

## UNC Charlotte – Lee College of Engineering Senior Design Program

### Senior Design Project Description

<b>Company Name</b>	<i>EPRI</i>	<b>Date Submitted</b>	<i>04/26/2019</i>
<b>Project Title</b>	<i>Wind Turbine Design Project</i> <b>EPRI_WIND</b>	<b>Planned Starting Semester</b>	<i>Fall 2019</i>

#### Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

<b>Discipline</b>	<b>Number</b>	<b>Discipline</b>	<b>Number</b>
Mechanical	4	Electrical	1
Computer	1	Systems	
Other (multi-disciplinary or systems )			

#### Company and Project Overview:

The Electric Power Research Institute (EPRI) conducts research, development, and demonstration projects for the benefit of the public in the United States and internationally. As an independent, nonprofit organization for the public interest, we focus on electricity generation, delivery, and use in collaboration with the electricity sector, its stakeholders and others to enhance the quality of life by making electric power safe, reliable, affordable, and environmentally responsible.

EPRI has collaborated with the electricity sector and its stakeholders since 1972 and our membership has grown to represent approximately 90% of the electric utility revenue generated in the United States and extends to participation in more than 35 countries. The worldwide membership that supports our work comprises more than 1,000 organizations. While most members are electric utilities, others are businesses, government agencies, regulators and public or private entities engaged in some aspect of the generation, delivery, or use of electricity.

Through their advisory roles in EPRI, its research sectors and programs, EPRI members help inform the development of EPRI's annual research portfolio, identify critical and emerging electricity industry issues, and support the application and technology transfer of EPRI's research and development.



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EPRI has teamed with UNCC to support a senior design project focused on wind energy if the students choose to select it.

### **Project Requirements:**

- Research, design, build, and test an operational wind turbine according to a rule-set determined by industry needs, such as requirements set by the U.S. department of energy (DOE) collegiate wind turbine competition. This inaugural wind-turbine design project will be reviewed by wind turbine experts at EPRI and by UNCC professors and peers.
- Example rules are posted here:  
[https://www.energy.gov/sites/prod/files/2019/01/f58/CWC%202019%20Rules%20and%20Requirements%20Manual\\_20190104\\_0.pdf](https://www.energy.gov/sites/prod/files/2019/01/f58/CWC%202019%20Rules%20and%20Requirements%20Manual_20190104_0.pdf)
  - Rules may be simplified if necessary – but course could include design, reporting, cost-benefit analysis of 2-3 major design choices, and final testing and measurements of power production and efficiency of an operational wind turbine.

### **Expected Deliverables/Results:**

- Rule-set will be solidified during the first week of course-work, but deliverables will likely include
  - Design report with goals and analytical design results
    - efficiency, electrical output, mechanical loads
  - Functional ‘small’ wind turbine designed and built by students
  - Test plans, physical testing, and test reports validating whether goals met
    - efficiency, electrical output, mechanical loads
    - wind tunnel testing (“free jet” or otherwise)

### **Disposition of Deliverables at the End of the Project:**

Delivered to EPRI after the conclusion of the Expo.

### **List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):**

- ME students desired to have taken, or be taking MEGR 3090 Fundamentals of Wind Energy Systems
- Design group will need to be resourceful to best utilize opportunities and interactions with cross-functional departments, labs, professors, and students from different educational backgrounds. A wind turbine system is designed utilizing, but not limited to, the following engineering disciplines:
  - Aerodynamics
    - Rotary-wing focus, “blade element momentum” analysis, wind-tunnel testing
  - Mechanics
    - Materials
    - Dynamics
  - Electrical



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- Controls / Computer