Sustainable and Renewable Energy (SREE)

Sustainable and Renewable Energy (SREE) Courses

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 their associated fundamental physics of conversion. Renewables: wind, large hydro, solar radiation, solar thermal. Fossil and biofuels. Nuclear. Climate science: the carbon cycle and the role of anthropogenic GHG emissions in climate warming. Terrestrial, thermodynamic and electrical limitations.
Includes: Experiential Learning Activity
Prerequisite(s): ENVE 2001 and MAAE 2300 and (ELEC 2602 or fourth-year status in Environmental Engineering).
Lectures three hours per week, laboratories/problem analysis one hour per week.

SREE 3002 [0.5 credit]
Electrical Distribution Systems
Electricity Distribution: topology, load characteristics, load prediction, voltage regulation, power flow, power loss, capacitors, state estimation, system reliability, system protection. Distribution Automation: components and architectures, communication systems. Distributed Generation: guides and regulations, microgrids, case study.
Includes: Experiential Learning Activity
Prerequisite(s): SREE 3001 and (ELEC 2602 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 cell: model, current#voltage curves, maximum power point tracking, grid connection; grid connection of wind generator; DC# AC and AC#DC converter simulation and analysis; energy storage classification; battery: equivalent circuit model, charging and discharging; renewable generation; feed#in tariff program.
Includes: Experiential Learning Activity
Prerequisite(s): SREE 3001 and (ELEC 2602 or ELEC 3605).
Lectures three hours per week, laboratories three hours per week alternate weeks.

SREE 4001 [0.5 credit]
Efficient Energy Conversion
Sustainable large-scale power generation. Geothermal, solar thermal, hydrogen power plants. Thermal grids and thermal energy storage. Environmental and economic aspects of power generation. Impacts of intermittent power generation. Sizing of wind, solar PV, run-of-river hydro, and offshore power plants. Current and future energy network topologies.
Includes: Experiential Learning Activity
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]
Modelling and Analysis of Energy Systems: Risk, Reliability, and Economics
Energy technologies exist within a context of economic, policy, and behavioral choices that affect their adoption. This course will introduce engineering methods for analyzing risk, uncertainty, and system-level decision-making. We will investigate criteria that affect energy systems: reliability, resilience, economics, financing, health, and environmental impacts.
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.
Includes: Experiential Learning Activity
Prerequisite(s): SREE 3002 and SREE 3003, and fourth-year status in Sustainable and Renewable Energy Engineering. Certain projects may have additional prerequisites or corequisites.