MECH5370 - Wind Energy Fluid Mechanics

MECH 5370 Wind Energy Fluid Mechanics (3 semester credit hours) This course provides an introduction of the flow physics in wind turbine arrays. The main aerodynamic characteristics of a wind turbine rotor, the concept of the wind turbine wake and its evolution, characteristics of the wind field for different atmospheric conditions will be discussed for both horizontal and vertical axis wind turbines. Using conservation principles, simplified models to assess wind turbine performances will be derived such as the Blade Element Theory, power performance and the Betz limit. Computational methods for simulating wind turbine wakes, ranging from analytical wake models to more sophisticated CFD tools will be reviewed. The course will also encompass basic notions on experimental techniques to monitor wind turbine wakes through wind LiDARs and how to reproduce down-scaled experiments in a wind tunnel environment . (3-0) Y