RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

ELEC 201 - Switchgears, Transformers, and Controls

I. Basic Course Information

A. Course Number and Title: ELEC 201 - Switchgears, Transformers, and Controls

B. New or Modified Course: Modified Course

C. Date of Proposal: Semester: Spring Year: 2017

D. Effective Term: Fall 2017

E. Sponsoring Department: Science and Engineering

F. Semester Credit Hours: 3

G. Weekly Contact Hours: 4 Lecture: 2
Laboratory: 2
Out of class student work per week: 5

H. Prerequisites: ELEC 101 Electrical Fundamentals

I. Laboratory Fees: Yes

J. Name and Telephone Number or E-Mail Address of Department Chair at time of approval: Sarah Imbriglio, 908-526-1200 Ext. 8241; sarah.imbriglio@raritanval.edu

II. Catalog Description

Prerequisites: ELEC 101 Electrical Fundamentals

Description: This course covers low and high voltage circuit breakers and switchgears primarily from 4 kV to 15kV. It shows basic switchgear construction, how circuit breakers function and general maintenance of such equipment. The basic theory of transformers and connection schemes of common types of transformers, including dry and wet type distribution transformers, power transformers, and instrument transformers, is explained. Control ladder and wiring diagrams, with input and output control devices are presented.

III. Statement of Course Need

A. This course is designed to introduce the students to topics related to Circuit Breakers, Switchgears, Transformers, and Controls. Understanding of these concepts and analysis techniques is necessary for the Electric Utility Technology AAS Program.

B. The course has a lab component to provide students with additional learning opportunities by using hands-on applications and experimentation.

C. This course meets a program requirement for Electric Utility Technology AAS Program.

IV. Place of Course in College Curriculum

A. Free Elective

B. This course meets a program requirement for Electrical Utility Technology AAS degree.

C. To see course transferability: a) for New Jersey schools, go to the NJ Transfer website, www.njtransfer.org; b) for all other colleges and universities, go to the individual websites.

V. Outline of Course Content

A. Basic Electrical Principles: Introduction to basic theories of electricity, calculate simple series and parallel circuits.

B. Transformer Principles: Changing AC voltages Step up and Step down voltages, turns ratio and efficiency of transformers.

C. Transformer Construction: Describe the construction of different types of transformers and transformer cooling.

D. Special Purpose Transformers: Describe various types of transformers, voltage regulation, autotransformers, dual voltage and power transformers.

E. Transformer Information and Characteristics: How to read and interpret information from a name plate on a transformer and useing the information for installation.

F. Polarity of Transformers the polarity is either additive or subtractive, needed to make transformer connections.

G. Installing Single Phase Transformers: Pole class guidelines, lifting and handling, bolting and grounding, making primary and secondary connections.

H. Single Phase Transformer Connections: Connection based on service voltage, duration of service and types of transformers.

I. Energizing Transformers: How to run a pre check before energizing transformers.

J. Characteristics of Wye and Delta Systems: Explain connections of a Wye and Delta systems.

K. Installing Three Phase Transformers Banks: Describe four different ways to connect three phase transformers based on location and usage.

L. Vector Diagrams: Visual picture of voltage values and phase of every primary and secondary voltage at the banks.

M. Three Phase Transformer Banks: Making connections using Wye to Wye, Delta to Delta, Wye to Delta, Delta to Wye and Open Delta.

N. Load Checks on Three Phase Transformer Banks: How to calculate the load on both Delta and Wye banks.

O. Describe Phasing and Parallel Transformer Banks: How to increase the capacity available in a circuit using phasing and paralleling.

P. Underground Transformers: How to install transformers based on configuration, safety clearances and cable connections.

VI. General Education and Course Learning Outcomes

A. General Education Learning Outcomes:

At the completion of the course, students will be able to:

1. Demonstrate a basic understanding of relevant circuit equipment and systems. (GE-NJ 1, 3)
2. Describe and perform various test procedures and explain the safety precautions for tests on relevant circuit equipment and systems. (GE-NJ 1, 4)
3. Apply basic laboratory techniques to relevant circuit equipment and systems, and report on their results. (GE-NJ 1, 4)

(* embedded critical thinking)

B. Course Learning Outcomes:

At the completion of the course, the student will be able to:

1. Demonstrate knowledge of circuit breakers and switchgears.
2. Assist an experienced electrician in performing routine maintenance and electrical tests on both air circuit breakers and oil circuit breakers.
3. Demonstrate basic understanding of transformer theory and transformer connection scheme.

4. Describe various transformer test procedures and explain the necessary safety precautions for each type of test.
5. Demonstrate an understanding of control ladder logic, wiring drawings, control input and output devices and their operation, and be able to perform wiring in the lab.
6. Recognize the parts of a standard on-off control system, be able to assist an experienced electrician to wire and troubleshoot control circuits, and interpret basic control drawings.

C. Assessment Instruments

A. Lab Reports (required)
B. HW assignments (required)
C. Tests and Exams (required)
D. Class Participation (required)
E. Discussions/Presentations

VII. Grade Determinants

A. Lab Reports (required)
B. HW assignments (required)
C. Tests and Exams (required)
D. Class Participation (required)
E. Discussions/Presentations

Primary formats, modes, and methods for teaching and learning that may be used in the course:

A. lecture/discussion
B. laboratory/experiments
C. small-group work
D. documentaries/video
E. student presentations
F. independent study

VIII. Texts and Materials

A. Transformers for Linemen, Third Edition, by Alexander Publications
B. Film and video
C. Other web and computer based sources

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

IX. Resources

A. Libraries
B. Computer with online access for research

X. Honors Options [if relevant]: no honors option