



Department Project Information

Department Name	MEES	Date Submitted	05/06/2022
Project Title	WIND TURBINE DESIGN COMPETITION (UNCC_ME_WIND)	Planned Starting Semester	Fall 2022

Funding

What is the source of funds that will be used to cover all direct costs of this project?

Self (Fundraising), Grant (DOE) _____

Is this source of funds already secured? ___ (Partially) ___ No ___

Work Space

Have you secured a lab/work space for the project to be built? Yes ___ No ___

Faculty Mentor/Grading Instructors *

	Name	Email	Phone
1	Arun Vishnu Suresh Babu	asures10@uncc.edu	704-687-5929
2			
3			

*List any graduate student that will be working on the project as a grading instructor so that they may be added to Canvas.

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. Assume 10 hours per week per student.

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

Discipline	Number	Discipline	Number
Mechanical	7	Electrical	2
Computer	1	Systems	0
Mech. Engineering Technology	1	Civil	



Project Overview:

This multidisciplinary project will be of interest to students from a variety of backgrounds such as mechanical, electrical, computer and civil engineering. The team will participate in the DOE collegiate wind competition (CWC) which is an opportunity for students to develop their abilities to identify, formulate and make decisions to solve real-world engineering problems independently. This unique hands-on experience involves students in i) designing the mechanical and electrical subsystems of a wind turbine according to design specifications, and ii) building the turbine prototype and components, and iii) testing the structural, electrical and electronic characteristics of the subsystems, and iv) the experimental evaluation of the performance of the final turbine prototype and thus allows students to demonstrate proof-of concept for their designs and gives previously abstract concepts tangibility. The turbine must be designed, and mechanical loads analyzed, to withstand continuous winds of up to a specified wind speed. The electrical and control systems must be designed to maintain regulated output voltage to meet variable electrical load demands. Besides, the dimensions of a test-facility and the overall project cost will serve as a set of design constraints. The turbine prototype must be designed for testing inside a given wind-tunnel facility with specified dimensions while meeting the cost constraint. The project also requires community outreach throughout the project as well as preparing written documentation as part of the CWC.

Project Requirements:

All team members must be available to conduct field/laboratory testing on weekends and evenings and over school breaks, as well as travel to the competition in May. The team members will be required to take the laboratory safety tests to access the university machine shops, electrical labs etc. All students on the team are required to participate in on and off campus outreach and fundraising events as required by the CWC.

Expected Deliverables/Results:

Deliverables include:

1. All senior design course deliverables
2. All competition deliverables as specified by DOE CWC
3. System block diagrams
4. System mechanical model, including stress analysis and static performance
5. System electrical load model and electrical diagrams
6. Turbine concept ideation sketches
7. System detailed drawings
8. System assembly drawings and procedure
9. System / subsystem testing plan
10. Financial plan
11. Outreach plan
12. System installation procedure and checklist



13. System operation procedure and checklist
14. Operable Hardware (turbine prototype and electrical subsystems assembly)

Disposition of Deliverables at the End of the Project:

The product can be displayed at the Senior Design Expo and then handed over to the mentor.

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

Student should have an interest in one or more of the following:

Aero/Fluid Dynamics, Mechanical Design, Electrical Circuit Design, Power Electronics, Power Systems, Microcontrollers, Structural Analysis, Instrumentation and Controls, Dynamic Systems, Wind Energy

Knowledge of or ability to learn one or more of the following software:

CAD - Pro/e and/or Solidworks

Circuit Design: Eagle or similar

Power Electronics & Power System Analysis: MATLAB SIMULINK , PSSE, or similar

CFD: ANSYS FLUENT/STAR CCM

FEA: Abaqus or similar

Programming: C/Java/Python , microcontroller programming

Engineering analysis: Matlab/Mathcad

Data Acquisition: Labview

Microsoft Project, Microsoft Word, LaTeX