

Sustainable and Renewable Energy (SREE)

Department of Mechanical and Aerospace Engineering

Faculty of Engineering and Design

SREE 1000 [0.0 credit]

Introduction to Sustainable Energy

The concept of energy sustainability. Energy-economy system. Global energy trends, the next 100 years. Energy reserves and resources. Primary and secondary clean energy. Energy use, efficiency and renewables. Energy and the environment/climate change. Sustainable energy choices and policies.

Prerequisite(s): registration in Sustainable and Renewable Energy Engineering.

Lectures one hour per week.

SREE 3001 [0.5 credit]

Sustainable and Renewable Energy Sources

Primary energy sources and the pathways to use.

Renewables: photovoltaic, solar-thermal, hydropower, geothermal, tidal. Fossil fuels and nuclear. Terrestrial, thermodynamic and electrical limitations.

Prerequisite(s): ENVE 2001 and MAAE 2300 and (ELEC 3605 or ELEC 2501 or fourth-year status in Environmental Engineering).

Lectures three hours per week, laboratories/problem analysis one hour per week.

SREE 3002 [0.5 credit]

Electricity: Use, Distribution, Integration of Distributed Generation

Electricity use in Ontario: rates, government incentives, smart use. Electricity Distribution: topology, reliability, load characteristics, voltage regulation, power loss, capacitors, economics of optimum choice, system protection.

Distributed Generation: guides and regulations, case study.

Prerequisite(s): SREE 3001, ELEC 4602 and (ELEC 2501 or ELEC 3605).

Lectures three hours per week, laboratories three hours per week alternate weeks.

SREE 3003 [0.5 credit]

Sustainable and Renewable Electricity Generation

Power system structures; photovoltaic (PV) cell model, PV current-voltage curves, maximum power point tracking, grid-connected PV systems; power flow of wind generation, grid connection of wind generator; energy storage classification, battery equivalent circuit model, battery charging and discharging; renewable generation; feed-in tariff program.

Prerequisite(s): SREE 3001, ELEC 4602 and (ELEC 2501 or ELEC 3605).

Lectures three hours per week, laboratories three hours per week alternate weeks.

SREE 4001 [0.5 credit]

Efficient Energy Conversion

Steam generators, solid, liquid, gaseous and biofuels and cycles. Geothermal, solar powerplants. Energy storage.

Environmental aspects of power generation. Industrial use and auto-generation of energy. Energy intensity and efficiency of industrial processes and products. Comparative analysis of raw material, energy, or product transport. Life-cycle analysis.

Precludes additional credit for MECH 4403.

Prerequisite(s): MAAE 2300, MAAE 2400 and fourth year status in Sustainable & Renewable Energy Engineering.

Lectures three hours per week, laboratories/problem analysis three hours per week.

SREE 4002 [0.5 credit]

The Energy Economy, Reliability and Risk

Interrelationship between energy and economic policy and regulations. Reliability of energy supply systems. Risk analysis and its application to the generation, distribution and environmental impacts of energy. Risks analysis and management associated with natural and human and regulatory influences. Environmental and public health risk analysis.

Prerequisite(s): fourth-year status in Engineering.

Lectures three hours per week.

SREE 4907 [1.0 credit]

Energy Engineering Project

Student teams develop professional-level experience by applying, honing, integrating and extending previously acquired knowledge in a major design project. Lectures are devoted to discussing project-related issues and student presentations. A project proposal, interim report, oral presentations, and a comprehensive final report are required.

Prerequisite(s): SREE 3002 and SREE 3003, fourth-year status in Sustainable and Renewable Energy Engineering and ECOR 4995 (may be taken concurrently). Certain projects may have additional prerequisites or corequisites. Lecture one hour a week, laboratory seven hours a week.