Dynamics and Control of Large Utility-Scale Wind Turbines for Fun and Profit

Wednesday October 19th
EEB 248
10 am – 11 am

Dr. Mark Balas - University of Wyoming

Abstract:
The next generation of utility-scale wind turbines will be larger and more flexible than earlier designs to promote greater energy capture and reduce the cost of energy. It is here that the implementation of active feedback control is crucial to meet design objectives. Not only must there be power regulation or optimization but also load mitigation to extend the life of the turbine. Wind turbine dynamics modeling for active control is composed of four principal parts:
1. Aerodynamics and Inflow Behavior,
2. Structural Dynamics,
3. Feedback Control Algorithms,
4. Power Electronics

Active control is a relatively new technology for wind turbines. Basic control theory used in this talk is linear time-invariant and periodic control using disturbance accommodation, but with a strong connection to the aerodynamics and structural dynamics of wind turbines. New work in adaptive control of wind turbines will also be presented.

Bio:
Mark Balas is the Guthrie Nicholson Professor of Electrical Engineering and Head of the Electrical and Computer Engineering Department at the University of Wyoming. He has the following technical degrees: PhD in Mathematics, MS Electrical Engineering, MA Mathematics, and BS Electrical Engineering. He has held various positions in industry, academia, and government. Among his careers, he has been a university professor for over 30 years with RPI, MIT, University of Colorado-Boulder, and University of Wyoming, and has mentored 39 doctoral students. He has over 300 publications in archive journals, refereed conference proceedings and technical book chapters. He has been visiting faculty with the US Air Force Research Laboratory-Kirtland AFB, the NASA-Jet Propulsion Laboratory, The NASA Ames Research Center, and is the Associate Director of the University of Wyoming Wind Energy Research Center and adjunct faculty with the School of Energy Resources. He is a fellow of the AIAA and a life fellow of the IEEE. He is the father of Drum and Bass DJ: Despise. When he grows up, he would like to race motorcycles.

Host: Edmond Jonckheere