# 11/7/2020

# brcc keystone logo

Baton Rouge Community College

*Academic Affairs Master Syllabus*

Date Approved: 3 September 2020

Term and Year of Implementation: Spring 2021

**Course Title:** Instrumentation Level 2 Part 1

**BRCC Course Rubric:** INST 1216

**Previous Course Rubric**: INST 1213 and INST 1223

**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 2 Modules 1 – 6. Successful completion of this course requires passing the NCCER Level 2 Modules 1 – 6 Exams with a 70% or higher. This course requires an exam fee.

**Prerequisites:**  INST 1119

**Co-requisites:** None

**Suggested Enrollment Cap:** 20

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

1. Describe the process of measuring temperature, pressure, levels, and flow.

2. Demonstrate how to select and use the device to measure temperature, pressure, level, and flow.

3. Interpret various types of electrical and instrumentation drawings.

4. Demonstrate the use of various types of test equipment such as the ammeter, voltmeter, ohmmeter, multimeter, continuity tester, voltage tester, electrical outlet tester, and other specialized test equipment for measuring voltage, current, and resistance.

5. Evaluate the use of selected cable testers to check out cables and the performance of copper and optical fiber cable.

**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 2 Modules 1 – 6 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. Temperature, Pressure, Level, and Flow

A. Process of measuring temperature

a. Units of measure for temperature

b. Instruments and methods used to measure temperature

B. Process of measuring pressure

a. Units of measure for pressure

b. Instruments and methods used to measure pressure

c. Conditions that can damage pressure-measuring instruments and the devices used to protect the instruments from these conditions

C. Process of measuring levels

a. Instruments and methods used to measure levels directly

b. Instruments and methods used to measure levels indirectly

c. Instruments and methods used to measure levels based on pressure

D. Process of measuring flow

a. Units of measure for flow

b. How friction and other flow characteristics affect flow rates

c. Instruments and methods used to measure flow rates through differential pressure

d. Instruments and methods used to measure flow rates by means other than differential pressure

II. Instrument Fitter’s Math

A. Types of angles, polygons, and triangles

a. Line segments and types of angles

b. Types of regular and irregular polygons

c. Types of triangles

B. Right triangles

a. The Pythagorean Theorem

b. Mathematical ratios between line segments

C. Trigonometric functions

a. Sine, cosine, and tangent functions of angles and their relationship to each other

b. Using tables and calculators to determine trigonometric values of angles

D. Applications of fitter’s math to bending tubing

a. Determining an angle when the line segment lengths are unknown

b. Determining the length of travel of a piping offset

c. Determining line segment lengths when the angle is known

III. Instrument Drawings and Documents

A. Standardized drawing elements

e. Instrumentation drawing components, such as symbols and data sheets

f. Electrical symbols

B. Types of electrical drawings

a. Single-line and three-line diagrams

b. Wiring diagrams

c. Raceway drawings

C. Types of instrumentation drawings

a. Piping and instrumentation drawings (P&IDs)

b. Loop sheets

c. Ladder diagrams

d. Equipment location and installation detail drawings

e. Flow drawings

f. Applications of drawings in the instrumentation trade environment

IV. Test Equipment

A. Types of Meters

a. Meters

b. Ammeters

c. Voltmeters

d. Ohmmeters

e. Multimeters

f. Digital Meters

B. Continuity and Voltage Testers; Oscilloscopes

a. Continuity Testers

b. Voltage Testers

c. Oscilloscopes

C. Wattmeters: Meggers: Line, Cable, and Signal Meters

a. Wattmeters

b. Megohmmeters (Meggars)

c. Line Frequency Meters

d. Power Factor Meters

e. Recording Instruments

f. Lineman’s Test Set

g. Cable Toners

h. Cable Certification Testers

i. Sound Pressure Level Meters

j. Radio Frequency (RF) Power Meters

k. Signal Level Meters

l. Time-Domain Reflectometers

m. Spectrum Analyzers

n. Signal Generators

o. Category Ratings

p. Testing and Troubleshooting

q. Safety

V. Panel-Mounted Instruments

A. Instrument Panel Layout

a. Factors related to instrument panel planning and layout

b. Tools used to lay out and fabricate an instrument panel

B. Instrument Panel Layout Process

a. Preparation of the instrument panel template for the layout process

b. Laying out an instrument panel

VI. Installing Field-Mounted Instruments

A. Fabricating Instrument Stands and Installing the Intended Instrument

a. Stand mounting approaches

b. Fabricating an instrument stand

c. Securing an instrument stand to concrete floors or metal grating

d. Mounting an instrument to a stand

B. Installing Various Types of In-Line Instruments

a. Mounting differential-pressure flowmeters

b. Mounting velocity flowmeters

c. Mounting volumetric flowmeters

d. Mounting Mass flowmeters

e. Mounting variable-area flowmeters

f. Mounting density meters

C. Installing Various Types of Vessel-Mounted Instruments

a. Mounting probe-type level instruments

b. Mounting displacer-type level instruments

c. Installing strap-mounted instruments

d. Mounting radiation meters for level and density measurement

D. Installing Surface-Mounted and Inserted Instruments

a. Installing surface-mounted temperature sensors

b. Installing thermowells and connector heads

c. Installing resistance temperature detectors (RTDs) and extension wiring

E. Manifold Valve Assemblies and Types of Flanges

a. Types of manifold valve assemblies

b. Types of seats in manifold assemblies

c. Installing a manifold valve assembly

d. Common flange types and their characteristics