

COURSE OUTLINE

**Industrial Technology 155
Verdugo Power Academy**

I. Catalog Statement

The Verdugo Power Academy produces candidates for an Electrical Line Mechanic (ELM) training program. Development of basic skills needed to be successful trainees will be emphasized. These skills include: overall safety considerations, power pole climbing skills, knowledge of the basic tools and materials involved with the electrical theory that is specific to this trade. A 175 hour power pole-climbing certificate of completion is granted to students who successfully complete this course.

Total Lecture Units: 8.0

Total Laboratory Units: 9.5

Total Course Units: 17.5

Total Lecture Hours: 128.0

Total Laboratory Hours: 472.0

Total Faculty Contact Hours: 600.0

Prerequisite: None.

Note: Students during the course of instruction will be required to lift up to 60 lbs with repetition and will be required to climb and perform installation and maintenance operations at the top of 30 foot power poles. Physical or psychological limitations should be taken into account when enrolling in the class.

Note: A maximum of 17.5 units will be granted for any combination of ITECH 155, ITECH 157 and ITECH 158.

II. Course Entry Expectations

Skill Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 3.

III. Course Exit Standards

Upon successful completion of the required coursework, the student should be able to:

1. describe electrical theory;
2. identify hot line tools and their use;
3. explain personal protective grounding practices;
4. explain single and three-phase construction;

5. explain grounding principles;
6. explain conductor handling and control;
7. explain transformer operation;
8. explain the purpose of substations;
9. explain underground equipment operations;
10. describe crossarm installation and removal;
11. describe the characteristics of conductors, insulators, and semi-conductors;
12. apply electrical formulas to circuit problem solving;
13. explain the rules for installation and maintenance of electric supply stations and equipment;
14. describe hazards of electrical system components;
15. describe terms and definitions of the trade;
16. perform common aerial lift operations;
17. apply splicing sleeves and mechanical jumpers; preformed and hand tied;
18. describe fall arrest equipment for pole climbers;
19. describe pole climbing procedures;
20. describe belting and un-belting procedures.

IV. Course Content

Total Faculty Contact Hours = 600

A. Electric Power Principles	Lecture 14 hours Lab 6 hours
1. Ohms law	
2. Electrical formulas and calculations	
3. Schematic diagrams	
B. Electrical Codes	Lecture 8 hours Lab 8 hours
1. OSHA (Standards-29 CFR) regulations	
2. NFPA (National Fire Protection Association) regulations	
3. NEC (National Electrical Code)	
C. Safe Work Practices	Lecture 4 hours Lab 12 hours
1. Responsibilities and expectations	
2. Safety meetings	
3. Safe work model	
D. Single-Phase and Three-Phase Rubber Gloving	Lecture 4 hours Lab 28 hours
1. Glove ratings	
2. Proper maintenance and testing	
3. Tool manipulation	
E. SMART Grid	Lecture 4 hours Lab 20 hours
1. Grid control principles	
2. Network communication principles	
F. Hot Stick Operations	Lecture 4 hours Lab 16 hours
1. Hot stick testing	

2. Human distance factor	
G. Lockout/Tagout	Lecture 4 hours
1. Control authority	Lab 4 hours
2. Circuit isolation procedure	
H. Meter Installation and Service	Lecture 4 hours
1. Arc-flash protection	Lab 12 hours
2. Troubleshooting practices	
I. Meter Reader/Installer Safety	Lecture 4 hours
1. Analog meter reading	Lab 4 hours
2. Digital meter replacement procedure and service initiation	
J. Underground Electrical Installation	Lecture 4 hours
1. Cable replacement techniques	Lab 20 hours
2. Cable splicing techniques	
3. Vault entry testing and ventilation	
K. Underground Electrical Systems	Lecture 4 hours
1. Duct and maintenance hole systems	Lab 20 hours
2. Direct-bury systems	
3. System protection requirements	
L. Underground Electrical Troubleshooting	Lecture 4 hours
1. Fault indicators	Lab 20 hours
2. System sectional testing	
3. Transformer faults due to temperature or moisture	
M. Personal Protective Grounding	Lecture 2 hours
1. Applying protective grounds	Lab 6 hours
2. Electric field induction	
3. Principles to control current and voltage	
N. Power Line Reconductoring	Lecture 6 hours
1. Overhead replacement practices	Lab 18 hours
2. Line induction considerations	
3. Equipment and tooling	
O. Single-Phase Transformers, Regulators, and Capacitors	Lecture 6 hours
1. Single-phase connections	Lab 18 hours
2. Single-phase taps	
3. Capacitive reactance	
4. Regulator ballasts	
P. Substation Equipment Operations	Lecture 8 hours

1. Air-insulated and gas-insulated	Lab 8 hours
2. Switchgear	
3. High and low voltage bussing	
Q. Three-Phase Transformers	Lecture 6 hours
1. Wye and Delta systems	Lab 18 hours
2. Phase designations	
3. Phase rotation	
R. Troubleshooting Customer Line Service Complaints	Lecture 6 hours
1. Response Time	Lab 18 hours
2. Fault isolation	
S. Overhead and Underground System Maintenance	Lecture 8 hours
1. Preventive maintenance practices	Lab 16 hours
2. Failure maintenance practices	
T. Overhead Equipment Installation	Lecture 6 hours
1. Transformer removal and installation	Lab 18 hours
2. Capacitor removal and installation	
3. High voltage switches and fuses	
U. Overhead Line Construction	Lecture 7 hours
1. Crossarm installation	Lab 18 hours
2. Insulator installation	
3. Hardware and tools	
V. Wood Pole Climbing Techniques	Lecture 11 hours
1. Use and care of pole climbing equipment	Lab 164 hours
2. Pole climbing practices	
3. Pole-top rescue	

V. Methods of Instruction

The following methods of instruction may be used in the course:

1. lecture;
2. demonstration;
3. multimedia presentations.

VI. Out of Class Assignments

The following out of class assignments may be used in the course:

1. individual projects (e.g. written assignments, reading reports);
2. group projects (e.g. homework problems, problems solving demonstrations, discussion on textbook topics).

VII. Methods of Evaluation

The following methods of evaluation may be used in the course:

1. midterm examination;
2. final examination;
3. manipulation skills evaluation (e.g. use of hot stick, rubber gloving, meter installation, underground electrical installation, pole climbing, overhead line construction and equipment installation).

VIII. Textbook

Kurtz and Shoemaker, The Lineman and Cableman's Handbook, [Current Edition].
Hightstown, N.J.: McGraw Hill, 2009.
10th Grade Textbook Reading Level. ISBN: 978-0-071-46789-6

IX. Student Learning Outcomes

1. Student will be able to demonstrate knowledge of electrical circuits, power principles and electricity codes.
2. Student will be familiar with the SMART grid system and its functions.
3. Student will be familiar with pole climbing techniques and overhead line construction.