Name: Susannah Smith
Year in Course: 3rd, Senior Year
Topic: Wind Energy
Mentor: Sam Roach, UMass Amherst
Title: Investigating the Impact of Region 2 Operation on Spar, Barge, and Semi-submerged Offshore Wind Turbine Platforms using OpenFAST

There has been a recent push for renewable energy research, especially wind energy. Horizontal axis wind turbines (HAWTs) are one of the most studied aspects of wind energy and the type of technology focused on specifically in this research. Wind turbines can be categorized into onshore and offshore energy, and offshore power can be further split into floating and standing foundations. Three types of floating foundations include barge, spar, and semi-submersible foundations, which can be implemented in situations that require different depths, locations, water conditions, and costs. Spar foundations are a long cylinder with ballast tanks that floats vertically. Barge platforms have a horizontal large surface area. Semi-sub foundations have columns that are partially submerged in a triangular base arrangement. Each floating foundation has multiple mooring lines connected to the ocean floor. Floating HAWTs, or Floating Offshore Wind Turbines (FOWTs) can be modeled using OpenFAST's simulation and linearization software. OpenFAST has capabilities to design and test two and three bladed turbines in different atmospheric conditions and special events, such as starting the generator or idling blades. Then, nonlinear results can be linearized into cyclical matrices and charts. This research tests the impacts of high speed wind on barge, spar, and semi-sub foundations using simulation and linearization during prime operation, excluding special events, start of operation, or shutting down. The ultimate goal of the research is to determine which of the offshore platforms is most resilient and able to withstand intense wind speeds, which is present in over 50% of offshore operations. This can be applied to create a more energy and cost efficient wind turbine to be implemented into wind farms.