

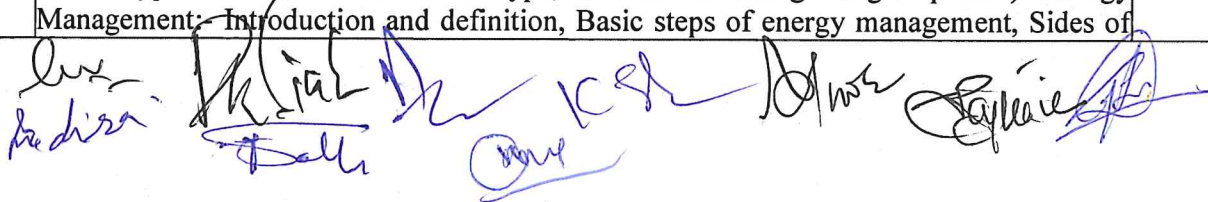
**FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28)**  
**DEPARTMENT OF INDUSTRIAL CHEMISTRY**  
**COURSE CURRICULUM**

<b>PART-A: Introduction</b>			
Program: Bachelor in Science (Honors/Honors with Research)		Semester - VII	Session: 2024-2025
1	Course Code	ICSE-07T	
2	Course Title	ENERGY SOURCES	
3	Course Type	DSE	
4	Pre-requisite(if,any)	As per program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> <li>➤ To understand the energy sources available.</li> <li>➤ To understand the concept of energy sources working.</li> <li>➤ To understand importance of and application of alternate energy sources</li> <li>➤ To understand the biomass energy sources, wind energy, solar energy, wind energy.</li> </ul>	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks:40

**PART -B: Content of the Course**

Total No.of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics(Course contents)	No.of Period
I	<b>Solar energy:-</b> 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 paraboloid collector and paraboloid concentrating collector; Thermal application of solar energy water heating, space heating, power generation, space cooling & refrigeration, distillation drying and cooking.)	12
II	<b>Wind energy:-</b> Introduction, Importance, Application and Equipments of wind energy. (Utilization of wild energy, Advantages and disadvantages of wind energy, Site selection for wind farms, Basic components of wind energy conversion system-WECS, Classification of WECS) <b>Geothermal energy:-</b> Introduction, Importance, Application and Equipments of geothermal energy. (Geothermal sources: Hydrothermal system, Geopressured resources, Petrothermal resources, Application of geothermal energy, Advantages and disadvantages of geothermal energy over other energy forms, Operational and environment problems).	11
III	<b>Ocean thermal energy:-</b> Introduction, Importance, Application and Equipments of ocean thermal energy. (Ocean thermal energy conversion system-OTEC: Open cycle OTEC system, Closed cycle OTEC system) <b>Tide energy:-</b> 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.) <b>Oceanic wave energy:-</b> 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.)	11
IV	<b>Biomass energy:-</b> 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.) <b>Energy Management:-</b> Introduction and definition, Basic steps of energy management, Sides of	11



	energy management and Objective of energy management.	
Keywords	<b>Energy Conservation, Energy Resources, Applications of Energy, Wave Energy, Energy Management</b>	

**Signature of Convener & Members (CBoS):**

### **PART-C: Learning Resources**

#### **Text Books, Reference Books and Others**

##### **Text Books Recommended –**

1. Sharma, S. P., & Chandramohan. (2001). Fuel and Combustion. Tata McGraw Hill Education.
2. Pandya, S. P. (2004). Conventional Energy Technology, Fuels and Chemical Energy. Tata McGraw Hill Education.

##### **Reference Books Recommended –**

1. Gilchrist, J. D. (1984). Fuels, Furnaces, and Refractories. Pergamon Press.
2. Coughanowr, D. R., & Koppel, L. B. (1993). Process Systems Analysis and Control. McGraw-Hill.
3. Considine, D. M. (1999). Process Instrumentation and Control Handbook: A Guide to Measurement, Communication, and Control. McGraw Hill.

##### **Online Resources–**

###### ➤ **e-Resources / e-books and e-learning portals**

- <https://www.energy.gov/eere/solar/solar-energy-technologies-office>
- <https://www.nrel.gov/>
- <https://gwec.net/>
- "<https://oceanservice.noaa.gov/economy/wind-energy/welcome.html>
- "<https://www.ocean-energy-systems.org/>
- "<https://www.ornl.gov/facility/ntrc/research-areas/bioenergy-technologies>
- <https://biomassmagazine.com/>

### **PART-D: Assessment and Evaluation**

#### **Suggested Continuous Evaluation Methods:**

**Maximum Marks: 100 Marks**

**Continuous Internal Assessment(CIA):30 Marks**

**End Semester Exam(ESE):70 Marks**

<b>Continuous Internal Assessment(CIA): (By Course Teacher)</b>	Internal Test / Quiz-(2): 20 +20 Assignment/Seminar- 10 Total Marks -30	Better marks out of the two Test / Quiz+ obtained marks in Assignment shall be considered against 30 Marks
<b>End Semester Exam (ESE):</b>	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4=20Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4x10=40Marks	

**Name and Signature of Convener & Members of CBoS:**

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**COURSE CURRICULUM**

<b>PART-A: Introduction</b>			
Program: Bachelor in Science (Honors/Honors with Research)		Semester - VII	Session: 2024-2025
1	CourseCode	ICSE CHSE-07P	
2	CourseTitle	ENERGY SOURCES LAB. COURSE	
3	CourseType	DSE	
4	Pre-requisite(if,any)	As per program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> <li>➤ To study about biogas plant</li> <li>➤ To study the production process of biodiesel.</li> <li>➤ To study the production process of bio-fuels.</li> </ul>	
6	CreditValue	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	TotalMarks	Max.Marks:50	Min Passing Marks:20
<b>PART -B: Content of theCourse</b>			
TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)			
Module	Topics(Coursecontents)		No.ofP eriod
Lab./Field Training/ Experiment Contents of Course	Biogas plants, comparison of bio-gas with other fuels, Selection of site for installation of a bio gas plant, Production of biogas - the biogas plants. Study of the production process of biodiesel. Study of the production process of bio-fuels.		<b>30</b>
Keywords	Energy Conservation, Energy Resources, Applications of Energy, Wave Energy, Energy Management		

**Signature of Convener & Members (CBoS):**

**PART-C: Learning Resources**

**Text Books, Reference Books and Others**

**Text Books Recommended –**

1. *Biomass, Biopolymer-Based Materials, and Bioenergy, 2019*
2. *Reddy, G. M., Reddy, B. V., & Ramesh, S. (2005). Biodiesel - A sustainable fuel. Allied Publishers Pvt. Ltd.*
3. *Bhattacharya, S. C., Khan, S. K., & Ambastha, A. K. (2009). Introduction to biofuels. Allied Publishers Pvt. Ltd.*
4. *Singh, S. D. (2011). Biofuels and bioenergy. Wiley India Pvt. Ltd.*

**Reference Books Recommended –**

- 5.
1. *Venko Beschkov, Biogas, Biodiesel and Bioethanol as Multifunctional Renewable Fuels and Raw Materials, 25 January 2017, DOI: 10.5772/65734*
2. *Raul, A. R. (2017). Biogas digester design construction and operation. LAP Lambert Academic Publishing.*

**Online Resources–**

- [https://link.springer.com/referenceworkentry/10.1007%2F978-3-319-28251-6\\_121-1](https://link.springer.com/referenceworkentry/10.1007%2F978-3-319-28251-6_121-1)
- <https://chemicalengineeringworld.com/extraction-processes/>
- <https://www.lennotech.com/library/extraction/>
- <https://www.vekamaf.com/equipment/extraction/>
- <https://chemicalengineeringworld.com/distillation-processes/>

**Online Resources–**

➤ e-Resources / e-books and e-learning portals

**PART-D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

**Maximum Marks: 50 Marks**

**Continuous Internal Assessment(CIA):15 Marks**

**End Semester Exam(ESE):35Marks**

<b>Continuous Internal Assessment(CIA):</b> (By Course Teacher)	Internal Test / Quiz-(2): 10 &10 Assignment/Seminar +Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz +obtained marks in Assignment shall be considered against 15 Marks
<b>End Semester Exam (ESE):</b>	<b>Laboratory / Field Skill Performance: On spot Assessment</b> S. Performed the Task based on lab. work - 20 Marks T. Spotting based on tools & technology (written) – 10 Marks U. Viva-voce (based on principle/technology) - 05 Marks	<b>Managed by</b> Course teacher as per lab. status

**Name and Signature of Convener & Members of CBoS:**

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