

**Graduate Studies Program:**  
**Academic Year 2014 - 15**

**"Renewable Energy Systems: Design,  
Development and Optimization"**

**Supervisor: Prof. Constantine David**

**Proposed Thesis Subject:**

**Manufacturing and performance evaluation of CFRP wind turbine blades**

**Introduction & Motivation:**

The subject of the proposed thesis is the implementation of a proper manufacturing process called VARTM (Vacuum Assisted Resin Transfer Molding) to produce prototype wind turbine blades in small scale that will be undergo a series of tests in order to evaluate their performance. The designed blades will be manufactured using low weight and of extremely high strength composite materials such as carbon fiber reinforced polymers (CFRP). Different combinations of carbon fibers and resin, under various process conditions, result in a wide range of different properties and strengths. The testing and examination comprises both investigation of the mechanical properties of the produced laminates and the blade's aerodynamics for maximum performance.

**Implementation & Means:**

- State of the art on wind turbine blades manufacturing processes and blade's performance testing
- 3D modeling and computational analysis of the designed wind turbine blades
- Design and manufacturing of the molds for the production of the blades
- Testing and evaluation of the produced wind turbine blades

**References:**

[1] Advances in Wind Turbine Blade Design and Materials, P Brøndsted, R Nijssen, Woodhead Publishing; 1 edition (November 14, 2013), ISBN-13: 978-0857094261

**Requirements:** 3D-Modeling, Materials Testing & Evaluation, Computational Mechanics