

Course Number and Title

NAU:

TTU: WE 5301 Advanced Wind Energy Technology II

UMass:

Effort: 3-credits, semester**Prerequisites:**

Graduate Student Status. This course will involve a combination of lecture- and project-based learning. Having previously taken the Advanced Wind Energy Technology I course (or its equivalent) will be beneficial, however, is not mandatory. About 30% of the lecture material will consist of fundamentals covered in Advanced Wind Energy Technology I, and remainder of the lecture will cover advanced topics as described below. For detailed understanding of the fundamentals, it is recommended that the students take Advanced Wind Energy Technology I. The project portion of the course will involve performing research, writing, and presenting an approved topic. Some experience with scientific writing will be beneficial for the course, however, is not mandatory.

Textbook / Resources:

The subject material will closely follow the textbook, “Wind Energy Explained: Theory, Design and Application” by James F. Manwell (Author), Jon G. McGowan (Author), Anthony L. Rogers (Author). Additionally, course content may be supplemented by guest lectures from experts in industry when available.

Course description:

This is a multidisciplinary course intended for students with a physical science or engineering background wishing to pursue a technical approach to wind energy. It assumes some basic knowledge of STEM (Science, Technology, Engineering and Math) disciplines. It will educate students in advanced aerodynamic, mechanical and electrical aspects of wind turbines and modern wind turbine architecture, as well as wind characterization, wind energy conversion, economics, electrical systems, and integration with the electric utility grid.

Learning Outcomes:

The following list contains the learning outcomes for the course:

1. Summarize wind and other renewable technology development and their place in the US utility generation mix
2. Estimate the performance and loads of an aerodynamic rotor
3. General understanding of turbine blade design methodology
4. General understanding of the innovation process in wind energy
5. Introduction to wind energy grid and network security

Topics:

Introduction; Wind Energy technology fundamentals
Relevant Meteorology concepts
One-dimensional momentum theory
Blade element moment theory
Wind turbine blade design

Turbine loads
Turbine design software (FAST, Q-Blade)
Generators
Wind energy innovation
Wind energy grid and network security
Wind energy economics

Assessment:

Students will be assessed via the traditional measures: performance on homework, exams and project-related work. The exact method of assessment will depend upon the faculty instructor for the course.