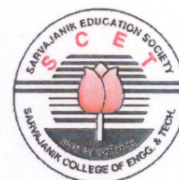




SARVAJANIK
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SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology



Bachelor of Technology (B.Tech)

B. Tech. Semester V

Subject Name: Petroleum Refinery Science & Engineering

Subject Code: BTCH15501

Type of course: Open elective I

Prerequisite: Basic Chemistry

Rationale: Students will be able to understand sources and processes of manufacture of various chemicals such as petroleum and petroleum products, petrochemicals.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction to Crude and Petroleum refining in India	3	7
2	Chemistry of alkanes, alkenes and alkynes: Acyclic and cyclic compounds. General reactions. Functionalization of alkanes – alkanes to alkenes and haloalkanes. Alkanes as fuels – environmental issues, carbon footprint. Oligomerization and polymerization of olefins	4	9
3	Sources of organic compounds: Coal, petroleum, biomass. Petrochemical processes. C1 sources, natural gas hydrates.	6	14
4	Crude oil evaluation: Introduction to Overall Refinery Flow, refinery tests	8	20
5	Products of refining : Low-Boiling Products, Distillate Fuels, Heating Oils, Residual Fuel Oils and their specification and applications	3	6
6	Refinery Feedstocks : Crude Oil Properties, Composition of Petroleum, Crudes Suitable for Asphalt Manufacture, Crude Distillation Curves like ASTM, TBP, EFV Concepts	3	6
7	Crude Distillation : Desalting Crude Oils, Atmospheric Topping Unit, Vacuum Distillation, Auxiliary Equipment	4	9
8	Types, Properties, and Uses of Petroleum Coke, Process Description—Delayed Coking, Flexicoking, Fluid Coking, Yields from Flexicoking and Fluid Coking, Visbreaking	4	9
9	Brief introduction to coking and thermal processes catalytic cracking, catalytic hydrocracking, hydroprocessing, hydrotreating, catalytic reforming and isomerisation, alkylation and polymerization, product blending and supporting processes.	10	20





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Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
35	30	30	05	0	0

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

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Modern Petroleum Refining Processes	Rao B.K.B.,	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi	2002	4 th Ed
2	Petroleum Refinery Engineering	W. L. Nelson,	McGraw-Hill Book Company, New York	1958	4 th Ed.
3	Handbook of Petroleum Processing	David S. J. Jones, Peter R. Pujado,	Springer Publication	2008	4 th Ed.

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Understand crude evaluation and global petroleum refining scenario	25
CO-2	Interpret the significance of tests and ASTM standards	20
CO-3	Analyze simple mechanisms and processing requirements for derivation of petroleum products	15
CO-4	Interpret process flow diagrams/process block diagrams for the manufacture of various chemicals from process description	20
CO-5	Evaluate major engineering problems and simplify the manufacturing process for a trouble free and safe operation.	20

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	1	2	1	3	2	3	3	2	1	1	3	3	3	2	2
CO-2	3	3	2	3	2	3	3	2	2	3	3	3	3	3	2
CO-3	3	2	2	3	2	3	3	3	3	2	3	3	3	3	2





CO-4	3	3	3	2	3	3	3	3	2	3	3	3	2	3	3
CO-5	2	3	3	3	3	3	3	3	3	2	3	3	2	3	3
Rationale*	12	13	11	11	12	15	15	13	11	11	15	15	13	14	12

Rationale*: All COs are satisfying the well-defined POs & PSOs

LIST OF PRACTICALS: (Minimum 7 to be performed.)

Sr No.	Description
1	To determine Softening Point for given Petroleum sample.
2	To determine Drop Point for given Petroleum sample.
3	To determine Flash and Fire point of petroleum product by Pensky Marten's apparatus.
4	To determine cloud and pour point for given petroleum sample.
5	To determine Aniline point & Diesel Index for given petroleum sample
6	To determine the carbon residue by Conradson method
7	To determine the Penetration Index using standard Penetrometer device
8	Study ASTM standards: Copper strip Corrosion Test
9	Study ASTM standards: Reid Vapor Pressure
10	Study ASTM standards: Smoke point

Major Equipment: ASTM standard apparatus for experiments 1-7.

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2	Petroleum Refinery Engineering	W. L. Nelson,	McGraw-Hill Book Company, New York	1958	4 th Ed.
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List of Open Source/learning website:

- <https://nptel.ac.in/courses/103/102/103102022/>
Refinery introduction, feedstocks, tests, evaluation
- <https://nptel.ac.in/courses/114/106/114106017/>
Safety, health Environment engg
- <https://nptel.ac.in/courses/114/106/114106042/>
Hazard management
- <https://nptel.ac.in/courses/103/103/103103207/>
Biomass conversion and refinery

