Apprenticeship and Industry Training

Powerline Technician

Apprenticeship Course Outline

021.2 (2014)

Alberta

Apprenticeship and Industry Training

ALBERTA INNOVATION AND ADVANCED EDUCATION

Powerline Technician: Apprenticeship Course Outline

ISBN 978-1-4601-1426-1 (PDF)

Powerline Technician
Table of Contents

Course Outline

Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding an employer. Employers hire apprentices, pay their wages and provide on-the-job training and work experience. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyperson or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution – usually a college or technical institute.

To become certified journeypersons, apprentices must learn theory and skills, and they must pass examinations. Requirements for certification—including the content and delivery of technical training—are developed and updated by the Alberta Apprenticeship and Industry Training Board on the recommendation of Powerline Technician Provincial Apprenticeship Committee.

The graduate of the Powerline Technician apprenticeship program is a certified journeyperson who will be able to:

- responsibly do all work tasks expected of a journeyperson
- supervise, train and coach apprentices
- use and maintain hand and power tools to the standards of competency and safety required by the trade
- construct, maintain, operate or repair electrical distribution and transmission systems and their equipment
- practice the safe work practices required by the trade
- perform with dexterity the hand skills required to carry out the required mechanical work
- perform assigned tasks in accordance with quality and production standards required by industry

Apprenticeship and Industry Training System

Industry-Driven

Alberta's apprenticeship and industry training system is an industry-driven system that ensures a highly skilled, internationally competitive workforce in more than 50 designated trades and occupations. This workforce supports the economic progress of Alberta and its competitive role in the global market. Industry (employers and employees) establishes training and certification standards and provides direction to the system through an industry committee network and the Alberta Apprenticeship and Industry Training Board. The Alberta government provides the legislative framework and administrative support for the apprenticeship and industry training system.

Alberta Apprenticeship and Industry Training Board

The Alberta Apprenticeship and Industry Training Board provides a leadership role in developing Alberta's highly skilled and trained workforce. The board's primary responsibility is to establish the standards and requirements for training and certification in programs under the Apprenticeship and Industry Training Act. The board also provides advice to the Minister of Advanced Education on the needs of Alberta's labour market for skilled and trained workers, and the designation of trades and occupations.

The thirteen-member board consists of a chair, eight members representing trades and four members representing other industries. There are equal numbers of employer and employee representatives.

Industry Committee Network

Alberta's apprenticeship and industry training system relies on a network of industry committees, including local and provincial apprenticeship committees in the designated trades, and occupational committees in the designated occupations. The network also includes other committees such as provisional committees that are established before the designation of a new trade or occupation comes into effect. All trade committees are composed of equal numbers of employer and employee representatives. The industry committee network is the foundation of Alberta's apprenticeship and industry training system.

Local Apprenticeship Committees (LAC)

Wherever there is activity in a trade, the board can set up a local apprenticeship committee. The board appoints equal numbers of employee and employer representatives for terms of up to three years. The committee appoints a member as presiding officer. Local apprenticeship committees:

- monitor apprenticeship programs and the progress of apprentices in their trade, at the local level
- make recommendations to their trade's provincial apprenticeship committee (PAC) about apprenticeship and certification in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- make recommendations to the board about the appointment of members to their trade's PAC
- help settle certain kinds of disagreements between apprentices and their employers
- carry out functions assigned by their trade's PAC or the board

Provincial Apprenticeship Committees (PAC)

The board establishes a provincial apprenticeship committee for each trade. It appoints an equal number of employer and employee representatives, and, on the PAC's recommendation, a presiding officer - each for a maximum of two terms of up to three years. Most PACs have nine members but can have as many as twenty-one. Provincial apprenticeship committees:

- Make recommendations to the board about:
    - standards and requirements for training and certification in their trade
    - courses and examinations in their trade
    - apprenticeship and certification
    - designation of trades and occupations
    - regulations and orders under the Apprenticeship and Industry Training Act
- monitor the activities of local apprenticeship committees in their trade
- determine whether training of various kinds is equivalent to training provided in an apprenticeship program in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- consult with other committees under the Apprenticeship and Industry Training Act about apprenticeship programs, training and certification and facilitate cooperation between different trades and occupations
- consult with organizations, associations and people who have an interest in their trade and with employers and employees in their trade
- may participate in resolving certain disagreements between employers and employees
- carry out functions assigned by the board

Powerline Technician PAC Members at the Time of Publication

Mr. R. Phillips	Calgary	Presiding Officer
Mr. P. Ryan	Edmonton	Employer
Mr. W. Eyolfson	Calgary	Employer
Mr. D. Hrushka	Edmonton	Employer
Mr. D. Death	Grande Prairie	Employee
Mr. G. DeCuypere	Lethbridge	Employee
Mr. R. Laybolt	Fort McMurray	Employee
Mr. C. McClarty	Camrose	Employee

Alberta Government

Alberta Advanced Education works with industry, employer and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and employers
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, employers, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Alberta Apprenticeship and Industry Training Board Safety Policy

The Alberta Apprenticeship and Industry Training Board (board) fully supports safe learning and working environments and emphasizes the importance of safety awareness and education throughout apprenticeship training- in both on-the- job training and technical training. The board also recognizes that safety awareness and education begins on the first day of on-the-job training and thereby is the initial and ongoing responsibility of the employer and the apprentice as required under workplace health and safety training. However the board encourages that safe workplace behavior is modeled not only during on-the-job training but also during all aspects of technical training, in particular, shop or lab instruction. Therefore the board recognizes that safety awareness and training in apprenticeship technical training reinforces, but does not replace, employer safety training that is required under workplace health and safety legislation.

The board has established a policy with respect to safety awareness and training:

> **The board promotes and supports safe workplaces, which embody a culture of safety for all apprentices, employers and employees. Employer required safety training is the responsibility of the employer and the apprentice, as required under legislation other than the *Apprenticeship and Industry Training Act.***

The board's complete document on its 'Apprenticeship Safety Training Policy' is available at www.tradesecrets.alberta.ca; access the website and conduct a search for 'safety training policy'.

Implementation of the policy includes three common safety learning outcomes and objectives for all trade course outlines. These common learning outcomes ensure that each course outline utilizes common language consistent with workplace health and safety terminology. Under the title of 'Standard Workplace Safety', this first section of each trade course outline enables the delivery of generic safety training; technical training providers will provide trade specific examples related to the content delivery of course outline safety training.

Addendum
As immediate implementation of the board's safety policy includes common safety learning outcomes and objectives for all course outlines, this trade's PAC will be inserting these safety outcomes into the main body of their course outline at a later date. In the meantime the addendum below immediately places the safety outcomes and their objectives into this course outline thereby enabling technical training providers to deliver the content of these safety outcomes.

As approved by the Board on May 12, 2017, the following Topic will be an addition to the safety outcomes already embedded within period one, section one of this course outline.

STANDARD WORKPLACE SAFETY

D. Apprenticeship Training Program..... Hours

Outcome: Manage an apprenticeship to earn journeyman certification.

1. Describe the contractual responsibilities of the apprentice, employer and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the apprentice record book.
3. Describe the procedure for changing employers during an active apprenticeship.
4. Describe the purpose of the course outline.
5. Describe the procedure for progressing through an apprenticeship.
6. Describe advancement opportunities in this trade.

Occupational Health and Safety

A tradesperson is often exposed to more hazards than any other person in the work force and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety (A division of Alberta Human Services) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.humanservices.alberta.ca

Technical Training

Apprenticeship technical training is delivered by the technical institutes and colleges in the public post-secondary system throughout Alberta. The colleges and institutes are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All training providers place a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all trades.

The technical institutes and colleges work with Alberta's Apprenticeship and Industry Training Board, industry committees and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs across the Province. They develop curriculum from the course outlines established by industry and provide technical training to apprentices.

The following institutions deliver Powerline Technician apprenticeship technical training:

Northern Alberta Institute of Technology
Fortis Alberta
ATCO Electric

Procedures for Recommending Revisions to the Course Outline

Advanced Education has prepared this course outline in partnership with the Powerline Technician Provincial Apprenticeship Committee.

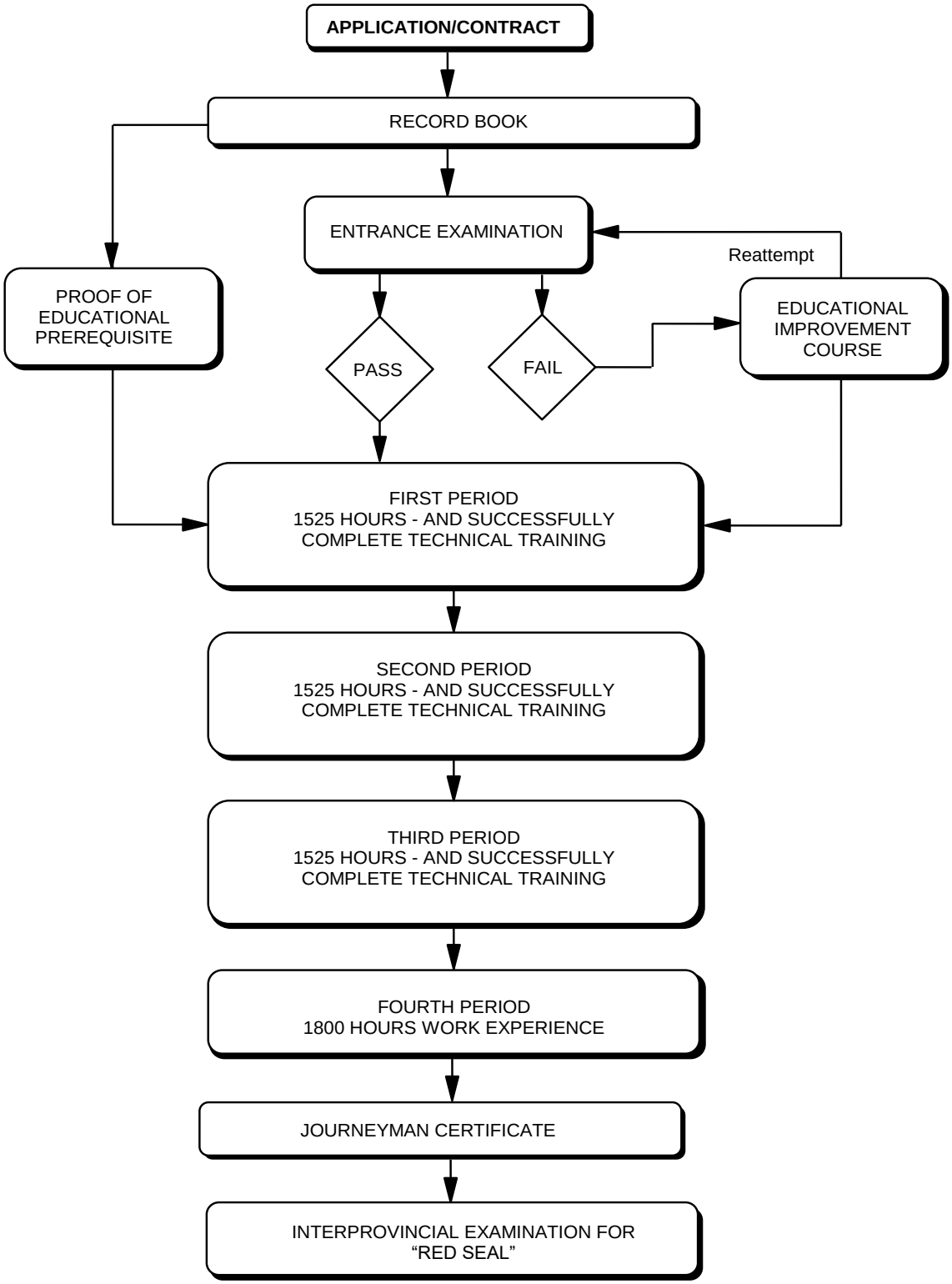
This course outline was approved on September 27, 2013 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Powerline Technician Provincial Apprenticeship Committee
c/o Industry Programs and Standards
Apprenticeship and Industry Training
Advanced Education
10th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations for change will be placed on the agenda for regular meetings of the Powerline Technician Provincial Apprenticeship Committee.

Apprenticeship Route toward Certification



Powerline Technician Training Profile
FIRST PERIOD
(7 Weeks 30 Hours per Week – Total of 210 Hours)

SECTION ONE

STANDARD WORKPLACE SAFETY AND CODES
28 HOURS

A	B	C
Safety Legislation, Regulations & Industry Policy in the Trade 4 Hours	Climbing, Lifting, Rigging and Hoisting 3 Hours	Hazardous Materials & Fire Protection 3 Hours
D	**E**	**F**
Personal Protective Equipment and Arc Flash 6 Hours	Introduction to Personal Protective Grounding 4 Hours	Introduction to Apprenticeship 2 Hours
G		
AEUC Section 0,2 and 4 6 Hours		

SECTION TWO

INTRODUCTION TO ELECTRICAL THEORY
49 HOURS

A	B	C
Trade Mathematics 4 Hours	Electrical Fundamentals 4 Hours	Series Resistive Circuits 6 Hours
D	**E**	**F**
Parallel Resistive Circuits 6 Hours	Series-Parallel Resistive Circuits 6 Hours	Power, Line Loss, and Voltage Drop 5 Hours
G	**H**	**I**
Edison Three Wire Distribution Systems 7 Hours	Electromotive Force 5 Hours	Phasors 6 Hours

SECTION THREE

INTRODUCTION TO TRANSFORMER THEORY
35 HOURS

A	B	C
Magnetism 5 Hours	Transformer Basics 5 Hours	Transformer Operation 5 Hours
D	**E**	**F**
Transformer Ratings 5 Hours	Transformer Windings and Tap Changers 5 Hours	Transformer Installation 5 Hours
G		
Transformer Cooling and Dielectric 5 Hours		

SECTION FOUR

OVERHEAD LINE CONSTRUCTION

70 HOURS

A	B	C
Powerline Poles 5 Hours	Pole Setting and Climbing Safety 6 Hours	Insulators 5 Hours
D	**E**	**F**
Anchors and Guys 4 Hours	Conductors 6 Hours	Conductors Stringing 5 Hours
G	**H**	**I**
Splicing and Terminating 6 Hours	Trade Tools and Equipment 6 Hours	Rigging and Hoisting 6 Hours
J	**K**	**L**
Radial Boom Digger (RBD) Fundamentals 6 Hours	Load Charts 5 Hours	Hydraulic Fundamentals 5 Hours
M		
Hydraulic Systems 5 Hours		

SECTION FIVE

INTRODUCTION TO METERING

28 HOURS

A	B
Electrical Measurement Devices 14 Hours	Single Phase Revenue Metering 14 Hours

SECOND PERIOD
(7 Weeks 30 Hours per Week – Total of 210 Hours)

SECTION ONE

INTERMEDIATE ELECTRICAL THEORY
70 HOURS

A	B	C
Resistance in AC Circuits 2 Hours	Inductance and Inductive Reactance 12 Hours	Capacitance and Capacitive Reactance 12 Hours
D	**E**	**F**
Impedance in Series Resistive-Reactive Circuits 14 Hours	Impedance in Parallel Resistive-Reactive Circuits 14 Hours	Single Phase Power and Power Factor 10 Hours
G		
Basic Three Phase Systems 6 Hours		

SECTION TWO

INTERMEDIATE TRANSFORMER THEORY
42 HOURS

A	B	C
Transformer Applications 4 Hours	System Grounding 6 Hours	Transformer Impedance 10 Hours
D	**E**	
Three Phase Transformer Connections 18 Hours	Three Phase Distribution Transformer Installations 4 Hours	

SECTION THREE

UNDERGROUND LINE CONSTRUCTION AND STREET LIGHTING
49 HOURS

A	B	C
Legal Land Descriptions 4 Hours	Underground Distribution 10 Hours	Underground Cable Termination and Splicing 11 Hours
D	**E**	
Underground Distribution Testing and Troubleshooting 8 Hours	Street Lighting and Relays 16 Hours	

SECTION FOUR

INTERMEDIATE METERING
28 HOURS

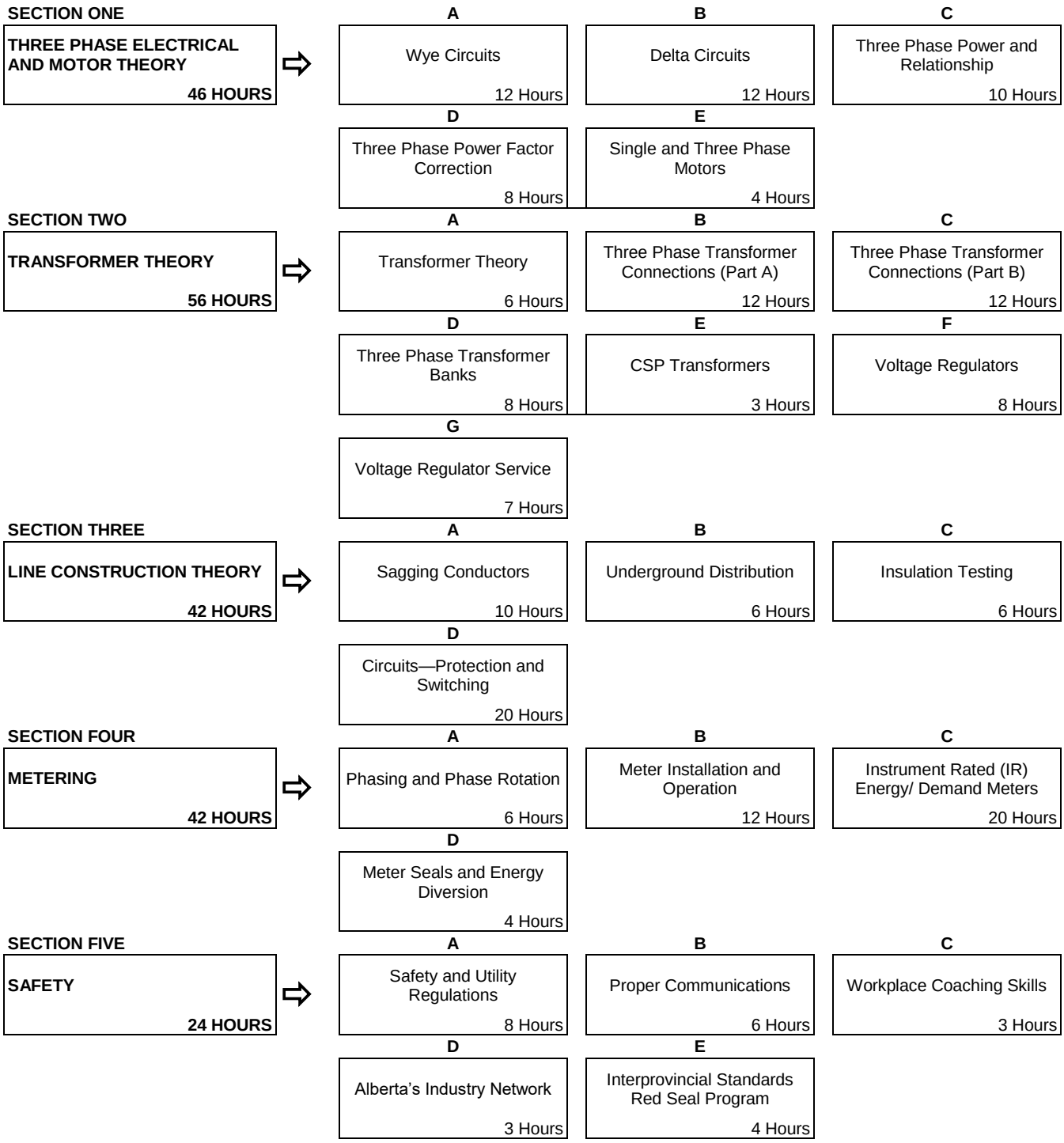
A	B	C
Electrical Measuring and Recording and Indicating Devices 6 Hours	Instrument Transformers 10 Hours	Instrument Rated Revenue Metering 12 Hours

SECTION FIVE

UTILITY CODES AND SAFETY
21 HOURS

A	B
Personal Protective Grounding 14 Hours	AEUC Section 6, 10 and 12 7 Hours

THIRD PERIOD
(7 Weeks 30 Hours per Week – Total of 210 Hours)



NOTE: The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

FIRST PERIOD TECHNICAL TRAINING
POWERLINE TECHNICIAN TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE: ..... STANDARD WORKPLACE SAFETY AND CODES..... 28 HOURS

A. Safety Legislation, Regulations & Industry Policy in the Trade..... 4 Hours

Outcome: Apply legislation, regulations and practices ensuring safe work in this trade.

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the employer's and employee's role with Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations and related advisory bodies and agencies.
3. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of worker and employers to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of employers and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

B. Climbing, Lifting, Rigging and Hoisting .....3 Hours

Outcome: Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and load moving equipment.

C. Hazardous Materials & Fire Protection ..... 3 Hours

Outcome: Apply industry standard practices for hazardous materials and fire protection in this trade.

1. Describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe three key elements of WHMIS.
3. Describe handling, storing and transporting procedures for hazardous material.
4. Describe venting procedures when working with hazardous materials.
5. Describe hazards, classes, procedures and equipment related to fire protection.

D. Personal Protective Equipment and Arc Flash ..... 6 Hours

Outcome: Describe the inspection, care and maintenance of PPE.

1. List the inspection and maintenance procedures for lineman's climbing belts and pole straps as per OH&S Code (part 9).
2. Describe the care, maintenance and storage of protective rubber gloves, sleeves, live line tools and live line cover-up.
3. Illustrate the daily inspection of protective rubber gloves, sleeves, live line tools and live line cover-up.
4. Describe the visual and dielectric testing of protective rubber gloves, sleeves, live line tools and live line cover-up.
5. List the types and applications of hot sticks and accessories.
6. Describe the causes and consequences of arc flash.

E. Introduction to Personal Protective Ground ..... 4 Hours

Outcome: Describe personal protective grounding.

1. Describe the hazards of current through a human body.
2. Identify the hazards that personal protective grounds guard against.
3. Identify the electrical and mechanical requirements of a personal protective ground.
4. Outline the procedure for installing and removing personal protective grounds.

F. Introduction to Apprenticeship ..... 2 Hours

Outcome: Describe the apprenticeship system.

1. Describe the apprenticeship system as it relates to apprentices training and responsibilities.
2. Describe the apprenticeship system as it relates employer's responsibilities in the apprenticeship systems.

G. AEUC Sections 0,2, and 4 ..... 6 Hours

Outcome: Apply Alberta Electrical Utility Code (AEUC) as it relates to sections 0, 2 and 4.

1. Interpret section "0" of the AEUC.
2. Interpret section "2" of the AEUC.
3. Interpret Appendix A section "4" of the AEUC.

SECTION TWO: ..... INTRODUCTION TO ELECTRICAL THEORY ..... 49 HOURS

A. Trade Mathematics ..... 4 Hours

Outcome: Solve trade related problems using mathematical skills.

1. Perform basic math calculations.
2. Define the terms ratio and direct proportion and perform calculations using both.
3. Convert between SI and Imperial units of measurement.
4. Solve linear, area, volume, weight and temperature problems.
5. Transpose simple algebraic equations to solve for one unknown.
6. Solve right angle triangles using trigonometry.

B. Electrical Fundamentals.....4 Hours

Outcome: Solve basic electrical problems.

1. Explain the fundamental relationship between the structure of the atom and the flow of electrons.
2. Explain the units of measurement for basic electrical terms and symbols.
3. Apply Ohm's Law to electrical circuit calculations.
4. Connect circuits to verify the relationships between voltage, current, and resistance.

C. Series Resistive Circuits.....6 Hours

Outcome: Analyze a series resistive Circuit

1. Define a series circuit and calculate current in a series circuit.
2. Explain the formula for total resistance and calculate resistance in a series circuit.
3. Explain Kirchhoff's voltage law as it relates to a series circuit.
4. Explain the relationship between the resistive values of components and their voltage drops and solve problems using the voltage divider rule.
5. Determine the voltage drop across a closed-or-open-circuit component in a series circuit.
6. Connect to verify Kirchhoff's current and voltage laws in a series resistive circuit.

D. Parallel Resistive Circuits.....6 Hours

Outcome: Analyze a parallel resistive circuit.

1. Define a parallel circuit.
2. Explain the formula for total resistance and calculate resistance in a parallel circuit.
3. Explain Kirchhoff's current law as it relates to a parallel circuit.
4. Describe the effects of open or short circuited components in a parallel circuit.
5. Use the current divider principle to calculate branch currents.
6. Connect to verify Kirchhoff's current laws in a parallel resistive circuit.

E. Series-Parallel Resistive Circuit.....6 Hours

Outcome: Analyze a basic series-parallel resistive circuit.

1. Identify series and parallel portions of a simple series-parallel resistive circuit.
2. Calculate the total resistance of a series-parallel circuit.
3. Apply Kirchhoff's current law in a series-parallel circuit.
4. Apply Kirchhoff's voltage law in a series-parallel circuit.
5. Solve problems involving series-parallel circuits.
6. Connect to verify the relationship of current, voltage and resistance in each part of a series/parallel circuit.

F. Power, Line Loss, and Voltage Drop.....5 Hours

Outcome: Describe power, energy, line loss, and voltage drop in electrical circuits.

1. Describe and calculate power and energy.
2. Describe and calculate voltage drop and its effect on circuits as current changes.

3. Describe and calculate line loss.
4. Connect circuits to verify power formulae.

G. Edison Three Wire Distribution Systems.....7 Hours

Outcome: Analyze Edison three wire distribution systems and the effects of an open neutral.

1. Describe a basic three wire distribution system and list its advantages.
2. Solve problems involving balanced and unbalanced three wire distribution.
3. Solve problems involving an open neutral on balanced and unbalanced three wire distribution systems.
4. Verify the effects of an open neutral on three wire distribution systems.

H. Electromotive Force.....5 Hours

Outcome: Explain Electromotive Force.

1. Define Electromotive Force (EMF).
2. Describe the production of EMF using chemicals, heat, light, and pressure.
3. Describe the connection of batteries in series and in parallel.
4. Describe the production of EMF using magnetism.
5. Describe standard ac sine wave values including instantaneous, RMS, and maximum.
6. Describe the relationship between cycles, poles, and frequency.
7. State nominal voltages used on utility systems.

I. Phasors.....6 Hours

Outcome: Solve single phase phasor problems.

1. Explain phasors and vectors.
2. Describe leading and lagging phasors.
3. Perform phasor addition using rectangular and polar calculations.

SECTION THREE:.....INTRODUCTION TO TRANFORMER THEORY.....35 HOURS

A. Magnetism..... 5 Hours

Outcome: Explain the principles of magnetism, electromagnetism, and electromagnetic induction.

1. Describe the properties of magnetic materials.
2. Define the terminology related to magnetism.
3. Describe electromagnetism and basic design considerations for electromagnetic devices.
4. Describe the process of electromagnetic induction.

B. Transformer Basics.....5 Hours

Outcome: Explain the construction and identification of transformers.

1. Describe the purposes and applications of transformers.
2. List the basic components and the nameplate information of a transformer.

3. Explain the standard terminal and winding identification.
4. Identify the primary and secondary terminals of a transformer and differentiate between step up and step down.

C. Transformer Operation.....5 Hours

Outcome: Explain the operation and loading of transformers.

1. Describe the operation of a transformer at no load (excitation).
2. Describe the operation of a transformer as load is added.
3. List the losses that occur in a transformer.
4. State why utilities may accept 100% efficiency for transformer calculations.

D. Transformer Ratings.....5 Hours

Outcome: Explain transformer voltage ratings.

1. State how transformers are rated and typically manufactured.
2. Solve problems involving transformer voltage, turns, and current ratios.
3. Describe the possible effects of operating a transformer at greater than rated voltage.
4. Calculate the rated primary and secondary currents of a transformer from nameplate data.
5. Select a properly rated transformer for a specified load.
6. Connect to verify transformer voltage, turns, and current ratios.

E. Transformer Windings and Tap Changers.....5 Hours

Outcome: Explain transformer windings and tap changers.

1. Differentiate between additive and subtractive polarity.
2. Explain why tap changers are used.
3. Explain how to set a tap changer to increase or decrease secondary voltage levels.
4. Determine the approximate voltage change when taps are changed to various steps.
5. Describe the steps required to safely change the tap setting on a tap changer.
6. Connect multi-winding transformers for series or parallel operation and calculate primary and secondary voltage levels.

F. Transformer Installation.....5 Hours

Outcome: Explain the installation of distribution transformers.

1. List the items to be checked prior to installing a transformer.
2. Select the size of fuse from a fuse chart for a given transformer.
3. Describe the connection of a lightning arrestor.
4. Define the causes of backfeed, hazards involved, and how to avoid them.
5. Explain the grounding of a single phase secondary service.
6. Identify the hazards of improper grounding.

G. Transformer Cooling and Dielectric.....5 Hours

Outcome: Explain transformer cooling methods and dielectric oil.

1. Describe the various methods of cooling of transformers.
2. Identify the hazards of PCBs as related to transformer oils.
3. Describe how impurities in oil affect its dielectric strength.
4. Describe how to take an oil sample and how it is tested.

SECTION FOUR:.....OVERHEAD LINE CONSTRUCTION .....70 HOURS

A. Power Line Poles .....5 Hours

Outcome: Explain powerline structures and their handling.

1. Describe the types of powerline structures.
2. Describe the treatments used for powerline poles.
3. Define the differences between classes of wood poles.
4. Identify the information found on pole stamps.
5. Describe basic framing and attachments to wood poles.
6. Describe the procedures for loading, hauling and unloading of poles.

B. Pole Setting and Climbing Safety.....6 Hours

Outcome: Explain pole installation and climbing.

1. Describe the forces exerted on power line structures.
2. Identify the standardized markings that are used in Alberta to mark location of underground facilities.
3. List the hazards involved in power digging and how to minimize these hazards.
4. Describe methods of setting poles.
5. Determine when pole cover up and rubber gloves are required to be used when setting poles.
6. Describe the factors that affect how poles are faced in various situations.
7. Describe problems caused when poles are improperly backfilled and tamped.
8. Explain the hazards involved in climbing poles.

C. Insulators.....5 Hours

Outcome: Explain the characteristics of insulators used in powerline construction.

1. List the common types of insulator materials used on power systems.
2. Describe the different type of insulators and their applications.
3. Define B.I.L. (basic impulse level) rating of power system insulators.
4. Define flashover and leakage current.
5. Define dielectric strength of insulating materials.
6. Identify typical causes of insulator failure.
7. List common causes and methods of prevention of radio/TV interference.

D. Anchors and Guys.....4 Hours

Outcome: Explain the application of anchors and guys used in powerline construction.

1. Describe the types and holding capacities of powerline anchors.
2. Describe the proper installation of typical anchor types.
3. Describe the proper placement of anchors and state reasons for anchor failure.
4. Calculate guy tensions.

E. Conductors.....6 Hours

Outcome: Describe the type of conductors used in powerline construction.

1. Describe the advantages and disadvantages of various types of material used for line conductors.
2. Recognize conductor sizes with the use of American Wire Gauge (AWG).
3. Explain the relationship between the size and ampacity of conductors.
4. Describe common aerial conductor types.

F. Conductor Stringing.....5 Hours

Outcome: Explain methods of stringing and recovering powerlines.

1. Describe common methods of handling and storage of reels of conductor.
2. Describe common methods of stringing and recovering power line conductors.
3. Describe the fundamental relationship between tension and sag.
4. Describe the methods used for conductor tie-in.

G. Splicing and Terminating.....6 Hours

Outcome: Explain how to splice, connect and terminate overhead conductors.

1. Describe the use of manual and power driven presses.
2. Describe how to check for proper compression.
3. Describe the preparation of conductors for splicing and deadending.
4. Identify the proper conductor splicing sleeves and press dies using reference charts (include automatic type splices).
5. Identify the proper insulated sleeve for low voltage conductor splicing from reference charts.
6. Demonstrate manufacturer's operating and maintenance practices for explosive actuated tools.

H. Trade Tools and Equipment.....6 Hours

Outcome: Explain the inspection, care, and maintenance of tools.

1. Describe the selection, use and operation of basic line construction tools.
2. Describe the sharpening of climber gaffs.
3. Describe care, maintenance and safety precautions for power and hand tools.

I. Rigging and Hoisting.....6 Hours

Outcome: Explain rigging and hoisting practices.

1. Identify types and ratings of synthetic rope.
2. Describe the causes and effects of shock loading on rigging.
3. Explain how to reeve a set of multiple rope blocks.
4. Demonstrate how to reeve a set of multiple rope blocks.
5. Calculate the mechanical advantage of rope blocks.
6. Demonstrate common knots and hitches on rope.
7. Estimating load weights for rigging and hoisting purposes.

J. Radial Boom Digger (RBD) Fundamentals ..... 6 Hours

Outcome: Explain hoisting and operating principles of a RBD.

1. Demonstrate knowledge of crane and hoisting signals.
2. Explain the importance of crew communications when operating load handling equipment.
3. Identify the inspection and maintenance of a RBD.
4. Describe the hazards and procedures for the inspection, setup and use for a RBD.
5. Explain the operating characteristics.

K. Load Charts..... 5 Hours

Outcome: Interpret load charts.

1. Explain the purpose of load charts.
2. Describe the effect of quadrants of operation on capacity.
3. Explain how capacities are affected by attachments.
4. Explain how capacities are affected by the location of the load in relationship to the unit.
5. Explain how capacities are affected by setup.

L. Hydraulic Fundamentals..... 5 Hours

Outcome: Explain fundamental hydraulic principles.

1. Apply Pascal's Law.
2. Describe the operation of a hydraulic cylinder.
3. Describe the operation of a control valve.
4. Describe the operation of a hydraulic pump.
5. Describe the operation of a hydraulic motor.

M. Hydraulic Systems ..... 5 Hours

Outcome: Explain the hydraulic systems on RBD's.

1. Identify the components.
2. Explain the functions of components.
3. Explain the hydraulic flow through a system.
4. Identify how the environment affects hydraulic systems.

SECTION FIVE: ..... INTRODUCTION TO METERING ..... 28 HOURS

A. Electrical Measurement Devices ..... 14 Hours

Outcome: Demonstrate the use of electrical measuring devices.

1. Describe the care, connections and safety precautions for common electrical measuring devices
2. Demonstrate accurate measurements using common electrical measuring devices.
3. Demonstrate range selection and wiring connections for common electrical measuring devices.

B. Single Phase Revenue Metering ..... 14 Hours

Outcome: Verify operation of single phase self-contained revenue metering.

1. Describe the basic operation of a kWhr meter.
2. Read a single–phase meters (energy and demand).
3. Verify socket connections prior to changing or installing a new meter.
4. Explain what a clock-over and a complete clock-over are.
5. Connect to verify correct operation of a single phase three wire energy meter.

SECOND PERIOD TECHNICAL TRAINING
POWERLINE TECHNICIAN TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....INTERMEDIATE ELECTRICAL THEORY ..... 70 HOURS

A. Resistance in ac Circuits .....2 Hours

Outcome: Explain how resistors affect an ac circuit.

1. Analyze an ac circuit containing resistors connected in series.
2. Analyze an ac circuit containing resistors connected in parallel.

B. Inductance and Inductive Reactance.....12 Hours

Outcome: Explain the effects of inductance on ac and dc circuits.

1. Describe a basic inductor (coil).
2. Describe inductance and the factors which affect it.
3. Describe induction and its effects.
4. Describe the effects of an inductor in a dc circuit.
5. Describe the effects of an inductor in an ac circuit.
6. Analyze an ac inductive circuit.
7. Describe the power relationships in an ac inductive circuit.
8. Connect to verify ac circuits containing inductance.

C. Capacitance and Capacitive Reactance .....12 Hours

Outcome: Explain the effects of capacitance on ac and dc circuits.

1. Describe the construction of a basic capacitor.
2. Describe capacitance and the factors which affect it.
3. Describe the effects of a capacitor in a dc circuit.
4. Describe the effects of a capacitor in an ac circuit.
5. Analyze an ac capacitive circuit.
6. Describe the power relationships in an ac capacitive circuit.
7. Explain the hazards of refusing capacitors.
8. Connect to verify ac circuits containing capacitance reactance.

D. Impedance in Series Resistive-Reactive Circuits.....14 Hours

Outcome: Explain impedance in series resistive reactive circuits.

1. Describe impedance in a series RL circuit.
2. Describe impedance diagrams and their relationship to phasor diagrams and power diagrams in series circuits.
3. Explain power factor and phase angle.

4. Describe impedance for series RC circuits.
5. Describe series RLC circuits and the hazards associated with them.
6. Connect to verify series resistive–reactive circuits.

E. Impedance in Parallel Resistive-Reactive Circuits.....14 Hours

Outcome: Analyze parallel resistive reactive circuits.

1. Describe impedance in a parallel RL circuit.
2. Describe impedance diagrams and their relationship to phasor diagrams and power diagrams in parallel circuits.
3. Explain parallel RL circuits.
4. Explain parallel RC circuits.
5. Explain parallel RLC circuits.
6. Connect to verify parallel resistive-reactive circuits.

F. Single Phase Power and Power Factor .....10 Hours

Outcome: Explain power and power factor.

1. Define true, apparent and reactive power.
2. Connect to verify true, apparent and reactive power.
3. Define power factor.
4. Describe the reasons for correcting power factor.
5. Solve power factor correction calculations.
6. Connect to verify power factor correction.

G. Basic Three Phase Systems .....6 Hours

Outcome: Explain basic three phase systems.

1. Describe basic three phase generation of voltages.
2. Describe wye connected loads and sources.
3. Describe delta connected loads and sources.

SECTION TWO:..... INTERMEDIATE TRANSORMER THEORY..... 42 HOURS

A. Transformer Applications .....4 Hours

Outcome: Explain transformers applications on power systems.

1. Describe the application of transformers in network distribution situations.
2. Describe the application of transformers in substation power situations.
3. Describe the application of transformers in general distribution situations.

B. System Grounding.....6 Hours

Outcome: Explain system grounding.

1. Describe the purpose of a system ground.
2. Describe the differences between neutral return systems and earth return systems.

3. Describe the hazards of an open neutral or an open ground connection.
4. Describe the function of a ground rod as an electrical connection.
5. Determine ground resistance by means of an earth resistance tester.

C. Transformer Impedance ..... 10 Hours

Outcome: Explain transformer impedance and paralleling of transformers.

1. Define percent impedance (%IZ).
2. Determine maximum secondary fault current using transformer nameplate information.
3. Describe the requirements for paralleling two single phase transformers.
4. Connect to verify the % IZ of a transformer.
5. Connect to verify how two single phase transformers in parallel share load.

D. Three Phase Transformer Connection ..... 18 Hours

Outcome: Determine the voltage relationships for standard three phase transformer connections.

1. Describe the voltage characteristics of standard three phase transformer connections.
2. Draw standard three phase transformer connections.
3. Connect to verify voltages of standard three phase transformer connections.

E. Three Phase Distribution Transformer Installation ..... 4 Hours

Outcome: Explain pre-installation requirements of transformers in a bank.

1. Determine the transformer connection by interpreting nameplate data.
2. Describe the possible internal winding connections that may be required before hanging transformers in a bank.
3. Determine fusing requirements for standard three phase transformer connections.
4. Describe the hazards of backfeeds and energized potentials from transformer banks.
5. Determine customer loading allowed for open wye and open delta connections.

SECTION THREE: .... UNDERGROUND LINE CONSTRUCTION AND STREET LIGHTING ..... 49 HOURS

A. Legal Land Descriptions ..... 4 Hours

Outcome: Explain the use of legal land descriptions in Alberta.

1. Describe the legal land description systems.
2. Locate a legal land description on a map.
3. Identify the legal land description of a location on a map.

B. Underground Distribution ..... 10 Hours

Outcome: Explain underground distribution systems.

1. Describe the advantages and disadvantages of underground distribution systems.
2. Identify associated components of underground systems.
3. Describe loop, radial and network systems.

4. Describe direct burial and ductwork installation of underground cable.
5. Explain the appropriate codes to be followed with installation.

C. Underground Cable Termination and Splicing ..... 11 Hours

Outcome: Explain methods used to terminate and splice underground cables.

1. Describe commonly used primary and secondary cables.
2. Describe the components and purpose of primary and secondary underground cables.
3. Describe the components and purpose of a high voltage termination.
4. Describe methods used to terminate and splice primary and secondary cables.
5. Identify a load break and a non-load break elbow.

D. Underground Distribution Testing and Troubleshooting ..... 8 Hours

Outcome: Explain testing and fault locating.

1. Explain the purpose of single line diagrams used for troubleshooting.
2. Verify proper system operation.
3. Interpret the operation of fault indicators.
4. Describe cable testing and fault locating methods.

E. Street Lighting and Relays……..16 Hours

Outcome: Explain street lighting systems.

1. Describe the installation of street lighting components.
2. Describe operating characteristics of lamps used in street lighting.
3. Describe operating characteristics and connections of lamp ballasts.
4. Describe the disposal methods of lamps and ballasts.
5. Describe the operation of relays and photoelectric eyes.
6. Demonstrate relay operation.
7. Demonstrate street light circuits.

SECTION FOUR: .....INTERMEDIATE METERING ..... 28 HOURS

A. Electrical Measuring, Recording, and Indicating Devices ..... 6 Hours

Outcome: Explain the purpose of electrical measuring, recording, and indicating devices.

1. Describe the purpose for the use recording devices.
2. Describe the purpose for the use measuring devices.
3. Describe the purpose for the use indicating devices.

B. Instrument Transformers ..... 10 Hours

Outcome: Explain the applications of instrument transformers.

1. Describe the function and ratings of potential transformers and their hazards.
2. Describe the function and ratings of current transformers and their hazards.
3. Explain primary and secondary fusing of potential transformers.

4. Explain current transformer grounding and shorting.
5. Connect to verify instrument transformer ratios.

C. Instrument Rated Revenue Metering ..... 12 Hours

Outcome: Explain the operation and connections of single phase instrument type revenue metering.

1. Describe the operation of an instrument rated revenue meter.
2. Calculate a load through a meter using kh.
3. Connect to verify the load on an energy meter.

SECTION FIVE: .....UTILITY CODES AND SAFETY..... 21 HOURS

A. Personal Protective Grounding..... 14 Hours

Outcome: Explain methods of grounding for personal protection.

1. Describe how personal protective grounding minimizes electrical hazards.
2. Describe step and touch potential and state how fault current varies with proximity to sources of fault current.
3. Describe the factors affecting resistance of ground electrode connections and reasons for keeping temporary ground rods away from the base of poles.
4. Explain the principles of equal-potential bonding and grounding.
5. Describe the sequence to be followed when installing or removing protective grounds.

B. AEUC Section 6, 10 and 12 ..... 7 Hours

Outcome: Apply Electrical Utility Code (AEUC) as it relates to sections 6, 10 and 12.

1. Interpret section “6” of the AEUC.
2. Interpret section “10” of the AEUC.
3. Interpret section “12” of the AEUC.
4. Interpret Appendix A section “4” of the AEUC.
5. Interpret Appendix C of the AEUC.
6. Interpret Appendix D of the AEUC.

THIRD PERIOD TECHNICAL TRAINING
POWERLINE TECHNICIAN TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....THREE PHASE ELECTRICAL AND MOTOR THEORY ..... 48 HOURS

A. Wye Circuits .....12 Hours

Outcome: Analyze balanced and unbalanced wye circuits using phasor diagrams.

1. Identify the relationship between line and phase current.
2. Identify the relationship between line and phase voltage.
3. Explain the function of the neutral conductor.
4. Explain the relationships between current and voltages in unity and non-unity power factors.
5. Connect to verify the relationships between voltage and current in unity and non-unity power factors.

B. Delta Circuits .....12 Hours

Outcome: Analyze balanced and unbalanced delta circuits using phasor diagrams.

1. Identify the relationship between line and phase current.
2. Identify the relationship between line and phase voltage.
3. Explain the relationships between current and voltages in unity and non-unity power factors.
4. Connect to verify the relationships between voltage and current in unity and non-unity power factors.

C. Three Phase Power Relationships .....10 Hours

Outcome: Describe three phase power in balanced and unbalanced systems.

1. Define true, apparent and reactive power.
2. Calculate true, reactive, and apparent power.
3. Connect to verify true, apparent and reactive power.

D. Three Phase Power Factor Correction .....8 Hours

Outcome: Explain three phase power factor correction in balanced and unbalanced systems.

1. Define power factor.
2. Describe the reasons for correcting power factor.
3. Solve power factor correction calculations.
4. Connect to verify power factor correction.

E. Single and Three Phase Motors .....4 Hours

Outcome: Compare the operation characteristics of single and three phase motors.

1. Compare single phase motors to three phase motors.
2. Describe the method used to reverse motors.
3. Describe the effects of an open phase on a three phase motor under starting and under running conditions.
4. Describe the effects of over and under voltage on motors.
5. Describe the effects on a utility system of full voltage starting large motors.
6. Describe the effects of voltage unbalance on a three phase motor.
7. Connect to verify single phase motor operation.
8. Connect to verify three phase motor operation.

SECTION TWO: ..... TRANSFORMER THEORY ..... 56 HOURS

A. Transformer Theory.....6 Hours

Outcome: Describe transformer operations.

1. Transformer ratings and ratios.
2. Transformer winding characteristics and terminology.
3. Transformer impedance and paralleling single phase transformers.

B. Three Phase Transformer Connections (Part A) .....12 Hours

Outcome: Describe the voltage and current relationships and fusing requirements for standard three phase transformer connections.

1. Determine the connection and fusing for a wye/wye transformer bank.
2. Determine the connection and fusing for a delta/delta transformer bank.
3. Determine the connection and fusing for a wye/delta transformer bank.
4. Determine the connection and fusing for a delta/wye transformer bank.

C. Three Phase Transformer Connections (Part B) .....12 Hours

Outcome: Determine the voltage and current relationships and fusing requirements for standard three phase transformer connections.

1. Determine the connection and fusing for an open delta/open delta transformer bank.
2. Determine the connection and fusing for an open wye/open delta transformer bank.
3. Determine the connection and fusing for a delta/four wire delta transformer bank.
4. Determine the connection and fusing for a crowfoot transformer bank.

D. Three Phase Transformer Banks .....8 Hours

Outcome: Explain considerations when altering a three phase transformer bank.

1. Define causes of backfeed, the hazards involved, and how to avoid it.
2. Determine the rated phase and line currents for a given three phase transformer bank.
3. Describe the requirements for paralleling three phase transformer banks.

4. Define ferro-resonance and describe how to minimize or eliminate its effects.
5. Perform alterations on a three phase transformer bank maintaining the same phase sequence and position of the high leg as prior to the work being performed.

E. CSP Transformers ..... 3 Hours

Outcome: Describe completely self protected (CSP) transformers.

1. Explain the differences between CSP transformers and standard distribution transformers.
2. List the applications and advantages of CSP transformers.

F. Voltage Regulators ..... 8 Hours

Outcome: Describe operation of voltage regulating equipment.

1. Describe voltage regulation and why it is required.
2. Differentiate between on-load and off-load tap changers and state at least one utility application for each.
3. Interpret the nameplate data on voltage regulating equipment.
4. Explain the effect of the buck or boost winding on the output voltage with the use of a schematic.
5. Describe, in general terms, the operation of a step regulator control unit, making reference to:
   a) basic voltage setting
   b) band width setting
   c) delay timer
   d) buck boost selector switch

G. Voltage Regulator Service ..... 7 Hours

Outcome: Explain pre-commissioning of voltage regulating equipment.

1. Explain the precaution necessary when paralleling lines or feeders supplied from different voltage regulators.
2. Describe in detail, how to bypass voltage regulating equipment and how to return it to service, using sequenced and non-sequenced bypass switches.
3. Explain the effects on customer voltage if the regulator source and load connections are interchanged.
4. Explain the hazards of touch potential near voltage regulator controls, and how they may be reduced.
5. Describe typical pre-commissioning checks on voltage regulating equipment.

SECTION THREE: ..... LINE CONSTRUCTION THEORY ..... 42 HOURS

A. Sagging Conductors ..... 10 Hours

Outcome: Explain the requirements and methods of sagging for overhead conductors.

1. Explain the effects on a line if the sagging is either too tight or too loose.
2. Choose the appropriate sag chart, given the necessary line and conductor information (initial or final).
3. Determine the correct sag from charts given the necessary information.
4. Explain in detail the line and sight method of sagging.

5. Explain in general terms other methods of sagging.
6. Explain methods of determining sag on an existing energized line.
7. Explain the effect on sag when changing span length.
8. Explain ruling span and actual (sagging) span.

B. Underground Distribution ..... 6 Hours

Outcome: Explain the requirements for the identification, mapping and switching of new underground installations.

1. Verify a single line diagram (S.L.D.) as built, identify cables and return construction guarantee of isolation (GOI) (clearance or permit).
2. Prepare a switching program to energize a new section of an underground system given a single line diagram.

C. Insulation Testing ..... 6 Hours

Outcome: Explain insulation testing.

1. State the reasons for insulation testing.
2. Describe the components of current resulting from high potential testing.
3. Explain the term high potential testing and the hazards involved.

D. Circuits – Protection and Switching ..... 20 Hours

Outcome: Explain operation of circuit protection and switching equipment.

1. Define the terms fault and short circuit current.
2. Explain how kVA and % IZ affect fault current.
3. Explain the purpose and basic operation of:
   a) fuses
   b) sectionalizers
   c) circuit reclosers
   d) arrestors
   e) relays operating a circuit breaker.
4. Explain how the time of operation varies with the magnitude of current.
5. Explain what it means to co-ordinate fuses, sectionalizers and circuit reclosers.
6. Explain the switching hazards and basic operation of the following:
   a) hot line jumpers
   b) fused disconnects
   c) solid blade disconnects and gang operated switches
   d) sectionalizers and circuit reclosers.
7. Identify common ANSI / IEEE device numbers from single line drawings.

SECTION FOUR: ..... METERING ..... 42 HOURS

A. Phasing and Phase Rotation ..... 6 Hours

Outcome: Demonstrate the use of electrical phasing and phase rotation indicating devices.

1. Determine the phase sequence of a colour coded or otherwise identified three–phase system with the use of a phase sequence indicator.

2. Relate the hazards involved when using phasing sticks.
3. Demonstrate how to verify proper operation of phasing sticks by cross phasing.
4. Phase-in two three–phase lines with the use of phasing sticks.

B. Meter Installation and Operation ..... 12 Hours

Outcome: Explain the installation requirements for polyphase "S" base meters.

1. Explain under what conditions a meter must be installed on the load side of a customer's disconnecting means.
2. Explain the proper mounting height for self contained meters.
3. Explain where and why a network meter is used.
4. Identify the correct phase colour codes and the correct phasing for polyphase meter sockets.
5. Identify a service with a high leg using a voltmeter.
6. Describe the operation and connection of the following meters:
   a) network meter "S" base
   b) three phase four wire wye "S" base
   c) three phase four wire delta "S" base
7. Verify socket connections and make necessary checks on the meter prior to change or new installation of the meters stated above.
8. Determine the load seen by a meter using Kh for balanced and unbalanced loads.
9. Verify the load 'seen by' a meter using a load check (current and voltage) for balanced and unbalanced loads.
10. Determine the actual consumption using the internal multiplier and the meter register readings.

C. Instrument Rated (IR) Energy/Demand Meters ..... 20 Hours

Outcome: Explain the operation and connection of an instrument rated meter.

1. Explain the operation of an instrument transformer rated meter.
2. Calculate the load on a meter using Kh for balanced and for unbalanced loads.
3. Verify the load 'seen by' a meter using a load check (current and voltage) and the meter multiplier for balanced and unbalanced loads.
4. Determine the actual consumption using the meter multiplier and the meter register readings.
5. Explain how burden can affect the accuracy of the instrument transformers.
6. Describe how and why instrument transformer rated meters are to be grounded.
7. Verify the connection of an instrument transformer meter in reference to a wiring diagram.
8. Connect a meter on an instrument transformer rated meter service:
   a) three phase four wire delta - energy/demand meter
   b) three phase four wire wye - energy/demand meter
9. Explain the possible hazards and safe use of test switches on an instrument rated meter.
10. Describe the standard Measurement Canada color code wiring between test switches, meter and instrument transformers.
11. Explain the operation of a kVA or kW thermal demand meter.
12. Describe why demand metering is important to a utility and how to reset demand meters.

D. Meter Seals and Energy Diversion ..... 4 Hours

Outcome: Explain energy diversion and government requirements on re-testing of meters.

1. Describe indications of external tampering on metering devices.
2. Describe other indications of energy theft.
3. Explain the difference between government and utility sealing on meters.
4. Explain the government requirements on the re-testing of meters.

SECTION FIVE: ..... SAFETY ..... 24 HOURS

A. Safety and Utility Regulations ..... 8 Hours

Outcome: Interpret rules and regulations according to legislated requirements.

1. Locate and use CSA 22.3 Overhead Systems as it pertains to the construction of overhead systems.
2. Locate and use section 8 of the AEUC as it pertains to the operation of:
   a) generating stations.
   b) substations.
   c) electrical equipment installations.
3. Locate and use section 10 of the AEUC.
4. Identify applicable AEUC rules given a typical work situation.
5. Locate and use CSA 22.3 Overhead Systems rules to determine vertical design clearances above ground.
6. Locate and use CSA 22.3 Underground Systems as it pertains to underground construction.
7. Restate the safe limits of approach from Appendix A sections 4 and 2 in the AEUC.

B. Proper Communications ..... 6 Hours

Outcome: Develop switching programs for overhead and underground systems.

1. From a single line diagram, prepare a switching program to isolate and issue a GOI (or permit) on a section of:
   a) overhead system
   b) underground system
   c) combination of both overhead and underground systems

C. Workplace Coaching Skills ..... 3 Hours

Outcome: Use coaching skills when coaching an apprentice.

1. Describe the process for coaching an apprentice.

D. Alberta's Industry Network ..... 3 Hours

Outcome: Describe the role of the network of industry committees that represent trades and occupations in Alberta.

1. Describe Alberta's Apprenticeship and Industry Training system.
2. Describe roles and responsibilities of the Alberta Apprenticeship and Industry Training Board, the Government of Alberta and post-secondary institutions.
3. Describe roles and responsibilities of the Provincial Apprenticeship Committees (PACs), Local Apprenticeship Committees (LACs) and Occupational Committees (OCs).

E. Interprovincial Standards Red Seal Program ..... 4 Hours

Outcome: Use Red Seal products to challenge an Interprovincial examination.

1. Identify Red Seal products used to develop Interprovincial examinations.
2. Use Red Seal products to prepare for an Interprovincial examination.

Apprenticeship and Industry Training

Alberta Trades. World Ready.

021.2