

GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (THERMAL ENGINEERING) (21)

HYDROGEN & FUEL CELL TECHNOLOGY

SUBJECT CODE: 2712108

M.E. 1st SEMESTER

Type of course: Major Elective - 1

Prerequisite: Enthusiasm to learn the course

Rationale: The course is designed to provide the fundamental concept of hydrogen and fuel cell and relevant engineering and technologies

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks		
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
				ESE	OEP	PA	RP			
4	2	0	5	70	30	30	0	20	0	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Hydrogen – Fundamentals: Hydrogen as a source of energy, physical and chemical properties, salient characteristics, relevant issues and concerns	5	5
2	Hydrogen Storage and Applications: Production of hydrogen, steam reforming, water electrolysis, gasification and woody biomass conversion, biological hydrogen production, photo dissociation, direct thermal or catalytic splitting of water, hydrogen storage options, compressed gas, liquid hydrogen, hydride, chemical storage, safety and management of hydrogen, applications of hydrogen	20	40
3	Fuel Cells- Types: Brief history, principle, working, thermodynamics and kinetics of fuel cell process, types of fuel cells; AFC, PAFC, SOFC, MCFC, DMFC, PEMFC – relative merits and demerits, performance evaluation of fuel cell, comparison of battery Vs fuel cell	17	30
4	Fuel Cells -Application And Economics: Fuel cell usage for domestic power systems, large scale power generation, automobile, space applications, economic and environmental analysis on usage of fuel cell, future trends of fuel cells	14	25

Reference Books:

1. Viswanathan, B and M Aulice Scibioh, Fuel Cells – Principles and Applications, Universities Press
2. Rebecca L. and Busby, Hydrogen and Fuel Cells: A Comprehensive Guide, Penn Well Corporation, Oklahoma
3. Bent Sorensen (Sorensen), Hydrogen and Fuel Cells: Emerging Technologies and Applications, Elsevier Academic Press, UK
4. Kordesch, K and G.Simader, Fuel Cell and Their Applications, Wiley-Vch, Germany
5. Hart, A.B and G.J.Womack, Fuel Cells: Theory and Application, Prentice Hall, NewYork Ltd., London
6. Jeremy Rifkin, The Hydrogen Economy, Penguin Group, USA

Course Outcome:

After learning the course the students should be able to:

1. Understand fundamental concept and working of various fuel cells, their relative advantages / disadvantages and hydrogen generation/storage technologies