

HESEE : Hydrogen Energy – Science , Engineering and Economics

Programme : **B.Tech.**Year : **2015-16**Semester : **2nd**Course : **Open Elective**Credits : **4**Hours : **3**

Course Context and Overview (100 words):

With no emissions other than water and the capability of production from a variety of primary sources, hydrogen has been heralded as the sustainable fuel of the future. This invisible, tasteless gas is the most abundant element in the universe and is the basic building block and fuel of stars, and an essential raw material in innumerable biological and chemical processes.

This innovative course in engineering curriculum will cover the major technological issues and economical prospects of hydrogen as a new energy carrier and fuel. Starting with a discussion of the drivers for hydrogen, subsequent sections will consider the technical challenges that face the global introduction of this alternative energy supply. Key issues include the manufacture of hydrogen from natural gas and coal, the options for sequestering carbon dioxide, alternative sources of hydrogen such as water via electrolysis, methods of hydrogen distribution and storage, and fuel cells and their applications.

Prerequisites Courses:

Nil

Course outcomes (COs):

On completion of this course, the students will have the ability to:
CO1 understand the essentials of Hydrogen Energy.
C02 The students will acquire knowledge of different energy sources, types of fuel cells, how they work and fuels they use.
C03 The students will be able to compare different building materials for fuel cells and techniques to achieve the most efficient outcome.
C04 The students will be able to discuss different types of fuel cells, fuels and how they work as well as how their application to both stationary and transportation situations can be beneficial.

Course Topics:

Topics	Lecture hours
UNIT - I Fundamentals	
Global energy situation and energy security	2

Basics of hydrogen as a fuel	6
UNIT - II Hydrogen production principles	4
UNIT – III Hydrogen storage and distribution mechanisms	4
UNIT – IV Hydrogen Safety	2
UNIT – V Hydrogen electrolyser principles and uses of stored hydrogen	2
UNIT – VI Introduction to Fuel Cells	10
UNIT – VII How to install a fuel cell	3
UNIT – VIII Hydrogen R & D opportunities	2
UNIT –IX Hydrogen Economy : Costs and Viability	3
UNIT –X Fuel cell demonstrations, quizzes, assignments and discussions	2

Textbook references :

Text Book : No specific text book. Study materials provided by instructor.

Reference books :

1. **Tomorrow's Energy: Hydrogen, Fuel Cells, and the Prospects for a Cleaner Planet** by Peter Hoffmann
2. **HYDROGEN - Hot Stuff Cool Science 2nd edition: Discover the Future of Energy** by Rex A. Ewing
3. **The Hydrogen Economy** by Jeremy Rifkin
4. **Hydrogen Energy Challenges and Prospects** by D A J Rand & R M Dell

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.) : will be provided later.

Evaluation Methods:

Item	Weightage
Quizzes and Home assignments	15%
Midterm	30%
Final Examination	50%
Attendance	5%

Prepared By:
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