Course code	Course Name	L-T-P Credits	Year of Introduction
CH462	NATURAL GAS ENGINEERING	3-0-0-3	2016

Prerequisite : Nil

Course Objective

- To know about the properties of natural gas.
- To understand salient features of a gas reservoir.
- To be able to develop systems for natural gas production.

Syllabus

Introduction to Natural Gas, origin of natural gas, other sources of gaseous fluids. Gas Reservoir Performance and Gas flow measurement, Methods of measurements, Gas compression, Types of Compressors Heat and Mass Transfer Principles and Applications in Natural Gas Engineering, natural gas processing, Gas Gathering, Transport and Storage, Transmission of Natural Gas, Unconventional gas, LNG: Production and Utilization

Expected Outcome:

The students will be able to

i. Explain natural gas processing
ii. Describe gas compression, gas gathering and transport installation
iii. Perform trouble shooting of natural gas pipelines

Reference Books

1. "Gas Processes Suppliers Handbook", USA, 1980.
2. Beggs, D, H, Gas Production Operations. Edition Technip. 1984
3. Ikoku, Chi, "Natural Gas Production Engineering", John Wiley and Sons, 1984.
4. Katz D.L.et al., Natural Gas Engineering (Production & storage), McGraw-Hill, Singapore.
5. Kumar Sanjay, "Gas Production Engineering", Gulf Publishing Company, TX, USA, 1987.
6. Lee, J, Wattenbarger, R. A., "Gas Reservoir Engineering", Society of Petroleum Engineers, TX, USA, 1996.

Course Plan

Module	Content	Hours	Sem. Exam mark
I	Introduction to Natural Gas, origin of natural gas, other sources of gaseous fluids. Phase behaviour fundamentals, qualitative and quantitative phase behaviour, vapour- liquid equilibrium. Equation of state, critical pressure and temperature determination. Gas compressibility, viscosity and thermal conductivity, formation volume factor.	5	15%
II	Fundamentals of gas flow in conduits, fundamentals of fluid flow in porous media, inflow performance curves, outflow performance. Gas flow measurement, fundamentals, Methods of measurements, Orifice meters equation, turbine meters, Selection, Recording charts, Uncertainties in flow.	6	15%
	FIRST INTERNAL EXAM		
III	Types of Compressors, Selection, Thermodynamics of Compressors, Compression calculations. Heat and Mass	7	15%

	Transfer Principles and Applications in Natural Gas Engineering, Use of Mollier Diagrams.		
IV	Gas liquid separations, dehydration processes, absorption and adsorption by gas permeation. Desulfurization processes, solid bed sweetening process, physical and chemical absorption processes, Acid gas removal. Integrating natural gas processing.	8	15%
SECOND INTERNAL EXAM			
V	Gas Gathering, Transport and Storage: Gas Gathering System. Steady Flow in Simple Pipeline System, Steady State and non Steady State Flow in Pipelines, Solution for Transient Flow. Transmission of Natural Gas, Specifications. Underground Storage and Conservation of Natural Gas.	8	20%
VI	Unconventional gas**:** Coal Bed Methane, Natural Gas Hydrate, Basin Centered Gas, Tight Gas Sands, Shale Gas. Current Technology for Shale Gas and Tight Gas Exploration and Production. LNG: Production and Utilization Issue and Challenges to Enhance Supply of Natural Gas.	8	20%

Question Paper Pattern

Maximum Marks: 100 Exam Duration: 3 Hours

Part A: There shall be **Three questions** uniformly covering Modules 1 and 2, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 15 marks for all the subdivisions put together.
(2 x15= 30 Marks)

Part B: There shall be **Three questions** uniformly covering Modules 3 and 4, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 15 marks for all the subdivisions put together.
(2 x15= 30 Marks)

Part C: There shall be **Three questions** uniformly covering Modules 5 and 6, each carrying 20 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 20 marks for all the subdivisions put together.
(2 x20= 40 Marks)