Curriculum Design for An Inclusive, Interdisciplinary Collegiate Wind Competition Course

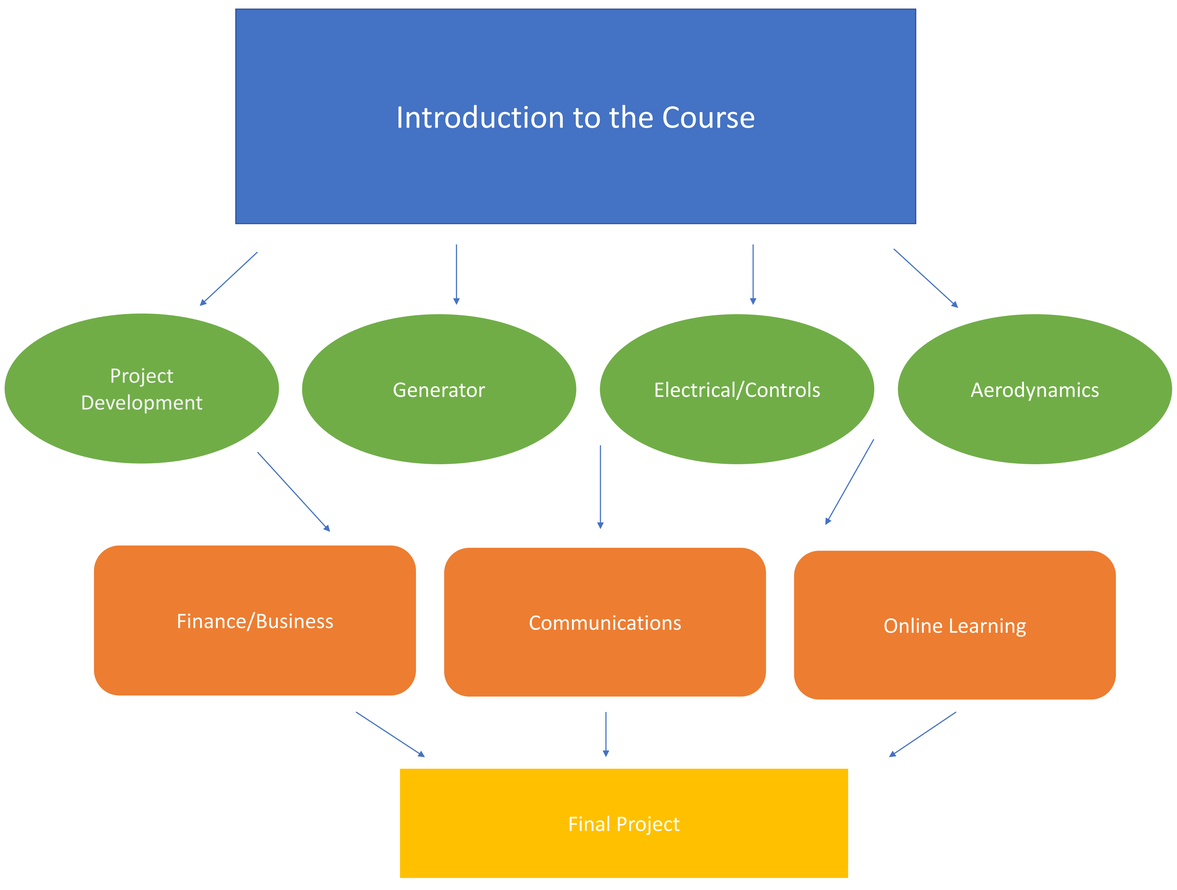
Valerie Doornbos[1] and Dr. Susan Stewart[2]
[1]Ripon College
[2]Department of Aerospace Engineering at The Pennsylvania State University
College of Engineering

Motivation and Objectives

- A student wind energy club already exists at Penn State, but the gender diversity has historically trailed off throughout the year. There is a desire to engage a broader group of students in the competition and make the environment more inclusive for this group.
- To create curriculum design for an interdisciplinary and inclusive wind energy course which prepares Penn State students to attend the U.S. Department of Energy's Collegiate Wind Competition (CWC).
- To incorporate student "funds of knowledge" by designing a curriculum to attract students of all backgrounds, genders, disciplines, and cultures.

Figure 1: The 2018 Penn State CWC Team

Course Design



- The Introductory Module introduces students to wind energy, sustainability, and climate change, among many other concepts.
- Students then select a track from Project Development, Generator, Aerodynamics, and Electrical/Controls which enables them to learn in the area which bests suits their interests.
- There are also many optional activities related to Finance/Business, Communications, and several Online Learning modules to help round out their experience.
- The course culminates in a Final Project, which requires the different tracks to work together to produce a report to be used in the competition.

Examples of Class Assignments
- The History of Wind Turbines Presentation
- Wind Turbine Terminology Quiz
- Societal Impacts of Wind Turbines Response Paper
- Analysis of Prior CWC Designs

Figure 2: Testing the turbine at the CWC

Obstacles Faced

- Not all students taking this course have an engineering background, so I needed to design activities which would appeal to everyone.
- Historically, few CWC participants have gone into wind/renewable energy jobs. The curriculum tries to better engage this cohort in the renewables movement by imparting on them its importance as it relates to climate change.
- It can be extremely difficult to attract people who are outside of the engineering department because of Penn State's numerous class offerings and the intimidation about the title of the course (AERSP 497).

Conclusions and Next Steps

- The next step will be to instruct the class and receive student feedback.
- Alterations can be made from this feedback to help improve the course for future students.
- By designing this curriculum, I hope to increase the environmental literacy of all students and help to provide a memorable classroom experience.

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References

- Office of Energy Efficiency & Renewable Energy. "Collegiate Wind Competition." *Energy.gov*, U.S. Department of Energy, 2019, https://www.energy.gov/eere/collegiatewindcompetition/collegiate-wind- competition.
- Shearer, Christine, et al. "Technical Assessment for Onshore Wind Energy." *Technical Assessment for Onshore Wind Energy*, Project Drawdown, June 2019, www.dropbox.com/home/Wind%20Onshore?preview=1_PD-TechnicalReport_Wind+ONSHORE_Scholars.docx.
- United States, Energy Efficiency & Renewable Energy, et al. "Wind Technology Market Report 2017." *Wind Technology Market Report 2017*, U.S. Department of Energy, 2017. https://emp.lbl.gov/sites/default/files/2017_wind_technologies_market_report.pdf.