Birla Institute of Technology and Science, Pilani – Pilani Campus
Instruction Division
First Semester 2016-2017
Course Handout (Part-II)

Date: 02/08/2016

In addition to Part I (General Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

Course No. : CHE G533
Course Title : Petroleum Product Characterization
Instructor-in-Charge : HARE KRISHNA MOHANTA

1. Course Description

Methods of estimation of characterization parameters for pure hydrocarbons; methods of characterization of petroleum fractions and products; experimental methods on measurement of basic properties obtained from laboratory testing; methods of prediction of properties for defined mixtures from pure-component properties (normal boiling point, density, molecular weight, critical properties, etc.); methods of prediction of properties for undefined mixtures based on certain bulk properties; characterization methods for light and heavy as well as narrow and wide boiling range mixtures; predictive methods for some characteristics specifically applicable to petroleum fractions that affect the quality of a fuel; standard test methods recommended by ASTM for various properties; minimum laboratory data needed to characterize various fractions as well as analysis of laboratory data and criteria for development of a predictive method; introduction to characterization of crude oils and reservoir fluids; associated Petroleum Laboratory experiments.

2. Scope and Objective

The primary objective of this course is to give a theoretical as well as a practical experience on the treatment and testing techniques involved in petroleum refineries. Its scope is limited to the analysis and characterization of petroleum products.

3. Text Book

T1. Riazi.M.R, *'Characterization and Properties of Petroleum Fractions'*, First edition, ASTM International Standards Worldwide, 2005.
T2. J.G. Speight, "*Handbook of Petroleum Product Analysis*", Wiley, 2001.

4. Reference Books

R1. W.L. Nelson, "Petroleum Refinery Engineering", McGraw Hill, 4th ed., 1968.
R2. M.A. Fahim, T.A. Al-Shhaf, A.S. Elkilani, "Fundamentals of Petroleum Refining", Elsevier, 1st Ed., 2010.

5. Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Ref. to TB/RB Chap.
1-3	Petroleum and Petroleum Products	Composition of petroleum; Refinery Products and Test Methods.	2,3 (R1) 2 (T2)
4-10	Thermophysical Properties of Petroleum Fractions and Crude Oils	Classification, Characterization and evaluation of crude oil, Properties of petroleum products and crude oils.	4 (R1) 3 (R2)
11-16	Characterization and	Prediction of Molecular Weight, Boiling Point,	2 (T1)

	properties of pure Hydrocarbons	Specific Gravity, Critical properties and Acentric fator.	
17-22	Characterization of Petroleum Fractions	Boiling Point and Distillation Curves; Conversion of Distillation Data; Properties of petroleum fractions; Properties of mixtures.	3 (T1)
23-28	Characterization of Reservoir Fluids and Crude Oils	Specification of Reservoir Fluids and Crude Assays; Calculation of Properties of Crude Oils and Reservoir fluids.	4 (T1)
29-32	PVT Relations and Equations of State	Phase rule; Cubic Equation of State; Noncubic Equations of State; Rackett Equation.	5 (T1)
33-36	Thermodynamic Relations for Property Estimation	Fundamental Thermodynamic Relations; Properties of ideal gases; Phase equilibria of Mixtures.	6 (T1)
37-38	Estimation of Thermophysical Properties	Density;Vapor Pressure; Enthalpy; Heat Capacity.	7 (T1)
39-40	Estimation of Transport Properties	Viscosity, Thermal Conductivity, Diffusivity, Surface Tension.	8 (T1)
41-42	Phase Equilibrium Calculations	Bubble Point and Dew Point Calculations; True Critical Properties; Asphaltene prediction; Enhanced Oil Recovery.	9 (T1)

6. Evaluation Scheme:

EC No.	Component	Duration (Minutes)	Weightage (%)	Date & Time	Remarks
1.	Mid-Semester Test	90	90 (30%)	<TEST_1>	CB (10%) +OB (20%)
3.	Petroleum Lab	2 hours per week	90 (30%)		-
3.	Comprehensive Exam.	180	120 (40%)	<TEST_C>	CB

7. Chamber Consultation Hour: To be announced in the class

8. Notices:
All notices concerning this course will be displayed in Nalanda Portal (***http://nalanda.bits-pilani.ac.in/***) and on the Chemical Engineering Notice Board.

9. Make-up Policy:
Make-up will be granted only for genuine cases.

Instructor-in-charge
CHE G533