

## Electricity

### Description

The electricity program provides the student with an opportunity to master the skills required for success in the electrical trade. Entering students are not required to have any knowledge of the electrical trade. The two-year curriculum leads to a Certificate of Achievement or an Associate in Science degree.

### Program Emphasis

The program begins with an introduction to basic electrical theory and continues through advanced electrical theory, installation and maintenance of industrial equipment, familiarization with electrical codes and blueprints, and the characteristics and uses of motor controls.

<b>Faculty</b>	<b>Office</b>	<b>Telephone</b>
Mike Brown	T-107	(619) 388-3565

### Career Options

Employment may be found as an electrician, electric lineman, maintenance electrician, electrical helper, electrical motor repairer, appliance repairer, or protective signal installer and repairer.

### Academic Programs

The certificates of achievement and associate degree, Electricity, require completion of the courses listed below.

### Certificate of Achievement: Electricity

Courses Required for the Major:	Units
ELCT 111, Electrical Theory I.....	3

ELCT 111L, Electrical Laboratory I.....	2
ELCT 121, Electrical Theory II .....	3
ELCT 121L, Electrical Laboratory II .....	2
ELCT 131, Electrical Theory III .....	3
ELCT 131L, Electrical Laboratory III .....	2
ELCT 141, Electrical Theory IV .....	3
ELCT 141L, Electrical Laboratory IV.....	2
<b>Total Units =</b>	<b>20</b>

### Certificate of Achievement: Electricity

#### Lineman

Completion of this program will not guarantee employment as a Lineman with San Diego Gas and Electric Company.

Courses Required for the Major:	Units
ELCT 190, Electric Lineman IA.....	5
ELCT 191, Electric Lineman IB.....	5
ELCT 192, Electric Lineman IIA.....	5
ELCT 193, Electric Lineman IIB.....	5
ELCT 194, Electric Lineman IIIA .....	5
ELCT 195, Electric Lineman IIIB .....	5
<b>Total Units =</b>	<b>30</b>

### Certificate of Achievement: Electricity

#### Electrical Control Systems Option

Courses Required for the Major:	Units
Complete requirements for the Certificate of Achievement, Electricity .....	20
<b>AND</b> , in addition, complete:	
ELCT 200, Electric Control Systems.....	3
ELCT 200L, Electric Control Systems Laboratory.....	2
<b>Total Units =</b>	<b>25</b>

### Associate in Science Degree: Electricity

Courses Required for the Major:	Units
Complete the Certificate of Achievement, Electricity.....	20
<b>Total Units =</b>	<b>20</b>

Additional general education and graduation requirements for the associate degree are listed in the catalog. **The associate degree requires a minimum of 60 units.**

**Recommended elective:** Electricity 270.

## Associate in Science Degree: Electricity

### Lineman

Completion of this program will not guarantee employment as a Lineman with San Diego Gas and Electric Company.

<b>Courses Required for the Major:</b>	<b>Units</b>
ELCT 190, Electric Lineman IA .....	5
ELCT 191, Electric Lineman IB .....	5
ELCT 192, Electric Lineman IIA.....	5
ELCT 193, Electric Lineman IIB.....	5
ELCT 194, Electric Lineman IIIA .....	5
ELCT 195, Electric Lineman IIIB .....	5
<b>Total Units = 30</b>	

Complete the Certificate of Achievement, Electricity. Additional general education and graduation requirements for the associate degree are listed in the catalog. **The associate degree requires a minimum of 60 units.**

**Recommended elective:** Electricity 270.

### Courses

#### Electricity (ELCT)

#### 111 Electrical Theory I

**3 hours, 3 units  
Grade Only**

*Corequisite:* Electricity 111L.

*Advisory:* English 56 and Mathematics 96, each with a grade of "C" or better, or equivalent, or Assessment Skill Levels R5 and M5.

This course is a study of the fundamentals of electrical theory including basic safety practices and a history of industrial electricity and electronics. Course topics include the theory and application of fundamental units of measurement, wire splicing, permanent magnets, electromagnets, and electrical/electronic symbols. This course includes a study of the theory of electricity sources including batteries, mechanical generators, photocells, and thermocouples. In addition, Basic Ohm's Law theory including calculations of DC voltage, DC current, resistance, DC power, inductance and capacitance in DC circuits is discussed. This course is designed as preparation for the major in electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

#### 111L Electrical Laboratory I

**6 hours lab, 2 units  
Grade Only**

*Corequisite:* Electricity 111.

*Advisory:* English 56 and Mathematics 96, each with a grade of "C" or better, or equivalent, or Assessment Skill Levels R5 and M5.

This course involves laboratory practice in basic electricity. Laboratory time includes instruction and laboratory assignments in the proper use and care of electrical tools, meters, instruments, and equipment with an emphasis on safe working habits. Laboratory assignments include the application of basic direct and alternating current circuitry and wattage of fabricated circuits. Students gain additional practice in the development of electrical diagrams using proper symbols and nomenclature. An introduction to inductance and capacitance in direct current or DC circuits is included. This course is designed as a preparation for the major in Electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

#### 121 Electrical Theory II

**3 hours, 3 units  
Grade Only**

*Prerequisite:* Electricity 111 and 111L, each with a grade of "C" or better, or equivalent.

*Corequisite:* Electricity 121L.

This course involves a detailed study of the theory of alternating current including the generation of AC; electrical degrees, effective and average values; addition and subtraction of phasors; resistance, inductance, and capacitance in AC circuits; reactance; and impedance. This course also includes an in-depth study of single-phase series and parallel circuits, three-phase power generation, current and voltage relationships in wye and delta connected power sources and loads. A study of three-phase transformers with various connections and under various load conditions is also included. This course is designed as a preparation for the major in Electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

#### 121L Electrical Laboratory II

**6 hours lab, 2 units  
Grade Only**

*Prerequisite:* Electricity 111 and 111L, each with a grade of "C" or better, or equivalent.

*Corequisite:* Electricity 121.

This course involves laboratory practice in direct current and alternating current circuits. Activities include practice with basic DC motor circuits, power

transmission lines, and instruction in the safe use of three-phase power supplies. This course also includes practice using AC voltmeters, AC ammeters, and AC wattmeters to measure phase angle, real power, apparent power, watts, vars, volt-amps, and power factor in single-phase and poly-phase circuits including three-phase circuits with wye and delta connections. This course is designed as preparation for the major in Electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

### 131 Electrical Theory III

**3 hours, 3 units  
Grade Only**

*Prerequisite:* Electricity 121 and 121L, each with a grade of "C" or better, or equivalent.

*Corequisite:* Electricity 131L.

This course involves practice in planning the installation of electrical circuits on construction jobs according to the National Electrical Codes and Blueprints. This course also includes practice in making detailed drawings of electrical wiring circuits using standard symbols and estimating the wiring material required to complete a single-family dwelling. Planning the installation of communication circuits, heating systems, service entrance equipment, remote control systems, motor starting equipment, circuit protective devices, control components, and pilot devices is also included. This course is designed as preparation for the major in Electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

### 131L Electrical Laboratory III

**6 hours lab, 2 units  
Grade Only**

*Prerequisite:* Electricity 121 and 121L, each with a grade of "C" or better, or equivalent.

*Corequisite:* Electricity 131.

This course involves laboratory practice in the installation of construction wiring materials including installation and connection of lighting circuits, receptacle circuits, special purpose circuits, communication circuits, heating systems, service entrance equipment, remote control systems, electric motor circuits, and pilot devices. Safety is emphasized through practice in the installation of electrical equipment according to blueprints and local and national codes. Instruction and practice in fire prevention and construction site safety habits are also included. This course is designed as preparation for the major in Electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

### 141 Electrical Theory IV

**3 hours, 3 units  
Grade Only**

*Prerequisite:* Electricity 131 and 131L, each with a grade of "C" or better, or equivalent.

*Corequisite:* Electricity 141L.

This course involves the advanced theory of the characteristics and uses of direct current generators, direct current motors, direct current motor controls, alternating current generators, and three-phase motors. This course also includes the advanced theory of the characteristics and uses of three-phase motors and three-phase controllers, single-phase motors and single-phase controllers, electronic devices, and static controls. Digital and logic controls are also investigated. This course is designed as preparation for the major in Electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

### 141L Electrical Laboratory IV

**6 hours lab, 2 units  
Grade Only**

*Prerequisite:* Electricity 131 and 131L, each with a grade of "C" or better, or equivalent.

*Corequisite:* Electricity 141.

This course involves laboratory practice and experimentation with DC generators, DC motors, three-phase alternators, squirrel-cage induction motors, and wound rotor induction motors. This course also includes laboratory practice and experimentation with induction motors, synchronous motors, and single-phase motors, including split-phase, capacitor start, universal, and repulsion-start induction run motors. Additionally, experiments are conducted with phase sequence, frequency, selsyn systems, and SCR speed controls. This course is designed as preparation for the major in Electricity. (FT) Associate Degree Credit & transfer to CSU and/or private colleges and universities.

### 190 Electric Lineman IA

**5 hours, 5 units  
Grade Only**

*Advisory:* English 51 and English 56, each with a grade of "C" or better or equivalent, or Assessment Skills Levels W5 and R5; and Mathematics 95 with a grade of "C" or better, or equivalent, or Assessment Skill Level M40.

*Limitation on Enrollment:* This course is not open to students with credit for San Diego Gas and Electric 302. This course provides an orientation in the power distribution and line construction industry. Basic electrical principles and safety on the job are emphasized. Topics include basic mathematical computations, including trigonometry fundamentals,

electron theory and the fundamentals of magnetism. Students will combine electrical theory with laboratory and practical applications in the course of study. (FT) Associate Degree Credit.

### 191 Electric Lineman IB

**5 hours, 5 units  
Grade Only**

*Prerequisite:* Electricity 190, with a grade of "C" or better, or equivalent.

*Limitation on Enrollment:* This course is not open to students with credit for San Diego Gas and Electric 304. This course involves the study of the power distribution and line construction industry. Topics include methods of producing electricity, A.C. and D.C. meters and circuitry and electric batteries. Students will also learn about Ohm's Law and Kirchhoff's Law and electromagnetic induction. (FT) Associate Degree Credit.

### 192 Electric Lineman IIA

**5 hours, 5 units  
Grade Only**

*Prerequisite:* Electricity 191, with a grade of "C" or better, or equivalent.

*Limitation on Enrollment:* This course is not open to students with credit for San Diego Gas and Electric 310. This course is a study of alternating current circuits, A.C. and D.C. motors and generators, pole and overhead construction, and transformers and voltage regulators. Topics include schematics, shunt and series capacitors and safety issues outlined by the Occupational Safety and Health Act (OSHA). Calculating power used by electrical circuits is also covered. (FT) Associate Degree Credit.

### 193 Electric Lineman IIB

**5 hours, 5 units  
Grade Only**

*Prerequisite:* Electricity 192, with a grade of "C" or better, or equivalent.

*Limitation on Enrollment:* This course is not open to students with credit for San Diego Gas and Electric 312. This course is a continuation of pole and overhead line construction. Topics covered include state safety orders for line construction and maintenance, transmission and distribution systems and conductors and electrical systems faults. Students will also learn about short circuits, system protective concepts and how to identify control circuits from wiring diagrams. (FT) Associate Degree Credit.

### 194 Electric Lineman IIIA

**5 hours, 5 units  
Grade Only**

*Prerequisite:* Electricity 193, with a grade of "C" or better, or equivalent.

*Limitation on Enrollment:* This course is not open to students with credit for San Diego Gas and Electric 320. This course covers advanced theory of electrical distribution lines and systems. Other topics include phasing, system groundings, substations and the use of electrical instruments. Students will also learn how to connect transformers in accordance with the state code. Usage of fusing tables and reference tables, including technical symbols are also covered. (FT) Associate Degree Credit.

### 195 Electric Lineman IIIB

**5 hours, 5 units  
Grade Only**

*Prerequisite:* Electricity 194, with a grade of "C" or better, or equivalent.

*Limitation on Enrollment:* This course is not open to students with credit for San Diego Gas and Electric 322. This course is a continuation of advanced theory of electrical distribution lines and systems. Topics include the use of "hot sticks" and special equipment; repair and maintenance of poles and lines both cold and energized, safety practices and the local/state requirements. Students will be expected to master competencies such as those included in elements of electricity, overhead pole and electrical line construction, safety codes and applications, electric power system, transformer and meter installations, and exploration of underground electrical distribution. (FT) Associate Degree Credit.

### 200 Electrical Control Systems

**3 hours, 3 units  
Grade Only**

*Prerequisite:* Electricity 121 and 121L, each with a grade of "C" or better, or equivalent

*Corequisite:* Electricity 200L.

This course involves electrical control system theory emphasizing standard motor controls, transducers, static control devices, programmed controllers, and remote electronic controls. (FT) Associate Degree Credit.

### 200L Electrical Control Systems Laboratory

**6 hours lab, 2 units  
Grade Only**

*Prerequisite:* Electricity 121 and 121L, each with a grade of "C" or better, or equivalent.

*Corequisite:* Electricity 200.

This course involves practice in electrical control systems emphasizing standard motor controls, transducers, static control devices, programmed controllers, and remote electronic controls. (FT) Associate Degree Credit.

***This discipline may offer specialized instruction in one or more of the following areas: Supervised Tutoring (044), Special Topics (265), Independent Study (290), Individualized Instruction (296), Service Learning (277), Applied Applications and Software Skills (045L), or Work Experience (270). Detailed course descriptions are listed on page 96. Please refer to the class schedule and/or see the dean or department chair for availability.***