

COURSE STRUCTURE

OF

Minor in Petroleum Engineering

(Approved by 90th Academic Council On 05.05.2015)

**(For Non Petroleum Engineering
Undergraduate Students)**

TO BE IMPLEMENTED FROM SESSION

(2015 – 2016)



**DEPARTMENT OF PETROLEUM ENGINEERING
INDIAN SCHOOL OF MINES
DHANBAD 826004**

**COURSE STRUCTURE OF MINOR IN PETROLEUM ENGINEERING
FOR NON-PETROLEUM UNDERGRADUATE STUDENTS**

(Effective from 2015 – 16 session)

Sl. No.	Semester	Course No.	Name of the course	L	T	P	Credit Hrs.
1.	V	PEM15101	Petroleum Drilling and Production Engineering	3	1	0	7
2.	V	PEM15201	Practical in Drilling Fluids and Cements	0	0	2	2
3.	VI	PEM16101	Natural Gas Engineering	3	1	0	7
4.	VI	PEM16201	Practical in Petroleum and Petroleum Products Testing	0	0	2	2
5.	VII	PEM17101	Reservoir Engineering and Field Development	3	1	0	7
6.	VIII	PEM18101	Enhanced Oil Recovery Techniques	3	1	0	7
			Total contact Hours = 20	12	4	4	32

COURSE CONTENTS

COURSE NO.	COURSE NAME	L	T	P
PEM15101	PETROLEUM DRILLING AND PRODUCTION ENGINEERING	3	1	0

COURSE CONTENT:

Section A: Oil & Gas Well Drilling-

1. **Well planning:** Drilling planning approaches, Evaluation of pore & fracture pressure, Casing seat selection.
2. **Rotary Drilling Method:** Rig parts, selection and general layout. Advancements in Rig Equipment: Top drive & Bottom drive systems.
3. **Drilling Operations & Practices:** Hoisting, Circulation, Rotation, power plants and Power transmission.
4. **Drilling Fluids:** Types, function, properties, equipments & Design.
5. **Cementing:** Methods, Tools & Techniques, cementing calculations, Special Cement System.
6. **Wire Lines:** Types & Classification, service life evaluation & precautions in handling.
7. **Drill Bits:** Types and Application, selection, design & performance.
8. **Drill String & Casing String:** Parts, function & operations. Selection/ Design.
9. **Drilling Problems, their control & Remedies:** Pipe sticking, Sloughing Shales, Lost Circulation, Blow Outs.
10. **Oil Well Fishing:** Fish classification, tools and techniques.
11. **Fundamental of directional drilling**

Section B: Oil & Gas Production-

1. **Well equipment:** Well head assembly, Christmas tree, valves, hangers, flow control devices, packers, tubular and flow lines, safety & control systems.
2. **Well completion:** Systems, types and applications.
3. **Well perforation & Well activation**
4. **Processing in oil fields:** GGS/CTF - layout, sequential treatment, separation, storage and transportation of petroleum. Demulsification & desalting.
5. **Introduction to well servicing and stimulation system:** objectives and applications.

COURSE NO.	COURSE NAME	L	T	P
PEM15201	Practical in Drilling Fluids and Cements	0	0	2

COURSE CONTENT:

1. Practical related to measurements of drilling fluids properties like mud weight, Plastic viscosity, Gel strength, Filtration loss, Sand content etc.
2. Practical related to the setting point and consistency of cement slurry.

COURSE NO.	COURSE NAME	L	T	P
PEM16103	NATURAL GAS ENGINEERING.	3	1	0

COURSE CONTENT:

1. **Introduction:** Composition of Natural Gas, Utilization of Natural Gas, Natural Gas Industry, Natural Gas Reserves, Types of Natural Gas Resources, Future of the Natural Gas Industry.
2. **Properties of Natural Gas:** Physical properties of natural gas and hydrocarbon liquids associated with natural gas. Reservoir aspects of natural gas.
3. **Gas Compression:** Types of Compressors, Selection, Thermodynamics of Compressors, Compression calculations. Heat and Mass Transfer Principles and Applications in Natural Gas Engineering, Use of Mollier Diagrams.
4. **Gas Flow Measurement:** Process control and instrumentation in natural gas processing plants.
5. **Natural Gas Processing:** Field separation and oil absorption process, Refrigeration and low temperature processing, Liquefaction Process, Dehydration of Natural Gas, Sweetening of Natural gas and sulphur recovery. Processing for LPG, CNG, system, Conversion of gas to liquid.
6. **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.
7. **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.
8. **LNG: Production and Utilization**
9. Issue and Challenges to Enhance Supply of Natural Gas.

COURSE NO.	COURSE NAME	L	T	P
PER16201	Practical in Petroleum and Petroleum Products Testing	0	0	2

COURSE CONTENT:

Practical related to Testing of Petroleum and Petroleum Products.

COURSE NO.	COURSE NAME	L	T	P
PEM17101	PETROLEUM RESERVOIR ENGINEERING AND FIELD DEVELOPMENT	3	1	0

COURSE CONTENT:

1. Characteristics of crude oil and natural gas, classification of crude and its physico-chemical properties.
2. **Petrophysical properties of reservoir rocks:** porosity, permeability, fluid saturation. Fluid flow through porous media.
3. **Reservoir Fluids:** Gas, condensate and oil reservoirs, Reservoir fluid properties. Reservoir fluid sampling and PVT studies.
4. **Thermodynamics of fluid system:** Phase behavior of single & multiphase systems,
5. **Reserve Estimation:** Material Balance, Volumetric Methods, Reservoir simulation method, Decline curve analysis.

6. **Reservoir energies & drives:** Basic drive mechanism, Water influx;
7. **Well performance:** productivity index, IPR. Water and gas coning, Open flow potential for gas wells.
8. Applications of horizontal wells, ERD & multi-laterals.
9. **Oil & Gas field development:** Oil and gas field development: Principles of oil and gas field development; rational development plan; well spacing and patterns, Reservoir drives and drive mechanism, Economics of field development

COURSE NO.	COURSE NAME	L	T	P
PEM18101	ENHANCED OIL RECOVERY TECHNIQUES	3	1	0

COURSE CONTENT:

1. Introduction: Historical background and review of primary and secondary recovery, injection rate and pressures in secondary recovery. Flood Patterns and Coverage.
2. Microscopic displacement of fluids in a reservoir: Capillary forces, viscous forces, phase trapping, mobilization of trapped phases.
3. Macroscopic displacement of fluids in a reservoir: Areal sweep efficiency, vertical sweep efficiency, displacement efficiency, mobility ratio, well spacing.
4. Flow of immiscible fluids through porous media. Continuity equation, equation of motion, solution methods Water flooding, Fractional flow equation, Frontal advance theory. Recovery efficiency, permeability heterogeneity.
5. Water flooding performance calculations: Frontal advance method, viscous fingering method, Stiles method, Dykstra-Parsons Method, Water for water flooding.
6. Chemical Flooding: Polymer flooding and mobility control processes, Micellar/ polymer flooding, phase behavior of micro-emulsions, phase behavior and IFT, wettability alterations, Alkali flooding.
7. Miscible Displacement Processes: Mechanism of miscible displacement, phase behavior related to miscibility, high pressure gas injection, enriched gas injection, LPG flooding, Carbon dioxide flooding, alcohol flooding.
8. Thermal Recovery Processes: mechanism of thermal flooding, hot water flooding, cyclic steam injection, estimation of oil recovery from steam drive, in-situ combustion, air requirement for in-situ combustion.
9. Microbial oil recovery
10. EOR Project Evaluation.