



9060

ELECTRICAL TRADES

AC FUNDAMENTALS (12B)

40S/40E/40M

An Electrical Trades Technology Course

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Course Description

Students will become familiar with AC theory, including electrical fundamentals, magnetism, electromagnetism, and RLC circuits. Students will also focus on cross-curricular knowledge from mathematics and physics.

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

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

- SLO 12B.1.1.1: Identify safety and health requirements. (A2.1)
- SLO 12B.1.1.2: Describe the importance of using personal protective equipment (PPE), and identify PPE and procedures related to PPE. (A2.2) (TSA 16)
- SLO 12B.1.1.3: Outline the safety principles for working on and around electrical equipment. (A2.3) (TSA 18)
- SLO 12B.1.1.4: Identify fire safety and outline workplace fire safety principles. (A2.4) (TSA 19)
- SLO 12B.1.1.5: Recognize and control hazards. (A2.6)
- SLO 12B.1.1.6: Identify the hazards in confined spaces and the preparation needed to work in a confined space. (A2.7) (TSA 20)
- SLO 12B.1.1.7: Identify first aid/CPR. (A2.8)
- SLO 12B.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)
- SLO 12B.1.1.9: Identify and control hazards. (A2.10)
- SLO 12B.1.1.10: Create and maintain a safe and organized working environment.

GLO 1.2: Demonstrate awareness of electrical safety as it pertains to the ***Trade Safety Awareness Manual***.

No applicable SLOs.

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 12B.2.1.1: Demonstrate the safe and appropriate identification, selection, and operation of equipment and tools (e.g., mega ohmmeter).

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.**

No applicable SLOs.

Goal 4: Demonstrate an understanding of **electrical theory.**

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

- SLO 12B.4.1.1: Describe the nature of magnetic fields, including the concept of flux, force fields, and the field around current-carrying conductors.
- SLO 12B.4.1.2: Describe how magnetic flux, flux density, magnetomotive force, and reluctance are related.
- SLO 12B.4.1.3: Calculate the current required to establish a required magnetic flux in a series magnetic circuit.
- SLO 12B.4.1.4: Demonstrate the operation of a relay as a magnetic circuit.
- SLO 12B.4.1.5: Demonstrate how forces are created by magnetic attraction in relays and solenoids (e.g., ampere turns).
- SLO 12B.4.1.6: Describe electromagnetism and inductance, including the operation of coils (i.e., rotating magnetic fields, generator applications, stored energy [Lenz's Law], and motor principles).
- SLO 12B.4.1.7: Explain the difference between DC and AC.
- SLO 12B.4.1.8: Explain why in some industrial applications DC is preferred to AC.
- SLO 12B.4.1.9: Describe the advantages that AC has over DC in the generation, transmission, and distribution systems, and explain why it has these advantages.

- SLO 12B.4.1.10: Explain why high voltage DC has been used for transmission of energy from distant generating stations.
- SLO 12B.4.1.11: Demonstrate the graphic method of generating sine waves and cosine waves, and relate these waves to the trigonometric formula.
- SLO 12B.4.1.12: Demonstrate how a sinusoidal voltage is generated when a coil is rotated in a uniform magnetic field.
- SLO 12B.4.1.13: Describe which factors determine the frequency of the voltage from an AC generator.
- SLO 12B.4.1.14: Define instantaneous, peak, and RMS values.
- SLO 12B.4.1.15: Describe the phase relationship between voltage and current in an AC circuit containing a resistance.
- SLO 12B.4.1.16: Describe the effective values of AC current and voltages.
- SLO 12B.4.1.17: Calculate the power dissipated in a resistor for a given applied peak voltage.
- SLO 12B.4.1.18: Explain the difference between the voltage given by an AC voltmeter and that displayed on an oscilloscope.
- SLO 12B.4.1.19: Describe a power curve, the current, and voltage in phase.
- SLO 12B.4.1.20: Describe the action of a half and full wave rectifier, and explain why average values instead of effective values are used for computing the DC output.

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.

No applicable SLOs.

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.**

No applicable SLOs.

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 12B.8.2.1: Describe and solve right-angle triangles with the use of electrical terminology. (A4.5)

GLO 8.3: Apply the knowledge and skills from the **sciences.**

No applicable SLOs.

GLO 8.4: Apply the knowledge and skills from **information and communication technology.**

No applicable SLOs.

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.

No applicable SLOs.

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 12B.10.1.1: Demonstrate an awareness of possible health concerns related to high tension power lines.

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

SLO 12B.10.2.1: Minimize wastage of materials.

SLO 12B.10.2.2: Demonstrate an understanding of how electricity is generated, focusing on Manitoba.

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

No applicable SLOs.

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**.

No applicable SLOs.

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

No applicable SLOs.

Goal 12: Demonstrate **employability skills**.

GLO 12.1: Demonstrate **fundamental employability skills**.

SLO 12B.12.1.1: Demonstrate regular and punctual attendance.

SLO 12B.12.1.2: Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, co-workers, and students.

SLO 12B.12.1.3: Demonstrate accountability by taking responsibility for their actions.

SLO 12B.12.1.4: Demonstrate adaptability, initiative, and effort.

SLO 12B.12.1.5: Demonstrate teamwork skills.

SLO 12B.12.1.6: Demonstrate the ability to stay on task and effectively use time in class and work environments.

SLO 12B.12.1.7: Demonstrate the responsible use of wireless communication devices.

GLO 12.2: Demonstrate an awareness of **cultural competence** and its importance in the workplace.

No applicable SLOs.

GLO 12.3: Demonstrate an understanding of the **business operation** of an electrical trades facility.

SLO 12B.12.3.1: Participate in classroom and workstation cleanup.

GLO 12.4: Demonstrate **critical thinking skills** in planning, procedures, analysis, and diagnosis.

SLO 12B.12.4.1: Demonstrate critical-thinking skills.

SLO 12B.12.4.2: Use a variety of strategies in order to diagnose and solve problems.

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 12B.13.1.1: Demonstrate an awareness of the history behind the adoption of AC over DC as household current.
