



9039

ELECTRONICS AC CIRCUIT  
FUNDAMENTALS (11A)

30S/30E/30M

An Electronics Technology Course



# 9039: ELECTRONICS AC CIRCUIT FUNDAMENTALS (11A) 30S/30E/30M

## Course Description

This course builds on the electrical theory learned in Introduction to Electronics Technology. It focuses on AC waveforms and how they interact with reactive components in RL, RC, and RCL series and parallel circuits. They will also explore frequency-sensitive circuits.

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

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

- SLO 11A.1.1.1: Create and maintain a safe work environment.
  - SLO 11A.1.1.2: Describe and utilize personal protective equipment (PPE) and follow prescribed procedures.
  - SLO 11A.1.1.3: Demonstrate an awareness of electrical safety.
  - SLO 11A.1.1.4: Demonstrate an awareness of fire safety.
  - SLO 11A.1.1.5: Recognize and control hazards.
  - SLO 11A.1.1.6: Demonstrate an understanding of how Ohm's law relates to electrical safety.
  - SLO 11A.1.1.7: Demonstrate awareness of emergency procedures related to electrical shock.
  - SLO 11A.1.1.8: Demonstrate awareness of shop safety procedures.
  - SLO 11A.1.1.9: Demonstrate awareness of accident reporting procedures.
  - SLO 11A.1.1.10: Demonstrate awareness of the rights and responsibilities of employees, employers, and supervisors under the Workplace Health and Safety Act (Manitoba).
  - SLO 11A.1.1.11: Demonstrate awareness of the rights and responsibilities of employees, employers, and supervisors as they relate to the right to refuse work as described in the Workplace Health and Safety Act (Manitoba).
  - SLO 11A.1.1.12: Identify the safety requirements as they apply to WHMIS for products used in an electronics technology facility.
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**Goal 2: Demonstrate the **identification, selection, utilization, and maintenance** of **tools and materials**.**

**GLO 2.1:** Demonstrate the **identification** and **selection** of tools and materials.

SLO 11A.2.1.1: Identify and select appropriate tools and materials.

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**GLO 2.2:** Demonstrate the **utilization** of tools and materials.

SLO 11A.2.2.1: Demonstrate the appropriate utilization of tools and materials.

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**GLO 2.3:** Demonstrate the **maintenance** of tools and materials.

SLO 11A.2.3.1: Demonstrate the appropriate maintenance of tools and materials.

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**Goal 3: Demonstrate the **identification, selection, value determination, and utilization** of **components**.**

**GLO 3.1:** Demonstrate the **identification** and **selection** of components.

SLO 11A.3.1.1: Identify and select appropriate components used in AC circuits.

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**GLO 3.2:** Demonstrate the appropriate **value determination** of components.

SLO 11A.3.2.1: Determine values of components.

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**GLO 3.3:** Demonstrate the appropriate **utilization** of components.

SLO 11A.3.3.1: Demonstrate the appropriate utilization of components used in AC circuits.

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**Goal 4:** Demonstrate the **utilization and maintenance of equipment.**

**GLO 4.1:** Demonstrate the **utilization and maintenance of equipment other than diagnostic equipment.**

SLO 11A.4.1.1: Demonstrate the appropriate utilization and maintenance of equipment other than diagnostic equipment.

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**GLO 4.2:** Demonstrate the **utilization and maintenance of diagnostic equipment.**

SLO 11A.4.2.1: Demonstrate the appropriate utilization and maintenance of signal generators.

SLO 11A.4.2.2: Demonstrate the appropriate utilization and maintenance of oscilloscopes.

SLO 11A.4.2.3: Demonstrate an understanding of the difference between measuring DC quantities and AC quantities with a VOM.

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**Goal 5:** Demonstrate **schematic reading.**

**GLO 5.1:** Read, understand, and interpret **schematic diagrams.**

SLO 11A.5.1.1: Read, understand, and interpret schematic diagrams related to AC circuits.

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**GLO 5.2:** Demonstrate **rendering.**

SLO 11A.5.2.1: Render schematic diagrams.

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**GLO 5.3:** Demonstrate **breadboarding.**

SLO 11A.5.3.1: Demonstrate the appropriate use of solderless breadboards.

SLO 11A.5.3.2: Demonstrate the appropriate method of enclosing electronics projects that use line voltage.

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**Goal 6:** Demonstrate an understanding of **electrical theory** and the **analysis of electrical circuits**.

**GLO 6.1:** Demonstrate an understanding of **electrical theory**.

- SLO 11A.6.1.1: Explain the function and construction of inductors.
  - SLO 11A.6.1.2: Calculate the total inductance of series and parallel inductive networks.
  - SLO 11A.6.1.3: Demonstrate an understanding of how magnetism influences inductance.
  - SLO 11A.6.1.4: Demonstrate an understanding of how magnetism generates electricity (i.e., alternators, DC generators).
  - SLO 11A.6.1.5: Demonstrate an understanding of how electric current produces an electric field.
  - SLO 11A.6.1.6: Demonstrate an understanding of the difference between AC and DC current and voltage.
  - SLO 11A.6.1.7: Demonstrate an understanding of the characteristics of an AC waveform.
  - SLO 11A.6.1.8: Demonstrate an understanding of the relationship between DC voltage and an RMS value.
  - SLO 11A.6.1.9: Demonstrate an understanding of phase relationships.
  - SLO 11A.6.1.10: Demonstrate an understanding of how frequency affects inductance and capacitance.
  - SLO 11A.6.1.11: Demonstrate an understanding of how inductive and capacitive reactance affects current in a purely capacitive or inductive circuit.
  - SLO 11A.6.1.12: Demonstrate an understanding of a purely capacitive or purely inductive AC circuit (i.e., phase relationship, power dissipation).
  - SLO 11A.6.1.13: Demonstrate an understanding of how transformers operate in an AC circuit.
  - SLO 11A.6.1.14: Demonstrate an understanding of high pass, low pass, and band pass filter circuits.
  - SLO 11A.6.1.15: Demonstrate an understanding of resonant circuits.
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**GLO 6.2:** Demonstrate the procedures for **analyzing electrical circuits**.

SLO 11A.6.2.1: Demonstrate appropriate procedures for measuring AC quantities with a VOM.

SLO 11A.6.2.2: Demonstrate appropriate procedures for measuring voltage and frequency with an oscilloscope.

SLO 11A.6.2.3: Analyze RL, RC, and RLC circuits (series and parallel).

SLO 11A.6.2.4: Analyze the operation of transformers in an AC circuit with respect to power conservation.

SLO 11A.6.2.5: Analyze high pass, low pass, and band pass filter circuits.

SLO 11A.6.2.6: Analyze resonant circuits.

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**Goal 7:** Demonstrate **soldering skills, fabricating printed circuit boards, and selecting and installing** components.

**GLO 7.1:** Demonstrate **soldering skills**.

SLO 11A.7.1.1: Demonstrate appropriate soldering skills.

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**GLO 7.2:** Demonstrate the procedures for **selecting and installing components**.

SLO 11A.7.2.1: Appropriately select and install components.

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**GLO 7.3:** Demonstrate the procedures for **fabricating printed circuit boards**.

SLO 11A.7.3.1: Fabricate circuit boards.

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**Goal 8:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they apply to electronics technology.

**GLO 8.1: Read, interpret, and communicate** information.

SLO 11A.8.1.1: Read, interpret, and communicate information related to electronics technology.

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

SLO 11A.8.2.1: Demonstrate an understanding of how a sine wave is generated mathematically.

SLO 11A.8.2.2: Perform inductance and capacitance calculations using different frequencies.

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

No applicable SLOs.

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**Goal 9:** Understand **education, career opportunities, employment conditions,** and **professional organizations** in the electronics industry.

**GLO 9.1:** Understand **education, career opportunities, employment conditions,** and **professional organizations** in the electronics industry.

SLO 11A.9.1.1: Demonstrate an understanding of employment conditions in electronics technology.

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**Goal 10:** Demonstrate awareness of **sustainability** as it pertains to electronics technology.

**GLO 10.1:** Describe the impact of **human sustainability** on the health and well-being of electronics technicians and those who use their products.

No applicable SLOs.

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**GLO 10.2:** Describe the electronic technology's sustainability practices and impact on the **environment.**

SLO 11A.10.2.1: Discuss how electronics technology can have a positive impact on the environment.

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**Goal 11:** Demonstrate awareness of the **ethical standards and legal issues.**

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

SLO 11A.11.1.1: Discuss the requirements for ethical behaviour in school and the workplace.

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**Goal 12:** Demonstrate **employability skills**.

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

- SLO 11A.12.1.1: Demonstrate regular and punctual attendance.
  - SLO 11A.12.1.2: Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, co-workers, and students.
  - SLO 11A.12.1.3: Demonstrate accountability by taking responsibility for one's actions.
  - SLO 11A.12.1.4: Demonstrate adaptability, initiative, and effort.
  - SLO 11A.12.1.5: Demonstrate the ability to accept and follow direction and feedback.
  - SLO 11A.12.1.6: Demonstrate teamwork skills.
  - SLO 11A.12.1.7: Demonstrate the ability to stay on task and effectively use time in class and work environments.
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**GLO 12.2:** Demonstrate an awareness of **cultural proficiency**, and its importance in the workplace.

- SLO 11A.12.2.1: Discuss how people's culture affects their values and behaviour.
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**GLO 12.3:** Demonstrate **critical thinking skills** in planning, procedures, analysis, and diagnosis.

- SLO 11A.12.3.1: Demonstrate critical thinking skills.
  - SLO 11A.12.3.2: Demonstrate problem-solving skills.
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**Goal 13:** Understand the **evolution, technological progression, and emerging trends** in electronics technology.

**GLO 13.1:** Describe the **evolution, technological progression, and emerging trends** in electronics technology.

- SLO 11A.13.1.1: Demonstrate awareness of the history behind the widespread use of AC current.
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