# Electric Utility Substation and Relay Technology (A50510)

The Electric Utility Substation and Relay Technology curriculum provides the skills to maintain high voltage equipment and protective systems for the electric utility transmission system. Training in operation and maintenance of critical infrastructure associated with the transmission grid is included.

Courses are designed to develop student understanding of maintenance and troubleshooting on transmission equipment, including three phase power theory, protective relaying, power transformers, voltage regulators, capacitors, and power circuit breakers common to electric utility and numerous other industries.

Graduates should qualify for entry-level employment in electric utility, renewable energy, and industrial facilities as technicians who diagnose and service equipment and components used for electrical power transmission.

## COURSE REQUIREMENTS

Richmond Community College provides day and evening course sequences for selected programs to enable students to better plan what courses to take to reach their educational goals. However, given the continued increase in the use of technology in instruction and increasing student demand for distance learning courses, the College may offer hybrid, online, web-based and information highway courses in place of traditional courses in any course sequence that is listed. Therefore, students should be aware of this possibility and prepare themselves to successfully function in a hybrid, online, web-based, or information highway course.

| | | | | Class | Lab | Work/ Clinical | Credit |
|---|---|---|---|---|---|---|---|
| **A. General Education Courses** | | | | | | | |
| 1. Required Courses | | | | | | | |
| ECO | 251 | Principles of Microeconomics | | 3 | 0 | 0 | 3 |
| or | | | | | | | |
| ECO | 252 | Principles of Macroeconomics | | 3 | 0 | 0 | 3 |
| ENG | 111 | Writing and Inquiry | | 3 | 0 | 0 | 3 |
| ENG | 112 | Writing/Research in the Disciplines | | 3 | 0 | 0 | 3 |
| MAT | 171 | Precalculus Algebra | | 3 | 2 | 0 | 4 |
| | | Humanities/Fine Arts Elective* | | 3 | 0 | 0 | 3 |
| **B. Major Courses** | | | | | | | |
| 1. Core Courses | | | | | | | |
| *To receive a degree, diploma or certificate from RCC, a student must have a grade of "C" or better in all core courses for the program of study.* | | | | | | | |
| EUS | 110 | Intro to Electric Utility Industry | | 3 | 3 | 0 | 4 |
| EUS | 130 | Electric Utility Print Reading | | 3 | 2 | 0 | 4 |
| EUS | 210 | Large High Voltage Power Transformer I | | 2 | 3 | 0 | 3 |
| EUS | 215 | Large High Voltage Power Transformer II | | 2 | 3 | 0 | 3 |
| EUS | 220 | High Voltage Power Circuit Breakers | | 2 | 3 | 0 | 3 |
| EUS | 230 | Electric Utility Protective Relaying I | | 2 | 3 | 0 | 3 |
| EUS | 235 | Electric Utility Protective Relaying II | | 2 | 3 | 0 | 3 |
| EUS | 240 | Substation Ancillary Systems | | 2 | 3 | 0 | 3 |
| EUS | 260 | Capstone & Case Studies in EUSRT | | 0 | 4 | 0 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | Other Major Courses | | | | | |
| | ELC | 112 | DC/AC Electricity | 3 | 6 | 0 | 5 |
| | or | | | | | | |
| | ELC | 131 | Circuit Analysis I | 3 | 3 | 0 | 4 |
| | ELC | 128 | Introduction to PLC | 2 | 3 | 0 | 3 |
| | ELN | 229 | Industrial Electronics | 3 | 3 | 0 | 4 |
| | EUS | 225 | Electrical Utility Safety & Human Perf. | 2 | 0 | 0 | 2 |
| | EUS | 255 | Electrical Utility Troubleshooting | 1 | 3 | 0 | 2 |
| | MAT | 172 | Precalculus Trigonometry | 3 | 2 | 0 | 4 |
| | PCI | 172 | SCADA Systems | 3 | 3 | 0 | 4 |
| **Other Major Choice (1 course required)** | | | | | | | |
| | ELC | 117 | Motors and Controls | 2 | 6 | 0 | 4 |
| | or | | | | | | |
| | ELN | 231 | Industrial Controls | 2 | 3 | 0 | 3 |
| **C. Other Required Courses** | | | | | | | |
| | ACA | 122 | College Transfer Success | 0 | 2 | 0 | 1 |

**Total Credit Hours** **71-73**

*Approved Electives are listed on the page before the Course Descriptions.

## SEMESTER SCHEDULE
## ELECTRIC UTILITY SUBSTATION AND RELAY TECHNOLOGY

| | | | Class | Lab | Work/ Clinical | Credit |
|---|---|---|---|---|---|---|
| **First Year – Fall Semester** | | | | | | |
| ACA | 122 | College Transfer Success | 0 | 2 | 0 | 1 |
| ECO | 251 | Principles of Microeconomics | 3 | 0 | 0 | 3 |
| or | | | | | | |
| ECO | 252 | Principles of Macroeconomics | 3 | 0 | 0 | 3 |
| ELC | 131 | Circuit Analysis I | 3 | 3 | 0 | 4 |
| or | | | | | | |
| ELC | 112 | DC/AC Electricity | 3 | 6 | 0 | 5 |
| ENG | 111 | Writing and Inquiry | 3 | 0 | 0 | 3 |
| EUS | 110 | Intro to Electric Utility Industry | 3 | 3 | 0 | 4 |
| MAT | 171 | Precalculus Algebra | 3 | 2 | 0 | 4 |
| | | | 15 | 10-13 | 0 | 19-20 |
| **First Year – Spring Semester** | | | | | | |
| ELC | 117 | Motors and Controls | 2 | 6 | 0 | 4 |
| or | | | | | | |
| ELN | 231 | Industrial Controls | 2 | 3 | 0 | 3 |
| ENG | 112 | Writing/Research in the Disciplines | 3 | 0 | 0 | 3 |
| EUS | 130 | Electric Utility Print Reading | 3 | 2 | 0 | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| EUS | 210 | Large High Voltage Power Transformers I | 2 | 3 | 0 | 3 |
| MAT | 172 | Precalculus Trigonometry | 3 | 2 | 0 | 4 |
| | | | 13 | 10-13 | 0 | 17-18 |
| | | **Second Year – Fall Semester** | | | | |
| ELN | 229 | Industrial Electronics | 3 | 3 | 0 | 4 |
| EUS | 215 | Large High Voltage Power Transformers II | 2 | 3 | 0 | 3 |
| EUS | 225 | Electric Utility Safety & Human Performance | 2 | 0 | 0 | 2 |
| EUS | 230 | Electric Utility Protective Relaying I | 2 | 3 | 0 | 3 |
| EUS | 240 | Substation Ancillary Systems | 2 | 3 | 0 | 3 |
| | | Humanities/Fine Arts Elective* | 3 | 0 | 0 | 3 |
| | | | 14 | 12 | 0 | 18 |
| | | **Second Year – Spring Semester** | | | | |
| ELC | 128 | Intro to PLC | 2 | 3 | 0 | 3 |
| EUS | 220 | High Voltage Power Circuit Breakers | 2 | 3 | 0 | 3 |
| EUS | 235 | Electric Utility Protective Relaying II | 2 | 3 | 0 | 3 |
| EUS | 255 | Electric Utility Troubleshooting | 1 | 3 | 0 | 2 |
| EUS | 260 | Caps & Case Stud in EUSRT | 0 | 4 | 0 | 2 |
| PCI | 172 | SCADA Systems | 3 | 3 | 0 | 4 |
| | | | 10 | 19 | 0 | 17 |

**Total Credit Hours** **71-73**

*Approved Electives are listed on the page before the Course Descriptions.

## EUSRT: BASIC POWER SYSTEMS (CERTIFICATE) (C50510)
## COURSE REQUIREMENTS

| | | | Class | Lab | Work/ Clinical | Credit |
|---|---|---|---|---|---|---|
| ELC | 131 | Circuit Analysis I | 3 | 3 | 0 | 4 |
| EUS | 110 | Intro to Electric Utility Industry | 3 | 3 | 0 | 4 |
| EUS | 130 | Electric Utility Print Reading | 3 | 2 | 0 | 4 |
| EUS | 210 | Large High Voltage Power Transformers I | 2 | 3 | 0 | 3 |
| | | | 11 | 11 | 0 | 15 |

**Total Credit Hours** **15**

## ELECTRIC UTILITY TRANSFORMER TEST SPECIALIST (DIPLOMA) (D50510)
## COURSE REQUIREMENTS

| | | | | Class | Lab | Work/ Clinical | Credit |
|---|---|---|---|---|---|---|---|
| **A. General Education Courses** | | | | | | | |
| 1. Required Courses | | | | | | | |
| ENG | 111 | Writing and Inquiry | | 3 | 0 | 0 | 3 |
| MAT | 171 | Precalculus Algebra | | 3 | 2 | 0 | 4 |
| | | *Humanities/Fine Arts Elective | | 3 | 0 | 0 | 3 |
| **B. Major Courses** | | | | | | | |
| 1. Core Courses | | | | | | | |
| *To receive a degree, diploma or certificate from RCC, a student must have a grade of "C" or better in all core courses for the program of study.* | | | | | | | |
| EUS | 110 | Intro to Electric Utility Industry | | 3 | 3 | 0 | 4 |
| EUS | 130 | Electric Utility Print Reading | | 3 | 2 | 0 | 4 |
| EUS | 210 | Large High Voltage Power Trans I | | 2 | 3 | 0 | 3 |
| EUS | 215 | Large High Voltage Power Trans II | | 2 | 3 | 0 | 3 |
| EUS | 240 | Substation Ancillary Systems | | 2 | 3 | 0 | 3 |
| 2. Other Major Courses | | | | | | | |
| ELC | 112 | DC/AC Electricity | | 3 | 6 | 0 | 5 |
| or | | | | | | | |
| ELC | 131 | Circuit Analysis I | | 3 | 3 | 0 | 4 |
| ELC | 117 | Motors and Controls | | 2 | 6 | 0 | 4 |
| or | | | | | | | |
| ELN | 231 | Industrial Controls | | 2 | 3 | 0 | 3 |
| EUS | 225 | Electric Utility Safety & Human Perfor. | | 2 | 0 | 0 | 2 |
| **C. Other Required Courses** | | | | | | | |
| ACA | 122 | College Transfer Success | | 0 | 2 | 0 | 1 |
| | | **Total Credit Hours** | | | | **37-39** | |

*Approved Humanities/Fine Arts Electives are listed on the page before the Course Descriptions.

## SEMESTER SCHEDULE
## ELECTRIC UTILITY TRANSFORMER TEST SPECIALIST (DIPLOMA) (D50510)

| | | | Class | Lab | Work/ Clinical | Credit |
|---|---|---|---|---|---|---|
| **First Year – Fall Semester** | | | | | | |
| ACA | 122 | College Transfer Success | 0 | 2 | 0 | 1 |
| ELC | 112 | DC/AC Electricity | 3 | 6 | 0 | 5 |
| or | | | | | | |
| ELC | 131 | Circuit Analysis I | 3 | 3 | 0 | 4 |
| EUS | 110 | Intro to Electric Utility Industry | 3 | 3 | 0 | 4 |
| | | | 6 | 8-11 | 0 | 9-10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **First Year – Spring Semester** | | | | |
| ELC | 117 | Motors and Controls | 2 | 6 | 0 | 4 |
| or | | | | | | |
| ELN | 231 | Industrial Controls | 2 | 3 | 0 | 3 |
| EUS | 130 | Electric Utility Print Reading | 3 | 2 | 0 | 4 |
| EUS | 210 | Large High Voltage Power Transformers I | 2 | 3 | 0 | 3 |
| | | Humanities/Fine Arts Elective* | 3 | 0 | 0 | 3 |
| | | | 10 | 8-11 | 0 | 13-14 |
| | | **First Year – Summer Semester** | | | | |
| EUS | 215 | Large High Voltage Power Transformers II | 2 | 3 | 0 | 3 |
| EUS | 240 | Substation Ancillary Systems | 2 | 3 | 0 | 3 |
| | | | 4 | 6 | 0 | 6 |
| | | **Second Year – Fall Semester** | | | | |
| ENG | 111 | Writing and Inquiry | 3 | 0 | 0 | 3 |
| EUS | 225 | Electric Util. Safety & Human Performance | 2 | 0 | 0 | 2 |
| MAT | 171 | Precalculus | 3 | 2 | 0 | 4 |
| | | | 8 | 2 | 0 | 9 |
| | | **Total Credit Hours** | | | **37-39** | |