

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



COURSE OUTLINE

COURSE TITLE: RENEWABLE ENERGY

CODE NO. : NET 211 SEMESTER: 4

PROGRAM: NATURAL ENVIRONMENT TECHNOLOGIST

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**DATE: JAN. 2013 PREVIOUS OUTLINE
DATED: Jan. 2012**

APPROVED:

Dean

DATE

TOTAL CREDITS: 2

PREREQUISITE(S):

HOURS/WEEK: 2

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- I. **COURSE DESCRIPTION:** Renewable Energy will give the students a background on Energy and its use in modern day society. It will include discussion on the basic principles and facts of Energy, how we measure energy, the history and future of Energy and how we can best meet our Energy needs in the most efficient and sustainable manner. The course will introduce students to the effects of population growth and distribution on land for food production, water quality/quantity, energy and fuel use and demand, biodiversity, etc., in relation to global sustainability. It will include discussion on the basic principles of system stress, the earth's carrying capacity, our reliance on fossil fuels, the future of energy and how we can best meet our escalating demand for energy in a more efficient and sustainable manner. The course will then evolve into a comprehensive discussion on climate change and its major drivers and impacts and what is required for adaptation and remediation. We will also explore key issues surrounding the climate change debate to help delineate hype from hazard and who to believe. The course will discuss the need for a shift in our thinking and our culture regarding our consumptive habits involving fossil fuels and the need more stringent conservation efforts in the transportation and construction and building (residential, institutional and industrial) sectors, where 70% of energy consumption occurs and conservation efforts and applications are sorely needed. The course will include a more technical introduction and application of energy conservation techniques Students will learn why energy conservation is the first line of defense in developing a renewable energy strategy and how it drives the present move to green construction. The course will provide an introduction to energy evaluation principles and techniques, used in Canada and the U.S., and will prepare them to develop an energy conservation plan and perform a home/building energy audit. We will conclude by identifying energy alternatives and steps that people can take to insure a transition to a more sustainable life style that can build community resilience and self reliance, stimulate business and economic development, and help mitigate environmental damage. Remedial actions that will be discussed will range from simple to complex, and from benign to perilous.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. Understand the history and use of energy in society and the threats associated with the present trends in energy use and consumption

Potential Elements of the Performance:

- Describe Canada's role in global energy production and consumption and compare to other global countries
 - Show which forms of energy and energy use patterns we are currently consuming that could be more efficiently applied to the various energy use sectors
 - List the present energy types and the key consumers and describe how and which are the most efficient and have the greatest opportunity for conservation
2. Introduce students to the concepts of energy and thermodynamics, atomic and molecular motion, states of matter, heat transfer, thermal expansion, specific heat and heats of fusion and vapourization, forms of energy and energy transfer, conservation and energy efficiency. This will include an understanding of the related measurement terminologies.

Potential Elements of the Performance:

- Identify and describe the different energy measurement terminologies and their interrelationship to energy use and data collection and analysis.
 - Identify the different forms of energy and the different ways they are transformed, transferred and used.
 - Relate how these transformations could relate to conservation efforts and the building or renovating of a home
3. Identify the three pillars of energy conservation and the key factors affecting energy use in buildings and homes. Students will learn the major sources of energy use and the details of their relative efficiency..Students will learn how to measure consumption and price and demonstrate the ability to perform an energy audit using the Home Energy Savings (HES) program

Potential Elements of the Performance:

- Identify and describe the main energy consumers in a home or building and their relative advantage and disadvantages.
- List and describe the operational characteristics of the different heating, cooling, ventilation and hot water systems and describe their pros and cons
- Learn how electrical use is measured and priced and then measure and evaluate household and building (school) electrical consumption patterns.
- Students will perform a number of cost/benefit analysis to replace existing appliances with more efficient replacements
- Students will use a watt meter to measure energy consumption of various appliances.
- Students will learn the major components of an energy evaluation and how to enter data and make recommendations to improve energy efficiency.

4. Describe the major laws and guidelines available to support energy conservation initiatives and those used to govern building in Canada and outline the key building and design standards available and used to rate energy efficiency and innovation. Students will then be able to describe the major components and characteristics needed to be incorporated in building an energy efficient home

Potential Elements of the Performance:

- Outline the major components of the Green Energy Act and describe how it supports energy conservation
- Identify and describe the major building standards and accreditations' presently used in Canada and their major components
- List the components and discuss the details of their relative importance to energy conservation.
- Demonstrate the major constraints in meeting the top designations of these certification systems
- Demonstrate an understanding of different building styles and structures and the various components of the building envelope

6. Describe the incentives and benefits that we can or would derive

by making more of Canada's homes energy efficient. Assess the number of homes built during different eras and develop a plan to attain a 1980's building code designation including the relative cost/benefit to the federal and provincial governments, the consumer, and the renovation/manufacturing businesses.

Potential Elements of the Performance

- List the benefits available to upgrading various components of the home envelope including the heating/cooling and water systems
- Provide a report to outline the potential energy savings of upgrading Ontario's house inventory to 2000 code standards and the resulting costs/benefits
- Demonstrate how this reduces our carbon footprint and outline how these savings can contribute to our overall well being and reduce our need and reliance on fossil fuels

III. TOPICS:

- 1. How Global Population Growth Trends are affecting our ability to sustain the Earth**
- 2. The history of Energy use and it's affect on the Global environment;**
 - a) Land Use Changes and biodiversity**
 - b) Impacts on Aquatic environments, food chains and diversity**
 - c) Climate Change, history, present status, future predications and remedial actions**
 - d) The need to shift from globalization to localization**
 - e) Transition from a culture of consumption (collecting stuff) to one of conservation and sustainability**
- 3. The need for conservation, conservation principals, best bets, energy audits, green building**
- 4. Renewable Energy Alternatives – Opportunity or Anachronism**
- 5. Survival of the Fittest – The new Reality**

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

**Peak Everything, Heinbeck; Renewable Energy handbook;
 Scientific American September 2005, Human Population Grows Up.
 Boom, Bust and Echo 2000, David K. Foot.
 The Politics of Venom and Accusation, MacLeans Sept. 2010 , Is
 America Bringing Us Down? MacLeans Oct. 2010; Rough Guide to
 Climate Change, Henson. Transition Handbook, Rob Hopkins**

V. EVALUATION PROCESS/GRADING SYSTEM:

Reading Assignments and Summaries 8 @ 5%	40%
Bonus Assignments 2 @ 5%	10%
Electrical Worksheet	5%
Home Energy Evaluation	10%
Group Assignment & Presentation	25%
Final Test	<u>20%</u>
Total	110%

The following semester grades will be assigned to students:

Grade	Definition	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	

U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

VI. SPECIAL NOTES:

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

Since many of the assignments will be made after receiving classroom instruction, those students not in attendance will not be considered eligible to perform the assignment and a 0 grade will be given. Unless the student has contacted the instructor in advance with a legitimate excuse.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.

<Renewable Energy>

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