NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ENERGY AND ENVIRONMENT

COURSE PLAN – PART I			
Name of the programme and specialization	**M.Tech (Energy Engineering)**		
Course Title	**WIND ENERGY AND HYDRO POWER SYSTEMS**		
Course Code	**EN 646**	**No. of Credits**	**03 (3-0-0)**
Course Code of Pre-requisite subject(s)			
Session	**Jan 2021**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr. Jaganathan VM**	**Department**	**Energy and Environment**
Official Email	**vmjagan@nitt.edu**	**Telephone No.**	**+91 - 431 - 2503135**
Name of Course Coordinator(s) (if, applicable)	**Dr. Premalatha M**		
Official E-mail	**latha@nitt.edu**	**Telephone No.**	**+91 - 431 - 2503135**
Course Type (please tick appropriately)	**Core course** ☐	**Elective course** ☑	

Syllabus (approved in BoS)

Measurement and instrumentation – Beau fort number -Gust parameters – wind type – power law index -Betz constant -Terrain value.
Energy in wind– study of wind applicable Indian standards – Steel Tables, Structural Engineering. Variables in wind energy conversion systems – wind power density – power in a wind stream– wind turbine efficiency – Forces on the blades of a propeller – Solidity and selection curves.
HAWT, VAWT– tower design-power duration curves- wind rose diagrams- study of characteristics- actuator theory- controls and instrumentations.
Grid-combination of diesel generator- Battery storage - wind turbine circuits - Wind farms - fatiguestress.
Overview of micro mini and small hydro, Site selection and civil works, Penstocks and turbines, Speed and voltage regulation, Investment issues, load management and tariff collection
Distribution and marketing issues, case studies, Wind and hydro based stand-alone / hybrid power systems, Control of hybrid power systems, Wind diesel hybrid systems.

COURSE OBJECTIVES

- To introduce the concept of wind energy and hydro electric power.
- To know more about wind turbine –selection, design and instrumentation
- To bring out the developments and limitations of wind energy technology.

- To give a detailed overview on wind turbine circuits and grid combinations as hybrid systems.
- To present a overview on hydro-electric power, design and sizing of micro, mini and small hydro systems.
- To introduce case studies and other issues related to Wind/hydro and other hybrid combinations of practical relevance.

MAPPING OF COs with POs

Course Outcomes	**Programme Outcomes (PO)** (Enter Numbers only)
To explain and understand the importance of wind and hydro power in the current energy scenario.	**POs 1, 2, 4, 6, 7, 9 and 10**
To do the basic design calculation and analysis of wind farm proposed at particular site.	
To demonstrate knowledge on wind energy aerodynamics and sizing criterions.	
To bring out the limitations of wind and hydro energy and recommend suitable hybrid options.	
To explain and comprehend the different case studies and other issues related to wind and hydro power and come up with new ideas.	

COURSE PLAN – PART II

COURSE OVERVIEW

EN646 deals with fundamentals of different types conventional and non-conventional power plants, their application and economics of power generation.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery (Online/ MS Teams)**
1	1 - 2 Weeks	Measurement and instrumentation – Beau fort number -Gust parameters – wind type – power law index -Betz constant -Terrain value.	Power Point presentations and Interactive board
2	3 – 6 weeks	Energy in wind– study of wind applicable Indian standards – Steel Tables, Structural Engineering. Variables in wind energy conversion systems – wind power density – power in a wind stream– wind turbine efficiency – Forces on the blades of a	Power Point presentations and Interactive board

		propeller – Solidity and selection curves. **(Guest Lectures – 1 hour)**	
3	7 – 8 weeks	HAWT, VAWT– tower design-power duration curves- wind rose diagrams-study of characteristics- actuator theory- controls and instrumentations. Grid-combination of diesel generator-Battery storage - wind turbine circuits - Wind farms -fatiguestress.	Power Point presentations and Interactive board
4	9 – 11 weeks	Overview of micro mini and small hydro, Site selection and civil works, Penstocks and turbines, Speed and voltage regulation, Investment issues, load management and tariff collection. **(Guest Lectures – 1 hour)**	Power Point presentations and Interactive board
5	12 – 13 weeks	Distribution and marketing issues, case studies, Wind and hydro based stand-alone / hybrid power systems, Control of hybrid power systems, Wind diesel hybrid systems.	Power Point presentations and Interactive board

COURSE ASSESSMENT METHODS (shall range from 4 to 6**)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Quiz - 1	End of 6th week	50 minutes	25
2	Assignments	4th week – 10th week	Cummulative weightage of assignments	10
3	Quiz - 2	10th week	50 minutes	25
4	Seminars	10th week	15 minutes/each student	10
CPA	Compensation Assessment*	12th week	50 minutes	25
5	Final Assessment *	14th week	120 minutes	30

***mandatory; refer to guidelines on page 6**

COURSE EXIT SURVEY
Feedback through google docs at the end of the course

COURSE POLICY (including compensation assessment to be specified**)**

MODE OF CORRESPONDENCE

Students can meet me in my office (MN 004, Ground Floor, DEE building) or email me at vmjagan@nitt.edu

COMPENSATION ASSESSMENT POLICY

Compensation Assessment will be conducted only for students who miss Quiz-I or Quiz-II on valid/genuine grounds of medical or other emergencies.

PASSING CRITERIA

- A minimum of 30% should be scored in the final assessment for a pass.
- The passing minimum for all the courses shall be the maximum of 35% or Class Average/2.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

Reference Textbooks

1. S. Rao& B. B. Parulekar, "Energy Technology", 4th edition, Khanna publishers, 2005.

2. Wind energy Handbook, Edited by T. Burton, D. Sharpe, N. Jenkins and E. Bossanyi, John Wiley & Sons, 2001

3. Wind and Solar Power Systems, Mukund. R. Patel, 2nd Edition, Taylor & Francis, 2001

4. L .L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.

5. D. A. Spera, Wind Turbine Technology: Fundamental concepts of Wind Turbine Engineering, ASME Press

6. Anna Mani &Nooley, "Wind Energy Data for India", 1983.

1. IS 875 Part IV and IS 1893 semics D+STDS mareials STDS IS 226 (IS 2862, ASTMS 36, BS 4360 GR 43D and A).

7. Logan (EARL),"Turbo Machinery Basic theory and applications", 1981.

FOR APPROVAL

Course Faculty	**CC- Chairperson** (Dr A ARUNAGIRI)	**HOD**

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.