

# **Sustainable Energy and Energy Conversion Lab**

# ECE 3047

**Credit Hours:** 

1.00

# Course Levels:

Undergraduate (1000-5000 level)

#### **Course Components:**

Lecture Lab

#### **Course Description:**

Laboratory introducing basics of energy conversion processes for electrical energy supply systems utilizing conventional rotating machines and hardware-in-the-loop simulation system for sustainable energy systems.

#### Prerequisites and Co-requisites:

Prereq: 3040 (341), and enrollment in ECE or EngPhysics major.

#### **Course Goals / Objectives:**

- Master the basic concepts of transformers, 3-phase ac synchronous generators, 3-phase ac induction motors, and dc motors
- Be competent with the data acquisition concepts related to higher voltages and currents
- Be competent with operation of the ac and dc electric machinery in both generating and motoring modes
- Be familiar with the computer simulation tools
- Be exposed to using the real-time simulation platform

### **Course Topics:**

- Introduction to electrical energy systems; laboratory data acquisition system
- Introduction of hardware-in-the-loop based real time simulations; failure modes can be simulated and utilizing D/A capability can monitor real-time v(t)'s and i(t)'s.
- DC machines (motor mode), including variable speed operation
- Transformers and 3-phase synchronous generators
- 3-phase induction machines motor & generator action, with variable speed motor drive
- Introduction to simulation tools
- Real-time Simulation of DC-DC Converters

### **Designation:**

Elective