

DISTANCE-LEARNING
POWER DELIVERY PROGRAMS
NORTHWEST LINEMAN COLLEGE

2024 CATALOG

UPDATED 2023



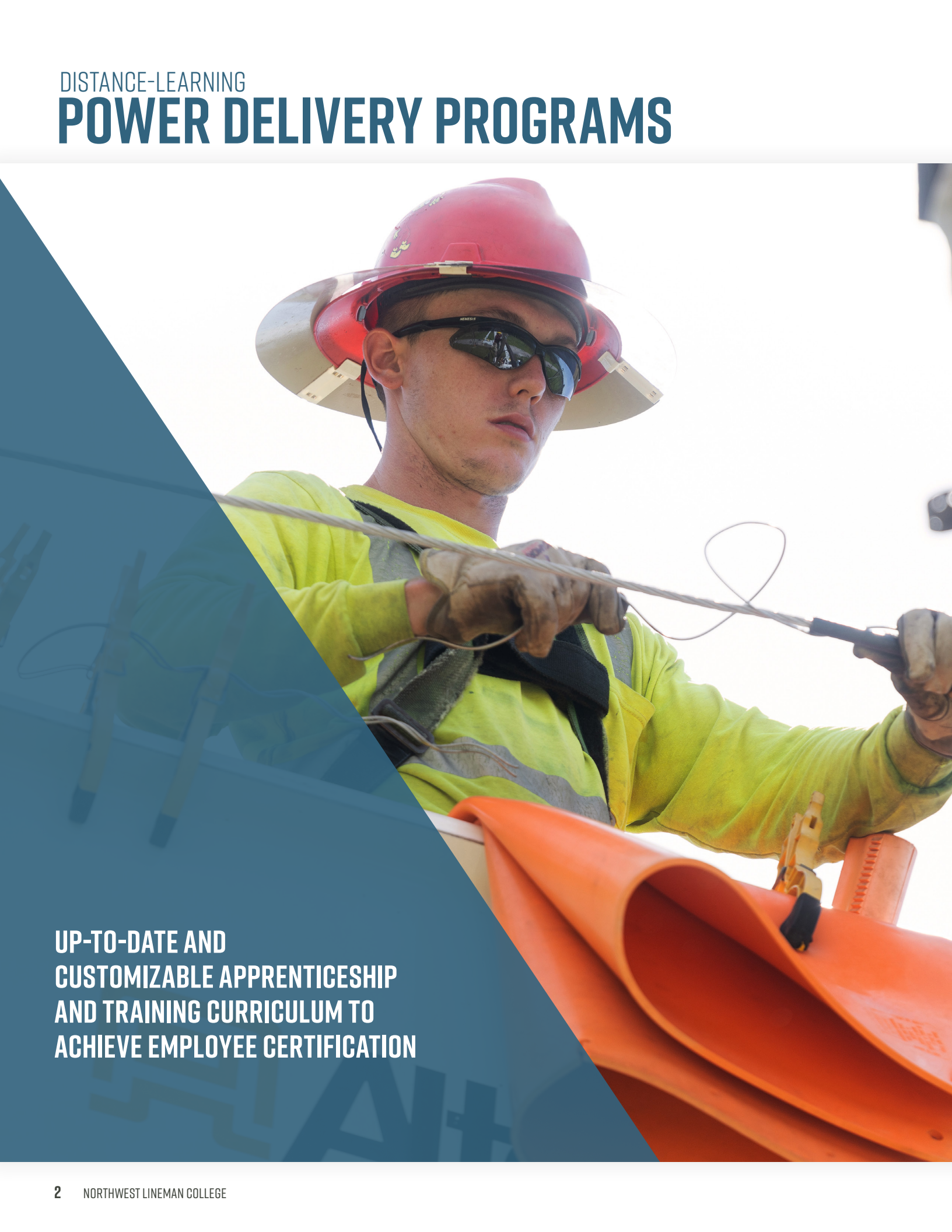
LINEMAN.EDU

A QUANTA SERVICES COMPANY

**APPRENTICESHIP AND CUSTOMIZED
TRAINING PROGRAMS**

DISTANCE-LEARNING

POWER DELIVERY PROGRAMS

A lineman wearing a red hard hat, safety glasses, and a yellow high-visibility vest is working with power lines. He is holding a pair of pliers and a wire. The background is a bright, overexposed sky. A large blue diagonal graphic element is on the left side of the image.

UP-TO-DATE AND
CUSTOMIZABLE APPRENTICESHIP
AND TRAINING CURRICULUM TO
ACHIEVE EMPLOYEE CERTIFICATION

4	PROGRAM OVERVIEW	18	CUSTOMIZE YOUR OWN PROGRAM
6	OUR CURRICULUM	20	COURSE DESCRIPTIONS
8	STANDARD PROGRAMS	26	PROGRAM BENEFITS
8	Lineworker Certification Program	30	HOW TO ENROLL
10	Substation Technician Certification Program	34	POLICIES
12	System Operator Certification Program		
14	Meter Technician Certification Program		
16	Transmission Technician Certification Program		

RECENT UPDATES TO THE POWER DELIVERY PROGRAMS

Northwest Lineman College released updates to the Power Delivery Programs in 2023 to incorporate the following:

UNDERGROUND
DISTRIBUTION AND
TRANSMISSION

EPZ GROUNDING
COMPETENCIES

REFRESHED
LEADERSHIP
TRAINING

MODERNIZED
CURRICULUM AND
GRAPHICS

INDUSTRY STANDARDS
IN SAFETY, TECH,
AND EQUIPMENT

Other updates include:

- Adding study guides to each chapter of all manuals and flashcards for added learning opportunities.
- Revised Journeyman Excellence course to include a new course capstone project focused on job planning.
- Refreshed behavior training and evaluations.

PROGRAM OVERVIEW

Our Power Delivery Programs offer distance-learning curriculum for employee certification. These customizable programs are used for an apprentice-leading-to-journeyman or employee certification through digital or paper manuals, study guide activities, and training videos. The curriculum is modern, up-to-date, and makes difficult concepts easy to understand, thus maximizing student learning and retention.

Whether you're building out an apprenticeship program, offering refresher training, or providing continuing education, hundreds of companies across the United States use these programs to ensure their employees are highly trained, well-educated, and, above all, safe.



HELPS IMPROVE SAFETY
THROUGH EMPLOYEE EDUCATION



INCLUDES CURRICULUM
ASSOCIATED WITH ANSI, ASTM, AND OSHA



UP TO 150 HOURS OF RELATED
TECHNICAL INSTRUCTION EACH YEAR



INCLUDES RECORD MANAGEMENT
AND STUDENT NOTIFICATIONS



CUSTOMIZABLE PROGRAMS
TO MEET YOUR COMPANY NEEDS



5 STANDARD PROGRAMS
FOR APPRENTICESHIPS IN POWER DELIVERY



These programs are the time-tested benchmark of apprentice training. Today, hundreds of companies across the United States use these programs to ensure their employees are safe and well educated.

HOW OUR PROGRAM WORKS

Choose one of our five standard programs or customize your own. The standard programs are built into three or four modules, one for each year of an apprenticeship. Each module contains up to 10 courses. The courses comprise technical aspects of the power delivery industry and provide valuable background information about the power system's construction, maintenance, and operation.

There are two simple ways to create a customized program:

1. Start with a standard program and replace unwanted courses with any of our 74 self-contained courses.
2. Build your own from the ground up by selecting up to 10 courses for each desired module.

STANDARD PROGRAMS:

- Lineworker Certification Program
- Substation Technician Certification Program
- System Operator Certification Program
- Meter Technician Certification Program
- Transmission Technician Certification Program

CURRICULUM LAYOUT AND DESIGN

NLC's curriculum takes complicated content and makes it easy to understand, maximizing student learning and retention.

- 1 LAYOUT**
Chapters and titles are listed in headings so the reader can easily identify their location.
- 2 MARGIN STATEMENTS**
Key points are reinforced with margin statements. Thousands of margin statements are used in the program.
- 3 GRAPHICS-TO-TEXT RATIO**
A picture is worth a thousand words, and NLC has made a significant effort to include hundreds of original, high-quality graphics in our curriculum. These graphics illustrate difficult concepts in an easy to understand format that does not sacrifice the technical integrity of the topic. We use a 50/50 ratio of graphics-to-text as a design guideline.
- 4 SMART VIDEO LEARNING**
QR codes and short URLs are used throughout the program, allowing trainees to connect easily to digital video resources.
- 5 TYPE**
Optimal font size and specific typefaces are used for readability.
- 6 ORGANIZATION**
Content is organized to align with outcomes and build trainee knowledge as they progress through the program.
- 7 3D GRAPHICS**
3D graphics are used to illustrate complex topics, helping students learn proper procedures before applying skills in the field and lab.

PERSONAL PROTECTIVE GROUNDING 1

Static/Shielding Wire

This conductor is installed on transmission lines in areas that are exposed to lightning. It can consist of one or two conductors that are positioned above the phase conductors on the structure. They are grounded by various methods, depending upon the structure type and the design of the line.

3

Static/shield wire

Ground wire (connected to static/shield wire)

LEARN MORE 2:47

Ground Rod Resistance

LINEMAN CHANNEL.COM

lcvid.com/groundrod

4

Driven Ground Rod

This is typically a 5/8- or 3/4-inch ground rod that is driven into the earth as deep as practical. The ground rod can be viewed as a sprinkler system spewing out water through many holes or paths. By penetrating the earth, the ground rod provides many paths for the flow of electrons, and the more paths that are provided, the less resistance.

It is also important to note that a seasonal temperature change from 68 to 23 degrees F will increase soil resistance by a factor of 10, due to freezing.

The ground rod should be driven as deep as possible to reduce overall resistance.

Correct

Incorrect

Doubling the length of the ground rod into the earth will typically decrease ground resistance by 40% while doubling its diameter only reduces resistance by 10%.

18 LINEMAN APPRENTICESHIP PROGRAM

CLEARING LINES AND EQUIPMENT | CHAPTER TWO

5

Visual Clearance Point

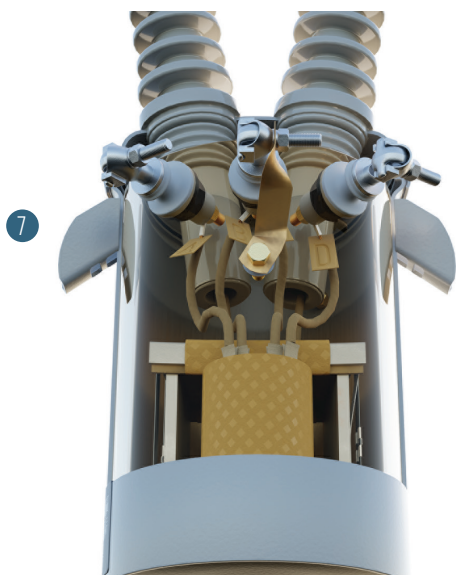
Although not specifically required by OSHA, a visual-open clearance point is always recommended, and required by many companies. The requirement of a visual opening has been a long-standing preference by many utilities, and it clearly provides a more secure and safe clearance. An example of a clearance point without a visual open would be any type of an enclosed circuit breaker, which is open, but the contacts are not visible from outside the enclosure.

6

The normal open distance between the contacts is typically a very short distance, and there have been cases of circuit breakers not opening all three phases properly. A **visual clearance** point provides a clear visual air gap between the source and load terminals of a device.

2

Although not specifically required by OSHA, a visual-open clearance point is always recommended, and required by many companies.



Visual clearance point



ONLINE LEARNING

With an unyielding determination to do what is best for our students and partners, we have implemented an online **learning management system (LMS)** for our apprenticeship programs. The LMS delivers versatile training for students and increased support for companies.

The LMS is designed to be used across any digital device. It ensures your apprentices have 24/7 access to our curriculum, making it optimal for the educational experience.

We recommend apprentices bring a tablet or laptop to access our curriculum digitally during their training with us.

LINEWORKER CERTIFICATION PROGRAM



MODULE DETAILS SEE PAGES 20–24 FOR COURSE DESCRIPTIONS



150+ HOURS OF TRAINING PER MODULE



\$662 PER MODULE, PER TRAINEE FOR DIGITAL CURRICULUM, AND \$688 FOR PHYSICAL*



10 COURSES PER MODULE



ONLINE TESTING



10 EXAMS PER MODULE



TRAINING VIDEOS INCLUDED WITH TUITION

**See page 30 for more details*

MODULE COURSES

YEAR ONE

- Introduction to Power Delivery
- Safety 1
- Working in Elevated Positions
- Knots, Splices, and Rope
- Electrical Systems
- First Aid
- Applied Mathematics
- Basic Electrical Theory
- Transformer Basics
- OSHA 1

YEAR TWO

- Safety 2
- AC Fundamentals
- Personal Protective Grounding
- Live-Line Equipment and Methods
- Rigging
- Underground Conductors
- Overhead Conductors
- Electrical Test Equipment
- Introduction to Substations
- OSHA 2

YEAR THREE

- Safety 3
- Special Elements 1
- Metering
- System Power Flow
- Advanced Transformers
- Maps and Standards
- System Protection
- NESC 1
- NESC 2
- OSHA 3

YEAR FOUR

- Safety 4
- Communication Systems
- Special Elements 2
- Vegetation Management
- System Operation
- System Automation
- Overhead Line Design
- Underground Line Design
- Trouble Investigation
- Crew Leadership

PERSONAL PROTECTIVE GROUNDING

1.4 SOURCES OF ELECTRIC ENERGY

Understanding the various possible sources of energy leads to proper application of personal protective grounds. Personal protective grounds are installed to protect lineworkers from the line becoming accidentally or inadvertently energized by sources of electric energy. These sources are identified here and should always be taken into consideration when applying personal protective grounds.

Understanding the various possible sources of energy leads to proper application of personal protective grounds. Personal protective grounds are installed to protect lineworkers from the line becoming accidentally or inadvertently energized by sources of electric energy. These sources are identified here and should always be taken into consideration when applying personal protective grounds.

INDUCED VOLTAGE OR INDUCTION

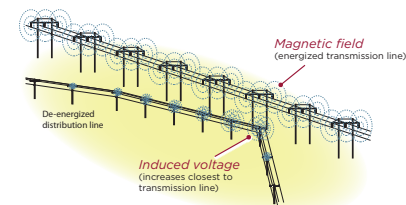
Induction is most commonly encountered from existing energized lines that are adjacent to the work site. This can be encountered when stringing or removing conductors adjacent to an energized line. The amount of induction is somewhat proportional to the line voltage, the amount of current flowing in the line, and the distance from the line. The closer the de-energized line is to an energized line, the more induction that will occur.

LEARN MORE 1:27



Induction

lcvid.com/indct



Induction as a possible source.

Radio, television, and microwave towers can also be a source of induced voltage. Again, being closer to the towers increases the amount of induction.

SUBSTATION TECHNICIAN CERTIFICATION PROGRAM



MODULE DETAILS SEE PAGES 20–24 FOR COURSE DESCRIPTIONS



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10 COURSES PER MODULE



ONLINE TESTING



10 EXAMS PER MODULE



TRAINING VIDEOS INCLUDED WITH TUITION

*See page 30 for more details

MODULE COURSES

YEAR ONE

- Introduction to Power Delivery
- Substation Safety 1
- Working in Elevated Positions
- Knots, Splices, and Rope
- Electrical Systems
- First Aid
- Applied Mathematics
- Basic Electrical Theory
- Introduction to Substations
- OSHA 1

YEAR TWO

- Substation Safety 2
- AC Fundamentals
- Working on Lines and Stations
- Rigging
- Disconnects and Switches
- Substation Conductors
- Substation Construction
- Substation OSHA 2
- Circuit Breakers
- Substation Transformers

YEAR THREE

- Supply Station NESC 1
- Supply Station NESC 2
- Substation Safety 3
- Metering and Instrument Transformers
- Substation Design 1
- Capacitors, Reactors, and Surge Arresters
- Introduction to Substation DC Systems
- Electronics
- Substation Maps and Standards
- Substation OSHA 3

YEAR FOUR

- Substation Communication Systems
- Substation Safety 4
- Substation Design 2
- Substation Special Elements
- Substation System Operation
- System Automation
- Substation System Protection
- Circuit Breaker and Instrument Transformer Testing
- Relays
- Transformer Testing

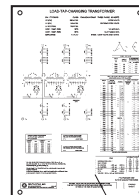
EQUIPMENT INSTALLATION AND STRUCTURE ERECTION | CHAPTER THREE

TRANSFORMER AND REGULATOR INSTALLATION 3.2

Larger power transformers are usually shipped without oil in them, while smaller units might be shipped with oil. The total weight, with or without oil, can be determined by closely interpreting the transformer nameplate.

The equipment's weight will also determine what slings are used, and how they are rigged from the equipment to the crane. Proper planning and strategies will ensure that the lift is performed in a safe and efficient manner. It is also important to verify the high-voltage side and low-voltage side of the unit so that it is installed properly.

It is important to verify the high-voltage side and low-voltage side of the unit so that it is installed properly.



Transformer nameplate.
Note total weight.

ITEMS:	APPROXIMATE WEIGHTS	
	lbs	kg
UNTANKING (CORE & COIL) *	47700	21635
TANK & FITTINGS	25030	11340
OIL-MAIN TANK (3325 gal) (12565 L)	24940	11315
OIL-RADIATORS (235 gal) (890 L)	1780	800
OIL-LTC (280 gal) (1060 L)	2100	950
TOTAL (3640 gal) (14535 L)	101500	46040

* INCLUDES 1200 lbs (545 kg) PREVENTIVE AUTO



Transformer installation (courtesy US Army).

NORTHWEST LINEMAN COLLEGE 43

Reference page

SYSTEM OPERATOR CERTIFICATION PROGRAM



MODULE DETAILS SEE PAGES 20–24 FOR COURSE DESCRIPTIONS



150+ HOURS OF TRAINING PER MODULE



\$662 PER MODULE, PER TRAINEE FOR DIGITAL CURRICULUM, AND \$688 FOR PHYSICAL*



7-8 COURSES PER MODULE



ONLINE TESTING



7-8 EXAMS PER MODULE



TRAINING VIDEOS INCLUDED WITH TUITION

*See page 30 for more details

MODULE COURSES

YEAR ONE

- Basic Electrical Theory
- AC Fundamentals
- Electrical Systems
- Introduction to Power Delivery
- Personal Protective Grounding
- Working on Lines and Stations
- Introduction to Substations

YEAR TWO

- System Power Flow
- Maps and Standards
- Substation Maps and Standards
- Disconnects and Switches
- Circuit Breakers
- Substation Transformers
- Capacitors, Reactors, and Surge Arresters

YEAR THREE

- Substation System Operation
- System Operation
- Substation Communication Systems
- Introduction to Substation DC Systems
- System Automation
- Substation System Protection
- Trouble Investigation
- Relays

PERSONAL PROTECTIVE GROUNDING

Doubling the length of the ground rod into the earth will typically decrease ground resistance by 40% while doubling its diameter only reduces resistance by 10%.

LEARN MORE 2:47

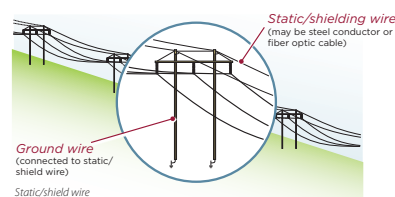


Ground Rod Resistance
lcvid.com/groundrod



STATIC/SHIELDING WIRE

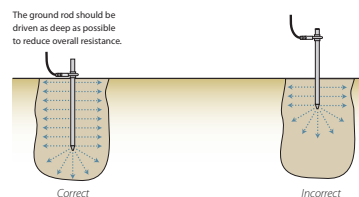
This conductor is installed on transmission lines in areas that are exposed to lightning. It can consist of one or two conductors that are positioned above the phase conductors on the structure. They are grounded by various methods, depending upon the structure type and the design of the line.



DRIVEN GROUND ROD

This is typically a 5/8- or 3/4-inch ground rod that is driven into the earth as deep as practical. The ground rod can be viewed as a sprinkler system spewing out water through many holes or paths. By penetrating the earth, the ground rod provides many paths for the flow of electrons, and the more paths that are provided, the less resistance.

It is also important to note that a seasonal temperature change from 68 to 23 degrees F will increase soil resistance by a factor of 10, due to freezing.



METER TECHNICIAN CERTIFICATION PROGRAM



**PROGRAMS ARE COMPLETELY
SELF-CONTAINED. NO OTHER
BOOKS OR REFERENCE MATERIALS
ARE REQUIRED FOR COMPLETION.**

MODULE DETAILS SEE PAGES 20–24 FOR COURSE DESCRIPTIONS



150+ HOURS OF TRAINING PER MODULE



\$662 PER MODULE, PER TRAINEE FOR DIGITAL CURRICULUM, AND \$688 FOR PHYSICAL*



10 COURSES PER MODULE



ONLINE TESTING



10 EXAMS PER MODULE



TRAINING VIDEOS INCLUDED WITH TUITION

*See page 30 for more details

MODULE COURSES

YEAR ONE

- Introduction to Power Delivery
- Safety 1
- Electrical Systems
- First Aid
- Applied Mathematics
- Basic Electrical Theory
- Transformer Basics
- OSHA 1
- Safety 2
- AC Fundamentals

YEAR TWO

- Electronics
- Electrical Test Equipment
- Introduction to Substations
- OSHA 2
- Safety 3
- Metering
- Advanced Transformers
- Maps and Standards
- System Protection
- NESC 1

YEAR THREE

- NESC 2
- OSHA 3
- Safety 4
- Special Elements 1
- Special Elements 2
- System Operation
- Communication Systems
- System Automation
- Trouble Investigation
- Crew Leadership

METERING

LEARN MORE

2:28



Meter Testing and Installation
lcvid.com/mtsn

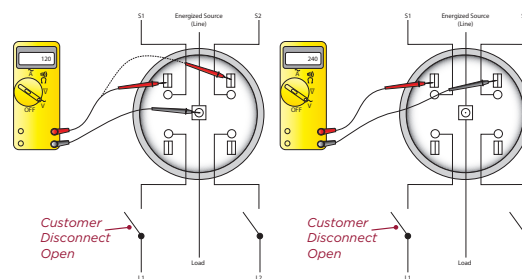


VOLTMETER METHOD

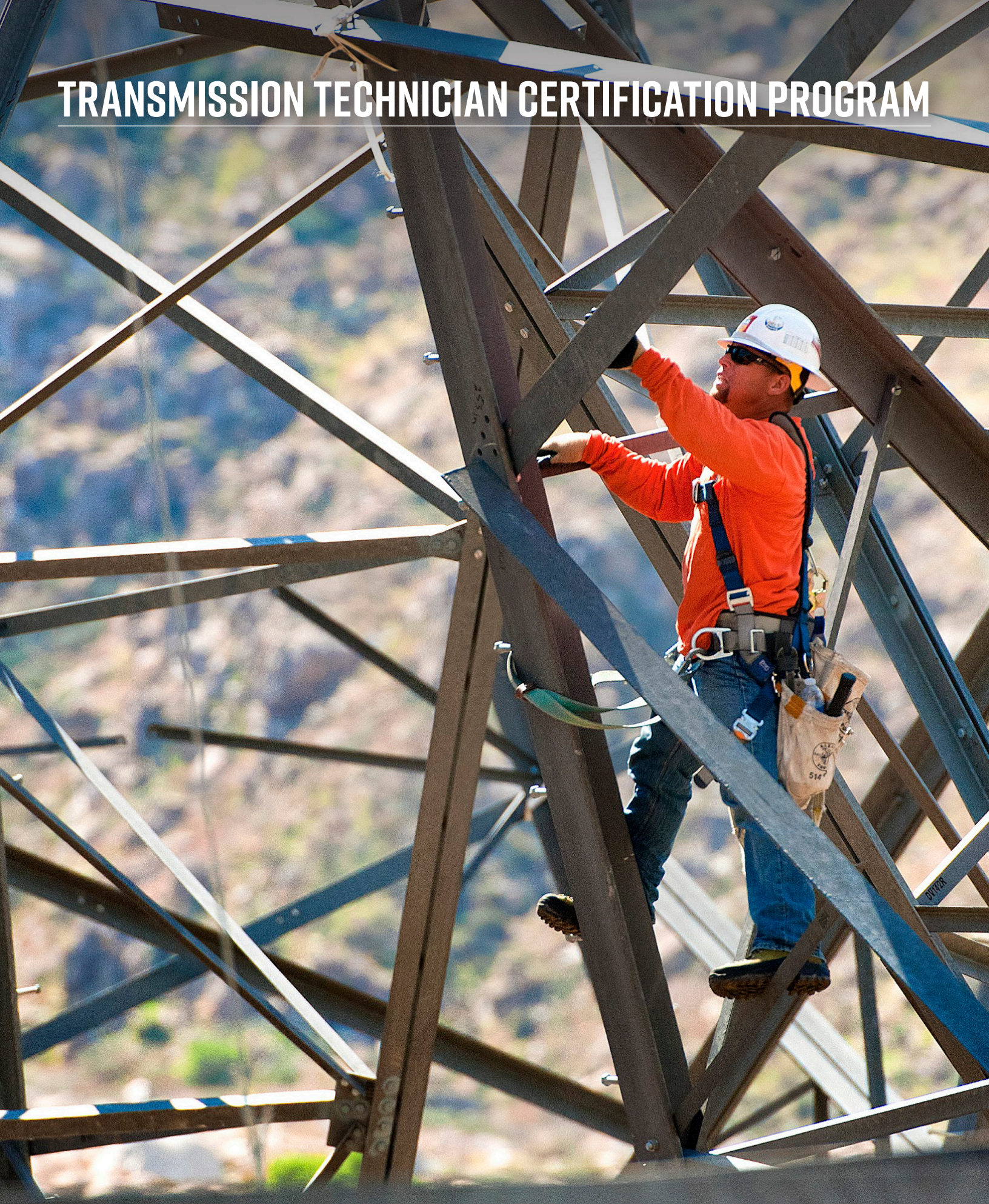
Using a standard voltmeter, the meter base can be checked for back feed, short circuits, open circuit, or closed customer breaker.

1. With the source side energized and the customer's disconnect open, proper voltage to the meter socket can be confirmed with the following:

- A voltage reading of 120 volts between S1 and neutral
- A voltage reading of 120 volts between S2 and neutral
- A voltage reading of 240 volts should be read between S1 and S2



TRANSMISSION TECHNICIAN CERTIFICATION PROGRAM



MODULE DETAILS SEE PAGES 20–24 FOR COURSE DESCRIPTIONS



150+ HOURS OF TRAINING PER MODULE



\$662 PER MODULE, PER TRAINEE FOR DIGITAL CURRICULUM, AND \$688 FOR PHYSICAL *



10 COURSES PER MODULE



ONLINE TESTING



10 EXAMS PER MODULE



TRAINING VIDEOS INCLUDED WITH TUITION

**See page 30 for more details*

MODULE COURSES

YEAR ONE

- Introduction to Power Delivery
- Safety 1
- Working in Elevated Positions
- Knots, Splices, and Rope
- Electrical Systems
- Disconnects and Switches
- Wood Structure Maintenance
- Basic Electrical Theory
- Transformer Basics
- OSHA 1

YEAR TWO

- Safety 2
- AC Fundamentals
- Personal Protective Grounding
- Live-Line Equipment and Methods
- Rigging
- Transmission Inspections
- Overhead Conductors
- Electrical Test Equipment
- Introduction to Substations
- OSHA 2

YEAR THREE

- Safety 3
- Special Elements 1
- Transmission Conductor Installation
- System Power Flow
- Advanced Transformers
- Maps and Standards
- Substation System Protection
- NESC 1
- NESC 2
- OSHA 3

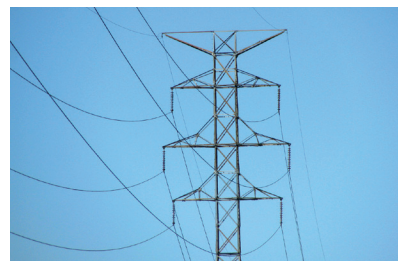
YEAR FOUR

- Safety 4
- Substation Communication Systems
- Special Elements 2
- Vegetation Management
- System Operation
- System Automation
- Overhead Line Design
- Steel Structure Maintenance
- Substation Transformers
- Crew Leadership

TRANSMISSION INSPECTIONS

3.3 ABOVE GROUND INSPECTIONS

Above-ground inspection of a steel tower is normally done from the ground with a pair of binoculars.



Above-ground inspection of a steel tower is normally done from the ground with a pair of binoculars. The following are a few things to check for that will help you assess the condition of a steel tower.

The first thing that should be checked is if the tower is plumb. A simple string with a weight will tell you if the tower is plumb. The tower should not be leaning or display signs of twisting.

Stand at the center of the tower base and look up. The tower should have good symmetry all the way up. There should not be any bent or twisted supports.



Looking up

CUSTOMIZE YOUR OWN PROGRAM

A photograph of two linemen in white hard hats and safety glasses working on a large, light blue electrical transformer. They are wearing yellow and white gloves and are focused on the equipment. The transformer has a red "DANGER" label with a lightning bolt symbol and the text "ELECTROCUTION HAZARD". Below the label, it says "15 VA" and "15 W". The background is dark, suggesting an indoor or nighttime setting.

FOR MORE INFORMATION
CALL 888-LINEWORK EXT. 5000
EMAIL PDPADMIN@LINEMAN.EDU

MODULE DETAILS SEE PAGES 20–24 FOR COURSE DESCRIPTIONS



150+ HOURS OF TRAINING PER MODULE



\$662 PER MODULE, PER TRAINEE FOR DIGITAL CURRICULUM, AND \$688 FOR PHYSICAL*



UP TO 10 COURSES PER MODULE



TRAINING VIDEOS INCLUDED WITH TUITION



UP TO 10 EXAMS PER MODULE



ONLINE TESTING

**See page 30 for more details*

OVERVIEW

Create an individualized, custom-made apprenticeship or training program. Begin by selecting up to 10 courses from our extensive list on pages 20–24 to create a module, then select the number of modules per trainee.

There are 74 courses to choose from with topics that include overhead distribution, transformers, safety, and many more. For questions or assistance, please contact us.

1

STEP 1
SELECT UP TO 10 COURSES PER MODULE

2

STEP 2
SELECT NUMBER OF MODULES

3

STEP 3
CONTACT US TO ENROLL

COURSE DESCRIPTIONS

AC FUNDAMENTALS - ELE 2106

(112 pages)

AC Generation, Series and Parallel Circuits, Inductance, Capacitance and Power Factor, and Three-Phase Power.

ADVANCED TRANSFORMERS - TRA 3105

(114 pages)

Winding Designations, Three-Phase Connections, Fusing and Loading, Transformer Vectors, and Installation.

APPLIED MATHEMATICS - MAT 1106

(80 pages)

Whole Numbers, Fractions, Decimals, and Percentages, Powers and Roots, Algebra and Geometry, and Trigonometry and Binary Systems.

BASIC ELECTRICAL THEORY - ELE 1105

(62 pages)

Atomic Structure, Magnetism and Static Electricity, Voltage and Amperage, Ohms and Watts, and Ohm's Law.

CAPACITORS, REACTORS, AND SURGE ARRESTERS PLD 3106

(106 pages)

Surge Arresters, Reactors, Capacitors, Maintenance of Reactors and Capacitors, and Capacitor/Reactor Operation.

CIRCUIT BREAKER AND INSTRUMENT TRANSFORMER TESTING - TRA 4105

(118 pages)

Introduction, Circuit Breakers, Current Transformers, Voltage Transformers, and Coupling Capacitor Voltage Transformers.

CIRCUIT BREAKERS - ELE 2107

(88 pages)

Introduction to Circuit Breakers, Types of Circuit Breakers, Circuit Breaker Components, Circuit Breaker Control Circuits, and Circuit Breaker Auxiliary Equipment.

COMMUNICATION SYSTEMS - COM 4105

(114 pages)

Communications Basics, Communication Systems Utilized by Power Companies, Services Offered by Power Companies, Distribution Fiber Installations, and Transmission Fiber Installation.

CREW LEADERSHIP - LEAD 4105

(128 pages)

Background, Resources, Knowledge, Skills, and Abilities, Job Responsibilities, and Assisting the Crew Leader.

DISCONNECTS AND SWITCHES - PLD 2105

(98 pages)

Getting Started, Disconnects, Switches, Maintenance, and Operation of Disconnects and Switches.

ELECTRICAL SYSTEMS - ELS 1107

(110 pages)

Electrical Systems – An Overview, Generation, Transmission, Distribution, and Substations.

ELECTRICAL TEST EQUIPMENT - EQU 2106

(70 pages)

Low-Voltage Test Equipment, High-Voltage Test Equipment, Cable and Fault Locating Equipment, Substation Test Equipment, and Specialized Test Equipment.

ELECTRONICS - EQU 3105

(104 pages)

Introduction to Solid State Electronics, Solid State Devices and Applications, AC Circuits, Digital Electronics, and Wireless Electronics and Communication.

FIRST AID - FIR 1107

(60 pages)

Electrical Burns, Heat and Cold Illnesses, Stings and Bites, Sight and Hearing Injuries, and Elevated Position Rescue.

INTRODUCTION TO POWER DELIVERY - SYO 1105

(86 pages)

The Importance of Electricity, History of Power Delivery, Types of Companies, Positions and Career Paths, and Key Agencies and Organizations.

INTRODUCTION TO SUBSTATION DC SYSTEMS - ELE 3105

(116 pages)

DC System Fundamentals, Batteries, Battery Chargers, Battery Safety and Inspection, and Ground Detection.

INTRODUCTION TO SUBSTATIONS - SUB 2105

(78 pages)

Substations – An Overview, Circuit Breakers and Disconnects, Transformers, Regulator/LTC, and Relays and Metering.

KNOTS, SPLICES, AND ROPE - ROP 1105

(78 pages)

Rope Types, Knots, Splices, and Slings, Chain, and Shackles.

LIVE-LINE EQUIPMENT AND METHODS - LIV 2105

(110 pages)

Live-Line Work – An Overview, Live-Line Tools, Protective Equipment, Rubber Glove Methods, Hot Stick Methods, and Barehand Methods.

MAPS AND STANDARDS - MAP 3105

(78 pages)

Mapping Basics, Distribution Mapping, Transmission Mapping, Substation Mapping, and Construction Standards.

METERING - MET 3105

(108 pages)

Metering – An Overview, Self-Contained Meters, Transformer-Rated Metering, Automated Metering Systems, Testing Meters, and Smart Home.

METERING AND INSTRUMENT TRANSFORMERS - TRA 3106

(113 pages)

Introduction to Revenue Metering, Current Transformers, Potential Transformers, Transformer-Rated Metering, and Panel Meters.

NESC 1 - NES 3105

(132 pages)

Applying the NESC, Inspection of Utility Facilities, Grounding, Electric Supply Stations and Equipment, Underground Lines, and Work Rules.

NESC 2 - NES 3106

(98 pages)

Overhead Lines and Equipment, Conductor Movement and Resulting Clearances, Clearances Between Crossing Lines and Parallel Lines, Clearances to Buildings and Other Installations, Clearances Between Wires, Conductors, and Cables, and Overhead Strengths and Loadings.

OSHA 1 - SAF 1108

(48 pages)

Subpart R, Introduction and Paragraphs (a) and (b); Subpart R, Paragraph (c): Job Briefings; Subpart R, Paragraph (g): Personal Protective Equipment; Subpart R, Paragraphs (i) and (k): Hand and Portable Power Tools, and Materials Handling and Storage; and Subpart R, Paragraph (n): Personal Protective Grounding.

OSHA 2 - SAF 2105

(60 pages)

Subpart R, Paragraph (h): Ladders and Platforms; Subpart R, Paragraph (j): Live-Line Tools; Subpart R, Paragraph (l): Working On (or Near) Exposed Energized Parts; Subpart R, Paragraph (m): De-energizing Lines and Equipment for Employee Protection; and Subpart R, Paragraph (r): Line-Clearance Tree Trimming.

OSHA 3 - SAF 3105

(82 pages)

Subpart R, Paragraph (e): Enclosed Spaces; Subpart R, Paragraph (f): Excavations; Subpart R, Paragraph (p): Mechanical Equipment;

Subpart R, Paragraph (q): Overhead Lines; Subpart R, Paragraph (t): Underground Electrical Installations; Subpart R, Paragraph (u): Substations; and Subpart R, Paragraph (w): Special Conditions.

OSHA FOR POWER DELIVERY - SAF 5105

(132 pages)

Introduction to OSHA, Focus Four, Personal Protective and Life-Saving Equipment and Health Hazards in Construction, Excavations, Material Handling, Storage, Use and Disposal, and Enclosed Spaces.

OVERHEAD CONDUCTORS - CON 2106

(104 pages)

Conductor Basics, Conductor Types, Conductor Selection, Stringing and Sagging, and Splicing and Attaching.

OVERHEAD LINE DESIGN - PLD 4106

(96 pages)

Line Routes, Structure Design, Insulation and Equipment, Transformers, Services, and Secondary, and Transmission.

PERSONAL PROTECTIVE GROUNDING - GRO 2106

(108 pages)

General Information, Overhead Distribution, Underground Distribution, Transmission, and Substations.

RELAYS - REL 4105

(132 pages)

Introduction, Overcurrent Relays, Differential Relays, Voltage and Frequency Relays, and Auxiliary Relays.

RIGGING - ROP 2106

(68 pages)

Weights and Loads, Sling Angles, Tensions, Equipment, and Applications.

RUS STANDARDS - STA 5105

(144 pages)

RUS Standards, Overhead Distribution Specifications, Underground Distribution Specifications, Transmission Specifications and Drawings, and Mechanics of Overhead Line Conductors.

SAFETY 1 - SAF 1109

(52 pages)

Introduction to Safety, Personal Protective Equipment, Hazards, Safety Attitude, Accident Investigation, and Job Briefings.

SAFETY 2 - SAF 2107

(60 pages)

Safety Meetings, Poor Safety, Public Safety, Communications, and Accident Review.

COURSE DESCRIPTIONS (CONTINUED)

SAFETY 3 - SAF 3107

(36 pages)

Electric and Magnetic Fields, Oil Spills, and Safety Data Sheets.

SAFETY 4 - SAF 4105

(76 pages)

Bloodborne Pathogens, Ergonomics, Safety Audits, Equipment Safety, and Key Safety Considerations.

SPECIAL ELEMENTS 1 - SPE 3105

(98 pages)

Power Quality, Streetlights, Line Inspections, Helicopter Utilization, and Hydraulics.

SPECIAL ELEMENTS 2 - SPE 4105

(56 pages)

Customer Relations, Corrosion, Flame Resistant Clothing, Security, and Disaster Restoration.

STEEL STRUCTURE MAINTENANCE - MAI 4105

(108 pages)

Insulator Cleaning, Member Replacement, Structure Replacement, Miscellaneous Maintenance, and Conductor and Insulator Maintenance.

SUBSTATION COMMUNICATION SYSTEMS - COM 4106

(114 pages)

Communications Basics, Communication Systems Utilized by Power Companies, Services Offered by Power Companies, Substation Communication Systems, and Substation Communications Equipment.

SUBSTATION CONDUCTORS - CON 2107

(110 pages)

Conductor Basics, Conductor Types, Conductor Selection and Installation, Medium- and High-Voltage Underground Conductors, and Low-Voltage Conductors.

SUBSTATION CONSTRUCTION - PLD 2106

(93 pages)

Site Preparation, Foundations, Conduit, and Ground Installation, Equipment Installation and Structure Erection, Control House and Control Wiring Installation, and Completion.

SUBSTATION DESIGN 1 - PLD 3105

(146 pages)

General Design Considerations, Physical Layout, Site Design, Grounding, and Major Equipment.

SUBSTATION DESIGN 2 - PLD 4105

(148 pages)

Bus Design, Structures and Foundations, Insulated Cables, Conduits and Raceways, Instruments, Relaying, and Metering, and Substation Control.

SUBSTATION MAPS AND STANDARDS - MAP 3106

(142 pages)

An Overview, Operating Drawings and Diagrams, Construction Drawings, Material Standards and Construction Standards, and Transmission and Distribution Maps.

SUBSTATION OSHA 2 - SAF 2106

(56 pages)

Subpart R, Paragraph (h): Ladders and Platforms; Subpart R, Paragraph (j): Live-Line Tools; Subpart R, Paragraph (l): Working On (or Near) Exposed Energized Parts; Subpart R, Paragraph (m): De-energizing Lines and Equipment for Employee Protection; and Subpart R, Paragraph (o): Testing and Test Facilities.

SUBSTATION OSHA 3 - SAF 3106

(70 pages)

Subpart R, Paragraph (e): Enclosed Spaces; Subpart R, Paragraph (f): Excavations; Subpart R, Paragraph (p): Mechanical Equipment; Subpart R, Paragraph (s): Communication Facilities; Subpart R, Paragraph (t): Underground Electrical Installations; Subpart R, Paragraph (u): Substations; and Subpart R, Paragraph (w): Special Conditions.

SUBSTATION SAFETY 1 - SAF 1110

(64 pages)

Introduction to Safety, Personal Protective Equipment, Hazards, Safety Attitude, Accident Investigation, and Job Briefings.

SUBSTATION SAFETY 2 - SAF 2108

(76 pages)

Safety Meetings, Poor Safety, Public Safety, Communications, and Accident Review.

SUBSTATION SAFETY 3 - SAF 3108

(48 pages)

Electric and Magnetic Fields, Oil Spills, and Safety Data Sheets.

SUBSTATION SAFETY 4 - SAF 4106

(76 pages)

Bloodborne Pathogens, Ergonomics, Safety Audits, Equipment Safety, and Key Safety Considerations.

SUBSTATION SPECIAL ELEMENTS - SPE 4106

(98 pages)

Power Quality, Corrosion, Mobile Substations, Flame-Resistant Clothing, and Hydraulics.

SUBSTATION SYSTEM OPERATION - SYO 4105

(182 pages)

The System Operator, Clearing Lines and Equipment, Distribution Operation, Substation Operation, and Transmission Operation.

SUBSTATION SYSTEM PROTECTION - SYP 4105

(132 pages)

System Protection Fundamentals, Distribution System Protection, Distribution Substation Protection, Transmission Protection, and Reporting and Monitoring Service Reliability.

SUBSTATION TRANSFORMERS - TRA 2106

(114 pages)

Getting Started, Transformer Theory, Components and Construction, Oil Preservation and Cooling Systems, and Connections and Special Applications.

SUPPLY STATION NESC I - NES 3107

(128 pages)

Applying the NESC, Protective Arrangements in Electric Supply Stations, Installation and Maintenance of Equipment, Part 1, Installation and Maintenance of Equipment, Part 2, and Grounding Methods for Electric Supply Stations.

ACCELERATE APPRENTICE PROGRESSION

HIRE GRADUATES FROM NLC'S ELECTRICAL LINEWORKER PROGRAM



INCREASE SAFETY & PRODUCTIVITY

NLC GRADUATES ARE:

- Certified
- Safe
- Professional
- Immediately productive on a crew



SAVE MONEY & RESOURCES

COMPANIES THAT HIRE NLC GRADUATES HAVE:

- Saved thousands of dollars in training costs
- Reduced turnover
- Increased apprenticeship completion rates

Graduates of NLC's pre-apprentice program are eligible for advanced standing in any NLC apprenticeship program. These graduates are often qualified to start as second-year apprentice new hires.

CALL 208-888-4817 EXT. 1812 FOR MORE INFORMATION

COURSE DESCRIPTIONS (CONTINUED)

SUPPLY STATION NESC 2 - NES 3108

(74 pages)

Supply Stations – Rules for Employees, General Rules for Employees, and Additional Rules for Supply Employees.

SYSTEM AUTOMATION - SYO 4106

(124 pages)

Overview, Key Equipment, Substation Automation, Distribution Automation, and Automated Meter Reading.

SYSTEM OPERATION - SYO 4107

(168 pages)

The System Operator, Clearing Lines and Equipment, Distribution Operation, Substation Operation, and Transmission Operation.

SYSTEM POWER FLOW - ELE 3106

(120 pages)

Power Flow Fundamentals, Transmission Power Flow, Distribution Power Flow, Customer Power Flow, and Power System Losses.

SYSTEM PROTECTION - SYP 3105

(112 pages)

System Protection Fundamentals, Distribution System Protection, Distribution Substation Protection, Transmission Protection, and Reporting and Monitoring Service Reliability.

TRANSFORMER BASICS - TRA 1106

(66 pages)

Identification, Anatomy, Theory, Nameplates, and Transformer Installation.

TRANSFORMER TESTING - TRA 4106

(152 pages)

Testing Basics, Turns Ratio Test, DC Resistance Test, Exciting Current and Reactance Losses, Capacitance and Dielectric Losses, and Transformer Condition Testing.

TRANSMISSION CONDUCTOR INSTALLATION - TRS 3105

(150 pages)

Transmission Conductor Installation, Stringing Conductors on New Lines and Reconductoring Existing Lines, Equipment, Sagging and Deadending Conductors, and Clipping in Conductors.

TRANSMISSION INSPECTIONS - TRS 2105

(104 pages)

Introduction, Wood Pole Line Inspections, Steel Structure Line Inspections, Helicopter Inspections, and ROW/Vegetation/Encroachments.

TROUBLE INVESTIGATION - SYO 4108

(74 pages)

Communications, Investigating Customer Complaints, Transformer Trouble Investigation, Radio or TV Interference, and Case Studies.

UNDERGROUND CONDUCTORS - CON 2105

(84 pages)

Conductor Types and Specifications, Substructure and Cable Installation, Pulling Underground Cables, Splicing, Terminating, and Marking, and Transmission and Underwater Installations.

UNDERGROUND LINE DESIGN - PLD 4107

(124 pages)

Fundamental Design, Location and Trench Design, Substructure Design, Switches and Protective Equipment, and Transformers, Secondary, and Services.

VEGETATION MANAGEMENT - VEG 4105

(66 pages)

Vegetation Management – An Overview, Tools and Equipment, Vegetation Control, Pruning Methods, and Safety Standards.

WOOD STRUCTURE MAINTENANCE - MAI 1105

(98 pages)

Introduction, Wood Pole Testing and Treating, Structure and Member Replacement, Miscellaneous Maintenance, and Conductor and Insulator Maintenance.

WORKING IN ELEVATED POSITIONS - EPO 1106

(80 pages)

Fall Protection, Wood Poles and Aerial Lifts, Steel Structures and Ladders, and Rescuing the Injured.

WORKING ON LINES AND STATIONS - ELS 2105

(136 pages)

Getting Started, The System Operator, Clearing Lines and Equipment, Working on De-energized Lines and Equipment, and Working on Energized Lines and Equipment.



BENEFITS OF AN APPRENTICESHIP



Exceeds U.S. Department of Labor requirements for a formalized apprenticeship



Qualifies for U.S. Department of Labor Journeyman Certification



U.S. Department of Labor Apprenticeship registration assistance available



BENEFITS OF AN APPRENTICESHIP ACCORDING TO THE U.S. DEPARTMENT OF LABOR

91%

EMPLOYEE RETENTION

46%

**AVERAGE RETURN ON INVESTMENT
FOR A REGISTERED APPRENTICESHIP PROGRAM**

\$1.46 for every \$1.00 invested in an apprentice

- Aids in the recruitment and development of a highly skilled workforce.
- Improves productivity, profitability, and company bottom line.
- Creates flexible training options that ensure workers develop the right skills.
- Minimizes liability costs.
- Increases workforce retention.
- Can qualify for tax credits and employee tuition benefits in participating states.

SUPPORTING OUR CUSTOMERS

THE HONOR IS OURS

NLC's goal is to provide customers with the benchmark standard of training. This means that NLC makes every effort to provide the very best educational services possible. This includes—but is not limited to—curriculum maintenance, responsiveness, continual improvement based on customer needs, and an unwavering commitment to trainee success. We realize it is an honor to have each and every trainee who enrolls in our educational offerings. It is this perspective that ensures the delivery of these programs remains focused on the benchmark standard.

The Power Delivery Programs (PDP) Department is responsible for development of NLC's distance-learning programs. The department includes specialists in management and

administration, education, curriculum development, graphic design, videography, delivery, and research. This diverse group of educational content experts is one reason hundreds of power companies and contractors and thousands of trainees rely on NLC for their educational needs.

This catalog contains the various distance-learning programs offered, and the methods by which they are delivered. The overall objective of these programs is to certify industry professionals in the areas of construction, maintenance, and operation of power delivery systems, using a distance-learning format that exceeds the standards of the U.S. Department of Labor Office of Apprenticeship.

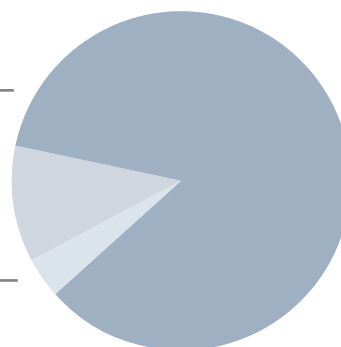
NLC CLIENT CATEGORIES

Companies utilizing one or more of our Power Delivery Programs:

85% UTILITY COMPANIES

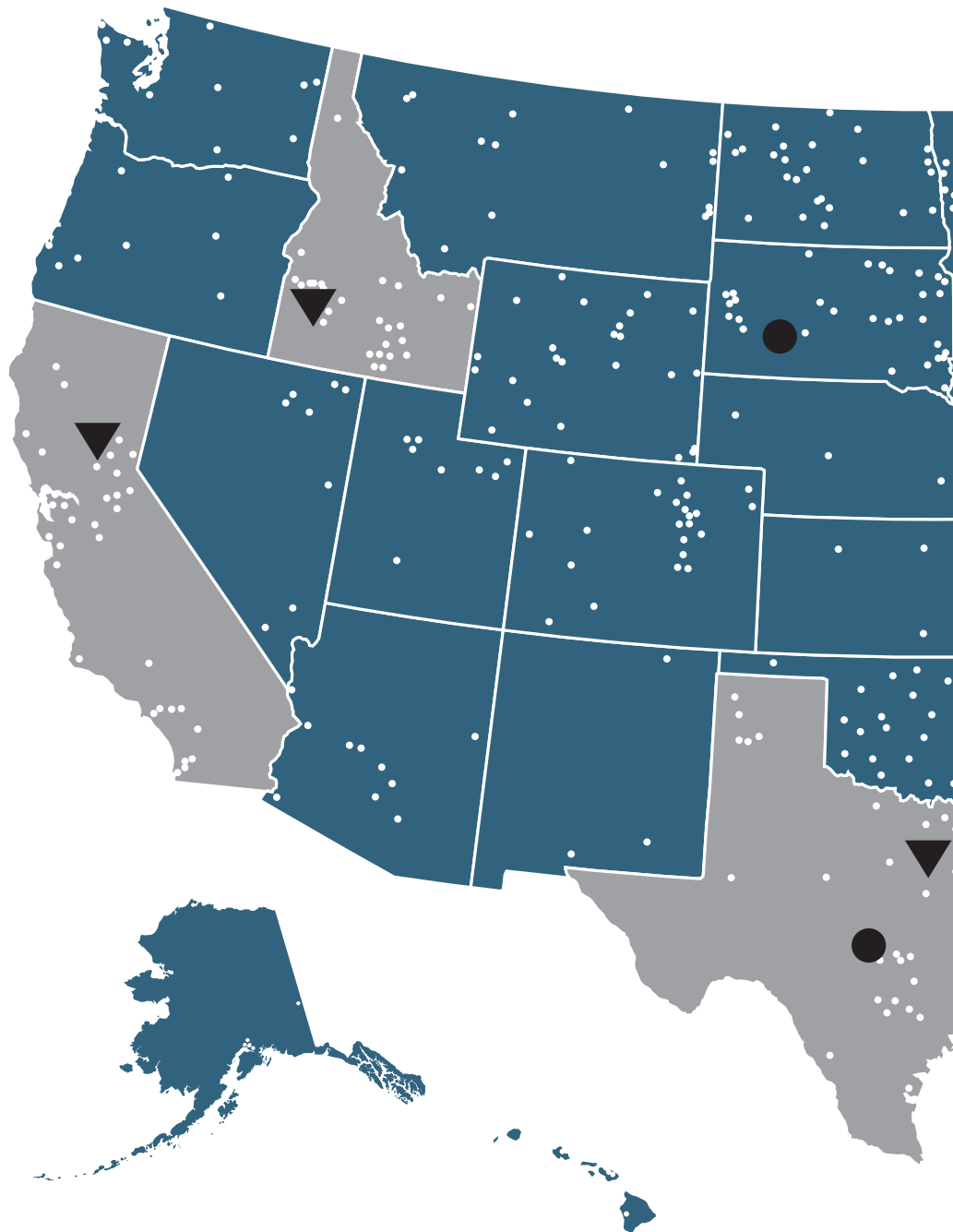
11% CONTRACTORS

4% OTHER



NATIONALLY RECOGNIZED

OUR AFFILIATIONS



OUR LOCATIONS

IDAHO CAMPUS

Meridian, ID
5 classrooms
7,200-square-foot lab facility
25-acre outdoor training yard

CALIFORNIA CAMPUS

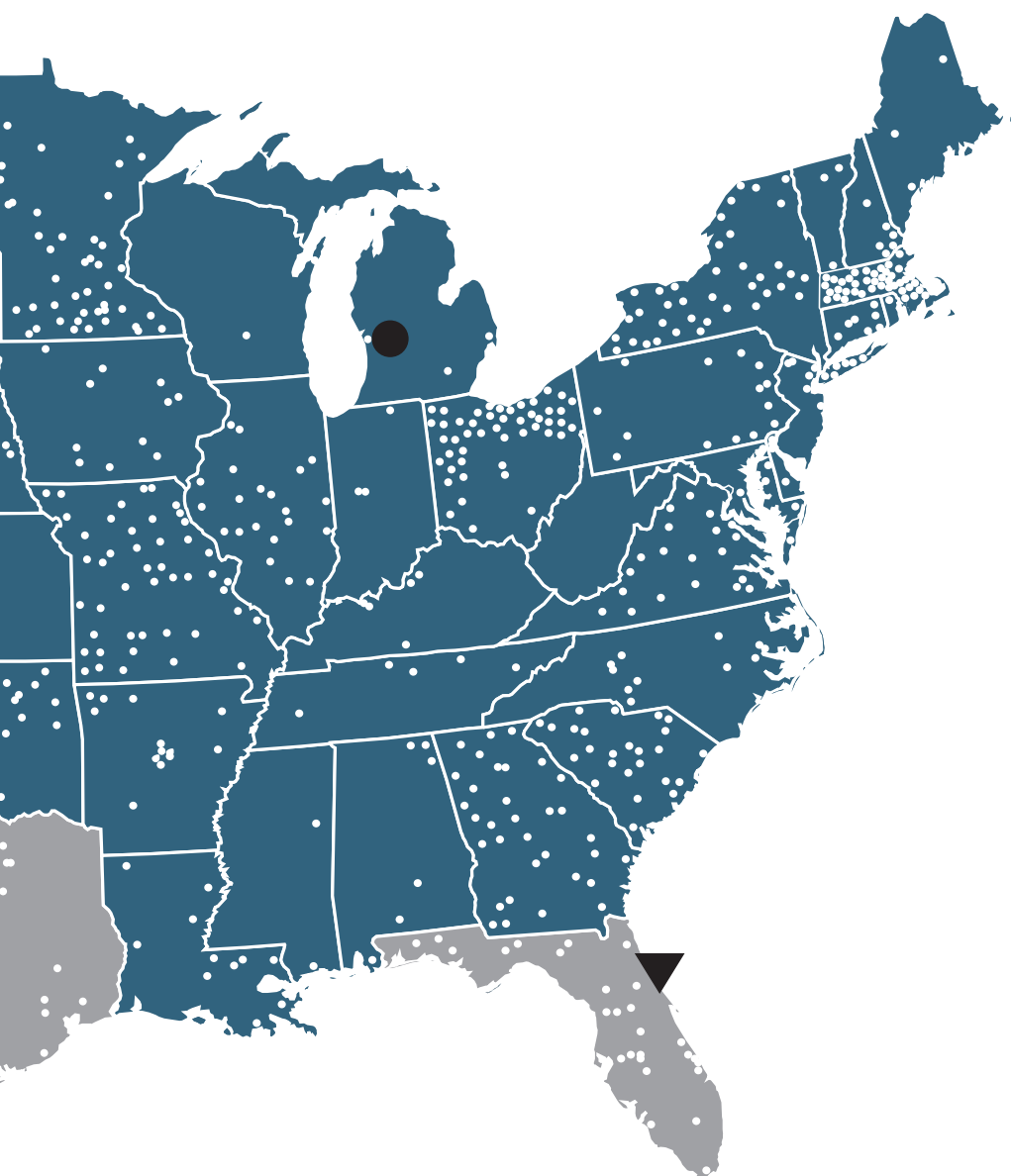
Oroville, CA
6 classrooms
15,000-square-foot lab facility
12-acre outdoor training yard

TEXAS CAMPUS

Denton, TX
3 classrooms
12,000-square-foot lab facility
12-acre outdoor training yard

FLORIDA CAMPUS

Edgewater, FL
3 classrooms
10,000-square-foot lab facility
16-acre outdoor training yard



NLC locations ▼

Satellite training facilities ●

Companies that use NLC training ○



HOW TO ENROLL



COST OPTIONS

DIGITAL CURRICULUM

\$662

OR

PHYSICAL CURRICULUM

\$688

BUNDLE PACKAGE

\$737

The cost is \$662 per student, per module for the digital curriculum only. For the physical curriculum option, the cost is \$688 per student, per module. The bundle package is for both physical and digital, the cost is \$737 per student, per module.

For more information, see *Tuition and Fees* in the Policies section.

ENROLLMENT PROCESS



Scan QR Code
for enrollment
information

After initial contact with the PDP team, you will be provided two forms electronically:



**Company
Training
Agreement**



**Test Facilitator
Agreement
of Integrity**

Upon completion of the forms, NLC will be ready to provide access to our curriculum for your apprentices.

“ We have several apprentices that are progressing through the books and the feedback I have received is extremely positive! Most of them are testing ahead of schedule and really like the course content better than the program they were enrolled in previously. Before, I felt I had to stay on the guys to keep them on pace with their books but with NLC they are coming to me and the other managers asking to test ahead of schedule. This is a testament to how well the NLC course work is put together and the apprentices are engaged and grasping the material much better than ever. Thank you for all your help with our apprenticeship program, we wouldn't be where we are at without your support.”

- ROBERT KIESS

DISTRICT MANAGER WITH CORE ELECTRIC COOPERATIVE

PROGRAM LEADERSHIP



TRAVIS HORTON
*Sr. Vice President,
Program Delivery*
thorton@lineman.edu



BRANDON WYLIE
*Program Executive of
Quanta Apprenticeships*
bwylie@lineman.edu



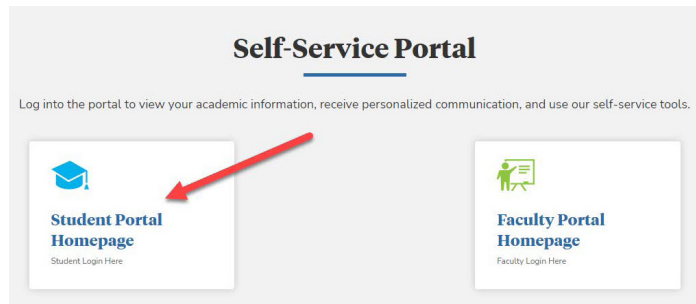
JENNELL HALL
*Director,
Operations – Apprenticeship*
jhall@lineman.edu

FOR MORE INFORMATION, CALL
208-888-4817 EXT 1812
PDPADMIN@LINEMAN.EDU

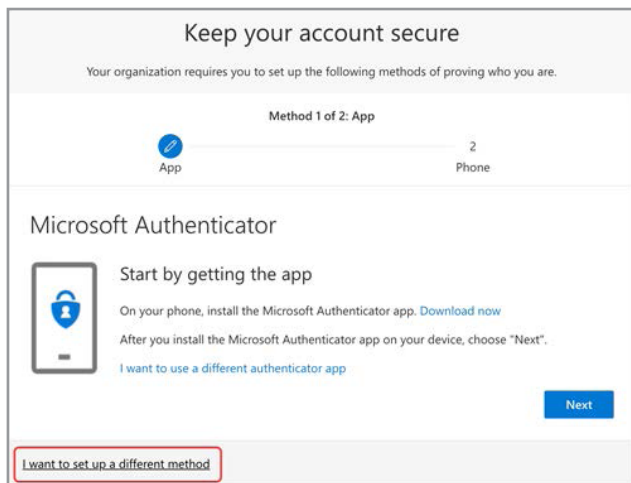
STUDENT INFORMATION SYSTEM (SIS)

The Student Information System (SIS) is a student portal that provides apprentices with a single point of access to their scheduled courses, online coursework, final grades, and unofficial transcript.

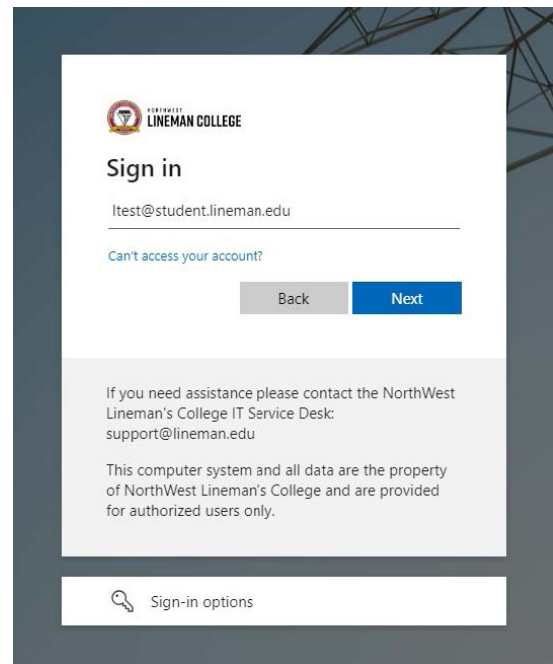
- 1 Log into the student portal with the URL <https://sisclientweb-100963.campusnexus.cloud/#/home> and click on the homepage.



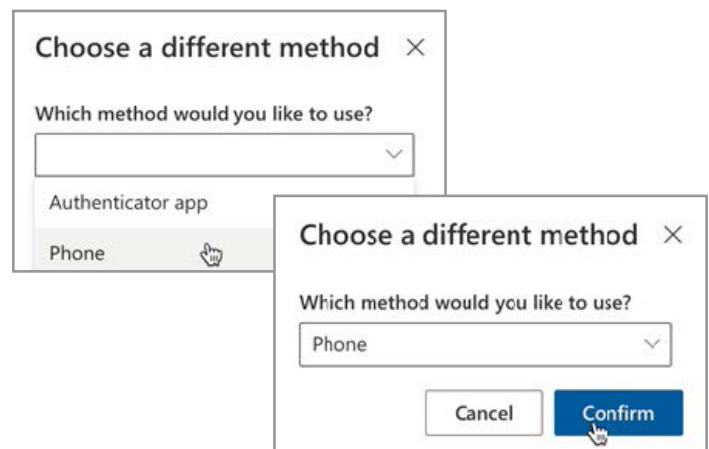
- 3 On the next page, you will be prompted to **Keep your account secure**, and will see a prompt to get the Microsoft Authenticator app. At the bottom of this prompt, there is the option to set up a different method. Click the link titled **I want to set up a different method**.



- 2 Next sign on with your **lineman.edu** credentials.



- 4 This will bring up the option to **Choose a different method**. From the drop-down menu select the **Phone** option and click **Confirm**.



- 5** Select your country code from the drop-down menu. The default option is **United States (+1)**.
- 6** In the text box titled **Enter phone number**, enter your 10-digit phone number including the area code.

Keep your account secure

Your organization requires you to set up the following methods of proving who you are.

Method 1 of 2: Phone

Phone 2 App

Phone

You can prove who you are by answering a call on your phone or texting a code to your phone.

What phone number would you like to use?

United States (+1)

☒ Text me a code

☐ Call me

Message and data rates may apply. Choosing Next means that you agree to the [Terms of service](#) and [Privacy and cookies statement](#).

Next

[I want to set up a different method](#)

- 7** Select the **Text me a code** option and click **Next**.

- 8** You will receive a text/SMS message containing a 6-digit authentication code. Enter the code in the text box and click **Next**.

Keep your account secure

Your organization requires you to set up the following methods of proving who you are.

Method 1 of 2: Phone

Phone 2 App

Phone

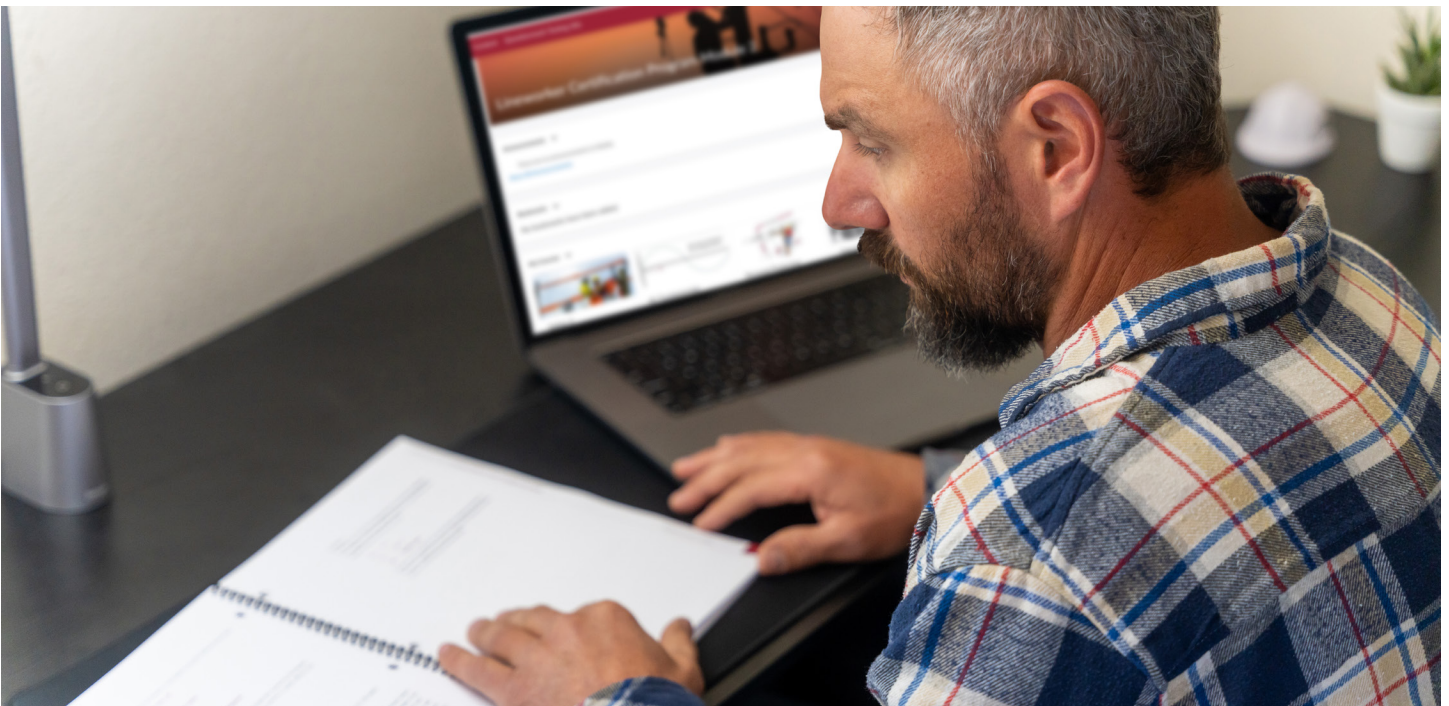
We just sent a 6 digit code to [redacted] Enter the code below.

[redacted]

[Resend code](#)

Back Next

[I want to set up a different method](#)



POLICIES

ENROLLMENT AND TESTING

ELIGIBILITY

Eligibility is the responsibility of the company.

- Trainee must be employed by an electric utility or power construction company (outside wiremen).
- Trainee must be at least 18 years of age.
- Trainee must be a high school graduate or possess a GED.
- Trainee must meet the minimum safety and behavioral criteria of their company, as indicated in NLC's Trainee Readiness Assessment, which can be found in the enrollment documents.

ADVANCED STANDING

Advanced standing recognizes previous training and allows apprentices to enter the program beyond year one with approval of the employer and under the following condition:

The applicant may enter year two if they are a graduate of a national or regional, pre-apprenticeship electrical lineworker program (and the accrediting body or agency for the program is registered with the U.S. Department of Education).

TESTING FOR ADVANCED PLACEMENT

Companies interested in the option to transfer their employee from another program into PDP are welcome; however, if an individual has been enrolled in another program for more than two years, it is advantageous to have them complete that program.

Nonetheless, advanced placement is permitted. Because OSHA requires employers to ensure their employees are trained, the point at which a trainee starts in the program is ultimately the company's decision. However, NLC does offer placement examinations that take much of the guesswork out of determining exactly where an employee should start the program.

- Placement examinations are provided for a flat fee of \$150.
- Placement examinations will be provided only upon request of the registered test facilitator.
- Placement examinations are not graded by NLC training specialists. Any placement exams would be assigned in Questionmark and results reviewed by a SME per request.
- Companies have access to the results of the apprentices.
- Based on examination results, NLC will recommend which module the individual should start with.

NLC recommends that companies with registered apprenticeship programs contact their government representative to verify that advanced placement is not in breach of their contract.

MINIMUM ACCEPTABLE SCORE

The minimum acceptable score for an examination is 72%. If a trainee scores less than 72% on an examination, the trainee must wait 14 days to retake that exam. The sponsoring company may require a higher minimum score prior to progressing to the subsequent course or module.

FACILITATION OF TESTS

All PDP exams must be administered by an individual who has completed and submitted the NLC Test Facilitator Agreement of Integrity and has been approved by NLC. All exams will be completed through the Questionmark testing platform and conducted electronically.

Test facilitators, as outlined in the Test Facilitator Agreement of Integrity, are responsible for maintaining the security of the PDP exam. Under no circumstances will an apprentice be permitted to retain the completed exam.

EXAM RESULTS

For exams completed online, results are available to the apprentice and test facilitator immediately upon submission by the apprentice.

DEPARTMENT OF LABOR (DOL) REGISTRATION

Enrolling in a Power Delivery Program does not register or enroll the company or individual with the U.S. Department of Labor. NLC can assist with the Department of Labor registration process, but is not allowed to register any company or individual. NLC's role is strictly advisory.

PROGRESSION

A trainee may receive only one module at a time. Upon successful completion of a module, the trainee is eligible to advance to the next module. NLC will track the progression of each trainee and initiate advancement. Subsequent modules will not be provided prior to completion of all required exams.

TESTING

Testing can begin when the apprentice receives the course material and at the end digression of the test facilitator.

TUITION AND FEES

TUITION PAYMENT

NLC accepts tuition payment from a sponsoring company only. Payments from trainees are not accepted.

Payment may be made with any of the following:

- Credit card
- Purchase order (NLC will invoice net 30)
- Check or money order

TUITION DISCOUNTS

Tuition discounts are available under the following conditions:

- 10% discount if the trainee you are enrolling is a graduate of NLC's Electrical Lineworker Program.
- 5% discount if the trainee you are enrolling is a graduate of an NLC distance-learning program.

Eligible discounts may not be combined.

TUITION REFUNDS

Tuition refunds are granted within 35 days of the shipping date of training materials, provided that:

- No examination has been taken.
- Materials are returned in like-new condition.

Tuition credit or refunds will be issued within 30 days of receipt of returned materials.

TRANSFERS

Currently enrolled apprentices who change employment between existing NLC PDP clients may be eligible for a transfer of the current PDP module.

Apprentices changing employment to non-PDP clients are not eligible for program transfers.

Qualifying transfers are subject to a \$150 transfer fee. For more information, contact: pdpadmin@lineman.edu

CALCULATION OF TRAINING HOURS

The Department of Labor (DOL) recommended minimum for academic curriculum is 144 hours per year. Programs offered by NLC are designed to meet (and often exceed) this minimum. The following calculation is used to determine the number of training hours for curriculum:

The average time it takes a trainee to read one page of curriculum is 16 minutes. To calculate hours, multiply 16 by the number of pages in the book and divide by 60. This will give you an estimate of the number of hours a trainee will take to complete a course. Once you have the number of hours, round to a whole number.

MORE INFORMATION

For more information or to resolve questions, contact NLC's PDP staff at 888-LINEWORK Ext. 5000 or pdpadmin@lineman.edu.



POWER DELIVERY PROGRAMS

NLC ETHOS STATEMENTS

NLC'S
**BUSINESS IS
EDUCATION**

ALWAYS ASK
**WHAT'S BEST
FOR THE STUDENT**

NLC HIRES AND RETAINS
**THE BEST
PEOPLE**

NLC MISSION

NLC creates and delivers world-class education and training to meet customer demand for powering the energy transition in North America and beyond.

NLC VISION

To train the energy workforce of the future where those we educate are safe in their careers and will always be first choice for the job.

NLC CORE VALUES

PASSION



LOVE WHAT YOU DO
AND HAVE FUN.

INTEGRITY



DO THE RIGHT THING EVEN WHEN
NO ONE IS WATCHING.

EXCELLENCE



INNOVATE ALWAYS
AND BE PROFESSIONAL.



POWER DELIVERY PROGRAMS



A  QUANTA SERVICES COMPANY

DISTANCE-LEARNING
POWER DELIVERY PROGRAMS
NORTHWEST LINEMAN COLLEGE

VOLUME I

ABOUT NLC

Northwest Lineman College (NLC) is an industry-leading educational institution that provides safety and certification training in power delivery. NLC offers complete solutions from entry-level career programs to advanced industry training and has remained committed to doing what's best for the student for more than 30 years. Since 1993, NLC has expanded to four locations in the US, training thousands annually, with a network of 900+ employers.