. Direct Current Power Supplies and Testing Methods

a. Direct current power supplies

b. Selecting and testing a direct current power supply

D. Electronic Instrumentation Signals

a. Analog signals

b. Digital signals

c. Interaction between programmable logic controllers (PLCs) and instrumentation signals

E. Instrumentation Circuitry

a. Temperature applications using an resistance temperature detector (RTD) bridge

b. Pressure applications using a strain-gauge bridge

c. Remote level applications

IV. Relays and Timers

A. Relays and Timers

a. Electromechanical relays

b. Solid-state relays

c. Pneumatic boosters

d. Timers and time clocks