# 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 1

**BRCC Course Rubric:** INST 1119

**Previous Course Rubric**: INST 1113, INST 1123, and INST 1133

**Lecture Hours per week-Lab Hours per week-Credit Hours**: 3-12-9

**Per semester: Lecture Hours-Lab Hours-Instructional Contact Hours**: 45-180-225

**Louisiana Common Course Number:**

**CIP Code:** 15.0404

**Course Description:** Covers the National Center for Construction Education and Research (NCCER) Instrumentation Level 1 Modules 1 – 12. Successful completion of this course requires passing the NCCER Level 1 Modules 1 – 12 Exams with a 70% or higher. This course requires lab and exam fees.

**Prerequisites:**  CORE 1003

**Co-requisites:** None

**Suggested Enrollment Cap:** 20

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

1. Describe the safety practices associated with potentially hazardous tools and materials including electrical and non-electrical equipment, as well as hand and power tools used by instrument technicians.

2. Interpret the different types of drawings, symbols, and abbreviations used in instrumentation work.

3. Describe the fundamentals of electricity, basic electrical theory, electrical measuring instruments, and wiring related to instrumentation systems.

4. Describe the types of tubing, tools and methods to cut and bend tubing, and the methods for joining tubing and related fittings.

5. Describe types of hoses used in instrumentation systems and various approaches to hose construction and relevant hose fittings.

**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 1 Modules 1 – 12 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. Instrumentation Safety Practices

A. Electrical hazards encountered by instrument fitters and technicians

a. Effects of electrical shock and how to reduce the risk

b. Common personal and general electrical protective equipment

c. Specific requirements for electrical safety

d. How to conduct a shock hazard analysis

B. Lockout/tagout procedures used to prevent energy-related injury

a. Lockout/tagout procedure for electrical and non-electrical equipment

b. Voltage testing requirements to be applied before beginning work

C. Safety practices related to potentially hazardous tools and materials

a. Basic hand and power tool safety practices

b. Hazards associated with various process fluids and solvents

c. Safety practices related to batteries

II. Hand and Power Tools for Instrumentation

A. Hand tools related to threaded fasteners

a. How to use taps

b. How to use dies

c. How to use extractors

B. Hand tools used in working with metal

a. Vises used to secure metal parts and pipe

b. Types of snips used to cut sheet metal

c. Conduit benders, cutters, and reamers

d. Miscellaneous hand tools used in instrumentation work

C. Power tools used by instrument fitters and technicians

a. Hammer drills and rotary hammers

b. Soldering guns and irons

c. Hydraulic knockout punches

d. Propellant-actuated tools

III. Craft-Related Mathematics

A. Conversion of units from standard system to metric system and vice versa

a. Units of measure in the standard and metric systems

b. Conversion of length, area, and volume values

c. Conversion of weight values

d. Conversion of temperature and pressure values

B. Basic algebraic equations

a. Algebraic terms

b. Sequence of operations

c. Solving basic algebraic equations

C. Geometric figures

a. Circles

b. Angles

c. Polygons

d. Triangles

IV. Instrument Drawings and Documents

A. Different types of drawings used in instrumentation work

a. Structure and use of an instrument index

b. Use and importance of instrument specifications

c. Types of drawings used in instrumentation projects

B. Instrumentation-related symbols and markings used on drawings

a. General instrument symbols used on instrumentation drawings

b. Graphic/pictorial and line symbols used on instrumentation drawings

c. Methods used to assign instrument tag numbers and identification abbreviations

V. Inspect, Handle, and Store Instrumentation Materials

A. How to properly receive arriving instrumentation materials

a. How to inspect and handle arriving instrumentation materials

b. How to properly identify and verify instrumentation materials

B. How to properly store instrumentation materials

a. Various categories of instrumentation materials relative to storage

b. Storage conditions for the various categories of instrumentation materials

VI. Electrical Systems for Instrumentation

A. Fundamentals of electricity

a. Creation and distribution of electrical power

b. Safety practices associated with electricity

c. Differences between alternating current and direct current

B. Basic electrical theory

a. Voltage, current, resistance, and power

b. Ohm’s Law to calculate current, voltage, and resistance in a circuit

c. Power formula to calculate how much power is consumed by a circuit

d. Differences between series and parallel circuits

e. Calculations of circuit loads

C. Electrical measuring devicess used in instrumentation work

a. Measuring voltage

b. Measuring current

c. Measuring resistance

D. Wiring related to instrumentation systems

a. Types of wiring by size, jacket, and rating

b. Purpose of electrical system grounding

VII. Fasteners

A. Threaded fasteners

a. Types and uses of threaded fasteners

b. How to install and torque threaded fasteners to a specific value

c. Installation of various types of anchors and anchor bolts

B. Non-threaded fasteners

a. Types and uses of retainers and pins

b. Installation of blind rivets

c. Devices used to secure instrumentation tubing and hosing

VIII. Gaskets, O-Rings, and Packing

A. Gaskets and gasket materials

a. Types of flange facings

b. Gasket usage and importance of compatibility

c. Applications of gaskets

d. Installation of gaskets

B. O-rings and packings

a. Types of O-rings

b. Installation of O-rings

c. Types of packing

d. Installation of packing

IX. Lubricants, Sealants, and Cleaners

A. Lubricants used in instrumentation work

a. Cutting fluids

b. Common lubricants

c. Safe handling and storage requirements for lubricants

B. Sealants and adhesive used in instrumentation work

a. Pipe and hardware sealants and adhesives

b. Other types of sealants and adhesives

c. Safe handling and storage requirements for sealants and adhesives

C. Cleaning materials and products used in instrumentation work

a. Cleaning tools and materials used in instrumentation work

b. Cleaning liquids in and around instrumentation work

c. Safe handling and storage requirements for cleaners and solvents

X. Tubing

A. Different types of tubing and their uses

a. Sizing of tubing

b. Materials used in tubing

c. Standards that apply to tubing products

d. Methods for properly handling and storing tubing

B. Tools and methods used to cut and bend tubing

a. Tube-cutting tools

b. Bend types and the flaws that must be avoided during bending

c. Bending devices and their uses

C. Methods for joining tubing and related fittings

a. Types of compression fittings

b. Assembly of a compression fitting

c. Flare fittings

d. Fittings used for welding and brazing

e. Method used to join PVC tubing

XI. Steel Piping Practices

A. Types of steel pipe and fittings

a. Characteristics and uses of steel pipe

b. Classification and measurement of pipe threads

c. Types of fittings used on steel pipe and their uses

d. Measuring lengths of steel pipe properly

B. Tools and methods used to cut and thread steel pipe

a. Pipe cutting and reaming tools and their uses

b. Threading tools and their uses

C. Methods of installing and mechanically joining steel pipe

a. Methods and use of tools to connect threaded pipe

b. Assembly of flanged steel pipe

c. Welding methods used to join pipe

d. Installing steel pipe correctly

XII. Hoses

A. Types of hoses used in instrumentation systems

a. Hose standards and common sizing/pressure rating conventions

b. Types of metallic hoses

c. Types of non-metallic hoses

d. Methods used in storing and handling hoses

B. Approaches to hose construction and relevant hose fittings

a. Approaches to hose construction and applications

b. Fittings used to assemble hoses and their uses

c. Installation of a standard reusable hose fitting