Course Type	Course Code	Name of Course	L	T	P	Credit
OE2	PEO303	Coal bed Methane, Gas Hydrates & Shale Gas / Oil	3	0	0	9

Course Objective
Introducing students to newer hydrocarbon resources including coalbed methane, methane hydrates, and shale oil/gas Teaching exploitation strategies for these emerging energy resources
Learning Outcomes
Familiar with newer resources for fossil fuel Exposure to contemporary energy recovery processes.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
	Coal Bed Methane		
1	Present status of coalbed methane- Global and Indian Scenario, Difference from conventional gas reservoirs in terms of gas storage, drilling & production	3	Knowledge of CBM and its current status at the world and Indian level
2	Coal formation and deposition, Coal properties, Generation of coalbed methane gas & its properties, properties of coal as reservoir rock	4	Knowledge on CBM source, i.e. coal and its properties
3	Gas content, adsorption isotherm, reserve estimation	4	Knowledge of estimating CBM content in coal and estimating total CBM reserves
4	CBM drilling, dewatering, gas rate, variation in coal porosity & permeability, coal shrinkage, water treatment and disposal	4	Knowledge on drilling, reservoir and production performance of CBM reservoirs
5	CO2 sequestration for enhanced CBM recovery	1	EOR in CBM reservoirs
	Gas Hydrates		
6	Present status of gas hydrates, formation, accumulation and properties of gas hydrates.	4	Knowledge of gas hydrates and its current status at the world and Indian level
7	Thermodynamics, kinetics and phase behavior of gas hydrates	4	Knowledge on gas hydrates thermodynamics
8	Prevention & control of gas hydrates during drilling and production	3	Knowledge on gas hydrates problems in drilling and production
9	Uses of gas hydrates	2	Other uses of gas hydrates
	Shale Gas/Oil		
10	Global Scenario of shale gas/oil production.	2	Knowledge of shale gas/oil and its current status at the world and Indian level
11	Nature, origin and maturation, reserve estimation	3	Characterization of shale and shale gas, reserve estimation
12	Development of current practices, hydraulic fracturing, Environmental issues in shale gas exploration.	4	Knowledge on production practices in shale gas reservoirs
13	Markets and Globus impact on energy scenario.	2	Knowledge on shale gas market
14	Introduction to oil shale and oil sand	2	Knowledge on oil shale and sand
	Total contact hours:	42	

Text Books:

i. Coalbed methane principles & practices — Rogers
ii. Natural Gas Hydrates A guide for Engineers — John J. Carrol
iii. Shale Oil Production Processes — James G. Speight

Reference Books:

i. Fundamentals of Coalbed Methane Reservoir Engineering: — John Seidle
ii. Coal & Coalbed Gas by Romeo: — M. Flores
iii. Clathrate Hydrates of Natural Gases: — Sloan
iv. Shale Gas Production Processes: — James G. Speight