Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-5 (B.Tech.)

Subject: Renewable Energy Resources – BETCH15313

Type of course: Professional Elective courses

Prerequisite: Basic Understanding of Physics, Chemistry, Fluid Flow and Heat transfer operations

Rationale: Renewable energy resources lies in their ability to combat climate change and reduce pollution, while simultaneously offering economic and social benefits. Renewable energy sources like solar, wind, and hydro power are environmentally friendly, providing cleaner energy than fossil fuels. They also contribute to energy independence, job creation, and improved public health

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	0	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No.	Course content	Hrs.	Weightage
1	**Classification of Energy:** Energy chain and common forms of usable energy - Present energy scenario - World energy status -Energy scenario in India - Introduction to renewable energy resources - Introduction to Solar Energy - Energy from sun - Spectral distribution of Solar radiation Instruments for measurement of solar radiation-Solar radiation data Analysis.	15	30%
2	**Application of Solar Energy:** Thermal applications - Introduction to Solar thermal collectors-Types - Principle of operation of different collectors - Flat plate Evacuated tube collectors Compound parabolic collectors - Solar air heaters - Solar dryers -solar cookers - solar stills - Solar ponds - concentrating collectors - line type - point type - Methods of Solar	15	20%

	power generation - Power towers.		
3	**Bio Energy Sources:** Energy through various processes - Energy through fermentation Gasification various types of Gasifiers -Pyrolysis - Fixed bed and fast Pyrolysis - Bio energy through digestion - Types of Digesters- Factors affecting the yield of products	15	30%
4.	**Wind Energy:** Resource assessment, types of wind turbines - selection of components - blade materials, power regulation - various methods of control, wind farms, site selection - offshore wind farm, Solar Wind Hybrid energy systems.	15	20%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Classification of Energy:** Find Review article related to current advancements in different energy resources and discuss with faculty and submit 200 words discussion outcome on GMIU web portal	10
2.	**Solar Energy:** Make short note on type of Solar Panel technologies and submit short note on GMIU web portal.	10
3.	**Bio Energy Sources:** Explore type of biomasses in Bhavnagar and nearby vicinity and make a note on its applicability for pyrolysis, make note on applicability and submit on GMIU web portal	10
4.	**Wind Energy:** Find out data of wind pattern for last 25 days in Gujrat and analyze it for wind turbine using wind turbine design parameters and submit calculation and data on GMIU web portal	10
5.	**Green Energy:** Submit your opinion in form of essay on green energy scopes in upcoming future in India. submit essay on GMIU web portal.	10
	Total	50

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	30%	10%	0%	0%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the different renewable energy resources.
CO2	To evaluate applicability of solar energy and use of solar equipment.
CO3	Identify the various processes of energy generation through biomass fermentation, gasification and pyrolysis and its practical applicability.
CO4	Develop critical understanding of wind turbine technologies and its important component.

Instructional Method:

The course delivery method will depend upon the requirement of content and needs of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done based on Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Energy Sources 2nd Edition by G.D. Rai, Khanna Publishers, New Delhi.

[2] Energy Technology by Rao & Parulaker, Khanna Publications, New Delhi.

[3] World energy Resources, Charles E Brown, Springer 2002