

Distribution Operations (LNWK 1241)



Credit: 2 semester credit hours (2 hours lecture)

Prerequisite/Co-requisite: None

Course Description

A study of the theoretical and practical operation of electric utility distribution systems. Topics include a customer service voltages, capacitors, and coordination of protection equipment.

Required Textbook and Materials

1. Electrical Essentials For Powerline Workers, Wayne Van Soelen
 - a. ISBN number: 0-7668-1080-1
2. OSHA handouts
3. Handout literature

Course Objectives

Given instructions and practice, the student will learn the purpose and coordination of system protection equipment, calculate primary and secondary voltages, and analyze types of distribution systems.

- A. Calculate customer service voltages. *SCAN SKILLS:* F1.4, F2.3, F3.4, F4.5, F5.4, F6.3, F9.4, F10.3, F11.4, F12.4, F13.3, F14.3, C1.2, C5.4, C6.4, C7.4, C10.3, C14.3
- B. Identify and explain types of reactance and calculate power factor. *SCAN SKILLS:* F1.4, F2.3, F3.3, F4.3, F5.4, F6.3, F9.3, F10.3, F11.4, F12.3, F13.3, F14.3, C1.3, C5.4, C6.4, C7.4, C10.3
- C. Explain the function of fuses, reclosers, sectionalizers, and surge arrestors. *SCAN SKILLS:* F1.3, F2.3, F4.2, F5.4, F6.3, F8.3, F9.4, F10.3, F11.4, F12.3, F13.3, F14.3, C1.3, C3.2, C5.4, C6.4, C7.4, C9.3, C10.3, C15.4, C16.3, C18.4, C19.4, C20.3
- D. Identify the causes of transient voltages. *SCAN SKILLS:* F1.3, F2.3, F5.4, F7.2, F9.4, F10.2, F11.4, F12.4, F13.3, F14.3, C1.2, C5.4, C6.4, C7.4, C10.3, C15.3, C16.3
- E. Identify problems associated with inrush current and switching. *SCAN SKILLS:* F1.3, F2.3, F5.4, F6.3, F8.3, F9.4, F11.4, F12.3, F13.3, F14.3, C1.3, C5.4, C6.4, C7.4, C9.3, C10.3, C15.3
- F. Apply and follow all relevant safety rules and procedures. *SCAN SKILLS:* F1.4, F2.4, F5.4, F6.3, F7.2, F8.4, F9.4, F11.4, F12.4, F13.4, F14.4, F15.3, F16.3, F17.4, C1.3, C4.3, C5.4, C6.4, C7.4, C9.4, C10.3, C12.3, C15.3, C16.4, C18.4, C19.4

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- G. Calculate capacitance necessary to control voltage. *SCAN SKILLS: F1.4, F2.3, F3.4, F4.5, F5.4, F6.3, F9.4, F10.3, F11.4, F12.4, F13.3, F14.3, C1.2, C5.4, C6.4, C7.4, C10.3, C14.3*
- H. Perform protective equipment coordination. *SCAN SKILLS: F1.4, F2.3, F3.4, F4.5, F5.4, F6.3, F9.4, F10.3, F11.4, F12.4, F13.3, F14.3, C1.2, C5.4, C6.4, C7.4, C10.3, C14.3*
- I. Describe equipment behavior under load. *SCAN SKILLS: F1.4, F2.3, F3.4, F4.5, F5.4, F6.3, F9.4, F10.3, F11.4, F12.4, F13.3, F14.3, C1.2, C5.4, C6.4, C7.4, C10.3, C14.3*
- J. Analyze types of distribution systems and networks. *SCAN SKILLS: F1.4, F2.3, F3.4, F4.5, F5.4, F6.3, F9.4, F10.3, F11.4, F12.4, F13.3, F14.3, C1.2, C5.4, C6.4, C7.4, C10.3, C14.3*

SCANS Skills and Competencies

Beginning in the late 1980's, the U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS) conducted extensive research and interviews with business owners, union leaders, supervisors, and laborers in a wide variety of work settings to determine what knowledge workers needed in order to perform well on a job. In 1991 the Commission announced its findings in *What Work Requires in Schools*. In its research, the Commission determined that "workplace know-how" consists of two elements: foundation skills and workplace competencies.

Course Outline

- I. OSHA 1910-269
 - A. lockout—tagout
- II. Fuses
 - A. purpose
 - B. opening and closing
 - C. load breaks
 - D. fuse sizes
 - E. erosion
 - F. in rush current
 - G. types
- III. Single Phase Reclosers
 - A. construction
 - B. types
 - C. one shot operations
 - D. internal contacts
 - E. safety
 - F. connecting and disconnection procedures
 - G. bypassing
- IV. Three Phase Reclosers
 - A. control panel
 - B. resistor sizes
 - C. ground trip block
 - D. lockout indicator
 - E. fault indicators
 - F. closing coil
 - G. DC control and battery
 - H. safety
 - I. bypassing
- V. Sectionalizers
 - A. Functions
 - B. Timing
- V. System Coordination
 - A. Time-current curves
 - B. Downstream devices
- VI. Fault Indicators
 - A. Purpose
 - B. Placement

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- VII. Isolation switches
 A. Single switches
 B. Gang switches

Grade Scale

90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
0 – 59	F

Course Evaluation

Final grades will be calculated according to the following criteria:

<i>Activity</i>	<i>Percentage</i>
Exam 1	30%
Exam 2-Breaker	30%
Exam 3-Fuses	20%
Daily Grades	20%
<i>Total</i>	<i>100%</i>

Grade points will be awarded in accordance with the college catalog.

1. Assignments are due on the due date assigned. Assignments turned in late will not receive full credit.
2. Tests must be taken on the announced date.
3. Daily grades include participation in classroom labs and skill level evaluations.
4. Late Penalties assessed on all work turned in late. 5 points per day

Course Requirements

1. Calculate customer voltages and loads
2. Calculate fuse sizes, determine fuse type for system coordination and application
3. Identify parts, operation and purpose of single phase reclosers
4. Identify parts, operation, and purpose of three phase reclosers
5. Describe proper lockout-tagout procedures with protective equipment
6. Identify all components used in system coordination

Attendance Policy

1. Class attendance is important to obtain the educational objectives of this course. Prospective employers may also review your attendance records. Regular attendance and being on time for classes will have a positive effect on your academics and employment opportunities.
2. Two unexcused absences will result in 1 letter grade drop.

Course Policies

1. No food, drinks in class.
2. Daily lab grades cannot be made up.
3. LIT is a tobacco free campus- no tobacco products allowed
4. Students must follow safety rules and procedures at all times. Failure to follow safety rules will require action from daily grade reduction to expulsion from LIT.
5. Students must have and wear all required clothing including climbing boots at all times, and have PPE and tools for participation in **class and Lab**.
6. **Turn off all Cell Phones during class, labs and when on the field.**
Unauthorized cell phone use will result in a 0 for the daily grade.
7. Do not bring children to class.
8. Cheating of any kind will not be tolerated. Students caught cheating or helping someone to cheat can and will be removed from the class for the semester.
Cheating can result from expulsion from LIT.
9. If you wish to drop a course, the student is responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an 'F' in the course.
10. Internet Usage
 - a. Classroom computers have access to the internet.
 - b. Student usage of the internet will be monitored.
 - c. Proper usage of the internet will be allowed. Used for classroom research or as directed.
 - d. Any unauthorized use of the internet will not be tolerated.
 - e. Improper usage of the internet, such as profanity, pornography, gambling, etc... will result in disciplinary action not limited to expulsion from LIT.

Disabilities Statement

The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building.

Course Schedule

Week	Topic	Reference
1	Course introduction and policies <ul style="list-style-type: none">• Lecture	Handouts
2	Lockout-tagout <ul style="list-style-type: none">• Lecture	OSHA handout

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Week	Topic	Reference
3/4	Lockout-tagout <ul style="list-style-type: none">• Lecture	OSHA handout
5/6	Customer voltages and loads <ul style="list-style-type: none">• Lecture	Handout
7/8	Customer voltages and loads <ul style="list-style-type: none">• Lecture• Exam 1	Handout
9/10	System coordination - fuses <ul style="list-style-type: none">• Lecture• Exam 2	Chapters 5
11/12	System coordination - Reclosers <ul style="list-style-type: none">• Lecture	Chapters 5
13	System coordination – Reclosers <ul style="list-style-type: none">• Lecture	Chapters 5
14/15/16	System coordination – Three Phase Reclosers <ul style="list-style-type: none">• Lecture• Exam 3	Chapters 5

Contact Information:

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