

**Course Name: Petrochemicals: Process Design and Optimization, Sustainable Petrochemical Manufacturing**

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**Objectives:** This course focuses on the process design, optimization, and sustainable manufacturing of petrochemicals. Students will gain a comprehensive understanding of the principles and practices involved in designing and optimizing petrochemical processes, with a focus on sustainability and environmental considerations. The course will cover topics such as feedstock selection, reaction kinetics, process modeling, energy efficiency, waste management, and emerging technologies in petrochemical manufacturing. Students will also explore case studies and real-world examples to enhance their knowledge and skills in petrochemical process design and optimization.

**Course Contents:**

**Introduction to Petrochemical Process Design and Optimization:** Overview of petrochemicals and their manufacturing processes, Importance of process design and optimization in petrochemical manufacturing

**Feedstock Selection and Reaction Kinetics:** Types of feedstocks used in petrochemical manufacturing, Kinetics of petrochemical reactions and their impact on process design

**Process Modeling and Simulation:** Principles and tools for process modeling and simulation, Optimization techniques for petrochemical process design

**Energy Efficiency and Heat Integration:** Energy conservation strategies in petrochemical processes, Heat integration and pinch analysis for energy optimization

**Waste Management and Emissions Reduction:** Strategies for waste minimization and recycling in petrochemical manufacturing, Environmental regulations and emissions reduction techniques

**Sustainable Petrochemical Manufacturing:** Life cycle assessment (LCA) and sustainability metrics in petrochemical processes, Green chemistry and renewable feedstocks in petrochemical manufacturing

**Emerging Technologies in Petrochemical Manufacturing:** Advanced catalysts and process intensification techniques, Circular economy approaches in petrochemical production

**Case Studies and Real-World Examples:** Analysis of successful petrochemical process design and optimization projects, Examination of sustainable petrochemical manufacturing practices, Industry trends and future directions in petrochemical process design and optimization

**Reference Text books:** "Petrochemicals: Process Design and Optimization" by Vivek Utgikar and Shriram Gokhale;  
"Sustainable Petrochemical Manufacturing" by Mohtada Sadrzadeh and Navid Mostoufi;  
"Chemical Process Design and Integration" by Robin Smith