Course code.	Course Name	L-T-P-Credits	Year of Introduction
CH362	NONCONVENTIONAL PETROLEUM RESOURCES	3-0-0-3	2016

Prerequisite : Nil

Course Objectives:

- To understand the geographic distribution of unconventional hydrocarbon resources
- To understand characterization of source and reservoir rocks
- To understand methodology to produce these reserves
- To understand environmental consequences of producing these reserves

Syllabus:

Non-conventional Oil, Shale gas, Coal Bed Methane (CBM), Gas Hydrates, Coal and Gas conversion to Oil, Environmental and Economic considerations of Non-conventional Petroleum Resources.

Expected Outcome:

The students will be able to

i. Apply the concepts related to exploration and development of Shale Gas Reservoirs.
ii. Apply the concepts related to exploration and development of Coal Bed Methane.
iii. Summarize and apply the concepts related to formation of gas hydrates.
iv. Recognize and apply different conversion processes for the production of hydrocarbons.
v. Demonstrate awareness related to environmental issues involved in the development of non-conventional hydrocarbon resources.

Reference Books:

1. Carrol John, 2003, Natural Gas Hydrates: A guide for engineers, Gulf Publications
2. Farooqi Ali, S M, Jones S A and Meldau R F, Practical Heavy Oil Recovery, SPE, 1997.
3. James T. Bartis, Frank Camm, David S. Ortiz, Producing Liquid Fuels from Coal, Prospects and Policy Issues. NETL, DOE, USA, 2008
4. Pramod Thakur, Steve Schatzel and Kashy Aminian, (Editors), 2014, Coal Bed Methane: From Prospects to Pipeline, Elsevier,
5. Rafiqul Islam, M, 2014, Unconventional Gas Reservoirs: Evaluation, Appraisal, and Development, Gulf Professional Publishing
6. Warner, H.R., 2009, Emerging and Peripheral Technologies, Society of Petroleum Engineers, Handbook, Volume VI

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Non-Conventional Oil: Introduction, geology of Heavy oil, extra heavy oil, Tar Sand and bituminous oil shales, their origin and occurrence worldwide, resources, reservoir characteristics, new production technologies.	6	15%
II	Shale Gas: Introduction and present status of shale gas. Formation and properties of shale gas. Drilling and completion	8	15%

	of shale gas. Uses and applications of shale gas. Environmental issues in shale gas exploration. Future prospects of shale gas.		
FIRST INTERNAL EXAM			
III	Coal Bed Methane (CBM): Formation and properties of coal bed methane. Thermodynamics of coal bed methane. Exploration and Evaluation of CBM. Hydro-fracturing of coal seam. Production installation and surface facilities. Well operations and production equipment.	8	20%
IV	Gas Hydrates: Introduction and present status of gas hydrates. Formation and properties of gas hydrates. Thermodynamics of gas hydrates. Drilling and completion of gas hydrates wells. Gas hydrates accumulation in porous media. Gas extraction from gas hydrates. Uses and applications of gas hydrates.	7	20%
SECOND INTERNAL EXAM			
V	Coal and Gas Conversion to Oil: Introduction, classification and principles, pyrolysis, theoretical aspect of processes involved in conversion. Technological development of direct conversion and indirect processes and sustainability of conversions.	7	15%
VI	Environmental and Economic Considerations: Environmental considerations of non-conventional oil and gas. Treating and disposing produced water. Economics of development	6	15%
END SEMESTER EXAM			

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 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)

Part C: There shall be **Three questions** uniformly covering Modules 5 and 6, 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)