

**Indian Institute of Technology Guwahati**  
**Proposal for a New Course / Revision of a Course**

<b>Course Number &amp; Title:</b> EN305 Wind and Hydro Energy Laboratory	
<b>L-T-P-C:</b> 0-0-3-3	
<b>Type of Letter Grading</b> (Regular Letter Grades / PP or NP Letter Grades): Regular letter grades	
<b>Kind of Proposal</b> (New Course / Revision of Existing Course): New Course	
<b>Offered as</b> (Compulsory / Elective): Compulsory course	
<b>Offered to:</b> B.Tech in Energy Engineering	
<b>Offered in</b> (Odd/ Even / Any): Odd	
<b>Offered by</b> (Name of Department/ Center): School of Energy Science & Engineering	
<b>Pre-Requisite:</b> Nil	
Preamble / Objectives (Optional): The objective of this lab is to understand the basic principles in the area of Wind & Hydro Energy Technology for undergraduate students through a series of experiments.	
Course Content/ Syllabus: Wind energy conversion system (WECS), operation of wind turbine nacelle, an electrical hub, and a hydraulic hub, cut-in speed of wind turbine, Tip Speed ratio (TSR) at different wind speeds, power analysis, doubly-fed induction generator (DFIG) and permanent magnet synchronous generator (PMSG) based WECS, small-scale hydropower plant.	
List of Experiments:	
1) Design and analysis of a wind turbine.	
2) Experimental determination of the cut-in speed of wind turbine.	
3) Evaluation of the coefficient of performance of wind turbine and the Tip Speed ratio (TSR) at different wind speeds.	
4) Analysis and characterization of wind energy conversion system	
5) Determination of the mechanical and electrical power:	
6) Study of maximum power point (MPP) of wind energy conversion system.	
7) Study of performance of doubly-fed induction generator (DFIG) for sub & super synchronous speed operation at different input mechanical power (P <sub>m</sub> ) condition.	
8) Study of performance of permanent magnet synchronous generator (PMSG) for variable speed/variable input mechanical power (P <sub>m</sub> ) condition.	
9) Performance characteristics of a micro hydel power plant	
10) Study of the operation of a hydraulic power installation.	
11) Determination of the electrical generation characteristics of the hydel power plant turbine, depending on the rotation speed.	
12) Performance characteristics of a Zero head/underwater turbine.	
13) Analysis of a Draft tube.	
Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".	
Text Books: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	J F Manwell, J G McGowan, and A L Rogers, <i>Wind Energy Explained: Theory, Design and Application</i> , 2 <sup>nd</sup> edition, John Wiley and Sons, Ltd.: West Sussex, UK, 2009.

2.	J M Hassan and et. al., <i>Hydraulic Power Plants: A Textbook for Engineering Students</i> , Bentham Science Publishers, USA, 2021.
Reference Books: (Format: Authors, <i>Book Title in Italics font</i> , Volume/Series, Edition Number, Publisher, Year.)	
1.	Instructor notes

Detailed Course Content (Optional) It will not be included in the Courses of Study Booklet		
Sl. No.	Broad Title / Topics	Number of Lectures
1		
2		
3		
4		
5		
Total Number of Lectures =		

In case of revision of existing course, Please provide below the details of existing course.	
<b>EXISTING COURSE</b>	
Course Number, Title, L-T-P-C: NA	
Pre-Requisite (if any): NA	
Contents: NA	
References: NA	