# ECE3072 Course Syllabus

**ECE3072**

**Electrical Energy Systems (1-2-3-3)**

**CMPE Degree**
This course is Elective for the CMPE degree.

**EE Degree**
This course is Required for the EE degree.

**Lab Hours**
3 supervised lab hours and 0 unsupervised lab hours

**Course Coordinator**
Saeedifard,Maryam

**Prerequisites**
ECE2040 [min C] or ECE 3710

**Corequisites**
None

**Catalog Description**
Non-renewable and renewable/sustainable energy sources. Processes, costs, and environmental impact of conversion into electric energy. Delivery and control of electric energy, electromechanical systems.

**Textbook(s)**
El-Sharkawi, *Electrical Energy: An Introduction* (3rd edition), CRC Press, 2012. ISBN 1466503033, ISBN 9781466503038 (required)

**Course Outcomes**
Upon successful completion of this course, students should be able to:

1. Perform basic calculations based on relationships involving energy in its various forms (mechanical, thermal, electrical, atomic)
2. Determine factors of CO2 emissions for various generation sources
3. Perform life cycle analysis and energy return on investment in making energy systems decisions
4. Analyze economic factors in energy systems investments
5. Calculate the cost and energy efficiency of traditional electric energy conversion sources (fossil fuel, nuclear, hydro)
6. Analyze geometry of the solar cell yields and perform engineering and economic analysis of the PV systems
7. Estimate the capacity and capacity factor of the wind turbine and determine basic elements of turbine design
8. Calculate the phasor relationships between voltages, currents, power and energy in three-phase and single-phase AC circuits
9. Calculate the magnetic field, stored energy, and inductance for simple magnetic circuits used in modeling electric machines

10. Perform energy efficiency and performance calculations on simple equivalent circuits for basic electric machines
11. Calculate the input-output relationships, energy efficiency and basic design of dc/dc, ac/dc and dc/ac converters
12. Calculate the force and torque in solenoids and electromechanical transducers such as relays
13. Perform energy efficiency and performance calculations of power supplies used for electronic equipment

**Student Outcomes**

In the parentheses for each Student Outcome:
"P" for primary indicates the outcome is a major focus of the entire course.
“M” for moderate indicates the outcome is the focus of at least one component of the course, but not majority of course material.
“LN” for “little to none” indicates that the course does not contribute significantly to this outcome.

1. ( P ) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. ( M ) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. ( M ) An ability to communicate effectively with a range of audiences
4. ( M ) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. ( LN ) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. ( M ) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. ( M ) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topical Outline**

1.Energy Requirements, Resources, and Sustainability.
2.Conversion of Non-Renewable and Renewable Energy Sources to Elect
3.Principles of Electric Power Delivery
4.Principles of Electric Energy Processing and Conversion
Laboratory Topics
1.PV Cell Characteristics
2.Wind Turbine Generator
3. Energy Storage - Battery Performance Analysis
4.Bicycle Ride
5.AC Circuits - Single Phase
6.Single phase transformer
7.Three Phase Circuits
8.Buck Converter
9.Single and Three phase rectifiers
10.Power Supply for Electronics Equipment