

Subject Code: 01CH0705

Subject Name: Petroleum Refining and Petrochemicals

B.Tech. Year - IV (Semester VIII)

Objective: The course is intended to have comprehensive knowledge of petroleum refining, various petroleum processes and products as well as petrochemicals

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the processing of crude oil through various processes.
2. Perform the various testing methods for petroleum products
3. Evaluate the significance of various standard specifications for fuels
4. Understand the various processes and unit operations in petrochemical industry

Pre-requisite of course: Fundamentals of Chemical Engineering, Mass transfer

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE	Internal (I)	Viva (V)	Term work (TW)	
3	0	2	4	50	20	30	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Chemistry of Petroleum What is crude oil? Origin, Exploration, Composition and Classification of crude oil, Pre-treatment and Transportation of crude oil.	4
2	Petroleum Refining Processing of Crude oil, Atmospheric Distillation Unit (ADU), Vacuum Distillation Unit (VDU), Products of refinery and their testing methods	8
3	Upgradation of Crude oil Need of cracking operations, Thermal cracking processes: visbreaking, thermal cracking and coking, Catalytic cracking – fixed bed, moving bed and fluidized bed processes.	6
4	Reforming processes Polymerization, alkylation, isomerization and reforming process	6
5	Introduction to Petrochemicals Introduction and Classification of petrochemicals, First generation petrochemicals – C1, C2, C3, C4 and BTX. Second generation petrochemicals – synthesis gas, ethylene oxide, formaldehyde chloromethanes, vinyl chloride, phenol, aniline and styrene	8



6	Advanced Petrochemicals Third generation petrochemicals – Olefinic polymers, plastics, rubbers, polyethylene, polypropylene, poly-butadiene, SBR, synthetic fibres Miscellaneous petrochemicals – proteins from petroleum, detergents, resins, TNT explosive	6
Total Hours		38

References

Text Books:

1. J.H. Gary and G.E. Handwork, Petroleum Refining, Technology and Economics: Merceidekker, New York, Latest Ed.
2. B.K. Bhaskar Rao, Modern Petroleum Refining Processes, 5th Edition Oxford and IBH publishing Co. 2013
3. S. Maiti, Introduction to petrochemicals, Oxford and IBH publishing Co.,2002

Reference Books:

1. Speight, J.G., Petroleum Refining Process Taylor and Francis, 2009

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	20%	10%	-

List of Experiments:

- 1) Determination of API gravity of given oil sample
- 2) Determination of flash point of given sample using Able's and Pensky-Martin apparatus
- 3) Determination of flash and fire point of given oil sample using Cleveland open cup apparatus
- 4) Determination of aniline point of diesel sample and corresponding cetane index
- 5) Determination of smoke point of kerosene sample using smoke point apparatus
- 6) Determination of viscosity and viscosity index of given oil sample using Redwood viscometer
- 7) Determination of viscosity of given oil sample using Saybolt viscometer



- 8) Determination of viscosity of given oil sample using Engler viscometer

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Design Based Problems (DP)/ Open Ended project (OEP):

In the beginning of the session, subject faculty will allot an OEP / DP to the students. Students will be free to choose a topic of their choice which will be relevant to the syllabus and they will either prepare a working model/ report / presentation / poster on their topic.