

COURSE TITLE	CLEAN AND RENEWABLE ENERGY PRODUCTION
COURSE CODE	01CH0513
COURSE CREDITS	3

Objective:

- 1 To provide fundamental knowledge of conventional and renewable energy sources, their characteristics, production processes, and cleaner technologies for sustainable energy generation.

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

- 1 Explain the characteristics of coal, petroleum, and natural gas as energy sources and evaluate cleaner technologies for energy production.
- 2 Analyze the refining and processing of crude oil, including conversion techniques and impurity removal for improved fuel quality.
- 3 Compare different renewable energy sources such as solar, wind, hydro, geothermal, and biomass-based energy production methods.
- 4 Assess various energy conversion technologies and their environmental impact to promote sustainable energy solutions.

Pre-requisite of course: Basic of Mass Transfer, Heat Transfer, Chemical reaction engineering

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 Coal as a Source of Energy, Characterization of coal, conventional route for energy production from coal, conventional routes to green energy routes: electrification, use of hydrogen as a fuel, Cleaner route for energy production from coal, gasification of coal, direct liquefaction of coal	10
2	Petroleum as a source of energy conventional routes to green energy routes, characteristics of crude oil and petroleum products, refining of crude oil for liquid fuels production, conversion of intermediate products, impurities removal from liquid fuels, residue up-gradation, heavy crude oil processing	10
3	Properties and routes for energy production syn gas production from natural gas, syn gas to liquid fuel production, Blue and green hydrogen production from water and through integration of renewable energies, Solar energy: advanced silicon technologies, Third generation solar cells, Wind energy	10

Contents : Unit	Topics	Contact Hours
4	Energy sources Hydro energy, Geothermal energy, Tidal energy, energy from biomass and wastes through biological route, chemical route and physical route, energy conversions	10
Total Hours		40

Textbook :

- 1 Coal Energy Systems, Miller Bruce G., Elsevier Academic Press, 2005
- 2 Sustainable utilization of natural resources, Mondal P and Dalai A., CRC Press , 2017

References:

- 1 Renewable Energy Resources, Renewable Energy Resources, Twidel, J. and Tony W., , Taylor & Francis., 2006
- 2 Energy Management and Conservation, Energy Management and Conservation, Kreith F., Goswami D.Y.,, CRC Press, 2008

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					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	30.00	30.00	10.00	0.00

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 black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 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, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/103107157>