Programme	**:**	**Diploma in CE/EE/ET/ME/MT/CM/IT**
Programme Code	**:**	**01/02/03/04/05/06/07/15/16/17/18/19/24**
Name of Course	**:**	**Renewable & Sustainable Energy Management**
Course Code	**:**	**AU483**

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**--**	**--**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Two class tests each of 60 minutes**	**3 Hrs**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

Energy is an important aspect in all sectors of country's economy. The energy crisis is mainly caused due to increased population and enhanced standard of living and life style of people. The conventional sources of energy are insufficient to meet these demands. Hence alternative energy sources are utilized for power production. The use of alternative energy source is increasing day by day. Diploma Engineers are to develop, operate and maintain these systems therefore essential to know basics of energy conversion, conservation, energy audit and waste heat recovery techniques.

Course Objectives:

After studying this course, the student will be able to

•	Know the National scene of energy production, utilization, consumption and reserves.
•	Appreciate the need for non-conventional energy sources.
•	Understand relative advantages and disadvantages of various non-conventional energy sources.
•	Develop awareness for effective utilization of alternative energy sources.
•	Identify different components of solar energy and wind energy sources.
•	Identify and analyze biomass plant.
•	Identify and apply energy conservation techniques for commonly used Power absorbing and generating devices.
•	Apply principles of energy conservation and energy management techniques.

Course Content:

Chapter No.		Name of Topic/Sub topic	Hrs	Marks
1.		**Review of conventional sources of energy**		
	1.1	Types of conventional energy sources, availability and important power plants in India	**03**	**06**
	1.2	India's production and reserves for fossil fuels, waterpower, nuclear power.		
	1.3	Need for non-conventional energy sources.		
	1.4	Environmental impact of various energy sources. Green building, sustainable development. Carbon credits and its significance		
2.		**Solar Energy**		
	2.1	Principle of conversion of solar energy into heat and electricity Solar radiation. Solar radiations at earth's surface	**04**	**10**
	2.2	Solar radiation geometry- declination, hour Angle, altitude angle, incident angle, zenith angle, solar azimuth angle.		
	2.3	Solar collectors and their types ,applications, advantages and limitations		
3		**Applications of Solar energy**		
	3.1	Solar electric power generation: solar photovoltaic cell, solar cell principle and working, its applications, advantages and disadvantages.	**04**	**10**
	3.2	Solar water heating, Solar distillation, Solar cooking and furnace,		
	3.3	Solar pumping and Green house, Agriculture and industrial process heat.		
	3.4	Space heating, space cooling,		
4.		**Wind Energy**		
	4.1	Basic principles of wind energy conversion, power in wind, available wind power formulation, power coefficient, and maximum power	**05**	**16**
	4.2	Main considerations in selecting a site for wind mills, advantages and limitations of wind energy conversion		
	4.3	Classification of windmills, construction and working of horizontal And vertical axis wind mills, their comparison.		
	4.4	Main applications of wind energy for power generation and pumping.		
5.		**Energy From Biomass**		
	5.1	Common species recommended for biomass, methods for obtaining energy from biomass.	**05**	**12**
	5.2	Classification of biomass- gasified, fixed bed and fluidized		
	5.3	Application of gasifier		
	5.4	Biodiesel production and application		

	5.5	Agricultural waste as biomass, biomass digester, comparison of biomass with conventional fuels.		
6.		**Geothermal Energy and Tidal Energy**		
	6.1	Availability, forms of geothermal energy- Dry steam, wet steam, hot dry rock, magnetic chamber system	**06**	**16**
	6.2	Different power plants available.		
	6.3	Tidal power, factors for selection of tidal power plant		
	6.4	Classification-Single basin, double basin type		
	6.5	Tidal power plants in world, ocean thermal plants.		
7		**Energy Conservation and management**		
	7.1	Energy conservation, Concept of energy management, need and importance of energy conservation	**05**	**10**
	7.2	Concept of payback period, return on investment, life cycle cost, Sankey diagrams, specific energy consumption, Distribution of energy consumption		
	7.3	Energy audit, types of audit, methods of energy conservation		
	7.4	Cogeneration and its application.		
		Total	**32**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Review of conventional sources of energy	Classroom teaching and Internet browsing
2.	Solar Energy	Classroom teaching and field visits, use of charts
3.	Wind Energy	Classroom teaching, field visit & use of charts
4.	Energy From Biomass	Classroom teaching, field visit & use of charts
5.	Geothermal Energy	Classroom teaching and Internet browsing
6.	Tidal Energy	Classroom teaching and Internet browsing
7.	Energy Conservation	Classroom teaching
8.	Energy Conservation Techniques	Classroom teaching and case study

Reference Books:

Sr. No	Author	Title	Publication
1.	Non conventional energy resources	Dr B.H.Khan	Tata McGraw Hill
2.	Non conventional energy Resources	G. D. Rai	Khanna publication
3.	Solar energy	S. P. Sukhatme	Tata McGraw Hill
4.	Solar energy	H. P. Garg	Tata McGraw Hill
5.	Power plant engineering	Arrora Domkundwar	Dhanpat Rai & co.
6.	India- The energy sector	P.H. Henderson	Oxford University Press
7.	Industrial energy conservation	D. A. Ray	Pergaman Press
8.	Non-conventional energy source	K. M. Mittal	---
9.	Energy resource management	Krupal Singh Jogi	---
10.	Website for Akshay Urja News Bulletin. (www.mnes.nic.in)	---	---

Learning Resources: Charts of solar water heater and cooker, Models of solar water heater and cooker, Photovoltaic cells etc., video cassette no.131, 365 of G.P.P. library

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Review of conventional sources of energy	06	--	--	06
2.	Solar Energy	04	06	--	10
3.	Applications of Solar energy	--	04	06	10
4.	Wind Energy	04	04	08	16
5.	Energy From Biomass	04	02	06	12
6	Geothermal Energy &Tidal Energy	06	04	06	16
7.	Energy Conservation& management	04	06	--	10
	Total	**28**	**26**	**26**	**80**

Prepared By:

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