

- a. Course Code : TEE-824
- b. Title: Hydrogen Production Technologies
- c. Credit Hours: 3-0
- d. Objectives: As already mentioned under section 3
- e. Outcomes:
 - The graduate will be able to comprehend the fundamental understanding of hydrogen production techniques and its utilization for energy purposes.
 - The graduate will also have in-depth knowledge of the design of the processes such as thermal reforming, biochemical, electrochemical and photocatalysis for hydrogen production.
 - Moreover, the graduate will be able to analyze the future hydrogen production and utilization techniques for the energy sector.
- f. Contents with suggested contact hours

No.	Topics	Textbook	Contact Hours
1	Fundamentals of Hydrogen Energy <ul style="list-style-type: none"> • Basics of hydrogen as an energy carrier. • Hydrogen's role in achieving energy sustainability. • Hydrogen economy: Potential, challenges, and global perspectives. • Environmental and societal impacts of hydrogen energy. • Thermodynamics and kinetics of hydrogen production processes. • Fundamental engineering calculations for process design. • Energy efficiency and sustainability metrics. 	SHP	9
2	Hydrogen Production by Electrical Energy <ul style="list-style-type: none"> • Electrochemical hydrogen production • Electrolyzers and its types • Recent advances in the process design of electrochemical systems 	SHP	6

3	Hydrogen Production by Thermal Energy <ul style="list-style-type: none"> • Thermochemical hydrogen productions • Water thermolysis and water splitting • Gasification and thermal reforming for green hydrogen production • Integrated system design for green-thermal hydrogen production 	SHP	6
4	Hydrogen Production by Biochemical and Photonic Energy <ul style="list-style-type: none"> • Biochemical Process • Integrated system for green bio-hydrogen production • Recent advances in Bio-hydrogen production • Photocatalysis for hydrogen production • Homogeneous and heterogeneous photocatalysis • Hybrid photocatalysis system design 	SHP	6
5	Hydrogen Production from Novel Methods <ul style="list-style-type: none"> • Photo-Thermochemical Water Splitting • Photo-Electro-Thermochemical Water Splitting • Coal gasification for Hydrogen Production • Nuclear-Based Natural Gas Reforming for Hydrogen Production • Solar Fuel Reforming for Hydrogen Production 	SHP	7
6	Hydrogen Storage and Transportation <ul style="list-style-type: none"> • Compressed hydrogen storage. • Cryogenic liquid hydrogen storage. • Solid-state storage (metal hydrides) • Energy vectors (ammonia, methanol) • Hydrogen pipelines and distribution networks. • Transport via cryogenic tanks and carriers. • Alternative hydrogen carriers (e.g., ammonia, LOHCs). • Challenges in safety, scalability, and cost-effectiveness. 	SHP	6
7	Applications Of Hydrogen Production <ul style="list-style-type: none"> • Energy Sector • Transportation • Industrial Applications • Environmental Applications 	SHP	5
	Total		45

g. Details of lab work, and workshop practice (if applicable).

NIL

- h. Recommended Reading (including Textbooks and Reference books with dates).

S. No.	Title	Author(s)	Assigned Code	Remarks
1	Sustainable Hydrogen Production	Ibrahim Dincer, Calin Zamfirescu	SHP	Text (Available in soft copy)
2	Hydrogen Production Technologies	Mehmet Sankir, Nurdan Demirci Sankir	HPT	Reference
3	Sustainable Hydrogen Production Processes.	Silveira, José Luz	SHPP	Reference
4	Advances in Hydrogen Generation Technologies	Murat Eyvaz	AHPP	Reference
5	Clean Hydrogen Production Methods	Sushant Kumar	CHPM	Reference
6	Advances in Hydrogen Production, Storage and Distribution	Angelo Basile, Adolfo Iulianelli	AHPS D	Reference

- i. Assessments

Sr. No.	Assessment	Weightage	Quantity
1	Assignments	10%	3
2	Quizzes	10%	3
3	Mid term	30%	1
4	Final	50%	1