Course Type	Course Code	Name of the course	L	T	P	Credits
DC	NFMC527	Processing of Liquid and Gaseous Fuels	3	1	0	4

Course Objective
The main aim of the course is to give detailed information about the processing of liquid and gaseous fuels.
Learning Outcomes
Upon successful completion of the course, the students will learn about • Different types of liquid and gaseous fuels • Fuel properties and characteristic techniques • Techniques employed for the processing of liquid and gaseous fuels

Unit No.	Topics to be Covered	Lecture Hours	Tutorial hours	Learning Outcome
1	**Introduction to liquid fuels:** Liquid fuel resources; World and Indian statistics; Origin and formation of petroleum or crude oil; Worldwide reserves and deposits; Petroleum industry in India	2	1	Knowledge about the fundamentals and origin of liquid fuels
2	**Characteristics of petroleum and refinery products:** Composition and chemistry of petroleum; Crude oil properties – API gravity, Watson characterization factor, Viscosity, sulphur content, True boiling point (TBP) curve, Flash point, Fire point, Smoke Point, Calorific value, Pour point, Aniline point, Diesel index, Reid vapor pressure, ASTM distillation curve, Octane number, Cetane number; Refinery products – LPG, gasoline, kerosene, jet fuel, diesel fuel, fuel oil, residual fuel oil, asphalt, petroleum coke.	4	1	Knowledge about the composition and properties of crude oil and refinery products
3	**Petroleum refining:** Pretreatment (dewatering and desalting); Distillation (atmospheric distillation, vacuum distillation); Thermal and Catalytic cracking; Catalytic reforming; Hydrogen processing (hydrocracking, hydrotreating); Coking (fluid coking, delayed coking, flexi coking); polymerization; alkylation; isomerization.	9	3	Understanding of the different techniques employed for refining petroleum oil
4	**Purification of petroleum products:** Desulphurization; Dewaxing; acid, alkali, & clay treatment; De-asphalting; De-aromatization of kerosene (Edeleanu process &Udex process)	7	2	Exposure to the purification techniques of petroleum products.

5	**Origin, formation, and classification of Gaseous fuel:** Gaseous fuel resources; World and Indian statistics; Origin and formation of Natural gas; Worldwide reserves and deposits; Liquified Natural Gas; Compressed Natural Gas; Coal gasification; composition of gaseous fuel	3	1	Familiarization with the gaseous fuels, their origin, and composition
6	**Coal Gasification and gas purification:** Fundamentals of coal gasification; SNG; Gasifiers, and gasification processes – Fixed bed gasifier, Fluidized bed gasifier, Entrained bed gasifier; Coal bed methane; Gas hydrates; Need for gas clean-up and purification; Nature of impurities; Purification methods (absorption, adsorption, membrane separation, cryogenic separation)	10	4	Knowledge about the techniques of coal gasification and purification
7	**Hydrogen:** Introduction; hydrogen as a future fuel; production pathways (thermal, electrochemical, and biological processes); hydrogen storage, dispensing, and utilization.	7	2	Exposure to the hydrogen fuel
Total		**42**	**14**	

Text Books:

1. Fuel Solids, Liquid and Gaseous: Edward Arnold and Co., *Authors*:J S S Brame and J G King.

Reference Books:

1. Modern Petroleum Refining Process:Oxford and IBH publishing India, *Authors*: B.K.Bhaskara Rao.
2. Elements of Petroleum Refinery Engineering: Khanna Book Publishing Company Ltd., *Authors*: O.P.Gupta.