



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3723022

Semester – II

Subject Name: Advances in Petroleum Refining and Petrochemicals

Type of course: Program Elective

Prerequisite: Basics of Organic Chemistry and General Chemical Technology fundamentals

Rationale: Crude Oil Refinery is the largest process industry in the Chemical sector in term of Quantum and eminence as it includes all the processes and equipment in the Chemical Industry. Some of the most difficult and tedious Unit Operations and processes is an inmate of Refinery section. The study of this subject will lead the students to gain specialized knowledge about a unique field in Chemical Engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Typical composition of petroleum regulations related to transportation and storage of petroleum. Petroleum products- their important properties, specification and testing methods. TBP and other distillations.	11
2	Crude assay analysis, inter-conversion of distillation data, Nelson's Method, Mid percentage curve, Yield curve, Edmisters method and product blending	10
3	Process Design of Atmospheric Distillation Unit (ADU), heat and mass balance calculations for ADU and VDU, types of equipment used: columns, pumps tube still heaters etc	10
4	Treatment of petroleum products, hydrodesulphurisation, hydrotreating, lube oil processing, deasphalting, dewaxing etc	7
5	Catalytic reforming, CCR (Continuous Catalytic Regeneration) Platforming	7
6	Advances in Fluidized Catalytic Cracking (FCC), feedstock properties of FCC, Thermodynamics, FCC Configuration, Material and Energy balance, Reactor-Regenerator FCC dynamic model	9



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Distribution of Theory Marks

R Level	U Level	A Level	N Level	E Level	C Level
7	14	14	14	14	7

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Nelson, W. L. Petroleum Refinery Engineering, Tata McGraw Hill publishing company, 1985
2. James H, Gary & Glenn E. Handwerk, 'Petroleum Refining, Technology & Economics', 5th Edition, Marcel Dekker, Inc, 2001.
3. Speight, J. G., The Chemistry and technology of Petroleum, 5th Edition, M. Dekker, 1991.
4. Watkins, R. N., Petroleum Refinery Distillation, 2nd Edn., Gulf Pub. Co., Houston, Tex, 1979.
5. Fundamentals of Petroleum Refining, Taher A. Al- Sahhaf, Amal Sayed Elkilani, B. V. Elsevier, 2010.
6. Fundamentals of Petroleum Refining, Taher A. Al- Sahhaf, Amal Sayed Elkilani, B. V. Elsevier, 2010.
6. The Petroleum Act, 1934. Professional Book Publishers, New Delhi.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Outline composition and transportation law	15
CO-2	Estimate crude assay analysis by different distillation methods	20
CO-3	Apply process design of vacuum distillation, atmospheric distillation on crude assay	25
CO-4	Apply different treatment methods on crude	15
CO-5	Design catalytic Cracking unit for residuum	15
CO-6	Estimate fluid catalytic cracking considering all parameters	10

List of Experiments:

List of Experiments (Any Five):

1. To carry out ASTM distillation of Petrol/ Gasoline & convert those distillation data into TBP and Equilibrium Flash Vaporization (EFV).
2. To carry out ASTM distillation of Diesel & convert those distillation data to TBP and EFV.
3. Mathematical modeling of FCC Reactor-Regenerator model.



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4. To find out important test properties of Gasoline/blends and compare it with actual data.
5. To find out important test properties of Naphtha and compare it with actual data.
6. To find out important test properties of Diesel and compare it with actual data.
7. To find out important test properties of Kerosene and compare it with actual data.
8. To find out important test properties of Lube oil and compare it with actual data.
9. To find out important test properties of Cycle stock/ Fuel oil and compare it with actual data.

Major Equipment:

Laboratory Distillation Columns

Equipment for testing of petroleum products

ASTM distillation apparatus