



9055

INTRODUCTION TO ELECTRICAL
TRADES TECHNOLOGY (10)

20S/20E/20M

An Electrical Trades Technology Course

9055: INTRODUCTION TO ELECTRICAL TRADES TECHNOLOGY (10) 20S/20E/20M

Course Description

Students will be introduced to basic electrical concepts. They will begin to design and wire circuits. Students are introduced to safety, tools, and equipment for electrical/electronic systems.

Goal 1: Describe and apply **health and safety** practices.

GLO 1.1: Describe and apply **health and safety** practices.

SLO 10.1.1.1: Identify safety and health requirements. (A2.1)

- overview of *The Workplace Safety and Health Act* (“the Act”)
 - rights and responsibilities of employees under the *Act*
 - rights and responsibilities of employers under the *Act*
 - rights and responsibilities of supervisors under the *Act*
- fourteen (14) regulations
- codes of practice
- guidelines
- right to refuse
 - explanation of right to refuse process
 - rights and responsibilities of employees
 - rights and responsibilities of employers
 - rights and responsibilities of supervisors under the *Act*

SLO 10.1.1.2: Describe the importance of using personal protective equipment (PPE), and identify PPE and procedures related to PPE. (A2.2) (TSA 16)

- employer and employee responsibilities as related to personal protective equipment.
- standards: Canadian Standards Association (CSA), American National Standards Institute (ANSI) and guidelines
- work protective clothing and danger if it fits poorly.
- gloves—importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)

- headwear—appropriate protective headwear when required and the approved type of headwear.
 - eye protection—comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
 - foot protection—when required according to safety standards
 - hearing protection
 - hazards of various noise levels (hearing protection must be worn)
 - laws
 - types of hearing protection
 - respiratory protection—types, overview of proper selection
 - fall protection—Manitoba requirements standards guidelines
 - ANSI (U.S.A. standards), etc.
 - ladders and scaffolding
 - safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)
- SLO 10.1.1.3: Outline the safety principles for working on and around electrical equipment. (A2.3) (TSA 18)
- effects of electric current on the human body
 - three factors that affect the severity of an electric shock
 - the effects of arc and blast on the human body and equipment
 - work with energized equipment
- SLO 10.1.1.4: Identify fire safety and outline workplace fire safety principles. (A2.4) (TSA 19)
- types of fires
 - types of firefighting equipment
 - classifications of fire extinguishers (A, B and C)
 - location of fire extinguishers and fire exits
 - fire alarms and drills
- SLO 10.1.1.5: Recognize and control hazards. (A2.6)
- safe work practices
 - basic risk assessment
 - injury prevention and control measures
 - identification of hazards involved in pneumatic tool use and explanation of how to guard against them

- SLO 10.1.1.6: Identify the hazards in confined spaces and the preparation needed to work in a confined space. (A2.7) (TSA 20)
- identification of a confined space
 - hazards of a confined space
 - physical
 - biological
 - working in a confined space
 - emergency response plan
 - self-contained breathing apparatus (SCBA)
- SLO 10.1.1.7: Identify first aid/CPR. (A2.8)
- overview of first-aid regulation
 - obligations of employers regarding first aid
 - Who is certified to provide first aid?
 - What to do while waiting for help?
 - Where is first-aid kit?
 - describe basic first-aid requirements and techniques
 - scope and limits of first-aid intervention
 - specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
 - What is it?
 - interface with other services and agencies (e.g. Workers Compensation claims)
 - describe basic cardiopulmonary resuscitation (CPR) requirements and techniques
 - How do you get certified?
 - scope and limits of CPR intervention (include varieties of CPR certification)
- SLO 10.1.1.8: Explain the Workplace Hazardous Material Information System (WHMIS), and identify the safety requirements as they apply to WHMIS. (A2.9) (TSA 13)
- WHMIS is a system
 - provincial regulation under *The Workplace Safety and Health Act*
 - each province has a WHMIS regulation
 - Federal *Hazardous Products Act*
 - WHMIS generic training:
 - WHMIS defined and the format used to convey information about hazardous materials in the workplace

- information found on supplier and workplace labeling using WHMIS
 - hazardous materials in accordance with WHMIS
 - compliance with government safety standards and regulations
 - description of WHMIS (include varieties of WHMIS Certification)
 - typology of WHMIS labels, symbols, and classifications
 - scope and use of Materials Safety Data Sheets (MSDS)
- SLO 10.1.1.9: Identify and control hazards (A2.10)
- basic control measures (injury prevention)
 - safe work procedures
 - explanation on the importance of industrial housekeeping
 - employer responsibilities
 - how and where to store materials
 - safety measures related to walkways, stairs and floor openings
 - explanation of how to protect the worker and others when working in traffic paths
- SLO 10.1.1.10: Create and maintain a safe and organized working environment.
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GLO 1.2: Demonstrate awareness of electrical safety as it pertains to the ***Trade Safety Awareness Manual***.

- SLO 10.1.2.1: Explain the importance of trade safety and health in reducing injuries and fatalities to young employees in Manitoba. (TSA 1)
- SLO 10.1.2.2: Describe the rights and responsibilities of employees, employers, and supervisors under the Workplace Safety and Health Act. (TSA 2)
- SLO 10.1.2.3: Describe the steps to use in the Right to Refuse process. (TSA 3)
- SLO 10.1.2.4: Explain how and where to find information on workplace safety and health. (TSA 4)
- SLO 10.1.2.5: Demonstrate how to handle a potentially dangerous work situation. (TSA 5)
- SLO 10.1.2.6: Explain the S.A.F.E. acronym. (TSA 6)
- SLO 10.1.2.7: Define workplace safety and health hazards. (TSA 7)
- SLO 10.1.2.8: Give examples of trade-specific workplace safety and health hazards. (TSA 8)

- SLO 10.1.2.9: Give examples of five types of safety and health hazards. (TSA 9)
- SLO 10.1.2.10: Define workplace safety and health risk. (TSA 10)
- SLO 10.1.2.11: Give examples of trade-specific workplace safety and health risks. (TSA 11)
- SLO 10.1.2.12: Explain the principles of hazard recognition and control as they apply to the electrical trades. (TSA 12)
- SLO 10.1.2.13: Match the WHMIS hazardous materials symbols and their meanings. (TSA 14)
- SLO 10.1.2.14: Describe the importance of the Material Safety Data Sheets (MSDS). (TSA 15)
- SLO 10.1.2.15: Demonstrate proper selection and use of a variety of personal protective equipment and fall protection systems. (TSA 17)

Goal 2: Demonstrate the safe and appropriate **identification, selection, operation, maintenance, and management of equipment and tools.**

GLO 2.1: Demonstrate the safe and appropriate **identification, selection, operation, maintenance, and management of equipment and tools.**

- SLO 10.2.1.1: Demonstrate the safe and appropriate identification, selection, and operation of equipment and tools.
- SLO 10.2.1.2: Demonstrate the safe and appropriate maintenance and management of equipment and tools.
- SLO 10.2.1.3: Describe DC instruments (including the operation of direct current measuring instruments, as well as their construction and use). (A8.3)
- analog meter movement
 - voltmeter circuit
 - ammeter circuit
 - wattmeter

Goal 3: Demonstrate the safe and appropriate **identification, selection, installation, maintenance, and management of devices and materials.**

GLO 3.1: Demonstrate the safe and appropriate **identification, selection, installation, maintenance, and management of devices and materials.**

- SLO 10.3.1.1: Correctly identify devices and materials.
- SLO 10.3.1.2: Maintain and manage devices and materials.
- SLO 10.3.1.3: Interpret information (including colour) found on cables and conductors.
- SLO 10.3.1.4: Select and install devices and materials according to the Canadian Electrical Code (CEC).

Goal 4: Demonstrate an understanding of **electrical theory (fundamentals).**

GLO 4.1: Demonstrate an understanding of **electrical theory.**

- SLO 10.4.1.1: Define terminology and describe basic concepts associated with electrical theory and circuitry. (A7.1)
 - electrical terminology
 - atomic structure and its effects on electrical flow
 - static electricity effect
 - distinguish between these theories and apply to electrical flow/current:
 - electron theory
 - conventional theory
 - resistance
 - explaining the nature of resistance and the factors that contribute to it
 - computing the resistance of wires and bus bars using metric units and AWG tables (wires) only
 - computing the temperature effect on resistance
 - explaining various types of standard resistors, including power ratings and colour coding
 - Ohm's Law
 - Work, power and energy

- SLO 10.4.1.2: Describe battery theory, installation, and maintenance. (A7.2)
- characteristics, types and ratings
 - safety considerations
- SLO 10.4.1.3: Describe AC wave forms. (A7.4)
- comparison to DC
 - other non sinusoidal wave forms
- SLO 10.4.1.4: Describe and apply principles and laws that govern electrical circuits. (A8.1)
- diagram simple electrical circuits and construct, calculate and compare the three types of simple circuits based on principles of electricity
 - series
 - parallel
 - series-parallel
 - perform electrical measurements and calculations within specific circuits
 - analyze and interpret results
 - Kirchhoff's Law of Voltage and Law of Amperage as it applies to a specific type of electrical circuit
 - battery connections and circuit applications

Goal 5: Demonstrate an understanding of the design, layout, and interpretation of branch circuits and systems.

GLO 5.1: Demonstrate an understanding of the design, layout, and interpretation of branch circuits and systems.

- SLO 10.5.1.1: Read, interpret, and draw basic schematic symbols.
- SLO 10.5.1.2: Select materials and devices based on the information found on simple wiring diagrams.

Goal 6: Demonstrate the procedures used to install and terminate branch circuits and systems.

GLO 6.1: Demonstrate the procedures used to install and terminate branch circuits and systems.

No applicable SLOs.

Goal 7: Demonstrate an understanding of the **testing, troubleshooting, and documentation of branch circuits and systems.**

GLO 7.1: Demonstrate an understanding of the **testing, troubleshooting, and documentation of branch circuits and systems.**

SLO 10.7.1.1: Demonstrate an understanding of the importance of testing, troubleshooting, and documentation of branch circuits and systems.

Goal 8: Describe and demonstrate the transferable **cross-curricular** knowledge and skills.

GLO 8.1: Read, interpret, and communicate information.

No applicable SLOs.

GLO 8.2: Apply the knowledge and skills from **mathematics.**

SLO 10.8.2.1: Describe and solve problems using algebraic equations and formulas. (A4.1)

- algebraic equations (addition, subtraction, multiplication and division)
- transposing of algebraic equations
- fractions (addition, subtraction, multiplication and division), decimals and percent
- positive and negative numbers
- ratios and proportions
- areas and volumes

SLO 10.8.2.2: Describe and solve the rules of significant figures. (A4.2)

- scientific notation
- engineering notation (kilo, mega, micro, milli, etc.)
- usage of significant figures.

SLO 10.8.2.3: Describe and solve basic Ohm's law circuits (series, parallel, and combination). (A4.3)

- resistance calculations (total and component)
 - current calculations (total and component)
 - power calculations (total and component)
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GLO 8.3: Apply the knowledge and skills from the **sciences**.

SLO 10.8.2.1: Describe simple machines, force, and pressure related to electrical trade applications. (A4.6)

- simple machines, including:
 - lever
 - inclined plane
 - pulley
- perform related calculations
 - force-distance
 - friction

SLO 10.8.3.2: Describe Charles' law and Boyle's law. (A4.7)

- pressure
 - temperature
 - volumes and vacuum
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GLO 8.4: Apply the knowledge and skills from **information and communication technology**.

No applicable specific learning outcomes.

Goal 9: Understand **career opportunities and working conditions**.

GLO 9.1: Describe **apprenticeship, education, career opportunities, professional organizations, and working conditions** related to electrical trades technology and associated fields.

SLO 10.9.1.1: Demonstrate an awareness of apprenticeship.

SLO 10.9.1.2: Demonstrate an understanding of various electrical trades and associated occupations.

Goal 10: Demonstrate awareness of **sustainability**.

GLO 10.1: Describe the impact of **human sustainability** on the health and well-being of tradespersons working in the electrical trades and those who use their services.

SLO 10.10.1.1: Demonstrate an awareness of the advantages of electricity and the contributions of electrical tradespersons to human well-being.

GLO 10.2: Describe the electrical trade's **sustainability practices and impact on the environment.**

SLO 10.10.2.1: Minimize wastage of materials.

SLO 10.10.2.2: Practise reducing, reusing, and recycling materials.

GLO 10.3: Describe **sustainable business practices** within the electrical trades.

SLO 10.10.3.1: Demonstrate an understanding of the importance of reducing, reusing, and recycling materials.

Goal 11: Demonstrate awareness of **ethical and legal standards** as they pertain to the electrical trades.

GLO 11.1: Demonstrate awareness of **ethical and legal standards.**

SLO 10.11.1.1: Demonstrate awareness of ethical standards.

SLO 10.11.1.2: Demonstrate respect for school property, including tools, materials, and equipment.

SLO 10.11.1.3: Demonstrate an understanding of the legal requirements related to the electrical trades.

GLO 11.2: Demonstrate an understanding of **electrical codes.**

SLO 10.11.2.1: Demonstrate an awareness of code standards in construction.

SLO 10.11.2.2: Describe the objectives and scope of the Canadian Electrical Code (CEC). (A5.1)

- orientation to CEC
 - sections, sub-sections, conventions

SLO 10.11.2.2: Describe residential system voltages and circuitry. (A5.2)

- advantages of 3 wire over 2-2 wire circuits,
 - potential circuit problems,
 - temporary wiring requirements
 - extra low voltage and low voltage systems
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Goal 12: Demonstrate employability skills.**GLO 12.1: Demonstrate fundamental employability skills.**

- SLO 10.12.1.1: Demonstrate regular and punctual attendance.
 - SLO 10.12.1.2: Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, co-workers, and students.
 - SLO 10.12.1.3: Demonstrate accountability by taking responsibility for their actions.
 - SLO 10.12.1.4: Demonstrate adaptability, initiative, and effort.
 - SLO 10.12.1.5: Demonstrate teamwork skills.
 - SLO 10.12.1.6: Demonstrate the ability to stay on task and effectively use time in class and work environments.
 - SLO 10.12.1.7: Demonstrate the responsible use of wireless communication devices.
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GLO 12.2: Demonstrate an awareness of cultural competence and its importance in the workplace.

- SLO 10.12.2.1: Demonstrate an awareness of culture.
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GLO 12.3: Demonstrate an understanding of the business operation of an electrical trades facility.

- SLO 10.12.3.1: Participate in classroom and workstation cleanup.
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GLO 12.4: Demonstrate critical thinking skills in planning, procedures, analysis, and diagnosis.

- SLO 10.12.4.1: Demonstrate an awareness of the need for critical thinking and problem solving while working in the electrical trades.
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Goal 13: Understand the evolution, technological progression, and emerging trends in the electrical trades.**GLO 13.1: Understand the evolution, technological progression, and emerging trends in the electrical trades.**

- SLO 10.13.1.1: Demonstrate an understanding of the history, technological progression, and emerging trends in the electrical trades.
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