

MODULE ENM2090: ENERGY DESIGNS/SYSTEMS 1 (BASIC PRINCIPLES)

Level: Intermediate

Theme: Management and Conservation

Prerequisite: None

Module Description: Students investigate the basic principles of energy conservation and efficiency and relate them to energy designs and systems used in the residential, commercial or transportation sector.

Module Parameters: Access to a construction, fabrication, mechanics or science laboratory.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none">explain basic principles of energy conservation and efficiency	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none">through laboratory investigations, identifying practical applications of:<ul style="list-style-type: none">laws of energy conservationbasic principles of energy efficiency. <p><i>Assessment Tool</i> <i>Lab Investigations: Intermediate Level, ENMLAB-2</i></p> <p><i>Standard</i> <i>Conduct lab investigations to a standard of 2 on the rating scale</i><ul style="list-style-type: none">a concept test in which the student demonstrates knowledge of energy forms, energy conversion, energy conservation and energy efficiency.<p><i>Assessment Tool</i> Transportation, Energy and Power Technology</p><p><i>Standard</i> <i>Response indicating 60% mastery</i></p></p>	<p>50</p>

MODULE ENM2090: ENERGY DESIGNS/SYSTEMS 1 (BASIC PRINCIPLES) (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • demonstrate applications of energy technology in the residential, commercial or transportation sector 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • given a specific residential/commercial structure or transportation system, preparing: <ul style="list-style-type: none"> – a flow chart and/or diagram that traces energy flow and conversion throughout the structure or system – a model of the structure or system incorporating design elements that address energy conservation and efficiency – a comparison of energy input and energy output for one or more individual components with the structure or system. <p><i>Assessment Tool</i> <i>Assessment Criteria: Flow Charts, ENMFLO</i> <i>Assessment Criteria: Diagrams and Technical Drawings, ENMDRA</i> <i>Project Assessment: Technology Design, ENMTEC</i></p> <p><i>Standard</i> <i>Complete the flow chart/diagram, model and comparison to a standard of 2 on the rating scale</i></p>	<p>40</p>
<ul style="list-style-type: none"> • describe career opportunities relevant to low energy design and technology 	<ul style="list-style-type: none"> • completing a research project on one or more career opportunities in low energy design and technology. <p><i>Assessment Tool</i> <i>Career Search: Intermediate Level, ENMCAR–2</i></p> <p><i>Standard</i> <i>Conduct research to a standard of 2 on the rating scale</i></p>	<p>10</p>
<ul style="list-style-type: none"> • demonstrate basic competencies. 	<ul style="list-style-type: none"> • observations of individual effort and interpersonal interaction during the learning process. <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>Integrated throughout</p>

MODULE ENM2090: ENERGY DESIGNS/SYSTEMS 1 (BASIC PRINCIPLES) (continued)

Concept	Specific Learner Expectations	Notes
<p>Energy Conservation and Efficiency</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • provide a rationale for energy conservation and efficiency based on economic and environmental factors • identify basic forms of energy and describe applications of each: <ul style="list-style-type: none"> – radiant – chemical – thermal – mechanical – electrical – nuclear • cite examples of energy technology used to convert one form of energy into another useful form • explain applications of the laws of energy conservation: <ul style="list-style-type: none"> – <i>First Law of Thermodynamics</i> – <i>Second Law of Thermodynamics</i> • define energy efficiency and explain its application in determining how well a technology converts energy from one form to another. 	<p>Research/discuss the statement – “Our society wastes approximately 50% of all its available energy.”</p> <p>Explain how the sun is the original source of all energy. Trace various forms of energy back to the sun.</p> <p>Distinguish between:</p> <ul style="list-style-type: none"> • energy and power • kinetic and potential energy. <p>For example:</p> <ul style="list-style-type: none"> • turbines • generators • motors • electric bulbs. <p>“Energy cannot be created or destroyed. The total energy in any system is considered to be constant.”</p> <p>“A natural process always takes place in such a direction as to cause an increase in the randomness (entropy) of the universe.”</p> <p>Distinguish between the efficiency of component parts and that of a total energy system.</p>
<p>Applications of Technology</p>	<ul style="list-style-type: none"> • identify energy sources for an existing residential/commercial structure or transportation system 	<p>Prepare flow charts that illustrate energy sources, energy conversion and energy transfer throughout a structure or system.</p>

MODULE ENM2090: ENERGY DESIGNS/SYSTEMS 1 (BASIC PRINCIPLES) (continued)

Concept	Specific Learner Expectations	Notes
<p>Applications of Technology (continued)</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • explain functions of technology in converting energy into useful forms within the structure or system • illustrate, by example, applications of energy conservation and efficiency evident in structure or system design • explain design principles incorporated to transfer energy throughout the structure or system • research methods used to measure energy within the structure or system • perform simple calculations and compare energy input/output for components within a structure or system • evaluate energy use within the structure or system based on: <ul style="list-style-type: none"> – total system efficiency – cost of operation – environmental and social effect. 	<p>Prepare diagrams of energy technologies that illustrate component parts and principles of operation.</p> <p>Consider:</p> <ul style="list-style-type: none"> • mechanical efficiency • volumetric efficiency • thermal efficiency. <p>Design principles and applications will vary according to the structure or system investigated.</p> <p>For structures investigate:</p> <ul style="list-style-type: none"> • British thermal unit and calorie • joules, kilojoules and gigajoules. <p>For transportation devices investigate:</p> <ul style="list-style-type: none"> • horsepower • torque. <p>For example:</p> <ul style="list-style-type: none"> • windows • lighting • wall structure • insulation. <p>Consider land use, atmospheric emissions, health, convenience, aesthetics.</p>
<p>Career Opportunities</p>	<ul style="list-style-type: none"> • research careers and the range of occupational opportunities in low energy design and technology; e.g.: <ul style="list-style-type: none"> – engineering – technical and support services – environmental management 	<p>Plan for individual/group research and presentations that address:</p> <ul style="list-style-type: none"> • job description • employment market • education/training • wage expectations. <p>Contact the “Career Information Hotline” (Alberta Advanced Education and Career Development)</p>

MODULE ENM2090: ENERGY DESIGNS/SYSTEMS 1 (BASIC PRINCIPLES) (continued)

Concept	Specific Learner Expectations	Notes
Career Opportunities (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none">• identify career opportunities and trends based on employment statistics• research trends in low energy designs and systems, and resulting career opportunities.	<p>See the National Occupational Profiles (NOC) in Section H: Linkages/Transitions.</p> <p>Arrange/facilitate:</p> <ul style="list-style-type: none">• information interviews• work study/experience• job shadowing.

