

Teaching Scheme					Hydrogen and C ₁ Technologies (22PCM210T)					
					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES

- Get a clear idea about the petrochemical Industry, its structure and constitutions.
- Understand the requirements of feedstocks for the production of hydrogen and synthesis gas.
- Study the various processes to produce hydrogen from hydrocarbons.
- Understand C₁ based technologies emphasizing on methanol synthesis
- Understand and evaluate methanol economy and futuristic C₁ technologies.

Unit I: Petrochemical industry its structure and feedstocks**6 Hr.**

Nature of petrochemicals: C₁, olefin and aromatic complexes; Petroleum feedstocks for production of hydro-gen and synthesis gas, types of synthesis gas and their applications; Production of hydrogen by elec- trolysis of water and its transportation.

Unit II: Hydrogen production and purification**8 Hr.**

Steam reforming of hydrocarbons: Reactions, catalysts and processes; Arrangement of steam re- former: Low temperature and high temperature shift convertors and operating conditions; Auto-ther- mal reforming; Water gas shift reaction, production of hydrogen by partial oxidation, reactions and technology; Purification of hydrogen.

Unit III: Production of C₁ petrochemicals**8 Hr.**

Scope of C₁ petrochemicals; Production of carbon mono oxide and its purification; Methane and its purification; Synthesis of Methanol: Chemistry, thermodynamics, kinetics and catalysis; Processes of methanol production; Synthesis of chloro-methanes and production processes; Methanol derivatives: Formaldehyde, MTBE, etc.

Unit IV Modern developments in C₁ technologies**6 Hr.**

Methanol economy, general outlook; Fischer-Tropsch synthesis: Its scope, chemistry, catalysis, prod- uct profile and technologies; Methanol to gasoline processes.

Total 28 Hr.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1: Understand the structure of petrochemical processes.

CO2: Understand and realise the effect of feedstocks on petrochemical processes.

CO3: Analyse the effect of various factors on hydrogen and synthesis gas production.

CO4: Illustrate the importance of C₁ technologies.

CO5: Evaluate the various technologies for methanol and its derivatives.

CO6: Design and apply concepts to the recent developments in C₁ technologies.

TEXT/REFERENCE BOOKS

4. Moulijn, J., Makkee, M. and Van Diepen, A. "Chemical Process Technology", 2nd Edition, Wiley, (2013).
5. Chauvel, A. and Lefebvre, G., "Petrochemical Processes I", Technip, (2001).

6. Olah, G.A. Goeppert, A. and Prakash, G.K.S., "Beyond Oil and Gas: The Methanol Economy", 3rd Edition, Wiley VCH, (2018).

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Part A: 10 Questions each carrying 5 marks

Part B: 5 Questions each carrying 10 marks

Exam Duration: 3 Hr.

50 Marks

50 Marks