7th Semester	RCH7D003	Clean Technology in Process Industries	L-T-P 3-0-0	3Credits

Module-I **10 hrs**

Environmental impact of chemicals and chemicalproduction, life cycle assessment, waste minimization techniques,sustainable development.

Evaluation of Conventional Technologies: Evaluation of presentprocess technologies for ammonia, sulphuric acid, caustic soda, pulpand paper, plastics and polymers synthesis. Analysis of rawmaterials, intermediates, final products, by-products and wastes.

Module-II **9 hrs**

Alternate Technologies: Alternative raw materials, low temperatureand low pressure and low energy consuming routes for themanufacture of caustic soda, leather, plastics, pulp and paper andrayon.

Module-III **8 hrs**

Process Modification and energy production from waste: Processmodification waste utilization and energy production from solidwaste, recycling and reuse of water, solid waste management.

Module-IV **9 hrs**

Advanced Technologies: Development of biodegradable and endproductsof polymers and plastics, CO_2 capture, sequestration andutilization.

Reference Book:

1. Jacob A. Moulijn, MichielMakkee, Annelies E. van Diepen,"Chemical Process Technology'', John Wiley and Sons Ltd. 2013

2. George T. Austin, "Shreve's Chemical Process Industries", TataMcGraw Hill Education2012

3. Gerard Kiely, "Environmental Engineering'', Tata McGraw-HillEducation2007

4. J. Mann and Y.A. Liu, "Industrial Water Reuse and WastewaterMinimization", McGraw-Hill Professional", Ist Edn.1999

5. Mahmoud M. El-Halwagi, Sustainable Design Through ProcessIntegration: Fundamentals and Application to Industrial PollutionPrevention, Resource Conservation, and Profitability Enhancement,Elsevier Science & Technology2011

6. Roberto Solaro, Emo Chiellini, Biodegradable Polymers and Plastics,Springer2003