NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECRONICS ENGINEERING

COURSE PLAN PART I				
Name of the programme and specialization	**M. Tech and Power Systems**			
Course Title	**Renewable Power Generation Technologies**			
Course Code	**EE673**		**No. of Credits**	**03**
Course Code of Pre-requisite subject(s)	**Basic Electronics and Machines, Power Electronics**			
Session	**August 2021**		**Section**	**-**
Name of Faculty	**Dr. P.Srinivasa Rao Nayak**		**Department**	**EEE**
Official Email	**psnayak@nitt.edu**		**Telephone No.**	**7708243070**
Name of Course Coordinator(s)	**-NA-**			
Official E-mail	**-NA-**		**Telephone No.**	**-NA-**
Course Type		**Core course**	✓	**Elective course**

Syllabus (approved in BoS)

Sun and Earth - Basic Characteristics of solar radiation - angle of sunrays on solar collector - Photovoltaic cell – characteristics - equivalent circuit - Photovoltaic modules and arrays.

PV Systems - Design of PV systems-Standalone system with DC and AC loads with and without battery storage - Grid connected PV systems - Maximum Power Point Tracking.

Wind energy - energy in the wind - aerodynamics - rotor types - forces developed by blades - Aerodynamic models - braking systems - tower - control and monitoring system - design considerations - power curve - power speed characteristics - choice of electrical generators

Wind turbine generator systems - fixed speed induction generator-performance analysis- semi variable speed induction generator - variable speed induction generators with full and partial rated power converter topologies - isolated systems-self excited induction generator - permanent magnet alternator - performance analysis.

Hybrid energy systems - wind-diesel system-wind - PV system-micro hydro - PV system – biomass - PV-diesel system – geothermal - tidal and OTEC systems

Reference Books:

1. *Chetan Singh Solanki, 'Solar Photovoltaics -Fundamentals, Technologies and Applications', PHI Learning Pvt. Ltd., New Delhi, 2011*
2. *Van Overstraeton and Mertens R.P., 'Physics, Technology and use of Photovoltaics', Adam Hilger, Bristol,1996.*
3. *John F.Walker& Jenkins. N , 'Wind energy Technology', John Wiley and sons, Chichester, UK, 1997.*
4. *Freries LL ,'Wind Energy Conversion Systems', Prentice Hall, U.K., 1990*

COURSE OBJECTIVES

This course makes the student to be aware of various forms of renewable energy and to understand in detail the wind energy conversion system and photovoltaic conversion system.

MAPPING OF COs with POs

Upon completion of the course, the students will be able to	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14
1. Appraise the need and possibility of extracting solar energy and converting into electrical energy using PV cell.	M	L	M	H	H	M	M	L	NA	NA	L	M	M	M
2. Design and analyze stand-alone and grid connected PV system.	L	L	H	H	H	H	M	H	NA	M	M	H	M	L
3. Describe the dynamics of wind turbine and electrical generator.	M	L	M	H	M	M	H	M	M	H	M	M	M	L
4. Select and design suitable configuration of the wind energy conversion system based on application.	M	L	M	M	L	M	H	H	NA	M	M	M	L	M
5. Suggest, design and analyze hybrid energy systems.	H	M	H	H	M	M	M	H	L	H	M	M	H	M

COURSE PLAN – PART II

COURSE OVERVIEW

Students get exposure to the fundamental of solar energy and PV cell. Further they will be exposed to design and analysis of PV system for grid connected and standalone applications with battery and without battery. Students will understand the significance of wind technology and its energy conversion systems. Hybrid energy systems such as wind-diesel, Wind-PV, Geothermal-tidal etc., are also focussed in this course.

COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week/Contact Hours	Topic	Mode of Delivery
1	Weeks 1 to 3 (7 contact hours)	Basics of solar radiation, PV cell, equivalent circuit and PV module and array	Online lecture / Videos
2	Weeks 4 to 6 (9 contact hours)	PV system design for standalone and grid-connected applications, Maximum Power Point Tracking	Online lecture / Videos
3	Weeks 6 (2 contact hours)	Numerical examples / problem solving	Online lecture
4	Weeks 7 to 8 (6 contact hours)	Wind energy – energy in the wind-rotor types, tower – control and monitoring system – power speed characteristics	Online lecture / Videos
5	Weeks 9 to 10 (6 contact hours)	Performance analysis of Wind turbine generator systems with various generator at fixed and variable speed	Online lecture / Videos
6	Weeks 11 to 12 (6 contact hours)	Hybrid Energy Systems	Online lecture / Videos / Software

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Assessment I	5th Week	1hour 15 minutes	25
2	Assessment II	9th Week	1hour 15 minutes	25
3	Assignment	11th Week	---	10

4	Compensation Assessment	13th Week	1hour 15 minutes	25
5	Final Assessment	14th Week	2 hours	40

COURSE EXIT SURVEY

- Feedback from the students during class committee meetings
- Anonymous feedback through questionnaire (Mid of the semester and End of the semester) End Semester feedback on course outcome.

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

1. All students are advised to check their NITT webmail regularly. All the correspondence (schedule of classes/schedule of assessment/ any other information regarding course) will be done through their webmail only.
2. The compensation assessment would be conducted at the end of regular classes.

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 programme.

ADDITIONAL INFORMATION, IF ANY

- The faculty is available for consultation at times as per the intimation given by the faculty.

- Queries may also be emailed to the faculty directly to psnayak@nitt.edu, arakesh@nitt.edu,

FOR APPROVAL

Course Faculty _____ **CC- Chairperson** Dr. S. Kayalvizhi **HOD** Approved by HoD

Dr. P. Srinivasa Rao Nayak