AC – 20/05/2025
Item No. – 6.18 (N) (3a) Sem. III

As Per NEP 2020

University of Mumbai

Syllabus for Basket of OE Vertical 3	
Faculty of Science	
Board of Studies in Chemistry	
Second Year Programme	
Semester	**III**
Title of Paper	**Credits**
I) Non-Conventional Energy Sources	**2**
From the Academic Year	**2025-26**

Title of Paper: Non-Conventional Energy Sources

Sr. No.	Heading	Particulars
1	**Description the course :**	The course aims to provide the information on various Non-Conventional Energy Sources
2	**Vertical :**	Open Elective
3	**Type :**	Theory
4	**Credit**:	2 credits (1 credit = 15 Hours for Theory in a semester)
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives**: **CO1:** Understand various energy sources and their forms. **CO2:** Describe the global and Indian energy scenario and types of conventional energy. **CO3:** Explain conventional energy sources like coal, oil, gas, and nuclear along with their effects and applications. **CO4**: Recognize the importance of renewable energy and its impact on the environment. **CO5**: Understand solar energy systems, storage methods, and their applications. **CO6**: Describe wind, ocean, and biomass energy systems and their working principles. **CO7**: Understand energy audits and the concept of carbon footprint.	

8	**Course Outcomes**: **Student will be** **OC1:** To understand different energy sources and their forms. **OC2:** To describe the global and Indian energy scenario and classify conventional energy sources. **OC3:** To explain sources, types, applications, and adverse effects of conventional energy like coal, oil, gas, and nuclear. **OC4:** To recognize the need for renewable energy and its environmental relevance. **OC5:** To explain solar energy systems, storage methods, and their applications. **OC6:** To describe wind, ocean, and biomass energy systems and understand energy audits

	and carbon footprint.

9	**Modules**

Semester	Module	Description	Credits
III	**I**	**Introduction of Energy and Solar Energy**	**02**
	II	**Other forms of energy**	

MODULE	DESCRIPTION	LECTURE
I	**1 Introduction of Energy and Solar Energy** 1.1 Introduction to energy sources and their availability, Different Forms of Energy (01L) 1.2 Global and Indian energy scenario, Conventional energy sources: Commercial and Non-Commercial (03L) 1.3 Conventional energy sources source: types, applications, adverse effect and, (i) Coal (ii) Oil and gas (iii) Agricultural and Organic waste water (iv) Nuclear energy (04L) 1.4 Need of renewable energy sources and its impact on environment (03L) 1.5 Solar Energy - solar energy storage systems and applications (04L)	**15 L**
II	**2 Other forms of energy** 2.1 Wind energy conversion, site selection, basic components of Wind Energy Conversion System (WECS), classification of WEC systems, applications (04L) 2.2 Energy from the oceans: Basic principle of Ocean Thermal Energy Conversion (OTEC) system, open cycle and closed cycle systems (04L) 2.3 Concept of Biomass, Biomass conversion technologies, Biogas generation and factors affecting to it. (04L) 2.4 Carbon footprint, Energy audit (typical Case Study) (03L)	**15 L**

10 Reference Books

1. Solar Energy; S.P. Sukhatme; TMH.
2. Non-Conventional Energy Sources; G.D. Rai; Khanna Publications.
3. Non-Conventional Energy Sources; B. H. Khan.
4. Treatise on Solar Energy; H.P. Garg; John Wiley & Sons.
5. Renewable Energy Conversion, Transmission and Storage; BentSorensen; Elsevier Publication.
6. Renewable Energy; Godfrey Boyle; Oxford University Press, Mumbai.
7. Renewable Energy Sources and Emerging Technology; D.P. Kothari, K.C. Singal, Rakesh Ranjan; PHI.
8. WEB RESOURCES:

(i) http://www.tn.gov.in/spc/tenthplan/CH_11_2.PDF

(ii) http://bieap.gov.in/Nonconventionalenergysources

(iii) http://www.emea.org/Guide%20Books/book4/4.12App%20of%20Non%20conventional

<table>
<tr><td>11</td><td>Internal Continuous Assessment: 40%</td><td>External, Semester End Examination 60% Individual Passing in Internal and External Examination</td></tr>
<tr><td>12</td><td>Continuous Evaluation through:
Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3)</td><td></td></tr>
<tr><td>13</td><td colspan="2">Format of Question Paper: for the final examination
<table>
<tr><td rowspan="2">Theory</td><td>Credit</td><td>No. of Hours</td><td>Marks</td></tr>
<tr><td>02</td><td>30</td><td>50</td></tr>
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<tr><td>Internal Continuous Assessment: 40% (20 Marks)</td><td>External, Semester End Examination: 60% Individual Passing in Internal and External Examination (30 Marks)</td></tr>
<tr><td>Continuous Evaluation through:
Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.(at least 3)</td><td>As per the Format of Question Paper</td></tr>
<tr><td colspan="2">Format of Question Paper: for the final examination</td></tr>
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Question Paper Pattern for 30 Marks:

Semester End Theory Examination:
1. Duration - These examinations shall be of one-hour duration.
2. Theory question paper pattern:
a. There shall be 02 questions, Question 1 carries 15 Marks based on Unit I and Question 2 carries 15 Marks based on Unit II.
b. All questions shall be compulsory with internal choice within the questions.</td></tr>
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Question	Particulars	Marks	Questions Based on
Q.1	A) Objective Questions 06 out of 10	06	Unit I
	B) Subjective Questions 03 out of 05	09	
Q.2	A) Objective Questions 06 out of 10	06	Unit II
	B) Subjective Questions 03 out of 05	09	
	Total	**30**	**---**

Sd/-
Sign of
Dr. Sunil Patil
Coordinator,
Board of Studies in Chemistry

Sd/-
Sign of
Prin. (Dr.) Madhav Rajwade
Offg. Associate Dean,
Faculty of Science and Technology

Sd/-
Sign of
Prof. (Dr.) Shivram Garje
Offg. Dean,
Faculty of Science and Technology