



8246

SUSTAINABLE ENERGY:  
TRANSPORTATION  
SYSTEMS (11C)

30S/30E/30M

A Sustainable Energy Course



# 8246: SUSTAINABLE ENERGY: TRANSPORTATION SYSTEMS (11C)

## 30S/30E/30M

### Course Description

This course explores the advantages and disadvantages of using sustainable energy sources for transportation, as compared to using fossil fuels.

Topics include the following:

- transportation system design: city, rural, and northern
- vehicle design: aerodynamic
- hybrid and electric vehicles
- hydrogen-powered vehicles
- safety practices and procedures

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**Goal 1:** Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

**GLO 1.1:** Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

- SLO 11C.1.1.1: Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.
- SLO 11C.1.1.2: Identify health and safety requirements.
- SLO 11C.1.1.3: Identify personal protective equipment (PPE) and procedures.
- SLO 11C.1.1.4: Identify electrical safety practices and procedures.
- SLO 11C.1.1.5: Identify fire safety practices and procedures.
- SLO 11C.1.1.6: Identify ergonomic considerations related to the sustainable energy industry.
- SLO 11C.1.1.7: Identify hazard recognition and control practices.
- SLO 11C.1.1.8: Describe the hazards of confined space entry.
- SLO 11C.1.1.9: Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).
- SLO 11C.1.1.10: Describe the identification and control of specified hazards.

- SLO 11C.1.1.11: Identify safe work practices related to the sustainable energy industry.
  - SLO 11C.1.1.12: Identify safety guidelines related to the sustainable energy industry.
  - SLO 11C.1.1.13: Identify safe material-handling procedures.
  - SLO 11C.1.1.14: Read, interpret, and communicate safety information (e.g., material safety data sheets [MSDS]) related to sustainable energy.
  - SLO 11C.1.1.15: Demonstrate safe practices for working on vehicles.
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**Goal 2:** Demonstrate the safe and appropriate **operation, handling, cleaning, maintenance, and storage** of **equipment, tools, materials, products, and consumable items**.

**GLO 2.1:** Demonstrate the safe and appropriate **operation and handling** of equipment, tools, materials, products, and consumable items.

- SLO 11C.2.1.1: Demonstrate the safe and appropriate operation and handling of hand tools (e.g., hammer, saw, screwdriver, wrench, pliers, metal cutters, utility knife).
  - SLO 11C.2.1.2: Demonstrate the safe and appropriate operation and handling of power tools (e.g., drill, skill saw, table saw).
  - SLO 11C.2.1.3: Demonstrate the safe and appropriate operation and handling of instruments related to electric and hydrogen-powered vehicles.
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**GLO 2.2:** Demonstrate the safe and appropriate **cleaning, maintenance, and storage** of equipment, tools, materials, products, and consumable items.

- SLO 11C.2.2.1: Demonstrate the safe and appropriate cleaning, maintenance, and storage of hand tools (e.g., hammer, saw, screwdriver, wrench, pliers, metal cutters, utility knife).
  - SLO 11C.2.2.2: Demonstrate the safe and appropriate cleaning, maintenance, and storage of power tools (e.g., drill, skill saw, table saw).
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**Goal 3:** Demonstrate an understanding of **demand-side management (DSM)** as it applies to sustainable energy.

**GLO 3.1:** Demonstrate an understanding of **DSM** as it applies to sustainable energy.

SLO 11C.3.1.1: Demonstrate an awareness of energy-efficient vehicles, transportation systems, mass transit, and active transportation systems.

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**Goal 4:** Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems**.

**GLO 4.1:** Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

SLO 11C.4.1.1: Describe the environmental, economic, and energy security advantages of electric and hydrogen-powered vehicles compared to those of fossil-fuel-powered vehicles.

SLO 11C.4.1.2: Demonstrate an understanding of the basic components of electric, hybrid, and hydrogen-powered vehicles.

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**GLO 4.2:** Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

SLO 11C.4.2.1: Demonstrate an understanding of the importance of energy efficiency in designing electric and hybrid vehicles.

SLO 11C.4.2.2: Demonstrate an understanding of the infrastructure needed to support electric and hydrogen-powered vehicles.

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**Goal 5:** Demonstrate the knowledge and skills required to **install or convert sustainable energy systems**.

**GLO 5.1:** Demonstrate the knowledge and skills required to **perform the installation or conversion** of sustainable energy systems.

SLO 11C.5.1.1: Demonstrate an understanding of the basics of converting a vehicle from using conventional power sources (e.g., human-powered bicycle, gas-powered vehicle) to using electric power sources.

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**Goal 6:** Demonstrate the knowledge and skills required to **maintain sustainable energy systems**.

**GLO 6.1:** Demonstrate the knowledge and skills required to **perform preventive maintenance** of sustainable energy systems.

SLO 11C.6.1.1: Demonstrate adherence to manufacturers' warranty conditions for electric and hydrogen-powered vehicles.

SLO 11C.6.1.2: Discuss the relationship between preventive maintenance and energy efficiency in transportation systems.

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**GLO 6.2:** Demonstrate the knowledge and skills required to **diagnose malfunctions** in sustainable energy systems.

SLO 11C.6.2.1: Demonstrate an understanding of vehicle diagnostics.

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**GLO 6.3:** Demonstrate the knowledge and skills required to **repair** sustainable energy systems.

SLO 11C.6.3.1: Demonstrate an understanding of how to select a qualified service provider for electric and hybrid vehicles.

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**Goal 7:** Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

**GLO 7.1:** Demonstrate **information and communication technology** skills required in the sustainable energy industry.

SLO 11C.7.1.1: Demonstrate the use of information and communication technology to research topics in sustainable energy.

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**GLO 7.2:** **Read, interpret, and communicate information** related to the sustainable energy industry.

SLO 11C.7.2.1: Demonstrate the ability to read and interpret system schematics.

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**GLO 7.3:** Demonstrate knowledge of **mathematical** concepts and skills related to the sustainable energy industry.

SLO 11C.7.3.1: Solve problems involving fractions.

SLO 11C.7.3.2: Solve problems involving decimals.

SLO 11C.7.3.3: Solve problems involving percentages and ratios.

SLO 11C.7.3.4: Solve problems involving metric and imperial measurements.

SLO 11C.7.3.5: Solve problems involving geometric formulas.

SLO 11C.7.3.6: Demonstrate an understanding of Newton's laws of motion.

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**GLO 7.4:** Demonstrate knowledge of **science** as it relates to the sustainable energy industry.

- SLO 11C.7.4.1: Demonstrate knowledge of science as it relates to sustainable transportation systems.
  - SLO 11C.7.4.2: Demonstrate an understanding of automotive aerodynamic considerations (e.g., drag, lift, down force).
  - SLO 11C.7.4.3: Demonstrate a basic knowledge of electric motors.
  - SLO 11C.7.4.4: Demonstrate an understanding of the process of hydrolysis.
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**GLO 7.5:** Demonstrate knowledge of **physical education/health education** as it relates to the sustainable energy industry.

No applicable SLOs.

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**Goal 8:** Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

**GLO 8.1:** Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

- SLO 11C.8.1.1: Demonstrate an understanding of the importance of accurate performance reporting for electric vehicles.
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**Goal 9:** Practise **employability skills** required in the sustainable energy industry.

**GLO 9.1:** Demonstrate **employability skills**.

- SLO 11C.9.1.1: Demonstrate problem-solving skills.
  - SLO 11C.9.1.2: Demonstrate critical thinking skills.
  - SLO 11C.9.1.3: Demonstrate regular attendance and punctuality.
  - SLO 11C.9.1.4: Demonstrate accountability by taking responsibility for own actions.
  - SLO 11C.9.1.5: Demonstrate adaptability, initiative, and effort.
  - SLO 11C.9.1.6: Demonstrate the ability to accept feedback and to follow direction.
  - SLO 11C.9.1.7: Demonstrate teamwork skills.
  - SLO 11C.9.1.8: Demonstrate the ability to stay on task and to make effective use of time in class and shop environments.
  - SLO 11C.9.1.9: Demonstrate the ability to communicate respectfully and effectively with co-workers and customers.
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**Goal 10:** Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

**GLO 10.1:** Describe the impact of **sustainability** on the **health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

No applicable SLOs.

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**GLO 10.2:** Describe the sustainable energy industry's **sustainability practices and their impact on the environment**.

No applicable SLOs.

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**GLO 10.3:** Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

No applicable SLOs.

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**Goal 11:** Demonstrate an understanding of **career options** in sustainable energy.

**GLO 11.1:** Describe **apprenticeship, post-secondary education, and employment opportunities** related to sustainable energy.

SLO 11C.11.1.1: Demonstrate an understanding of the various apprenticeship programs available in the area of transportation systems, especially as they relate to sustainable energy.

SLO 11C.11.1.2: Demonstrate an understanding of the various post-secondary degree and diploma programs available in the area of transportation systems, especially as they relate to sustainable energy.

SLO 11C.11.1.3: Demonstrate an understanding of the various entry- and advanced-level employment opportunities available in the area of transportation systems, especially as they relate to sustainable energy.

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**Goal 12:** Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends**.

**GLO 12.1:** Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends**.

SLO 11C.12.1.1: Discuss how the cost of sustainable energy technologies per unit decreases and performance increases over time.

SLO 11C.12.1.2: Discuss how sustainable energy systems will become economically more attractive as fossil fuels become scarcer.

SLO 11C.12.1.3: Demonstrate an understanding of the latest industry trends.

SLO 11C.12.1.4: Demonstrate an understanding of the provincial strategy for electric vehicles (e.g., *Manitoba's Electric Vehicle Road Map*, Manitoba Innovation, Energy and Mines).

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