Pre-Employment
Plan of Training
Industrial Electrician

Government of Newfoundland and Labrador
Department of Immigration, Population Growth and Skills
Apprenticeship and Trades Certification Division

March 2017

PLAN OF TRAINING

Pre-employment

Industrial Electrician

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Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Advanced Education, Skills and Labour
Apprenticeship and Trades Certification Division

Approved by:

Dave H

Chairperson, Provincial Apprenticeship and Certification Board

Date: March 30, 2017

Preface

This curriculum standard is aligned with the 2017 Level 1 Atlantic Apprenticeship Curriculum Standard (AACS) and the 2016 edition of the Red Seal Occupational Standard (RSOS) for the Industrial Electrician trade. It describes the curriculum content for the Industrial Electrician Pre-employment training program.

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We offer you a sincere thank you.

Contact Information

Department of Immigration, Population Growth and Skills
Apprenticeship and Trades Certification Division
Tel: 709-729-2729
Toll Free: 1-877-771-3737
Email: app@gov.nl.ca
Web: www.gov.nl.ca/atcd

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A. RSOS Comparison Chart

A Red Seal Occupational Standard (RSOS) comparison chart is located in the Atlantic Apprenticeship Curriculum Standard (AACS).

B. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.

The order of course delivery within each level can be determined by the training institution, as long as pre-requisite conditions are satisfied.

Upon completion of a Pre-employment program, individuals may be required to complete other certifications (employer or job site specific) in order to gain employment.

A Pre-employment student who becomes an apprentice will also be required to complete Level 2, 3 and 4 in the Atlantic Apprenticeship Curriculum Standard (AACS).

Pre-Employment				
Course No.	**AACS No.**	**Course Name**	**Hours**	**Pre-Requisite(s)**
TS1520	-	WHMIS	6	None
TS1530	-	Standard First Aid	14	None
ER1411	ELE-100	Safety	30	None
ER1112	ELE-105	Tools and Equipment	15	ER1411 TS1530
ER1105	ELE-110	Access Equipment	12	ER1411
ER1101	ELE-115	Hoisting, Lifting and Rigging	18	ER1411
ELE-120	ELE-120	Support Components	6	ER1411
ER1202	ELE-135	Drawings, Schematics and Specifications	30	None
ER1212	-	Electrical Drawings and Schematics	30	ER1202
ER1161	ELE-165	Introduction to the Canadian Electrical Code	24	None
ER1140	ELE-145	DC Theory	30	ER1411
ER1151	ELE-150	Series and Parallel DC Circuits	45	ER1140
ER1180	ELE-155 ELE-160	Single-Phase Theory	60	ER1151
ER1231	ELE-185	Conductors and Cables	30	ER1411 ER1161

Pre-Employment				
Course No.	**AACS No.**	**Course Name**	**Hours**	**Pre-Requisite(s)**
ER1570	ELE-170	Grounding and Bonding	6	ER1161
ER1221	ELE-190	Conduit, Tubing and Fittings	30	ER1161
ER2001	ELE-195	Raceways, Wireways and Busways	30	ER1411 ER1161
ER1242	ELE-200 ELE-205	Fundamental Wiring	60	ER1411 ER1161
ER2011	ELE-210	Lighting Systems and Controls	25	ER1242
ER1190	-	Three-Phase Theory	30	ER1180
ER1170	-	Voltage Drop and Power Loss	30	ER1190
ER1271	ELE-175	Single-Phase Service Entrance	30	ER1242
ER1371	ELE-180	Distribution Equipment	17	ER1190
ER1250	-	Protective Devices	30	ER1190
ER2022	-	Single-Phase Motors	30	ER1180
ER1580	ELE-140	Job Planning	6	ER1411 ER1212 ER1161
ER1281	-	Three-Phase Service Entrance	30	ER1271 ER1190
ER2351	-	Electric Surface Heating Systems	15	ER1242 ER1161
ER1262	-	Transformers	60	ER1190
ER2391	-	Fiber Optics	18	ER1242
ER1341	-	Fire Alarms	20	ER2391
ER2142	-	Security Systems	10	ER2391
ER2134	ELE-215	Communication Systems	20	ER2391
ER1590	ELE-125	Introduction to Communication and Trade Documentation	6	ER1580
ELE-130	ELE-130	Mentoring I	6	None
AM1000	-	Introduction to Essential Skills	9	None
AP1102	-	Introduction to Apprenticeship	12	None

Pre-Employment				
Course No.	**AACS No.**	**Course Name**	**Hours**	**Pre-Requisite(s)**
***AM1101**	-	Math Essentials	42	None
AM1161	-	Electrician Math Fundamentals	42	AM1101
CM2161	-	Communication Essentials	36	None
SD1761	-	Workplace Essentials	24	None
MC1062	-	Computer Essentials	15	None
OT1150	-	Workterm	80	None
		Total Pre-Employment Hours	**1119**	

*A student who can meet the mathematics requirement through an ACUPLACER® test may be exempted from AM1101 - Math Essentials. Please check with your training institution.

Required Work Experience

Pre-Employment

TS1520 Workplace Hazardous Materials Information System (WHMIS)

Learning Outcomes:

- Demonstrate knowledge of interpreting and applying the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health and Safety Act.

Duration: 6 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define WHMIS safety.
   - i. rational and key elements
   - ii. history and development of WHMIS
   - iii. WHMIS legislation
   - iv. WHMIS implementation program
   - v. definitions of legal and technical terms

2. Examine hazard identification and ingredient disclosure.
   - i. prohibited, restricted and controlled products
   - ii. classification and the application of WHMIS information requirements
   - iii. responsibilities for classification
     - the supplier
     - the employer
     - the worker - Classification: rules and criteria
     - information on classification
     - classes, divisions and subdivision in WHMIS
     - general rules for classification
     - class A - compressed gases
     - class B - flammable and combustible materials
     - class C - oxidizing material
     - class D - poisonous and infectious material
     - class E - corrosive material
     - class F - dangerously reactive material
   - iv. products excluded from the application of WHMIS legislation
     - consumer products
     - explosives
     - cosmetics, drugs, foods and devices
     - pest control products

- radioactive prescribed substances
- wood or products made of wood
- manufactured articles
- tobacco or products of tobacco
- hazardous wastes
- products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act

v. comparison of classification systems - WHMIS and TDG
vi. general comparison of classification categories
vii. detailed comparison of classified criteria

3. Explain labeling and other forms of warning.
   i. definition of a WHMIS label
      - supplier label
      - workplace label
      - other means of identification
   ii. responsibility for labels
      - supplier responsibility
      - employer responsibility
      - worker responsibility

   iii. introduce label content, design and location
      - supplier labels
      - workplace labels
      - other means of identification

4. Introduce material safety data sheets (MSDS).
   i. definition of a material safety data sheet
   ii. purpose of the data sheet
   iii. responsibility for the production and availability of data sheets
      - supplier responsibility
      - employer responsibility
      - workers responsibility

Practical Requirements:

1. Locate WHMIS label and interpret the information displayed.

2. Locate a MSDS sheet for a product used in the workplace and determine what personal protective equipment and other precautions are required when handling this product.

TS1530 Standard First Aid

Learning Outcomes:

- Demonstrate knowledge of recognizing situations requiring emergency action
- Demonstrate knowledge of making appropriate decisions concerning first aid

Duration: 14 Hours

Pre-Requisite(s): None

Practical Requirements:

1. Complete a **St. John Ambulance or Canadian Red Cross** Standard First Aid Certificate course.

ER1411 Safety

Learning Outcomes:

- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

Duration: 30 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Identify types of personal protective equipment (PPE) and clothing and describe their applications and limitations.

2. Describe the procedures used to care for and maintain PPE.

3. Identify hazards and describe safe work practices.
   - i. personal
     - Job Safety Analysis (JSA)
     - Tool box meetings
   - ii. workplace
     - energy state awareness (electrical & mechanical)
     - arc flash awareness (CSA - Workplace Electrical Safety (Standard) Z462-08)
     - isolation and de-energizing procedures
     - lockout / tag out
     - confined space awareness
     - fire
     - heights (fall arrest)
     - chemical / gas / radiation
     - asbestos
   - iii. environmental
     - discharge/spills

4. Describe basic employer and employee duties to comply with the applicable Act and safety regulations. (91-448 of OH&S Regulations)
   - i. employers responsibilities
   - ii. supervisors responsibilities
   - iii. employees rights and responsibilities
   - iv. Health and Safety Committee responsibilities

5. Identify and describe workplace safety and health regulations.
   i. federal
   ii. provincial/territorial
   iii. municipal

Practical Requirements:

1. Perform isolation and de-energizing procedures and lockout / tag out.

2. Identify and tag out faulty equipment.

ER1112 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for use.

Duration: 15 Hours

Pre-Requisite(s): TS1530, ER1411

Objectives and Content:

1. Identify types of hand tools and describe their applications and procedures for use.

2. Describe the procedures used to inspect and maintain hand tools.

3. Identify types of power tools and describe their applications and procedures for use.
   i. electric
   ii. hydraulic
   iii. pneumatic

4. Describe the procedures used to inspect and maintain power tools.

5. Identify types of basic electrical measuring and test equipment and describe their general applications.

6. Describe the procedures used to inspect and maintain electrical measuring and test equipment.

7. Identify types of powder-actuated tools and describe their applications.

8. Identify types of calibration, configuration and test equipment and describe their applications.

9. Identify types of installation and mounting hardware and describe their applications.

Practical Requirements:

1. Selection and proper use of various hand tools.

2. Selection and proper use of various power tools.

3. Demonstrate proper use of powder actuated tools.

ER1105 Access Equipment

Learning Outcomes:

- Demonstrate knowledge of ladders, scaffolding and hydraulic lifts, their applications, limitations and procedures for use.

Duration: 12 Hours

Pre-Requisite(s): ER1411

Objectives and Content:

1. Define terminology associated with ladders, scaffolding and hydraulic lifts.

2. Identify hazards and describe safe work practices pertaining to ladders, scaffolding and hydraulic lifts.
   i. fall arrest

3. Identify codes and regulations pertaining to ladders, scaffolding and hydraulic lifts.
   i. training and certification requirements

4. Identify types of ladders, scaffolding and hydraulic lifts and describe their characteristics and applications.

5. Describe the procedures used to erect and dismantle ladders and scaffolding.

6. Describe the procedures used to inspect, maintain and store ladders, scaffolding and hydraulic lifts.

Practical Requirements:

None.

ER1101 Hoisting, Lifting and Rigging

Learning Outcomes:

- Demonstrate knowledge of hoisting, lifting and rigging equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of basic hoisting and lifting operations.

Duration: 18 Hours

Pre-Requisite(s): ER1411

Objectives and Content:

1. Define terminology associated with hoisting, lifting and rigging.

2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.

3. Identify hazards and describe safe work practices pertaining to mobile and overhead cranes.

4. Identify codes and regulations pertaining to hoisting, lifting and rigging.
   i. training and certification requirements

5. Identify types of rigging equipment and accessories and describe their applications and procedures for use.

6. Identify types of hoisting and lifting equipment and accessories and describe their applications and procedures for use.
   i. chain fall
   ii. come along

7. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.

8. Identify types of knots, hitches, splices and bends and describe their applications and the procedures used to tie them.

9. Describe the considerations when rigging material/equipment for lifting.
   i. load characteristics
   ii. equipment and accessories
   iii. environmental factors
   iv. anchor points

v. sling angles

10. Describe the procedures used to ensure the work area is safe for lifting.
    i. supervision of lifts
    ii. securing work area
    iii. communication
    iv. OSHA requirements

11. Identify and describe procedures used to communicate during hoisting, lifting and rigging operations.
    i. hand signals (awareness of)
    ii. electronic communications
    iii. audible/visual
    iv. OSHA requirements

Practical Requirements:

1. Tie knots, bends, and hitches used for lifting and moving equipment.

2. Inspect, select and use the appropriate sling to perform a given task.

ELE-120 Support Components

Learning Outcomes:

- Demonstrate knowledge of interpreting, creating and extracting information from sketches, drawings and specifications.
- Demonstrate knowledge of procedures for fabricating support structures.
- Demonstrate knowledge of brackets, hangers and fasteners, their applications and their use.
- Demonstrate knowledge of measurement and layout techniques.
- Demonstrate knowledge of seismic restraint systems, their applications and their use.

Duration: 6 Hours

Pre-Requisite(s): TS1530, ER1411

Objectives and Content:

1. Create, interpret and extract information pertaining to support structures from sketches, drawings and specifications.

2. Identify support materials, their characteristics and applications.
   i. wood
   ii. steel
   iii. aluminum

3. Describe the procedures used to fabricate support structures.

4. Identify types of brackets, hangers and fasteners and describe their characteristics and applications.
   i. brackets
      - angle
      - T
      - L
      - floor
      - ceiling
   ii. hangers
      - trapeze
      - pipe clamps
      - beam clamps
   iii. fasteners
      - spring nuts
      - bolts

- screws
- concrete anchors

5. Describe the procedures for securing brackets, hangers and fasteners to structure.

6. Identify building materials and describe their characteristics and applications.
   i. steel
   ii. concrete
   iii. brick
   iv. block
   v. wood

7. Identify measurement and layout techniques used to ensure brackets, hangers and fasteners are positioned and mounted according to job specifications.

8. Identify types of seismic restraint systems and describe their characteristics and applications.
   i. chains
   ii. cables
   iii. rods
   iv. aircraft wires

9. Describe the procedures used to mount and secure seismic restraint systems to structure.

Practical Requirements:

None.

ER1202 Drawings, Schematics and Specifications

Learning Outcomes:

- Demonstrate knowledge of drawings, schematics and specifications and their applications.
- Demonstrate knowledge of interpreting and extracting information from drawings, basic schematics and specifications.

Duration: 30 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with drawings, schematics and specifications.

2. Identify types of drawings and describe their applications.
   i. civil/site
   ii. architectural
   iii. mechanical
   iv. structural
   v. electrical
   vi. shop drawings
   vii. sketches
   viii. as-builts

3. Interpret and extract information from drawings.
   i. alphabet of lines
   ii. elevations
   iii. scales
   iv. legends
   v. symbols and abbreviations
   vi. notes and specifications
   vii. Construction Specifications Canada (CSC)
      - specification division 23
      - specification division 25
      - specification division 26
      - specification division 27
      - specification division 28

4. Interpret and extract information from basic schematics and specifications.

5. Describe the function of a CAD system.

6. Identify documentation requirements for modifying drawings and specifications.

7. Describe the procedures used to document changes made to equipment and wiring.

Practical Requirements:

1. Gather and interpret information from various drawings.

2. Determine measurements from scaled drawings.

3. Sketch basic drawing views.

ER1212 Electrical Drawings and Schematics

Learning Outcomes:

- Demonstrate knowledge of advanced drawings and schematics and their applications.
- Demonstrate knowledge of interpreting and extracting information from advanced drawings and basic schematics.

Duration: 30 Hours

Pre-Requisite(s): ER1202

Objectives and Content:

1. Identify types of drawings and describe their applications.
   - i. piping and instrument drawings (P & IDs)
   - ii. installation drawings
   - iii. loop drawings
   - iv. location drawings
   - v. basic ladder logic (hard wire)

2. Review and interpret information from distribution system layout drawings.
   - i. switchboards/substations
   - ii. metering centers
   - iii. component tables

3. Review and interpret information from single-line drawings.
   - i. feeder size/risers
   - ii. transformers
     - voltage ratings
     - capacity
     - connections
   - iii. panel board designations
   - iv. distribution boards
   - v. connected apparatus
   - vi. equipment layout elevations
   - vii. fire alarm systems
   - viii. communication and security systems
   - ix. energy management systems

4. Review and interpret information from motor control center diagrams.
   i. starter/controller locations
   ii. wiring diagrams (generic)
   iii. overload/overcurrent
   iv. conductor sizes
   v. interconnections/interlocking

5. Describe procedures used to obtain material lists.

Practical Requirements:

1. Extract and interpret information from:
   i. site plans
   ii. elevation/floor plans
   iii. distribution system layout drawings
   iv. single-line drawings
   v. equipment schedules
   vi. equipment shop drawings

2. Determine measurements from scaled drawings.

3. Extract information from project documents.

4. Interpret reference/key diagrams used on drawings.

5. Use information to obtain a materials list for installation.

ER1161 Introduction to the Canadian Electrical Code

Learning Outcomes:

- Demonstrate knowledge of the procedures to locate and interpret information in the Canadian Electrical Code (CEC).

Duration: 24 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with the CEC.

2. Explain the layout of the CEC.
   i. sections
   ii. appendices
   iii. tables
   iv. indexes

3. Explain the methods used to locate information in the CEC and describe their associated procedures.
   i. by keyword in index
   ii. by subject area

4. Locate and interpret information in the CEC.

Practical Requirements:

1. Locate and select information from the CEC, Part 1.

2. Locate and select information from the CEC Handbook.

ER1140 DC Theory

Learning Outcomes:

- Demonstrate knowledge of direct current (DC) electricity, its characteristics and associated principles.
- Demonstrate knowledge of Ohm's law.
- Demonstrate knowledge of units of measure and symbols relating to DC electricity.
- Demonstrate knowledge of the instruments and procedures used to measure electricity.

Duration: 30 Hours

Pre-Requisite(s): ER1411

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to DC electricity.

2. Describe the atomic structure of matter.
   - i. electron theory
     - matter
     - atoms
     - electric charge
     - protons, electrons, neutron
   - ii. static electricity and electrostatics
     - positive and negative charge
     - electrostatic field
     - transferring static electricity
       - conduction
       - induction
   - iii. discharging static charges
     - electrons in motion
     - causes of current
     - conductors, semi-conductors, insulators
     - electron current flow
     - conventional current flow

3. Identify electrical units of measure and symbols.
   - i. absolute electrical units
     - current
     - voltage
     - resistance
   - ii. prefixes for absolute units

4. Identify different forms of energy and describe the effects of dynamic electricity.
   i. different forms of energy to produce electricity
      - chemical action
      - piezoelectric effect
      - magnetism
      - heat
      - light and solar energy
      - friction
   ii. effects of dynamic electricity
      - heating effects
      - chemical effects
      - magnetic effects
      - psychological and physiological effects

5. Identify and analyze the components necessary for the assembly of an electric circuit.
   i. the electron path (conductors)
   ii. the load
   iii. the source
   iv. the control
   v. closed circuit
   vi. open circuit
   vii. short circuit

6. Identify and describe the three basic electrical properties.
   i. voltage
   ii. current
   iii. resistance

7. Explain Ohm's Law.

8. Describe the following in relation to electricity.
   i. work
   ii. power
   iii. joules and coulombs
   iv. electrical power (watt)
   v. combination of the Power formulas and Ohm's Law
   vi. watts and horsepower
   vii. BTU
   viii. kilowatt hours
      - meter reading and cost

9. Identify measuring instruments and describe their applications and procedures for use.
   i. ammeter
   ii. voltmeter
   iii. ohmmeter
   iv. multimeter
   v. circuit tester
   vi. continuity tester
   vii. megger

Practical Requirements:

1. Compute values of electrical energy and power.

2. Use electrical measuring instruments.

3. Use instruments to troubleshoot DC components
   i. closed circuit
   ii. open circuit
   iii. short circuit

4. Ensure calibration of measuring instruments in accordance with manufacturing specifications.

5. Conduct megger test.

ER1151 Series and Parallel DC Circuits

Learning Outcomes:

- Demonstrate knowledge of series, parallel and complex DC circuits, their characteristics and operation.
- Demonstrate knowledge of the procedures used to troubleshoot DC circuits.
- Demonstrate knowledge of the procedures used to analyze and measure DC circuit values.

Duration: 45 Hours

Pre-Requisite(s): ER1140

Objectives and Content:

1. Describe the characteristics of a series circuit and calculate values.
   i. Resistance
   ii. current
   iii. voltage
   iv. power
   v. open resistor
   vi. shorted resistor

2. Describe the characteristics of a parallel circuit and calculate values.
   i. resistance
   ii. current
   iii. voltage
   iv. power
   v. open resistor
   vi. shorted resistor

3. Identify hazards and describe safe practices pertaining to DC electricity.

4. Interpret information pertaining to DC circuits found on drawings and specifications.

5. Explain Kirchhoff's Laws.
   i. current law
   ii. voltage law

6. Describe the characteristics of a combination circuit and calculate values.

7. Describe the procedures used to troubleshoot series, parallel and complex DC circuits.

Practical Requirements:

1. Analyze and measure amperage and voltage in series DC circuits.

2. Analyze and measure amperage and voltage in parallel DC circuits.

3. Analyze and measure amperage and voltage in combination DC circuits.

4. Analyze and measure resistance and/or continuity in basic DC circuits.

5. Analyze and measure power consumption in basic DC circuits.

ER1180 Single-Phase Theory

Learning Outcomes:

- Demonstrate knowledge of single-phase electricity, its characteristics and associated principles.
- Demonstrate knowledge of AC components and their characteristics.

Duration: 60 Hours

Pre-Requisite(s): ER1151

Objectives and Content:

1. Describe the principles of magnetism and the action of magnets.
   - i. magnetic and nonmagnetic substances categories
     - magnetic and nonmagnetic substances
     - poles of a magnet and the earth
   - ii. the theory of magnetism
     - magnetized and unmagnetized
     - magnetic field
     - magnetic lines
   - iii. magnetism properties
     - flux density (Weber's theory)
     - forces between magnetic poles
     - induced magnetism
     - permeability
     - reluctance
     - shielding
     - permanent and temporary magnet
     - retentivity
     - residual magnetism
     - demagnetizing

2. Describe the principles of electromagnetism.
   - i. the theory of electromagnetism
     - characteristics of an electromagnetic field
     - magnetic field around a current-carrying conductor
   - ii. direction of current flow and magnetic flux
     - direction of current and flux
     - dot-cross method
     - left-hand conductor rule
     - electromagnetic coil
     - left-hand coil rule
   - iii. the electromagnet

- characteristic of electromagnets (core, turns, strength)
- magnetic saturation
- core losses (hysteresis, eddy current, I^2R)
- uses of electromagnets

3. Describe the principles and characteristics of electromagnetic induction.
   i. principles of electromagnetic induction
      - Faraday's law
      - factors affecting amount of induced voltage
   ii. self and mutual induction
      - self-induction
      - henries
      - CEMF
      - mutual induction

4. Identify hazards and describe safe work practices pertaining to single-phase electricity.

5. Describe the generation of alternating current.
   i. direction of induced voltage
   ii. left-hand generator rule
   iii. alternation/revolution
   iv. cycle
   v. sine wave/plotting
   vi. electrical and mechanical degrees

6. Define different values and terms of alternating current.
   i. alternating current values
      - instantaneous values
      - maximum (peak) values
      - peak to peak values
      - effective (RMS) values
      - average values
   ii. terminology of alternating current circuits
      - frequency / hertz
      - period
      - phase (in phase, lagging, leading)

7. Describe the characteristics of components found in AC circuits.
   i. resistance in an AC circuit
   ii. inductance in an AC circuit
   iii. capacitance in an AC circuit
   iv. impedance in an AC circuit
      - trigonometric functions
      - impedance vector
   v. AC power and power factor correction in an AC circuit

- power factor introduction
- pure resistive circuit
- pure inductive circuit
- pure capacitive circuit
- resistive-reactive circuit
- apparent power and reactive power
- power factor correction

8. Solve RL, RC, and RLC AC series and AC parallel circuits.
   i. circuits with resistance and inductive reactance
   ii. circuits with resistance capacitive reactance
   iii. circuits with resistance, inductive reactance and capacitive reactance
   iv. power factor calculation

Practical Requirements:

1. Determine the properties of an AC circuit.

2. Connect AC series and AC parallel circuits containing RLC components.

3. Determine absolute values in AC series and AC parallel circuits containing RLC components.

4. Calculate power and power factor in AC circuits.

5. Use electrical instruments to troubleshoot series and parallel AC circuits.

ER1231 Conductors and Cables

Learning Outcomes:

- Demonstrate knowledge of conductors and cables and their associated components.
- Demonstrate knowledge of the procedures used to install conductors and cables.
- Demonstrate knowledge of the procedures used to terminate conductors.

Duration: 30 Hours

Pre-Requisite(s): ER1141, ER1161

Objectives and Content:

1. Define terminology associated with conductors and cables.
   - i. CSA designations
   - ii. voltage ratings
   - iii. number and size range of conductors
   - iv. number of strands
   - v. conditions of use
   - vi. allowable ampacity
   - vii. temperature ratings

2. Identify hazards and describe safe work practices pertaining to conductors and cables.

3. Identify tools and equipment relating to conductors and cables and describe their applications and procedures for use.

4. Interpret codes and regulations pertaining to conductors and cables.
   - i. Canadian Electrical Code (CEC)
     - applications
     - CSA designations
     - voltage ratings
     - number and size range of conductors
     - construction
     - conditions of use
     - allowable ampacity
     - temperature ratings
     - installation
     - terminations

5. Interpret information pertaining to conductors and cables found on drawings and

specifications.

6. Identify types of conductors and cables and describe their characteristics and applications.

7. Identify conductor and cable components and accessories and describe their characteristics and applications.

8. Identify methods of conductor protection and describe their characteristics and applications.
   i. mechanical
   ii. electrical

9. Identify the considerations and requirements for selecting conductors and cables and their associated components and accessories.

10. Describe the procedures used to install conductors and cables and their associated components and accessories.

11. Describe the procedures used to terminate conductors.

Practical Requirements:

1. Prepare and install conductors in raceways as per CEC requirements.

2. Set reels on jacks and stands.

3. Select and terminate cables.
   i. MI
   ii. Armoured
   iii. TECK
   iv. Aluminum sheathed
   v. NMD

4. Determine size of device and junction boxes.

ER1570 Grounding and Bonding

Learning Outcomes:

- Demonstrate knowledge of grounding and bonding methods and equipment.
- Demonstrate knowledge of the procedures used to install grounding and bonding systems.

Duration: 6 Hours

Pre-Requisite(s): ER1161

Objectives and Content:

1. Define terminology associated with grounding and bonding.

2. Identify hazards and describe safe work practices pertaining to grounding and bonding.

3. Interpret codes and regulations pertaining to grounding and bonding.

4. Interpret information pertaining to grounding and bonding found on drawings and specifications.

5. Identify tools and equipment relating to grounding and bonding and describe their applications and procedures for use.

6. Identify methods of grounding and bonding.
   i. exothermic system
   ii. crimp

7. Explain, via instructor demonstration, how to prepare and install an exothermic system, using both electronic and manual ignition systems for the following:
   i. tees
   ii. copper to ground rod weld
   iii. copper to steel weld

8. Identify grounding and bonding conductors, equipment and components and describe their characteristics and applications.

9. Identify the considerations and requirements for selecting grounding and bonding conductors, methods, equipment and components.

10. Describe the procedures used to install grounding and bonding systems.

11. Explain, via instructor demonstration, how to prepare and install a compression system for the following:
    i. tees
    ii. copper to ground rod
    iii. copper to steel
    iv. copper to copper butt splice

Practical Requirements:

None.

ER1221 Conduit, Tubing and Fittings

Learning Outcomes:

- Demonstrate knowledge of conduit, tubing and fittings, their components and accessories.
- Demonstrate knowledge of the procedures used to select, cut, bend and install conduit, tubing and fittings.

Duration: 30 Hours

Pre-Requisite(s): ER1161

Objectives and Content:

1. Define terminology associated with conduit, tubing and fittings.

2. Identify hazards and describe safe work practices pertaining to conduit, tubing and fittings.

3. Interpret codes and regulations pertaining to conduit, tubing and fittings.

4. Interpret information pertaining to conduit, tubing and fittings found on drawings and specifications.

5. Identify tools and equipment related to conduit, tubing and fittings and describe their applications and procedures for use.

6. Identify types of conduit and tubing and describe their characteristics, applications and limitations.

7. Identify conduit and tubing components and accessories and describe their characteristics and applications.
   i. fittings
   ii. couplings
   iii. connectors
   iv. boxes
   v. supports

8. Identify the considerations and requirements for selecting conduit and tubing and their associated components and accessories.

9. Describe the procedures used to cut and bend conduit and tubing.

10. Describe the procedures used to install and support conduit and tubing systems.

11. Describe the procedures used to select and install conduit and tubing related components.

Practical Requirements:

1. Apply proper cutting, coupling and termination methods used with conduit.

2. Install rigid metal conduit.

3. Prepare and bend EMT.

4. Install EMT.

5. Prepare and install PVC conduit.

6. Determine the size requirements of pull boxes and junction boxes.

ER2001 Raceways, Wireways and Busways

Learning Outcomes:

- Demonstrate knowledge of raceways, wireways and busways, their components and accessories.
- Demonstrate knowledge of the procedures used to select, install and support raceways, wireways and busways.
- Demonstrate knowledge of the procedures used to install cables and conductors in cable tray.

Duration: 30 Hours

Pre-Requisite(s): ER1161, ER1141

Objectives and Content:

1. Define terminology associated with raceways, wireways and busways.

2. Identify hazards and describe safe work practices pertaining to raceways, wireways and busways.

3. Interpret codes and regulations pertaining to raceways, wireways and busways.

4. Interpret information pertaining to raceways, wireways and busways found on drawings and specifications.

5. Identify tools and equipment relating to raceways, wireways and busways and describe their applications and procedures for use.

6. Identify types of raceways, wireways and busways and describe their characteristics and applications.

7. Identify raceway, wireway and busway components and accessories and describe their characteristics and applications.

8. Identify considerations and requirements for selecting raceways, wireways and busways and their components and accessories.

9. Describe the procedures used to install raceways, wireways and busways, their components and accessories.

10. Identify types of cable tray and describe their characteristics and applications.

11. Identify cable tray components and accessories and describe their characteristics and applications.

12. Identify the considerations and requirements for selecting cable tray and its components and accessories.

13. Describe the procedures used to install and support cable tray.

14. Describe the procedures used to install and secure cables and conductors in cable tray.

Practical Requirements:

1. Install data track.

2. Install cable tray and wireways.

ER1242 Fundamental Wiring

Learning Outcomes:

- Demonstrate knowledge of basic wiring applications and their associated devices and components.
- Demonstrate knowledge of the procedures used to install basic wiring devices and components.

Duration: 60 Hours

Pre-Requisite(s): ER1161, ER1141

Objectives and Content:

1. Define terminology associated with basic wiring.

2. Identify hazards and describe safe work practices pertaining to basic wiring.

3. Interpret codes and regulations pertaining to basic wiring.

4. Interpret information pertaining to basic wiring found on drawings and specifications.

5. Identify tools and equipment related to basic wiring applications and describe their applications and procedures for use.

6. Identify types of basic wiring applications.
   - i. lights and switches
   - ii. receptacles
   - iii. exhaust fans
   - iv. water pumps and water heaters
   - v. heaters and controls
   - vi. extra low voltage wiring
     - doorbell
     - lighting
   - vii. din rail
     - terminal blocks
     - relay block
     - fuse block
     - jumpers
     - overload relays

7. Identify types of cables used in basic wiring applications and describe their

characteristics.
   i. non-metallic sheathed cables
   ii. armored cables

8. Describe the procedures used to cut, strip and terminate wires used in basic wiring applications.

9. Describe the procedures used to fish and install cables used in basic wiring applications.

10. Describe the procedures used to provide mechanical protection and support for cables used in basic wiring applications.

11. Identify types of devices used in basic wiring applications and describe their characteristics.
   i. lampholders
   ii. switches
   iii. receptacles

12. Describe the procedures used to install devices used in basic wiring applications.

13. Identify types of boxes used in basic wiring applications and describe their characteristics.
   i. outlet
   ii. junction
   iii. pull

14. Describe the procedures used to select and install boxes used in basic wiring applications.

Practical Requirements:

1. Determine the branch circuit requirements according to the CEC.

2. Determine lighting and switching requirements according to the CEC.

3. Space, locate and install outlets according to CEC.

4. Locate and determine the circuit requirements and install specific-use outlets according to the CEC.

5. Install din rail (low-voltage wiring).

6. Install a door bell/door chime system.

ER2011 Lighting Systems and Controls

Learning Outcomes:

- Demonstrate knowledge of lighting systems and controls, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test lighting systems and controls.
- Demonstrate knowledge of the procedures used to store and dispose of fluorescent lighting ballasts, capacitors and lamps.

Duration: 25 Hours

Pre-Requisite(s): ER1242

Objectives and Content:

1. Define terminology associated with lighting systems and controls.
   i. LED
   ii. HID
   iii. incandescent
   iv. florescent

2. Identify hazards and describe safe work practices pertaining to lighting systems and controls.

3. Interpret codes and regulations pertaining to lighting systems and controls.

4. Interpret information pertaining to lighting systems and controls found on drawings and specifications.

5. Identify tools and equipment relating to lighting systems and controls and describe their applications and procedures for use.

6. Identify types of lighting systems and describe their characteristics and applications.

7. Identify lighting system components and accessories and describe their characteristics and applications.

8. Identify types of lighting system controls and describe their characteristics and applications.
   i. extra low voltage
   ii. low voltage

9. Identify lighting system control components and accessories and describe their characteristics and applications.

10. Identify considerations and requirements for selecting lighting systems, their controls, components and accessories.

11. Describe the procedures used to install and connect lighting systems, their controls, components and accessories.

12. Describe the procedures used to troubleshoot lighting systems, their controls, components and accessories.

13. Describe the procedures used to maintain, repair and test lighting systems, their controls, components and accessories.
   i. wireless
   ii. occupancy sensors
   iii. dimming systems

14. Identify the hazards associated with the storage and disposal of fluorescent lighting system ballasts, capacitors and lamps.

15. Describe the procedures used to store and dispose of fluorescent lighting system ballasts, capacitors and lamps.

Practical Requirements:

1. Install incandescent lighting according to CEC requirements in a specified location.

2. Install fluorescent lighting systems according to CEC requirements in a specified location.

3. Install LED lighting system complete with remote drivers according to CEC requirements in a specified location.

4. Connect an HID fixture complete with a multi-tap ballast.

5. Troubleshoot problems with fluorescent lighting systems.

ER1190 Three-Phase Theory

Learning Outcomes:

- Demonstrate knowledge of three-phase electricity, its characteristics and associated principles.
- Demonstrate knowledge of three-phase electricity calculations.

Duration: 30 Hours

Pre-Requisite(s): ER1180

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to three-phase electricity.

2. Describe the generation of three-phase voltages.
   i. characteristics of three-phase
   ii. phase sequence

3. Describe the voltage and current values in three-phase wye connections.
   i. voltage and current relationships in a wye connection
   ii. current relationships in a wye connection
   iii. ground connections
   iv. 3-wire wye connections
   v. 4-wire wye connections
   vi. phase loss calculations

4. Describe the voltage and current values in three-phase delta connections.
   i. cautions regarding improper delta connections
   ii. voltage relationships in a delta connection
   iii. current relationships in a delta connection
   iv. open delta connections
   v. 3-wire delta connections
   vi. 4-wire delta connections
   vii. comparing wye and delta systems

5. Perform calculations for balanced and unbalanced loads.

6. Describe the procedures used to calculate three-phase power, volt-amperes, reactive power and power factor.
   i. three-phase apparent power
   ii. three-phase power
   iii. power factor
   iv. measurements for three-phase power

7. Describe the procedures used to measure three-phase power using watt meters.
   i. two watt meter method
   ii. three watt meter method
   iii. polyphase watt meter

Practical Requirements:

1. Calculate three-phase power, volt-amperes, reactive power, and power factor.

2. Connect three-phase circuits and measure three-phase power using watt-meters.

ER1170 Voltage Drop and Power Loss

Learning Outcomes:

- Demonstrate knowledge of voltage drop and power loss and its impact on a circuit.

Duration: 30 Hours

Pre-Requisite(s): ER1190

Objectives and Content:

1. Identify the types of conductor materials and describe their characteristics.
   i. aluminum
   ii. copper

2. Identify types of insulators and describe their characteristics and applications.

3. Explain conductor resistance and its effects on a circuit.
   i. resistivity
   ii. cross-sectional area
   iii. length
   iv. temperature coefficient of resistance

4. Describe the procedures used to determine conductor resistance.

5. Explain line voltage drop and its effects on a circuit.
   i. factor affecting voltage drop
   ii. calculate voltage drop
   iii. CEC requirements
   iv. voltage drop percentage

6. Explain power loss and its effects on a circuit.
   i. calculate power loss

7. Describe the operation of a three-wire system.
   i. purpose of a three-wire system
   ii. neutral wire

Practical Requirements:

1. Use CEC tables to calculate voltage drop.

2. Calculate the absolute values in three-wire circuits.

ER1271 Single-Phase Service Entrance

Learning Outcomes:

- Demonstrate knowledge of single-phase service entrances, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test single-phase service entrances.
- Demonstrate knowledge of demand factor calculations.

Duration: 30 Hours

Pre-Requisite(s): ER1242

Objectives and Content:

1. Define terminology associated with single-phase service entrances.

2. Identify hazards and describe safe work practices pertaining to single-phase service entrances.

3. Interpret codes and regulations pertaining to single-phase service entrances.

4. Interpret information pertaining to single-phase service entrances found on drawings and specifications.

5. Identify sources of information and documentation required for the installation of single-phase service entrances.

6. Identify tools and equipment relating to single-phase service entrances and describe their applications and procedures for use.

7. Identify types of single-phase service entrances and describe their characteristics and applications.
   i. temporary service
   ii. overhead
   iii. underground
   iv. multiple metering

8. Identify single-phase service entrance components and accessories and describe their characteristics and applications.

9. Identify the considerations and requirements for selecting the type of single-phase service entrances, their components and accessories.

10. Describe the procedures used to calculate demand factor.

11. Describe the procedures used to install and connect single-phase service entrances, their components and accessories.

12. Identify the methods of grounding and bonding single-phase service entrances and describe their associated procedures.

13. Describe the procedures to troubleshoot single-phase service entrances, their components and accessories.

14. Describe the procedures used to maintain, repair and test single-phase service entrances, their components and accessories.

Practical Requirements:

1. Determine service layout and equipment/materials required.

2. Install a single-phase, three wire distribution system.

3. Install single-phase service entrance equipment.

4. Install grounding and bonding electrodes and conductors.

ER1371 Distribution Equipment

Learning Outcomes:

- Demonstrate knowledge of distribution equipment, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test distribution equipment.

Duration: 17 Hours

Pre-Requisite(s): ER1190

Objectives and Content:

1. Define terminology associated with distribution equipment.

2. Identify hazards and describe safe work practices pertaining to distribution equipment.

3. Interpret codes and regulations pertaining to distribution equipment.

4. Interpret information pertaining to distribution equipment found on drawings and specifications.

5. Identify tools and equipment relating to distribution equipment and describe their applications and procedures for use.

6. Identify types of distribution equipment and describe their characteristics and applications.
   i. enclosures
   ii. disconnect switches and switchgear
   iii. panel boards
   iv. low-voltage switchboards
   v. motor control centers

7. Identify distribution equipment components and accessories and describe their characteristics and applications.

8. Identify the considerations and requirements for selecting distribution equipment, its components and accessories.

9. Describe the procedures used to install and connect distribution equipment, its components and accessories.

10. Describe the procedures used to troubleshoot distribution equipment, its components and accessories.

11. Describe the procedures used to maintain, repair and test distribution equipment, its components and accessories.

Practical Requirements:

None.

ER1250 Protective Devices

Learning Outcomes:

- Demonstrate knowledge of protective devices, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test protective devices.

Duration: 30 Hours

Pre-Requisite(s): ER1190

Objectives and Content:

1. Describe the function of protective devices.
   i. overcurrent
   ii. overload
   iii. short circuit
   iv. maximum interrupting capacity

2. Identify hazards and describe safe work practices pertaining to protective devices.

3. Describe the effects of short-circuit current.
   i. fault currents
   ii. percent impedance
   iii. types of damage

4. Describe overcurrent devices, their characteristics and applications
   i. voltage
   ii. current
   iii. interrupting capacity
   iv. time-current characteristics

5. Identify types of fuses and disconnects, and describe their characteristics and applications.
   i. screw-base plug fuses
   ii. standard cartridge fuses
   iii. renewable link fuses
   iv. high rupture capacity fuses
   v. time delay fuses
   vi. classifications of fuses

6. Identify types of low-voltage circuit breakers and describe their characteristics and applications.
   i. thermal trip action
   ii. magnetic trip action
   iii. moulded case
   iv. high interrupting capacity type
   v. ground fault interrupters
   vi. arc fault circuit interrupters
   vii. surge suppression

7. Identify the CEC requirements for the selection of protective devices.

8. Describe the coordination of protective devices.
   i. manufacturer's chart
   ii. engineer's responsibilities
   iii. electrician's responsibilities

9. Describe the procedures used to troubleshoot and maintain protective devices.

Practical Requirements:

1. Select fuses/breakers according to specific requirements and CEC requirements.

2. Determine interrupting capacity requirements of fuses/breakers.

ER2022 Single-Phase Motors

Learning Outcomes:

- Demonstrate knowledge of single-phase motors, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test single-phase motors.

Duration: 30 Hours

Pre-Requisite(s): ER1180

Objectives and Content:

1. Define terminology associated with single-phase motors.

2. Identify hazards and describe safe work practices pertaining to single-phase motors.

3. Interpret codes and regulations pertaining to single-phase motors.

4. Interpret information pertaining to single-phase motors found on drawings and specifications.

5. Identify tools and equipment relating to single-phase motors and describe their applications and procedures for use.

6. Explain the construction and operating principles of single-phase motors.

7. Interpret information contained on motor nameplates.

8. Identify types of single-phase motors and describe their characteristics and applications.

9. Identify single-phase motor components and accessories and describe their characteristics and applications.

10. Identify coupling methods for single-phase motors and describe their characteristics and applications.

11. Identify the considerations and requirements for selecting single-phase motors, their components and accessories.

12. Describe the procedures used to install and connect single-phase motors, their components and accessories.

13. Describe the procedures used to troubleshoot single-phase motors, their components and accessories.

14. Describe the procedures used to maintain, repair and test single-phase motors, their components and accessories.

Practical Requirements:

1. Connect and operate single phase motors using the following:
   i. overload protection
   ii. one-time fuse
   iii. time-delay fuse
   iv. circuit breakers

2. Troubleshoot single-phase motors.

3. Conduct operational tests pertaining to single-phase AC motors.

ER1580 Job Planning

Learning Outcomes:

- Demonstrate knowledge of the procedures used to plan and organize job tasks.

Duration: 6 Hours

Pre-Requisite(s): ER1411, ER1212, ER1161

Objectives and Content:

1. Identify sources of information relevant to planning job tasks.
   i. documentation
   ii. drawings
   iii. related professionals
   iv. clients

2. Describe the considerations to plan and organize job tasks.
   i. permits
   ii. hazard assessment
   iii. personnel
   iv. tools and equipment
   v. materials and supplies
   vi. scheduling/sequencing

3. Identify elements in concrete walls and floors, concrete slab on grade and in soil and describe the types of equipment used to locate them.
   i. conduits
   ii. heating cables
   iii. pipes
   iv. reinforcement bar
   v. post-tensioned cables

4. Describe the safety requirements taken when x-ray surveying equipment is used in occupied buildings.

Practical Requirements:

1. Complete a hazard assessment form.

ER1281 Three-Phase Service Entrance

Learning Outcomes:

- Demonstrate knowledge of three-phase service entrances, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test three-phase service entrances.
- Demonstrate knowledge of three-phase service entrance related calculations.

Duration: 30 Hours

Pre-Requisite(s): ER1271, ER1190

Objectives and Content:

1. Define terminology associated with three-phase service entrances.

2. Identify hazards and describe safe work practices pertaining to three-phase service entrances.

3. Interpret codes and regulations pertaining to three-phase service entrances.

4. Interpret information pertaining to three-phase service entrances found on drawings and specifications.

5. Identify sources of information and documentation required for the installation of three-phase service entrances.

6. Identify tools and equipment relating to three-phase service entrances and describe their applications and procedures for use.

7. Identify types of three-phase service entrances and describe their characteristics and applications.

8. Identify three-phase service entrance components and accessories and describe their characteristics and applications.
   i. distribution panel
   ii. splitters and splitter troughs
   iii. metering equipment
   iv. conductors
   v. grounding and bonding

9. Identify the considerations and requirements for selecting three-phase service

entrances, their components and accessories.

10. Describe the procedures used to install and connect three-phase underground service entrances, their components and accessories.

11. Identify the requirements and describe the procedures for conductor installation and termination.

12. Describe the procedures used to troubleshoot three-phase service entrances, their components and accessories.

13. Describe the procedures used to maintain, repair and test three-phase service entrances, their components and accessories.

14. Perform calculations relating to three-phase service entrances.

Practical Requirements:

1. Install a 400A three-phase service complete with the following:
   i. CTs
   ii. splitters
   iii. panels
   iv. grounding/bonding

ER2351 Electric Surface Heating Systems

Learning Outcomes:

- Demonstrate knowledge of electric surface heating systems, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test electric surface heating systems.

Duration: 15 Hours

Pre-Requisite(s): ER1242, ER1161

Objectives and Content:

1. Define terminology associated with electric surface heating systems.

2. Identify hazards and describe safe work practices pertaining to electric surface heating systems.

3. Interpret codes and regulations pertaining to electric surface heating systems.

4. Interpret information pertaining to electric surface heating systems found on drawings and specifications.

5. Identify tools and equipment relating to electric surface heating systems and describe their applications and procedures for use.

6. Identify types of electric surface heating systems and describe their characteristics and applications.
   i. cables
   ii. panels
   iii. heat tracing
   iv. immersion heaters

7. Identify electric heating surface unit controls, components and accessories and describe their characteristics and applications.

8. Identify the considerations and requirements for selecting electric surface heating systems, their controls, components and accessories.

9. Describe the procedures used to install and connect electric surface heating systems, their controls, components and accessories.

10. Describe the procedures used to troubleshoot electric surface heating systems, their controls, components and accessories.

11. Describe the procedures used to maintain, repair and test electric surface heating systems, their controls, components and accessories.
    i. types of electric heaters
    ii. procedures used to install electric heaters
    iii. procedures used to control electric heaters
    iv. requirements used to perform a heatless calculation

Practical Requirements:

None.

ER1262 Transformers

Learning Outcomes:

- Demonstrate knowledge of transformers, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot and maintain transformers.

Duration: 60 Hours

Pre-Requisite(s): ER1190

Objectives and Content:

1. Define terminology associated with transformers.

2. Identify hazards and describe safe work practices pertaining to transformers.

3. Interpret codes and regulations pertaining to transformers.

4. Interpret information pertaining to transformers found on drawings and specifications.

5. Identify tools and equipment relating to transformers and describe their applications and procedures for use.

6. Explain the operating principles of transformers.

7. Interpret information contained on transformer nameplates.

8. Identify types and classes of transformers and describe their characteristics, applications.
   i. high-voltage
   ii. low-voltage
   iii. special

9. Identify applications for special transformers.
   i. instrument
   ii. auto transformer
   iii. ignition
   iv. isolation
   v. buck and boost
   vi. multi-tap
   vii. zig zag

viii. scott/tee

10. Identify transformer components and accessories and describe their characteristics and applications.

11. Explain transformer polarity and terminal markings.

12. Explain the operation of primary and secondary connections for single-phase transformers.

13. Explain the operation of primary and secondary connections for three-phase transformers.
    i. wye to wye
    ii. wye to delta
    iii. delta to wye
    iv. delta to delta
    v. three-phase four-wire delta
    vi. open delta

14. Identify the considerations and requirements for selecting transformers, their components and accessories.

15. Describe the procedures used to install and connect transformers, their components and accessories.

16. Describe the procedures used to install transformers in parallel.

17. Describe the procedures used to troubleshoot transformers, their components and accessories.

18. Describe the procedures used to maintain and test transformers, their connections, components and accessories.

19. Perform transformer related calculations.
    i. turns/voltage/current ratios
    ii. voltage, current and kVA
    iii. fault current

20. Use schematic diagrams to illustrate transformer connections.

Practical Requirements:

1. Perform polarity tests.

2. Measure transformer voltage/current ratios.

3. Measure and calculate three-phase voltage and current.

4. Connect three-phase transformers and verify connections and voltage.

5. Conduct operational tests pertaining to transformers.

6. Perform transformer related calculations.
   i. turns/voltage/current ratios
   ii. voltage, current and kVA calculations

ER2391 Fiber Optics

Learning Outcomes:

- Demonstrate knowledge of fiber optics, their applications and operation.
- Demonstrate knowledge of the procedures used to install, and connect, troubleshoot, maintain, repair and test fiber optic cables.

Duration: 18 Hours

Pre-Requisite(s): ER1242

Objectives and Content:

1. Define terminology associated with fiber optics.

2. Identify hazards and describe safe work practices pertaining to fiber optics.

3. Interpret codes and regulations pertaining to fiber optics.

4. Interpret information pertaining to fiber optics found on drawings and specifications.

5. Identify tools and equipment relating to fiber optics and describe their applications and procedures for use.

6. Explain the propagation of light through the optical fiber.

7. Identify types of fiber optics systems and describe their characteristics and applications.

8. Identify fiber optic system components and describe their characteristics and applications.
   i. sources
   ii. detectors
   iii. transmitters and receivers

9. Identify types of fiber optic cables and describe their characteristics and applications.
   i. indoor
   ii. outdoor
   iii. hybrid

10. Identify fiber optic cable components and accessories and describe their

characteristics and applications.

11. Identify the considerations and requirements for selecting fiber optic systems and cables, their components and accessories.

12. Describe the procedures used to install and connect fiber optic systems and cables, their components and accessories.
    i. bending radius
    ii. pulling tension
    iii. lubrication
    iv. terminating and splicing

13. Describe the procedures used to troubleshoot fiber optic systems and cables, their components and accessories.

14. Describe the procedures used to maintain, repair and test fiber optic systems and cables, their components and accessories.

Practical Requirements:

None.

ER1341 Fire Alarms

Learning Outcomes:

- Demonstrate knowledge of fire alarm systems, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test fire alarm systems.

Duration: 20 Hours

Pre-Requisite(s): ER2391

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to fire alarm systems.

2. Define terminology associated with fire alarm systems.

3. Interpret codes and regulations pertaining to fire alarm systems.
   i. Canadian Electrical Code requirements
   ii. National Building Code requirements
   iii. Fire Code requirements

4. Interpret information pertaining to fire alarm systems found on drawings and specifications.

5. Identify tools and equipment relating to fire alarm systems and describe their applications and procedures for use.

6. Identify types of fire alarm systems and describe their characteristics and applications.
   i. single stage/single zone
   ii. multi-zone
   iii. two stage
   iv. addressable

7. Identify fire alarm system components and accessories and describe their characteristics and applications.
   i. initiating devices (pull stations and detectors)
   ii. signaling devices (audible and visual)
   iii. control panel

iv. ancillary devices
- communications system wiring
- emergency visual/audio control systems
- fire alarm/extinguishing systems
- electromagnetic door release devices
- fire alarm accessories

8. Identify the considerations and requirements for selecting fire alarm systems, their components and accessories.

9. Describe the procedures used to install and connect fire alarm systems, their components and accessories.
   i. manufacturer's wire types/size requirements
   ii. end-of-line resistors selection chart
   iii. component connections
   iv. control panel connections
   v. typical test procedures

10. Describe the procedures used to verify a fire alarm system and troubleshoot problems.
   i. system check
   ii. systems verification

Practical Requirements:

1. Install, test, and troubleshoot a fire alarm system.

2. Conduct operational tests pertaining to fire alarms.

ER2142 Security Systems

Learning Outcomes:

- Demonstrate knowledge of security systems, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test security systems.

Duration: 10 Hours

Pre-Requisite(s): ER2391

Objectives and Content:

1. Define terminology associated with security systems.

2. Identify hazards and describe safe work practices pertaining to security systems.

3. Interpret codes and regulations pertaining to security systems.

4. Interpret information pertaining to security systems found on drawings and specifications.

5. Identify tools and equipment relating to security systems and describe their applications and procedures for use.

6. Identify types of security and surveillance systems and describe their characteristics and applications.
   i. perimeter
   ii. space
   iii. spot

7. Identify security and surveillance system components and accessories and describe their characteristics and applications.
   i. devices
      - detection/monitoring
      - alarm/signaling
      - access
   ii. control panels

8. Identify the considerations and requirements for selecting security and surveillance systems, their components and accessories.

9. Describe the procedures used to install and connect security and surveillance systems, their components and accessories.

10. Describe the procedures used to troubleshoot security and surveillance systems, their components and accessories.

11. Describe the procedures used to maintain, repair and test security and surveillance systems, their components and accessories.

Practical Requirements:

None.

ER2134 Communication Systems

Learning Outcomes:

- Demonstrate knowledge of communication systems, their applications and operation.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, maintain, repair and test communication systems.

Duration: 20 Hours

Pre-Requisite(s): ER2391

Objectives and Content:

1. Define terminology associated with communication systems.

2. Identify hazards and describe safe work practices pertaining to communication systems.

3. Interpret codes and regulations pertaining to communication systems.

4. Interpret information pertaining to communication systems found on drawings and specifications.

5. Identify tools and equipment relating to communication systems and describe their applications and procedures for use.

6. Identify types of communication systems and describe their characteristics and applications.
   i. voice/data
   ii. public address
   iii. nurse call
   iv. building automation

7. Identify communication system components and accessories and describe their characteristics and applications.

8. Identify methods of data transfer and describe their applications.
   i. copper
   ii. fiber optic
   iii. wireless

9. Identify the considerations and requirements for selecting communication

systems, their components and accessories.

10. Describe the procedures used to install and connect communication systems, their components and accessories.

11. Describe the procedures used to troubleshoot communication systems, their components and accessories.

12. Describe the procedures used to maintain, repair and test communication systems, their components and accessories.

13. Describe the procedures used to install, configure, and maintain networking systems.
    i. explain general types of network topologies used in industry.
        - bus
        - ring
        - star
    ii. explain the use of addressing with different network topologies
    iii. identify and explain the operation of networking components.
        - modems
        - routers
        - switches
        - structured cabling
        - racks
        - punch blocks
        - cross-connects
        - gateways
    iv. specialty tools such as punch downs, crimp tools
    v. identify and describe cables used for industrial networks
    vi. identify and explain the codes and standards for installation and maintenance of industrial networks
    vii. identify and explain the operation of network testing devices
        - wire mappers
        - multi-meters
        - network analyzers (OTDR)
    viii. describe the methods used for converting from one network protocol to another.

Practical Requirements:

None.

ER1590 Introduction to Communication and Trade Documentation

Learning Outcomes:

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of trade related documentation and its use.

Duration: 6 Hours

Pre-Requisite(s): ER1580

Objectives and Content:

1. Describe the importance of effective verbal and non-verbal communication.
   - i. other tradespersons
   - ii. colleagues
   - iii. supervisors
   - iv. suppliers/manufacturers

2. Identify types of trade related documentation and describe their purpose, applications and procedures for use.
   - i. manufacturers' specifications
   - ii. codes and standards (CSA)
     - Canadian Electrical Code
     - National Building Code
     - ISA
   - iii. work orders / work packs
   - iv. maintenance schedules
     - preventative maintenance
     - predictive maintenance
   - v. calibration/maintenance records

Practical Requirements:

1. Complete a work order.

ELE-130 Mentoring I

Learning Outcomes:

- Demonstrate knowledge of strategies for learning skills in the workplace.

Duration: 6 Hours

Pre-Requisite(s): None.

Objectives and Content:

1. Describe the importance of individual experience.

2. Describe the shared responsibilities for workplace learning.

3. Determine one's own learning preferences and explain how these relate to learning new skills.

4. Describe the importance of different types of skills in the workplace.

5. Describe the importance of essential skills in the workplace.
   i. reading
   ii. writing
   iii. document use
   iv. oral communication
   v. numeracy
   vi. thinking skills
   vii. working with others
   viii. digital technology
   ix. continuous learning

6. Identify different learning needs and describe the strategies to meet these needs.
   i. learning disabilities
   ii. learning preferences
   iii. language proficiency

7. Identify strategies to assist in learning a skill.
   i. understanding basic principles of instruction
   ii. developing coaching skills
   iii. being mature and patient
   iv. providing feedback

Practical Requirements:

None.

AM1000 Introduction to Essential Skills

Learning Outcomes:

- Demonstrate knowledge of the nine nationally recognized essential skills.
- Demonstrate knowledge of the essential skills levels of complexity.
- Demonstrate knowledge of the essential skills required for the learners chosen trade.
- Demonstrate an awareness of essential skills assessments.

Duration: 9 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Identify and describe the essential skills recognized by the Government of Canada through the Office of Literacy and Essential Skills (OLES).
   i. reading
   ii. document use
   iii. numeracy
   iv. writing
   v. oral communication
   vi. working with others
   vii. thinking
   viii. computer use
   ix. continuous learning

2. Describe the Levels of Complexity measurement assigned to essential skills.

3. Identify the essential skills, along with their complexity level, identified as necessary for the learner's trade.
   i. RSOS / NOA content[1]
   ii. OLES Essential Skills Profiles[2]
   iii. OLES tools and support for apprentices and tradespersons[3]

4. Describe the nature and purpose of essential skills assessment.
   i. self-assessment & formal assessment tools
   ii. indicators of deficiencies
   iii. suggestions for improvement

5. Describe the benefits of essential skills improvement.
   i. confidence at work
   ii. employability
   iii. success in apprenticeship
   iv. wage & job advancement

Practical Requirements:

1. Complete an essential skills self-assessment addressing numeracy, document use and reading. The online **Government of Canada Essential Skills Indicator[4] and Essential Skills self-assessment for the trades[5]** are to be used unless the instructor provides a similar assessment tool or tools.

2. Participate in a group discussion about the impact of gaps in essential skills that may be revealed by the self-assessments completed, and the value of improving essential skills.

*Students are graded complete or incomplete on this practical work, no grade is permitted for self-assessment performance. However, completion of the practical requirements is mandatory for completion of this unit.

Resources:

All footnotes are in the companion document “Resources for Introduction to Essential Skills” which is available online from Apprenticeship and Trade Certification.

AP1102 Introduction to Apprenticeship

Learning Outcomes:

- Demonstrate knowledge of how to become a registered apprentice.
- Demonstrate knowledge of the steps to complete an apprenticeship program.
- Demonstrate knowledge of various stakeholders in the apprenticeship process.
- Demonstrate knowledge of the Red Seal Program.

Duration: 12 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with apprenticeship.
   i. apprentice
   ii. registered apprentice
   iii. trade qualifier
   iv. journeyperson
   v. certified journeyperson
   vi. Certificate of Apprenticeship
   vii. Certificate of Qualification
   viii. dual certification
   ix. compulsory trades

2. Explain the roles and responsibilities of those involved in the apprenticeship system in Newfoundland and Labrador.
   i. registered apprentice
   ii. training institution
   iii. employer
   iv. journeyperson
   v. mentor
   vi. Department of Immigration, Population Growth and Skills
      - Industrial Training section
      - Standards and Curriculum section
   vii. Provincial Trade Advisory Committees (PTAC)
   viii. Provincial Apprenticeship and Certification Board (PACB)

3. Describe the training components of an apprenticeship.
   - i. in-school
     - Pre-employment / Level 1
     - advanced levels
   - ii. workplace experience

4. Explain the steps in the registered apprenticeship process.
   - i. meet entrance requirements
     - education
     - employment
     - Recognition of Prior Learning (RPL) - if applicable
   - ii. complete the registration process
     - application
     - required documents
   - iii. complete the Memorandum of Understanding (MOU)
     - contract responsibilities
     - probation period
     - cancellation
   - iv. maintain Record of Occupational Progress (Logbook)
     - sign off skills
     - record hours
     - update Apprenticeship Program Officer (APO) on progress
   - v. class calls
     - hour requirements
     - EI eligibility
     - training schedule
   - vi. level examinations - if applicable
   - vii. progression schedule
     - apprenticeship level
     - wage rates
   - viii. certification examinations
     - Provincial
     - Red Seal
       - written
       - practical - if applicable
   - ix. certification
     - Certificate of Apprenticeship
     - Certificate of Qualification
     - Provincial journeyperson - Blue Seal
     - Interprovincial journeyperson - Red Seal endorsement (RSE)

5. Identify the Conditions Governing Apprenticeship.

6. Discuss cancellation of apprenticeship.
   i. failure to notify of address change
   ii. extended periods of unemployment
   iii. lack of contact with an APO for an extended period
   iv. failure to respond to class calls
   v. declining of multiple class calls

7. Explain the Red Seal program.
   i. designated Red Seal trades
   ii. the Red Seal Occupational Standard (RSOS)
   iii. relationship of RSOS to Red Seal examination
   iv. national qualification recognition and mobility

8. Identify the current financial incentives available to apprentices.
   i. Federal
   ii. Provincial

9. Explain the Provincial / Territorial Apprentice Mobility Guidelines.
   i. temporary mobility
   ii. permanent mobility

10. Describe Atlantic and National Harmonization initiatives.

Practical Requirements:

1. Use the Provincial Apprenticeship and Trades Certification website at www.gov.nl.ca/atcd.
   i. locate, download, and complete the Application for Apprenticeship and Memorandum of Understanding (MOU)
   ii. locate the address of the Industrial Training office closest to this campus
   iii. locate the training schedule and identify the start date of the next class call for this trade
   iv. locate and review the learning resources applicable to this trade
      - Study Guide
      - Exam Preparation Guide
      - Plan of Training

2. Use the Plan of Training applicable to this trade.
   i. locate the hours for the trade
      - total in-school
      - total required for certification
   ii. locate the number of levels
   iii. locate the courses in each level
   iv. locate the hours required for progression to a Level 2 apprentice and the wage percentage of that level

AM1101 Math Essentials

Note: It is recommended that AM1101 be delivered in the first semester of the Pre-employment program.

Learning Outcomes:

- Demonstrate knowledge of essential numeracy skills.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of mathematical principles in trade problem solving situations.
- Demonstrate the ability to solve simple mathematical word problems.

Duration: 42 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Describe whole number operations.
   i. read, write, count, round off, add, subtract, multiply and divide whole numbers.

2. Describe the application of the order of operations in math problems.

3. Describe fraction and mixed number operations.
   i. read, write, add, subtract, multiply and divide fractions.

4. Describe decimal operations.
   i. read, write, round off, add, subtract, multiply and divide decimals.

5. Describe percent/decimal/fraction conversion and comparison.
   i. convert between fractions, decimals and percents.

6. Identify percentage operations.
   i. read and write percentages
   ii. calculate base, rates and percentages

7. Identify ratio and proportion operations.
   i. use a ratio comparing two quantities with the same units
   ii. use a proportion comparing two ratios

8. Describe the use of the imperial measurement system in math problems.
   i. identify units of measurement
      - length
      - mass
      - area
      - volume
      - capacity

9. Describe the use of the metric measurement system in math problems.
   i. identify units of measurement
      - length
      - mass
      - area
      - volume
      - capacity

10. Identify angles, lines and geometric shapes.
   i. use a protractor to measure angles
   ii. determine whether an angle is right, acute or obtuse
   iii. identify parallel, perpendicular, horizontal and vertical lines
   iv. identify types of triangles, quadrilaterals, and 3-dimensional shapes

11. Describe estimation strategies.
   i. estimate a linear measure using a referent
   ii. estimate length, area and volume of objects in metric and imperial systems

12. Describe problem solving that involves linear measurement using instruments such as rulers or tape measures, in the metric and imperial systems.

Practical Requirements:

1. To emphasize or further develop specific knowledge objectives, students will be required to complete practical demonstrations, which confirm proper application of mathematical theory to job skills.

AM1161 Electrician Math Fundamentals

Learning Outcomes:

- Demonstrate knowledge of mathematical concepts in the performance of trade practices.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Solve mathematical word problems.
- Demonstration knowledge of mathematical principles for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

Duration: 42 Hours

Pre-Requisite(s): AM1101

Objectives and Content:

The instructor is required to use trade specific examples to reinforce the course objectives.

1. Describe percent/decimal/fraction conversions and comparisons in trade specific situations.

2. Describe ratios and proportions as they relate to trade specific problems.

3. Describe the use of the Imperial and Metric measurement systems in trade specific applications.

4. Describe Imperial and Metric conversions in trade specific situations.
   i. convert between imperial and metric measurements
   ii. convert to another unit within the same measurement system

5. Describe how to manipulate formulas using cross multiplication, dividing throughout, elimination, and substitution to solve trade specific problems.
   i. right angle triangles
   ii. area
   iii. volume
   iv. perimeter
   v. density

6. Identify calculations involving geometry that are relevant to the trade.
   i. angle calculations
   ii. circle calculations

7. Identify math processes used to complete administrative trade tasks.
   i. material estimation
   ii. material costing
   iii. time & labour estimates
   iv. taxes & surcharges
   v. markup & projecting revenue

Practical Requirements:

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations, which confirm proper application of mathematical theory to job skills.

Note: This course is **Non-Transferable** to other trades programs, and **Not Eligible for Prior Learning Assessment**. Students completing training in this trade program are required to complete this math course. Apprentice transfers under Provincial / Territorial Mobility agreements may be exempt from this requirement.

CM2161 Communication Essentials

Learning Outcomes:

- Demonstrate knowledge of the importance of well-developed writing and oral communication skills in the workplace.
- Demonstrate knowledge of the principles of effective workplace writing.
- Demonstrate knowledge of the purpose of various types of workplace documentation and workplace meetings.
- Demonstrate knowledge of the importance of effective interpersonal skills in the workplace.
- Demonstrate knowledge of effective job search techniques

Duration: 36 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Define communications terminology used in the trade.

2. Identify the principles of effective workplace writing.
   i. grammar, punctuation, mechanics
   ii. sentence and paragraph construction
   iii. tone, language, and word choice
   iv. the writing process
      - planning
      - writing
      - editing/revising

3. Identify sources of information used to communicate in the workplace.
   i. regulations
   ii. codes
   iii. OH&S requirements
   iv. prints, drawings and specifications
   v. company and client documentation

4. Identify types and purposes of informal workplace documents.
   i. reports
      - incident
      - process
      - progress
   ii. common trade specific forms
   iii. primary and secondary methods of information gathering
   iv. accuracy and completeness in reports and forms

5. Demonstrate an understanding of interpersonal communications in the workplace.
   i. recognize group dynamics
   ii. contribute information and expertise
   iii. individual learning styles
      - audible
      - visual
      - experiential
      - theoretical
   iv. recognize respectful and open communication
   v. accept and provide feedback
   vi. interpret non-verbal communication cues
      - body language
      - signals

6. Demonstrate an understanding of effective oral communication skills.
   i. listening
      - receiving, understanding, remembering, reflecting, evaluating, paraphrasing, and responding
   ii. speaking
      - using clear and proper words
      - tone, style, and vocabulary
      - brevity
   iii. common workplace oral communication situations
      - introducing self and others
      - telephone conversations
      - tool box/safety talks
      - face-to-face conversations
      - communicating with co-workers, supervisors, clients, and other trades people

7. Identify common practices related to workplace meetings.
   i. meeting formats
   ii. meeting preparation
   iii. agendas and minutes
   iv. roles, responsibilities, and etiquette of meeting participants

8. Identify acceptable workplace use of communication technologies.
   i. cell / smart phone etiquette
   ii. voice mail
   iii. e-mail
   iv. texting / messaging through social media
   v. teleconferencing / videoconferencing for meetings and interviews
   vi. social networking
   vii. other emerging technologies

9. Demonstrate an understanding of effective job search techniques.
   i. employment trends, opportunities, and sources of employment
   ii. job ads and the importance of fitting qualifications to job requirements
   iii. resumes
      - characteristics of effective resumes
      - types of resumes
      - principles of resume formatting
   iv. effective cover letters
   v. job interview process
      - pre-interview preparation
      - interview conduct
      - post-interview follow up

Practical Requirements:

1. Write a well-developed, coherent, unified paragraph.

2. Complete a trade-related form.

3. Prepare an agenda for a toolbox safety talk.

4. Participate in a simulated oral workplace communication situation.

5. Prepare a resume.

SD1761 Workplace Essentials

Note: It is recommended that SD1761 be delivered in the second half of Pre-employment training.

Learning Outcomes:

- Demonstrate knowledge of workplace requirements in the areas of personal responsibility, unions, workers compensation, workers' rights, and human rights.
- Demonstrate knowledge of quality customer service.

Duration: 24 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify personal responsibilities and attitudes that contribute to on-the-job success.
   i. asking questions
   ii. working safely
   iii. accepting constructive feedback
   iv. time management & punctuality
   v. respect for authority
   vi. stewardship of materials, tools and properties

2. Define unions and identify their role in the workplace.
   i. purpose of unions
   ii. common union structure
   iii. unions in this trade

3. Demonstrate an understanding of the Worker's Compensation process.
   i. aims, objectives, and benefits of the Workplace Health, Safety and Compensation Commission
   ii. role of the workers advisor
   iii. internal review process

4. Demonstrate an understanding of worker's rights.
   i. labour standards
   ii. regulations, including:
      - hours of work & overtime
      - termination of employment
      - minimum wages & allowable deductions
      - statutory holidays, vacation time, and vacation pay

5. Demonstrate an understanding of human rights issues.
   i. awareness of the Human Rights Code and the role of the Human Rights Commission
   ii. categories of discrimination and strategies for prevention
      - direct
      - systemic
      - adverse effect
   iii. types of discrimination
      - race
      - ethnic origin
      - colour
      - religion
      - age
      - gender identify
      - sexual orientation
      - marital status
      - family status
      - disability
      - criminal conviction that has been pardoned
   iv. conduct that constitutes harassment and discrimination
      - objectionable conduct
      - comments or displays made either on a one-time or continuous basis that demeans, belittles, or causes personal humiliation or embarrassment to the recipient
   v. the value of diversity in the workplace
      - culture
      - gender identify
      - sexual orientation

6. Demonstrate an understanding of quality customer service.
    i. importance of quality service
    ii. barriers to quality service
        - physical and physiological
        - cultural
        - technological
    iii. customer needs & common methods for meeting them
    iv. characteristics & importance of a positive attitude
    v. interactions with challenging customers
    vi. addressing complaints and resolve conflict

Practical Requirements:

None.

MC1062 Computer Essentials

Learning Outcomes:

- Demonstrate knowledge of desktop/laptop and mobile computers and their operation.
- Demonstrate knowledge of word processing and spreadsheet software, internet browsers and their applications.
- Demonstrate knowledge of e-mail applications and procedures.
- Demonstrate an awareness of security issues related to computers.
- Demonstrate an awareness of online learning using computers.

Duration: 15 Hours

Pre-Requisite(s): None

Objectives and Content:

When possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify computer types used in the workplace, and the characteristics of each.
   i. desktop/laptop computers
   ii. tablets
   iii. smartphones

2. Identify common desktop and mobile operating systems.
   i. Windows
   ii. Mac OS
   iii. iOS
   iv. Android

3. Describe the use of Windows operating system software.
   i. start and end a program
   ii. use the help function
   iii. use the find function
   iv. maximize and minimize a window
   v. open and scroll through multiple windows
   vi. use the task bar
      - adjust desktop settings such as screen savers, screen resolution, and backgrounds
   vii. shut down a computer

4. Identify the skills necessary to perform file management commands.
   i. create folders
   ii. copy files and folders
   iii. move files and folders
   iv. rename files and folders
   v. delete files and folders

5. Describe the use of word processing software to create documents.
   i. enter & edit text
   ii. indent and tab text
   iii. change text attributes
      - bold
      - underline
      - font
   iv. change layout format
      - margins
      - alignment
      - line spacing
   v. spell check and proofread
   vi. save, close & reopen a document
   vii. print document

6. Describe the use of spreadsheet software to create documents.
   i. enter data in cells
   ii. format data in cells
   iii. create formulas to add, subtract, multiply and divide
   iv. save, close & reopen a spreadsheet
   v. print spreadsheet

7. Describe the use of the internet in the workplace.
   i. web browsers
   ii. search engines
   iii. security issues
   iv. personal responsibility for internet use at work

8. Describe the role of e-mail.
   i. e-mail etiquette
      - grammar and punctuation
      - privacy issues when sharing and forwarding e-mail
      - work appropriate content
      - awareness of employer policies

ii. managing e-mail
- using folders
- deleting, forwarding, replying

iii. adding attachments to e-mail
iv. view e-mail attachments
v. printing e-mail

9. Describe computer use for online learning.
i. online training
ii. level exams
iii. study guides
iv. practice exams

Practical Requirements:

1. Create, save and print a document using word processing software.

2. Create, save and print a document using spreadsheet software.

3. Send and receive an e-mail with an attachment.

OT1150 Workterm

Learning Outcomes:

- Demonstrate knowledge of theory and practical applications of trade skills, safe work practices, appropriate workplace behaviour, and time management through exposure to the trade in an authentic work environment

NOTE: The pre-apprentice must be supervised at the workplace. Supervision staff must be appropriately qualified to undertake that role – preferably a certified Journeyperson for the trade.

Duration: 80 Hours

Pre-Requisite(s): None

C. Conditions Governing Apprenticeship Training

1.0 General

The following general conditions apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board (PACB) in accordance with the **Apprenticeship Training and Certification Act (1999)**. If an occupation requires additional conditions, these will be noted in the specific Plan of Training for the occupation. In no case should there be a conflict between these conditions and the additional requirements specified in a certain Plan of Training. All references to Memorandum of Understanding will also apply to Letter of Understanding (LOU) agreements.

2.0 Entrance Requirements

2.1 Entry into the occupation as an apprentice requires:

Indenturing into the occupation by an employer who agrees to provide the appropriate training and work experiences as outlined in the Plan of Training.

2.2 Notwithstanding the above, each candidate must have successfully completed a high school program or equivalent, and in addition may be required to have completed certain academic subjects as specified in a particular Plan of Training. Mature students, at the discretion of the Director of Apprenticeship and Trades Certification, may be registered. A mature student is defined as one who has reached the age of 19 and who can demonstrate the ability and the interest to complete the requirements for certification.

2.3 At the discretion of the Director of Apprenticeship and Trades Certification, credit toward the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 An Application for Apprenticeship form must be duly completed along with a Memorandum of Understanding as applicable to be indentured into an Apprenticeship. The Memorandum of Understanding must contain signatures of an authorized employer representative, the apprentice and an official representing the Provincial Apprenticeship and Certification Board to be valid.

2.5 A new Memorandum of Understanding must be completed for each change in an employer during the apprenticeship term.

3.0 Probationary Period

The probationary period for each Memorandum of Understanding will be six months or 900 employment credit hours. Within that period the memorandum may be terminated by either party upon giving the other party and the PACB one week notice in writing.

4.0 Termination of a Memorandum of Understanding

After the probationary period referred to in Section 3.0, the Memorandum of Understanding may be terminated by the PACB by mutual consent of the parties involved, or cancelled by the PACB for proper and sufficient cause in the opinion of the PACB, such as that stated in Section14.

5.0 Apprenticeship Progression Schedule, Wage Rates and Advanced Training Criteria

Progression Schedule

Industrial Electrician - 7200 Hours			
Apprenticeship Level And Wages			
Level	Wage Rate	Requirements for Progression to Next Level	Next Level
1	60%	▪ Completion of Pre-Employment / AACS Level 1 training ▪ Registration as an apprentice ▪ Pass Level 1 exam* ▪ Minimum 1800 hours of combined relevant work experience and training	2nd Year
2	70%	▪ Completion of AACS Level 2 training ▪ Pass Level 2 exam* ▪ Minimum 3600 hours of combined relevant work experience and training	3rd Year
3	80%	▪ Completion of AACS Level 3 training ▪ Pass Level 3 exam* ▪ Minimum 5400 hours of combined relevant work experience and training	4th Year
4	90%	▪ Completion of AACS Level 4 training ▪ Pass Level 4 exam* ▪ Minimum 7200 hours of combined relevant work experience and training ▪ Sign-off of all workplace skills in apprentice logbook ▪ Pass certification exam	Journeyperson Certification

Wage Rates

- Rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice.
- Rates must not be less than the wage rate established by the Labour Standards Act (1990), as now in force or as hereafter amended, or by other order, as amended from time to time replacing the first mentioned order.
- Rates must not be less than the wage rate established by any collective agreement, which may be in force at the apprentice's workplace.
- Employers are free to pay wage rates above the minimums specified.

Level Exams*

- This program may **not** currently contain level exams, in which case this requirement will be waived until such time as level exams are available.

Industrial Electrician - 7200 Hours		
Class Calls (After Apprenticeship Registration)		
Call Level	Requirements for Class Call	Hours awarded for In-School Training
Direct Entry Level 1	▪ Minimum of 1800 hours of relevant work experience ▪ Prior Learning Assessment (PLA) at designated college (if applicable)	300
Level 2	▪ Minimum of 3000 hours of relevant work experience and training	270
Level 3	▪ Minimum of 5400 hours of relevant work experience and training	240
Level 4	▪ Minimum of 7000 hours of relevant work experience and training	360

Class Calls at Minimum Hours

- Class calls may not always occur at the minimum hours indicated. Some variation is permitted to allow for the availability of training resources and apprentices.

6.0 Tools

Apprentices shall be required to obtain their own hand tools applicable for the designated occupation of registration or tools as specified by the PACB.

7.0 Periodic Examinations and Evaluation

7.1 Every apprentice shall submit to such occupational tests and examinations as the PACB shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her apprenticeship level and rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Apprenticeship and Trades Certification and his/her date of completion shall be deferred accordingly. Persistent failure to pass required tests shall be a cause for revocation of his/her Memorandum of Understanding.

7.2 Upon receipt of reports of accelerated progress of the apprentice, the PACB may shorten the term of apprenticeship and advance the date of completion accordingly.

7.3 For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.

7.4 Course credits may be granted through the use of a PACB approved matrix which identifies course equivalencies between designated trades and between current and historical Plans of Training for the same trade.

8.0 Granting of Certificates of Apprenticeship

Upon the successful completion of apprenticeship, the PACB shall issue a Certificate of Apprenticeship.

9.0 Hours of Work

Any hours employed in the performance of duties related to the designated occupation will be credited towards the completion of the term of apprenticeship. Appropriate documentation of these hours must be provided.

10.0 Copies of the Registration for Apprenticeship

The Director of Apprenticeship and Trades Certification shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

11.0 Ratio of Apprentices to Journeypersons

Under normal practice, the ratio of apprentices to journeypersons shall not exceed two apprentices to every one journeyperson employed. Other ratio arrangements would be determined and approved by the PACB.

12.0 Relationship to a Collective Bargaining Agreement

Where applicable in Section 5 of these conditions, Collective Agreements take precedence.

13.0 Amendments to a Plan of Apprenticeship Training

A Plan of Training may be amended at any time by the PACB.

14.0 Employment, Re-Employment and Training Requirements

14.1 The Plan of Training requires apprentices to regularly attend their place of employment.

14.2 The Plan of Training requires apprentices to attend training for that occupation as prescribed by the PACB.

14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their MOUs reinstated by the PACB but would be subject to a commitment to complete the entire program as outlined in the General Conditions of Apprenticeship. Permanent cancellation in the said occupation is the result of non-compliance.

14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or qualifying to receive a class call to training as a registered Trade Qualifier. Cancellation must be mutually agreed upon by the employer and the apprentice.

14.5 An employer shall ensure that each apprentice is under the direct supervision of an approved journeyperson supervisor who is located at the same worksite as the apprentice, and that the apprentice is able to communicate with the journeyperson with respect to the task, activity or function that is being supervised.

14.6 Under the Plan of Training the employer is required to keep each apprentice employed as long as work is available, and if the apprentice is laid off due to lack of work, to give first opportunity to be hired before another is hired.

14.7 The employer will permit each apprentice to attend training programs as prescribed by the PACB.

14.8 Apprentices who cannot acquire all the workplace skills at their place of employment will have to be evaluated in a simulated work environment at a PACB authorized training institution and have sign-off done by instructors to meet the requirements for certification.

15.0 Appeals to Decisions Based on Conditions Governing Apprenticeship Training

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Immigration, Population Growth and Skills within 30 days of the decision.

D. Requirements for Red Seal Endorsement

1. Evidence the required work experiences outlined in this Plan of Training have been obtained. This evidence must be in a format clearly outlining the experiences and must be signed by an appropriate person or persons attesting that these experiences have been obtained to the level required.

2. Successful completion of all required courses in the program.

3. A combination of training from an approved training program and suitable work experience totaling 7200 hours.

   Or

   A total of 10,800 hours of suitable work experience.

4. Completion of a National Red Seal examination, to be set at a place and time determined by the Apprenticeship and Trades Certification Division.

E. Roles and Responsibilities of Stakeholders in the Apprenticeship Process

The apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section outlines these roles and the responsibilities resulting from them.

The Apprentice:

- completes all required technical training courses as approved by the PACB.
- finds appropriate employment.
- completes all required work experiences in combination with the required hours.
- ensures work experiences are well documented.
- approaches apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyperson.
- obtains the required hand tools as specified by the PACB for each period of training of the apprenticeship program.

The Employer:

- provides high quality work experiences in an environment conducive to learning.
- remunerates apprentices as set out in the Plan of Training or Collective Agreements.
- provides feedback to training institutions, Apprenticeship and Trades Certification Division and apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, releases apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ensures work experiences of the apprentice are documented.
- ensures a certified journeyperson is currently on staff in the same trade area as the apprentice and whose certification is recognized by the NL Department of Immigration, Population Growth and Skills.

The Training Institution:

- provides a high quality learning environment.
- provides the necessary student support services that will enhance an apprentice's ability to be successful.
- participates with other stakeholders in the continual updating of programs.

The Apprenticeship and Trades Certification Division:

- establishes and maintains program advisory committees under the direction of the PACB.
- promotes apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- establishes and maintains a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- ensures all apprentices are appropriately registered and records are maintained as required.
- schedules all necessary technical training periods for apprentices to complete requirements for certification.
- administers level, provincial and Red Seal examinations.

The Provincial Apprenticeship and Certification Board:

- sets policies to ensure the provisions of the **Apprenticeship and Certification Act (1999)** are implemented.
- ensures advisory and examination committees are established and maintained.
- accredits institutions to deliver apprenticeship training programs.
- designates occupations for apprenticeship training and/or certification.