

# ELTR-ELECTRICAL

## ELTR 1115. National Electric Code

### 3 Credits (3)

Provides students with a basic understanding of the National Electrical Codes and how they apply to residential, commercial, and renewable energy systems such as photovoltaic electrical generating systems. How the NEC Codes apply to a Industrial Setting.

**Prerequisite:** ELTR 1120.

### Learning Outcomes

1. Be able to navigate and interpret the various Sections and Articles found within the National Electric Code.
2. Demonstrate the NEC in the system design of the code.
3. Demonstrate how to apply the NEC Code to Solar Installations.
4. Demonstrate how to load wiring calculations to comply with NEC regulations for both Commercial and Residential.
5. Apply knowledge of the NEC Codes to commercial and industrial applications.

## ELTR 1120. Electrical Theory I

### 4 Credits (3+3P)

Covers the basic concepts of DC and AC theory with emphasis on electron theory, units of electrical measurement, NEC terminology, and selection of branch circuit conductors. Upon successful completion of this course the student will define the following concepts and demonstrate her/his ability to apply them to the electrical trade by means of written examinations and assignments, with a minimum accuracy of 71%.

### Learning Outcomes

1. Describe the components of an electrical circuit, electron theory, structure of an atom, properties of conductors, semiconductors, and insulators, sources of electricity, and the conversion of electrical energy.
2. Demonstrate and identify the characteristics of DC circuits, units of electrical measurement, characteristics of current, resistance, and voltage in a circuit, characteristics of a combination circuit, electrical components.
3. Apply the National Electrical Code, definitions and division of articles in the NEC.
4. Interpret NEC applications to residential wiring and the NEC enforcement on electrical codes, selection and calculation of conductor maximum ampacity including correction for ambient temperature of Branch circuit conductors, production of a sinusoidal wave.
5. Know key differences between AC and DC current, applications and theory of electrical components such as inductors, capacitors and transformers.

## ELTR 1130. Introduction to Electrical Power Systems

### 2 Credits (2)

An overview of electrical power systems, equipment, safety practices, first aid and CPR. Students must be accepted into the electrical lineworker program before enrolling in this course. Restricted to: OEET majors.

**Corequisite:** ELTR 1120.

### Learning Outcomes

1. List and discuss the major components of the electrical power grid and their operating functions.

2. Work as a team member with strong work ethics and a commitment to quality.
3. Adhere to OSHA ANSI working safety standards.

## ELTR 1140. Basic Motor Controls

### 5 Credits (2+6P)

Developing schematics and wiring simple manual and electromechanical control devices.

**Prerequisite:** ELTR 1120 or consent of instructor.

### Learning Outcomes

1. Describe the results of problems solving either orally or in writing.
2. Memorize and recall facts, procedures, and vocabulary pertaining to a motor and its characteristics.
3. Solve application problems using the appropriate design approach as a tool.
4. Express symbols and schematics designs as quantities in meaningful circuit analysis.
5. Evaluate current flow from a variety of electrical systems, utilizing rules for ladder diagrams.
6. Estimate the circuit response; compare estimated and actual responses for consistency.
7. Simplify, solve, evaluate and design various circuits and utilize needed learned interpretations.
8. Describe the results of problems solving either orally or in writing.
9. Explain sequential logic processes. 1
10. Simplify, solve, evaluate and graph various types of AC/DC electrical motor design circuits. 1
11. Simplify, solve, evaluate and programs various electrical installations. 1
12. Describe the results of problems solving either orally or in writing. 1
13. Explain sequential analysis processes as they relate to electrical systems and installation of motors. 1
14. Integrate various strategies and techniques from different areas of motor controls to application problems. 1
15. Express ladder diagrams in meaningful design interpretation.

## ELTR 1160. Electrical Lineworker Lab I

### 6 Credits (12P)

Climbing and work on utility poles using ropes and rigging, pole setting and an introduction to transmission and distribution line construction. Maintenance and troubleshooting to include the use of hot sticks. Students must be accepted into the electrical lineworker program before enrolling in this course. Restricted to: OEET majors.

**Corequisite:** ELTR 1120.

### Learning Outcomes

1. List and discuss the major components of the electrical power grid and their operating functions.
2. Work as a team member with strong work ethics and a commitment to quality.
3. Adhere to OSHA ANSI working safety standards.

## ELTR 1165. Electrical Lineworker II

### 6 Credits (12P)

Practice in the installation of electrical power lines including transformers, voltage regulators, and surge arrestors. Also advanced hot sticking procedures, troubleshooting, underground systems procedures, and pole-top rescue. Students must be accepted into the electrical lineworker program before enrolling in this course. Restricted to: OEET majors.

**Learning Outcomes**

1. Professionally communicate in oral and written forms.
2. Work effectively in a team-based environment.
3. Accurately perform electrical related calculations and interpret results for the purpose of repair or installation of electrical power systems.
4. Demonstrate the use of current industry techniques and equipment to diagnose electrical power systems and perform appropriate repairs.
5. Demonstrate the use of current industry techniques and equipment to perform the service and maintenance of electrical power and systems.
6. Demonstrate the use of current industry techniques and equipment in the installation of electrical power lines and associated equipment.
7. Demonstrate understanding of basic electrical principals as they relate to the installation and maintenance of electrical power systems.
8. Determine the appropriate ethical action that should occur in a given circumstance.
9. Demonstrate the ability to perform lineworker duties in a safe manner.

**ELTR 1220. Introduction to Wiring Lab****3 Credits (2+3P)**

Covers safety, tools, materials, single pole switches, receptacles, overcurrent protection, three- and four-way switches, pilot switches, door chimes, dryer and range receptacles and swamp coolers. Analyze Blueprint applications as it applies to electrical installations. NEC requirements for light commercial applications.

**Learning Outcomes**

1. Demonstrate and describe jobsite safety procedures.
2. Demonstrate the ability to install electrical circuits such as single-pole, three and four way lighting circuits, heating and cooling system circuits, door chime circuits, and residential and light commercial branch-circuits.
3. Demonstrate and/or describe the function of Overcurrent Protection in an electrical system.
4. Demonstrate the ability to analyze blueprint applications as it applies to electrical installations.
5. Demonstrate the ability to analyze the National Electrical Code as it applies to electrical installations.

**ELTR 1230. Residential Wiring II****3 Credits (2+3P)**

Introduction to electrical raceways and fittings; electrical conductors and cables; basic electrical construction drawings, residential electrical services, and electrical test equipment.

**Prerequisite:** C- or better in ELTR 1220.

**Learning Outcomes**

1. Demonstrate Hand Bending.
2. Demonstrate Raceway and fittings.
3. Identify Conductors and Cables.
4. Interpret Basic Electrical Construction Drawings.
5. Define Residential Electrical Services.
6. Demonstrate Electrical Test Equipment.

**ELTR 1996. Topics in Electricity****1-6 Credits**

Varies. May be repeated up to 6 credits.

**Learning Outcomes**

1. Varies.

**ELTR 2120. Electrical Power Systems II****3 Credits (2)**

Theory of power generation and distribution with emphasis on three phase systems to include transformers, voltage regulators, surge arrestors. Includes troubleshooting. Students must be accepted into the electrical lineworker program before enrolling in this course. Restricted to: OEET majors.

**Learning Outcomes**

1. Professionally communicate in oral and written forms.
2. Work effectively in a team-based environment.
3. Accurately perform electrical related calculations and interpret results for the purpose of repair or installation of electrical power systems.
4. Demonstrate the use of current industry techniques and equipment to diagnose electrical power systems and perform appropriate repairs.
5. Demonstrate the use of current industry techniques and equipment to perform the service and maintenance of electrical power and systems.
6. Demonstrate the use of current industry techniques and equipment in the installation of electrical power lines and associated equipment.
7. Demonstrate understanding of basic electrical principals as they relate to the installation and maintenance of electrical power systems.
8. Determine the appropriate ethical action that should occur in a given circumstance.
9. Demonstrate the ability to perform lineworker duties in a safe manner.

**ELTR 2891. Electrical Apprenticeship V****6 Credits (6)**

Commercial/industrial applications for electricians. Blueprint interpretation, commercial construction types and processes, wiring methods, wiring materials, and motor controls.

**Learning Outcomes**

1. Varies.

**ELTR 2892. Electrical Apprenticeship VI****6 Credits (6)**

In-depth commercial applications to include commercial/industrial service calculations, mobile home parks, multi-family dwellings, and commercial fire/security systems.

**Prerequisite:** ELTR 2891 and consent of instructor.

**Learning Outcomes**

1. Varies.

**ELTR 2893. Electrical Apprenticeship VII****6 Credits (6)**

Control devices in commercial/industrial applications; emphasis on logic in-line diagrams, time delay starters, reversing starters, and manual/magnetic solenoids.

**Prerequisite:** ELTR 2892 and consent of instructor.

**Learning Outcomes**

1. Varies.

**ELTR 2894. Electrical Apprenticeship VIII****6 Credits (6)**

Miscellaneous topics for the journey person electrician to include power distribution/transmission, solid state controls and relays, photoelectric and proximity controls and programmable controllers.

**Prerequisite:** ELTR 2893.

**Learning Outcomes**

1. Varies.

**ELTR 2995. Electrical Cooperative Experience**

**1-4 Credits (1-4)**

Supervised cooperative work program. Student is employed in an approved occupation and is supervised and rated by the employer and instructor. Student will meet in a weekly class.

**Learning Outcomes**

1. Varies.