Energy Resources and Utilization

1.1 Course Number: CH203

1.2 Contact Hours: 2-0-0 Credits: 06

1.3 Semester-offered: 3rd Year- odd

1.4 Prerequisite: Thermodynamics, Heat and Mass Transfer

1.5 Syllabus Committee member: Dr M S Balathanigaimani, Dr Deepak Dwivedi

2. **Objective:** To provide knowledge, understanding, and application-oriented skills on all fossil fuels resources and renewable energy sources and relevant technologies towards their effective utilization for meeting energy demand.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Solid Fuels	Coal: Preparation, carbonization, gasification and manufacture of coke Coal Testing & Analysis: proximate and ultimate analysis, calorific value, caking properties-free swelling Index, Gray King assay Other solid fuels- Wood, charcoal, biomass, briquettes, Pyrolysis, gasification, and liquefaction of solid fuels to other secondary fuels	5
2	Liquid Fuels	Petroleum: Origin of petroleum, Petroleum production, Composition of petroleum, Important distillation products and uses, Product specification and important properties, Testing of petroleum products: Specific gravity/API, RVP, flash and fire point, cloud and pour point, smoke point, carbon residue, sulfur content, calorific value, and kinematic viscosity	5
3	Gaseous Fuels	Types of gaseous fuels: Natural gas, liquefied petroleum gas, producer gas, water gas, coal gas, blast furnace gas Testing of fuel gases-Specific Gravity, calorific Value, Composition	4
4	Combustion of Fuels	Combustion of solid, liquid and gaseous fuels, Types of combustion appliances-burners	3
5	Solar Energy	Solar Energy: Solar thermal systems, Solar thermal power generation, Solar P.V.	4

6	Nuclear Energy	Nuclear Reactors for Power Generation	3
7	New Technologies	Hydrogen energy systems-hydrogen production, storage and use Nuclear Fusion: Introduction, Basic concepts, Fusion reaction physics, Thermonuclear reaction criterion, Confinement schemes, Inertial and magnetic confinement fusion, Nuclear Reactors and Nuclear wastes	5

4. **Readings**

4.1 Text Books:

1. Sarkar, S., “Fuels and Combustion” Orient Longman, 2nd Editions, 1990
2. 2. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Resources Basic Principles and Application”, Narosa Publishing House 2005
3. 3. Mohan Munasinghe, Peter Meier. Energy Policy analysis and Modelling: Cambridge University Press1993

4.1 Reference Books:

1. Francis Peter, “Fuels and Fuel Technology”, 1st Edition, A.Wheatan & Co. Ltd. Of Exefer, 1965
2. W. Francis and M. C. Peter, “Fuels and fuel technology a summarized manual”, Pergamon Press, Second Edition (1980).
3. J. A. Duffie and W.A. Beckman, “Solar Engineering and Thermal Processes”, 2nd Edition John Wiley and sons.
4. John Twidell and Tony Weir, “Renewable Energy Resources” Taylor and Francis Group 2007
5. Gerand J. Mangone, “Energy Policies of the world” Elsevier.

5. **Outcome of the Course:** The course will provide learning about different conventional and renewable energy resources such as solid, liquid, gaseous fuels, their origin, composition, classification, combustion & conversion processes. energy technologies and provide adequate inputs on a variety of issues, global energy supplies and economics. The course will enable students to evaluate detailed techno - economic aspects of various energy technologies and systems.