2011-2012 FALL SEMESTER
AE 495
Wind Energy and Wind Turbine Technology

PROJECT
Design, Production and Testing of a Vertical Axis Wind Turbine (VAWT)

The project work for AE 495 involves designing, producing and testing a Vertical Axis Wind Turbine (VAWT). Each project team should research and acquire the necessary knowledge on the basic principles of VAWT design and apply this knowledge to designing and building a prototype VAWT. You have about 2½ months of time, which is sufficient, but still you should use it efficiently. All project groups are expected to demonstrate their prototype turbine's performance at the end of the semester by testing it in the laboratory.

The turbine tests will be conducted in the Rüzgem (Hangar) Building. All turbines will be attached to the same power measurement unit, which will measure both the torque generated and the rpm of your turbine under different loading conditions. The turbines will be exposed to a 10 m/s wind speed, which will also be monitored. Both the maximum diameter (D_{max}) and the maximum height (H_{max}) of the turbines should not exceed 60 cm (including everything).

All groups are expected to submit a progress report and make a short presentation reporting their progress on the given deadline dates below. Late reports and presentations will not be accepted. The presentations should be 5 slides maximum and the presentation time should not exceed 5 minutes. I will strictly enforce this by stopping your presentation sharply at the end of the 5 minute period. Of course before doing that I will notify you when you have 1 minute left in your allotted time.

The time schedule for the project is as follows:

- Project announcement and groups formation – 31 October 2011
- Deadline for the submission of 1st Progress Report and Presentation – 28 November 2011
- Deadline for the submission of 2nd Progress Report and Presentation – 26 December 2011
- Final project report submission and Prototype Turbine Demonstrations in the Lab – Week of 23rd of January 2012

The projects will be graded as follows:

1st project progress report	2 points
1st project progress presentation	2 points
2nd project progress report	2 points
2nd project progress presentation	2 points
Final report	3 points
Final poster	4 points
Finished Prototype Turbine by Jan 23rd 2012	5 points
Turbine performance	$(PI/PI_{max}) \times (H_{max}/H) \times (D_{max}/D) \times 10$ points
TOTAL	**30 points**

PI is the Performance Index of your prototype turbine defined as:

$$PI = \frac{Power}{Cost} \times \text{Public Acceptance Coefficient}$$

Here, *Power* is the measured power produced by your turbine in Watts. Power measurements will be performed under three different loading conditions at the minimum and the average value will be used in the PI calculation. *Cost* is the manufacturing cost of your turbine in TL, which should include the "material cost" and the "labor cost" (iscilik). For the labor cost, you can use 10 TL man-hour as a base rate, which means if 1 person works for 1 hour for the construction of your turbine, she/he gets paid 10 TL. You will also have to submit all receipts or invoices for all items that you purchased to produce this wind turbine attached to your report as a proof of your material cost.

Public Acceptance Coefficient will be determined by all spectators who will attend the prototype demonstration session. Attendees will be composed of other group members and everybody else. Each attendee will be required to assign a grade from 1 to 10 for each turbine based on their perception of the visual impact of the turbine. The average value will be used in the PI calculation. PI_{max} is the Performance Index of the turbine that has the highest PI among all project groups. H and D are the height and diameter of your turbine, respectively. As you can see there will be a penalty for oversized turbines. For undersized turbines you will get more points however don't forget that smaller turbines generate much less power. Note that if you can build the smallest turbine with the highest PI, you can even get bonus points!

If you submit only the progress reports and presentations as well as the final report and the poster without producing a prototype turbine you can get 15/30 points maximum. If you produce a prototype turbine but if it does not work for some reason, fails to produce any power or breaks during the tests you can get 20/30 points maximum.

For the preparation of the progress and final reports as well as the presentations and the poster, please use the templates given on the course project website.

… and most important of it all … HAVE FUN!
Good Luck,
Dr. Oguz Uzol