

INSTITUTE	FACULTY OF TECHNOLOGY
PROGRAM	MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING
SEMESTER	1
COURSE TITLE	ENERGY TECHNOLOGY
COURSE CODE	01CM1107
COURSE CREDITS	3

Objective:

- 1 The Course aims to train students to use process and tools necessary for identifying and designing efficient industrial process energy system solutions.

Course Outcomes: After completion of this course, student will be able to:

- 1 Describe the different technologies and heat distribution configurations
- 2 Calculate energy conversion performance characteristics
- 3 Utilize renewable energy as an alternative for conventional energy processes
- 4 Design the power generating devices using renewable energy resources as per the industrial requirement

Pre-requisite of course:Engineering thermodynamics & Stoichiometry

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Introduction to Industrial Process Energy Systems Concepts, heat balances, heat distribution systems; local heating vs central heating systems, illustrating example from the pulping industry	6
2	Conventional Energy Technologies Thermal energy and thermal power stations, Vapour power cycles; Boiler systems, Types of boilers, Fuel handling systems; Ash handling; Treatment and conditioning of boiler feed water, Degasifier and Deaerator; Conditioning of cooling waters, Steam properties and steam calculations; Pressure reducing systems	10
3	Non-Conventional Energy Technologies Wind energy systems and Application areas, Hybrid conventional and geothermal power plants, Integrated coal gasifier and fuel cell power plant, Ocean energy models, Hydropower systems	8

Contents : Unit	Topics	Contact Hours
4	Application of Solar Energy Thermal applications, Introduction to Solar thermal collectors – Types, Principle of operation of different collectors, Flat plate, Evacuated tube collectors, Compound parabolic collectors, Solar air heaters, Solar dryers, solar cookers, solar stills, Solar ponds, concentrating collectors - line type, point type, Methods of Solar power generation, Power towers	8
5	Economics of Energy Conversion in Industrial Energy Systems Characteristics of heat pumps and combined heat and power (CHP) units (performance, investment costs), Influence of operating conditions on performance. Optimization of size and various design parameters based on process integration principles, Methodology for identifying the cost-optimal mix of technologies for satisfying a process heat demand, accounting for heat load variation over the course of the year	6
Total Hours		38

Textbook :

- 1 Energy Technology , Rao S. & Parulakar B.B., Khanna Publishers, New Delhi, 1994

References:

- 1 Energy harvesting technologies , Energy harvesting technologies , Priya, S., & Inman, D. J. , Springer., 2009
- 2 Non-conventional energy sources, Non-conventional energy sources, Rai, G. D., & Rai, C. D. , Khanna Publishers., 1992

Suggested Theory Distribution:

The suggested theory distribution as per Bloom’s taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by white board, may also use any of tools such as collaborative learning, demonstration, role play, Quiz, brainstorming, MOOCs, Active Learning Assignments etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

Instructional Method:

- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, VirtualLaboratory NPTEL videos, e-courses.

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/108/105/108105058/>