DEPARTMENT OF PRODUCTION TECHNOLOGY
MIT CAMPUS
ANNA UNIVERSITY : : CHENNAI – 600 044.

COURSE PLAN

COURSE DETAILS:

Degree	B.E		
Programme Name	MECHANICAL (6/8)		
Course Code &Title	ME5079 NEW AND RENEWABLE SOURCES OF ENERGY		
Credits	3	**Session**	Jan - Jun 2024
Course Type	Professional elective	**Section**	1
Name of the Faculty	Mr.A.Visagan, Teaching Fellow, Department of Production Technology, MIT Campus, Anna University, Chennai -44		

COURSE CONTENT:

Syllabus: (Approved Syllabus as per Regulation 2019)

UNIT I ENERGY SCENARIO **9**

Indian energy scenario in various sectors – domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status Potential of various renewable energy sources-Global energy status-Per capita energy consumption in various countries - Future energy plans

UNIT II SOLAR ENERGY **9**

Solar radiation – Measurements of solar radiation and sunshine – Solar thermal collectors – Flat plate and concentrating collectors – Solar thermal applications – Solar thermal energy storage – Fundamentals of solar photo voltaic conversion – Solar cells – Solar PV Systems – Solar PV applications.

UNIT III WIND ENERGY **9**

Wind data and energy estimation – Betz limit - Site selection for windfarms – characteristics Horizontal axis wind turbine – components - Vertical axis wind turbine – Wind turbine generators and its performance – Hybrid systems – Environmental issues - Applications.

UNIT IV BIO-ENERGY **9**

Bio resources – Biomass direct combustion – thermochemical conversion - biochemical conversion mechanical conversion - Biomass gasifier - Types of biomass gasifiers – Cogeneration – Carbonisation – Pyrolysis - Biogas plants – Digesters –Biodiesel production – Ethanol production -Applications.

UNIT V OCEAN AND GEOTHERMAL ENERGY 9

Small hydro - Tidal energy – Wave energy – Open and closed OTEC Cycles – Limitations – Geothermal energy – Geothermal energy sources - Types of geothermal power plants – Applications - Environmental impact.

TOTAL =45 PERIODS

TEXT BOOKS:

1. G.D. Rai, "Non-Conventional Energy Sources", Standard Publishers Distributors, 1992.
2. John Twidell, Tony Weir, and Anthony D. Weir, Renewable Energy Resources, Taylor & Francis, 2006.

REFERENCES:

1. B.H. Khan, "Non-Conventional Energy Resources", McGraw Hill, 2009.
2. G.N. Tiwari, "Solar Energy – Fundamentals Design, Modelling and applications", Alpha Science, 2015.
3. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, 2012.
4. N.K. Bansal, Non-Conventional Energy Resources, Vikas Publishing House, 2014.
5. S.P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", Tata McGraw Hill, 2009.

COURSE LEARNING OBJECTIVES

The main learning objective of this course is to prepare the students for:

1. Describing the current energy scenario in terms of conventional renewable energy and future plan.
2. Applying the principle of various solar energy generating devices.
3. Applying the principle of various wind energy devices.
4. Applying the principle of various bio energy devices.
5. Applying the principle of various ocean and geothermal energy devices.

COURSE OUTCOME (CO)

Upon completion of this course, the students will be able to:

1. Describe the current energy scenario in terms of conventional renewable energy and future plan.
2. Apply the principle of various solar energy generating devices.
3. Apply the principle of various wind energy devices.
4. Apply the principle of various bio energy devices.
5. Apply the principle of various ocean and geothermal energy devices.

COURSE ARTICULATION MATRIX

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1			0.6				0.9								0.3
2	0.6	0.6	0.9	0.6	0.3		0.9			0.3	0.6	0.9	0.9	0.6	0.6
3	0.6	0.6	0.9	0.6	0.3		0.9			0.3	0.6	0.9	0.9	0.6	0.6
4	0.6	0.6	0.9	0.6	0.3		0.9			0.3	0.6	0.9	0.9	0.6	0.6
5	0.6	0.6	0.9	0.6	0.3		0.9			0.3	0.6	0.9	0.9	0.6	0.6

The correlation levels:1: Low;2: Medium;3: High.

COURSE ALIGNED PROGRAMME OUTCOMES (PO) & PROGRAMME SPECIFIC OUTCOMES (PSO)

PO	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply knowledge of mathematics, basic science and engineering science.
2	Problem analysis	Identify, formulate and solve engineering problems.
3	Design/development of solutions	Design a system or process to improve its performance, satisfying its constraints.
4	Conduct investigations of complex problems	Conduct experiments & collect, analyze and interpret the data.
5	Modern tool usage	Apply various tools and techniques to improve the efficiency of the system.
6	The Engineer and society	Conduct selves to uphold the professional and social obligations.
7	Environment and sustainability	Design the system with environment consciousness and sustainable development.
8	Ethics	Interacting industry, business and society in a professional and ethical manner.
9	Individual and team work	Function in a multidisciplinary team.
10	Communication	Proficiency in oral and written Communication.
11	Project management and finance	Implement cost effective and improved system.
12	Life-long learning	Continue professional development and learning as a life-long activity.

PSO	Graduates demonstrate
1	Apply the knowledge gained in Mechanical Engineering for design and development and manufacture of engineering systems.
2	Apply the knowledge acquired to investigate research-oriented problems in mechanical engineering with due consideration for environmental and social impacts.
3	Use the engineering analysis and data management tools for effective management of multidisciplinary projects.

COURSE TENTATIVE SCHEDULE / PLAN

Week	Day	Date	Hrs	Unit	Topics	Text / Ref.
1	TH	25/01/2024	1	I	Indian energy scenario in various sectors – domestic, industrial, commercial, agriculture, transportation and others	T1
2	FR	26/01/2024	2		Present conventional energy status – Present renewable energy status	T1
3	TH	01/02/2024	1		Potential of various renewable energy sources-Global energy status	T1
4	FR	02/02/2024	2		Per capita energy consumption in various countries - Future energy plans	T1
5	TH	08/02/2024	1	II	Solar radiation – Measurements of solar radiation and sunshine	T1
6	FR	09/02/2024	2		Solar thermal collectors – Flat plate and	T1

					concentrating collectors	
7	TH	15/02/2024	1		Solar thermal applications – Solar thermal energy storage	T1
8	FR	16/02/2024	2		Fundamentals of solar photo voltaic conversion – Solar cells	T1
9	TH	22/02/2024	1		Solar PV Systems – Solar PV applications.	T1
10	FR	23/02/2024	2	III	Wind data and energy estimation – Betz limit	T1
11	TH	29/02/2024	1		Site selection for windfarms – characteristics	T1
12	FR	01/03/2024	2		Horizontal axis wind turbine – components - Vertical axis wind turbine	T1
13	TH	07/03/2024	1		Wind turbine generators and its performance	T1
14	FR	08/03/2024	2		Applications of wind energy	T1
15	TH	14/03/2024	1		Hybrid systems – Environmental issues - Applications.	T1
16	FR	15/03/2024	2	IV	Bio resources – Biomass direct combustion	T1
17	TH	21/03/2024	1		Thermochemical conversion	T1
18	FR	22/03/2024	2		Biochemical conversion	T1
19	TH	28/03/2024	1		Mechanical conversion -	T1
20	FR	29/03/2024	2		Biomass gasifier	T1
21	TH	04/04/2024	1		Types of biomass gasifiers - Cogeneration	T1
22	FR	05/04/2024	2		Carbonization – Process	T1
23	TH	11/04/2024	1		Pyrolysis-Process-Types-Applications	T1
24	FR	12/04/2024	2		Biogas plants – Digesters	T1
25	TH	18/04/2024	1		Biodiesel production	T1
26	FR	19/04/2024	2		Ethanol production - Applications.	T1
27	TH	25/04/2024	1	V	Small hydro - Tidal energy – Wave energy	T1
28	FR	26/04/2024	2		Open and closed OTEC Cycles – Limitations	T1
29	TH	02/05/2024	1		Geothermal energy – Geothermal energy sources	T1
30	FR	03/05/2024	2		Types of geothermal power plants	T1
31	TH	09/05/2024	1		Applications of Power plant	T1
32	FR	10/05/2024	2		Environmental impact	T1

COURSE DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓Chalk & Talk	✓ Stud. Assignments	✓Web Resources
✓ LCD/~~Smartboards~~	✓ Stud. Seminars	☐ Add-On Courses

COURSE ASSESSMENT METHODOLOGIES-DIRECT

✓ University (End Semester) Examination		✓Internal Assessment Tests	
✓ Assignments	☐ Laboratory Practices	☐ Mini/Major Projects	✓Stud. Seminars
☐ Viva Voce	☐ Certifications	☐ Add-On Courses	☐ Others

COURSE ASSESSMENT METHODS

S.N.	Mode of Assessment	Date	Duration	% Weight
1	Internal Assessment Tests1		1½ hr	25 %
2	Internal Assessment Tests2		1½ hr	25 %
3.	University Examination		3 hr	50 %

	Additional marks may be given for Assignments / Group/ Team Seminar Presentation)

COURSE ASSESSMENT METHODOLOGIES-INDIRECT

✓ Assessment of CO (By Feedback, Once)	✓ Student Feedback On Faculty (Once)
☐ Assessment of Mini/Major projects by Ext. Experts	☐ Others

COURSE (EXTRA) ESSENTIAL READINGS:

1. All tutorials have been given as video sources to the students.

COURSE EXIT SURVEY (will be collected at end of the course)

The purpose of this survey is to find out from students about their learning experiences and their thoughts about the course.

Rating:	1: Slight (Low)	2: Moderate (Medium)	3: Substantial (High)
CO1:			
CO2:			
CO3:			
CO4:			
CO5:			

COURSE POLICY (Compensation Assessment)

1. Attending all the assessment is mandatory for every student
2. Course policy will be followed as per the academic course regulation

COURSE ACADEMIC DISHONESTY AND PLAGIARISM

1. All rules and regulation prescribed by the ACOE, University Departments, are applicable in the Internal Assessment Tests and University (End Semester) Examinations. (https://acoe.annauniv.edu/download_forms/student_forms/Guidelines.pdf)
2. In general, possessing a mobile phone, carrying bits of paper with materials, talking to other students, copying from other students during Internal Assessment Tests and University (End Semester) Examinations will be treated as Malpractice and punishable as per the rules and regulations. The misuse of Assignment / Project / Seminar works from others is considered as academic dishonesty and will be treated with the rules and regulations of the University.

COURSE ADDITIONAL INFORMATION

Queries / clarifications / discussion (if required) may be e-mailed to / contact the course instructors during their Office Hours.

For Approval

Course Faculty | Course Coordinator | Professor in charge

6/12/2024

HOD (PT/MIT)