



Subject: Energy sources- MSCIN13516

Type of course: Major

Prerequisite: Students should have a basic knowledge of petrochemicals and polymers are primarily based on organic compounds (especially hydrocarbons). A strong understanding of organic reactions, functional groups, and isomerism is essential.

Rationale: To understand Job Creation and Industrial Growth: The petrochemical and polymer industries are large employers, involving millions of workers worldwide. The growth of these industries directly supports the global economy by creating jobs in manufacturing, research, logistics, and even consumer products.

Teaching and Examination Scheme:

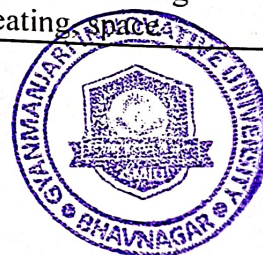
Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

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:

Unit No.	Course content	Hrs	% Weight age
1	Solar energy:- Introduction, Importance, Application and Equipments of solar energy. (Instrument used for solar radiation: Sun-shine recorder, pyrano meter and pyrhelio meter; Device for solar thermal collection and storage: flate plate collector, cylindrical parabolic collector and paraboloid concentrating collector; Thermal application of solar energy: water heating	15	25

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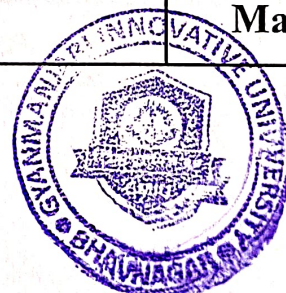


	heating, power generation, space cooling & refrigeration, distillation, drying and cooking.)		
2	<p>Wind energy:- Introduction, Importance, Application and Equipments of wind energy. (Utilization of wind energy, Advantages and disadvantages of wind energy, Site selection for wind farms, Basic components of wind energy conversion system-WECS, Classification of WECS)</p> <p>Geothermal energy:- Introduction, Importance, Application and Equipments of geothermal energy. (Geothermal sources: Hydrothermal system, Geopressed resources, Petrothermal resources, Application of geothermal energy, Advantages and disadvantages of geothermal energy over other energy forms, Operational and environment problems).</p>	15	25
3	<p>Ocean thermal energy:- Introduction, Importance, Application and Equipments of ocean thermal energy. (Ocean thermal energy conversion system-OTEC: Open cycle OTEC system, Closed cycle OTEC system)</p> <p>Tide energy:- Introduction, Importance, Application and Equipments of tide energy. (Components of tidal power plants: Single basin tidal power plant, Double basin tidal power plant, Advantages and disadvantages of tidal power plant.)</p> <p>Oceanic wave energy:- Introduction, Importance, Application and Equipments of oceanic wave energy. (Wave energy conversion device: Wave energy conversion by floats, Dolphin type wave power plant, Advantages and disadvantages of oceanic wave energy.)</p>	15	25
4.	<p>Biomass energy:- Introduction, Importance, Application and Equipments of biomass energy. (Energy from biomass, Methods of utilization, energy plantation, Biomass gasification, Classification of gasifier, Down draft gasifier, Application of gasifier, Problems associated with gasifier, Classification of biogas plants: Continuous type, Batch type, KVIC, Fixed dome type, Factors affecting biogas plants.)</p>	15	25
	Total	60	100

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
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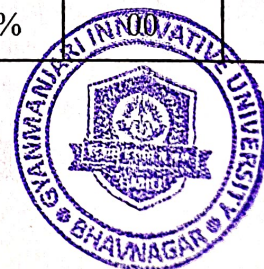


1.	WECS Component Analysis: Assign students to make labeled diagrams of wind energy conversion system components (blades, rotor, gearbox, generator)..Upload it on GMIU Web portal.	10
2.	Pros and Cons Discussion: Students list advantages and disadvantages and suggest ways to mitigate operational or environmental issues. Upload the details on GMIU Web portal.	10
3.	Wind Energy Debate: Split class into groups to discuss advantages vs disadvantages of wind energyEncourage critical thinking on operational costs, environmental issues, and energy yield.upload it to GMIU web Portal.	10
4.	Case Study Analysis: Examine a geothermal plant and analyze energy production efficiency and environmental impact, Prepare report and upload it to GMIU web Portal.	10
5.	Comparative Analysis: Compare biomass energy vs fossil fuels in terms of CO ₂ emissions and sustainability. Students must prepare the notes and submit them on the 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%		00

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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 above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand the principles, importance, and applications of solar energy & identify and describe the instruments for solar radiation measurement (sunshine recorder, pyranometer, pyr heliometer).
CO2	Develop an understanding of the principles, importance, and applications of wind energy. Evaluate the advantages and disadvantages of wind energy.
CO3	Remind the principles, importance, and applications of geothermal energy. Identify and classify geothermal sources (hydrothermal, geopressed, petrothermal).
CO4	Apply and explain the principles, importance, and applications of biomass energy. Identify methods of biomass utilization, including energy plantations, biogas, and gasification.

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any 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

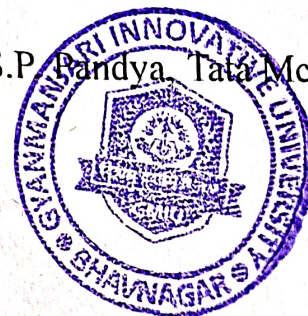
The internal evaluation will be done on the basis of Active Learning Assignment

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

Reference Books:

1. Fuel and Combustion by S.P. Sharma, Chandramohan, Tata McGrew Hill Book Co.
2. Conventional energy Technology, Fuels and Chemical Energy by S.P. Pandya, Tata Mc Grew Hill Book Co.

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3. Fuels, Furnaces and refractory by J.D. Gilchrist, Pergamon Press
4. Process systems, Analysis and Control by Coughanour and Koppe,
5. Process Instrument and Control, Hand book by Douglas, M.Considine, McGraw Hill Co.

Course Name				Credits				Examinations Marks			
Theory		Practical		Theory		Practical		Theory		Practical	
1	2	3	4	5	6	7	8	9	10	11	12

List of Experiments:

Sl. No.	Chemical	Area
1	Preparation of SA...	...
2	Preparation of SA...	...
3	Preparation of SA...	...
4	Preparation of SA...	...
5	Preparation of SA...	...
6	Preparation of SA...	...
7	Preparation of SA...	...
8	Preparation of SA...	...
9	Preparation of SA...	...
10	Preparation of SA...	...

