PE 315 Assessment of Petroleum Reserves

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	30	60	10	--	--	100

Unit I : Resource and Reserves **Hours: 12**

Resource and reserve definition, International efforts in standardization, SPE PRMS project, Discovery, Commerciality, project based resource assessment, Risk and Uncertainty, Risk measures, Proved, Probable and Possible Reserves, Incremental projects, Deterministic or Probabilistic resource, Unconventional resource, project based resource , project based resource evaluation, prospective resource, Contingent resource (1C, 2C and 3C)

Unit II : Commercial Considerations **Hours: 10**

Commercial Evaluations, Economic Limits, Non Hydrocarbon components, PSC and entitlement, contract limits, contingent resource versus 3P, common grey areas in SPE-PRMS, resource aggregation

Unit III : Reporting System **Hours: 10**

SEC, NPD, UNFC, Russian and Canadian Guidelines, Russian Mapping to PRMS, Canadian NI51-101 COGEH system, Monte Carlo Simulation,

Unit IV : Estimation Tool **Hours: 10**

Use of Crystal Ball, Performance based reserve estimation, Decline Curve Analysis, P/Z plots, history matched simulation, diagnostic plots, pitfalls of estimation
Tax, Royalty, Production Sharing (Risk) service, Joint Venture, Reactivation, ownership of resource, payment, economic drivers, operational freedom

Total Hours: 42

Texts and References:

1. Dore A G, Quantification and prediction of hydrocarbon Resources, Elsevier.
2. Grenon M, Review of World Hydrocarbon Resource Assessment, EPRI
3. Nakhle, C (2008) Petroleum Taxation, Routledg, Taylor and Francis
4. Energy Charter Secretariat (2011) Putting a price on energy Oil Pricing update.

PE 316 Natural Gas Engineering

Teaching Scheme					Examination Scheme					
					Theory			Practical		Total
L	T	P	C	Hrs/Week	MS	ES	IA	LW	LE/Viva	Marks
3	1	0	4	4	30	60	10	--	--	100

Unit I : Introduction **Hours: 12**

Composition, Physical & Thermal properties, Phase Behavior; Fields & reserves in India and energy scenario; major NG producing industries of India and their contribution to Indian economy; techniques of utilization

Unit II : Gas Processing **Hours: 10**

Conventional and advanced separation techniques; sulphur recovery; LPG, LNG & CNG systems; specifications of NG for transportation in pipelines , NG Utilization**:** uses, underground storage, conservation & concept of peak shaving etc.
CBM, NG hydrates & in-situ coal gasification, conversion of gas to liquid (GTL)

Unit III : Natural Gas Development Engineering **Hours: 10**

Compression calculations; gas flow measurement; compressor sizing, development and operation in gas fields; Gas from condenastae and Oil fields; Field separation and oil absorption process; Low temperature processing; Dehydration and Sweetening;

Unit IV : Marketing, Retailing and Gas Trading: **Hours: 10**

Gas station and marketing; City gas distribution system; Government regulations; Natural Gas demand and supply; Natural gas – Spot and Future Markets; End User engineering

Total Hours: 42

Texts and References:

1. Bradley, H. B. (1987) Petroleum Production Handbook. SPE Publication.
2. Skimmer, D. R. (1982) Introduction to Petroleum Production Volume 1, 2 and 3, Gulf Publishing
3. Katz: D. L. and Lee, R. L.(1990), Natural Gas Engineering-Production and Storage, McGraw-Hill Publishing Company, New York.
4. Kumar, S (1987) Gas production Engineering., Gulf Publishing

PE 317T Petroleum Production Engineering

Teaching Scheme					Examination Scheme					
					Theory			Practical		Total
L	T	P	C	Hrs/Week	MS	ES	IA	LW	LE/Viva	Marks
3	0	0	3	3	30	60	10	--	--	100

Unit I : Petroleum Production Engineering Fundamentals **Hours: 12**

Petroleum Production System- Role of Production Engineer, Well Completion, Well tests and Well test analysis

Unit II : Production Testing **Hours: 10**

Inflow Performance Relationship (IPR), Construction of IPR curve using Test Point, IPR for Two phase reservoir using Vogel's equation, concept of Productivity Index, Future IPR, Various flow regimes in wellbore.

Unit III : Artificial Lift Methods **Hours: 10**

Overview of artificial lift technology, Criteria for selection of artificial lift system, Reservoir performance, Artificial lift screening , Sucker Rod Pump (SRP), Gas Lift System, PCP, ESP system, Gas lift design: mandrels, valves, injection gas requirements, temperature, chokes, spacing, equilibrium curve, continuous flow design.

Unit IV : Production Enhancement **Hours: 10**

Introduction, Well Analysis and Remedial Measures, Low Productivity – Stimulation, Excessive Production of unwanted fluid, Water Control, Sand Control, Production Optimization, Best practices for installation and maintenance, Economic analysis

Total Hours: 42

Texts and References:

1. Dr. Guo Boyun , Computer Aided Petroleum Production Engineering
2. H Dale Begg , Production Optimization , OGCI Publication,tulsa.
3. Kermit Brown, Technology of artificial lift method –. Vol 2a ,2b.Penwell publishing company, Tulsa.

PE 317P Petroleum Production Engineering

Teaching Scheme					Examination Scheme					
					Theory			Practical		Total
L	T	P	C	Hrs/Week	MS	ES	IA	LW	LE/Viva	Marks
0	0	2	1	2	--	--	--	25	25	50

Laboratory Courses: Practical classes shall be based on theory course content of the corresponding courses.

Aim: Familiarization of various petroleum production operations.

PE 318 Reservoir Engineering

Teaching Scheme					Examination Scheme					
					Theory			Practical		Total Marks
L	T	P	C	Hrs/Week	MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	30	60	10	--	--	100

Unit I : Reservoir Properties & Darcy's Law **Hours: 12**

Bulk volume, Grain Volume, Effective Pore Volume and Net Volume. Porosity, Compressibility, Darcy's Law. Absolute and Effective Permeability, Permeability averaging, Transmissibility, Measurements of Permeability heterogeneity, Darcy's law of directional permeability, rock fluid interactions.

Unit II : Fluid and rock properties **Hours: 10**

Wettability, Capillary Pressure, correlation of capillary pressure to rock properties, Equivalent height and transition zone, mobility, relative mobility and flow capacity. Drivers of reservoirs

Unit III : Reserve Estimation **Hours: 10**

Reservoir Drive Mechanism, Reserve determination, Volumetric, and Material Balance, gas well deliverability, Production Performance ratio, Production Stages,

Unit IV : Fluid Displacement **Hours: 10**

Flow in porous media, flow units, Fractional flow, The Buckley-Leverett Theory, Welge's Method, Frontal Advance, Linear Stability Analysis, Well patterns, Fluid Coning, Pressure maintenance. Productivity Index, Specific Productivity Index, Continuity equation and its derivation; Diffusivity equation and its different forms

Total Hours: 42

Texts and References:

1. Ahmed T, Reservoir Engineering Handbook, Gulf Publishing, Houston.
2. Amyx J W,Bass DH, Whiting R L , Petroleum Reservoir Engineering, McGraw Hill, New York.
3. ReinHold, Flow of fluids through porous materials, Petroleum Publishing, Tulsa
4. Craft and Hakins , Applied petroleum Reservoir Engineering, Second edition, Prentice and Hall.

CH 306 Heat and Mass Transfer

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	30	60	10	--	--	100

Unit I: Heat Transfer **Hours: 12**

Conduction: Steady-state and transient flow through various geometries, Convection: LMTD and NTU, overall heat transfer coefficient. Application of dimensional analysis to convection. Heat transfer rate and Heat transfer coefficient calculations. Double pipe parallel and counter-flow heat exchangers, natural and forced convection through tubes and outside tubes, Shell and tube heat exchanger, and finned tube heat exchanger. Boiling of liquids and condensation of vapors

Unit II : Radiation **Hours: 10**

Radiation from black and real surfaces, radiation transfer between black and grey surfaces, view factor, radiation shield, and multi-sided enclosures., Thermal insulation, Economic and critical thickness of lagging.

Unit III : Mass Transfer **Hours: 10**

Diffusion in gases: Fick's law, determination and estimation of diffusion coefficient; diffusion through stagnant gas and equimolecular counter-diffusion. Diffusion in liquids: Mass transfer across phase boundaries, two-film theory and mass transfer coefficient.

Unit IV **Hours: 10**

Gas Absorption, adsorption, and Distillation (flash and differential): Basic principles, laws, and calculations. Equilibrium, co-current and counter-current operations. Ideal stage concept and calculation of number of ideal stages. Efficiency. Packed bed and tray columns

Total Hours: 42

Texts and References:

1. Coulson and Richardson‟s Chemical Engineering Vol-1, 6th Ed, Elsevier (Butterworth and Heinemann).
2. Warren L. McCabe, Julian C. Smith ,Unit Operations of Chemical Engineering, McGraw Hill.
3. Donald Q. Kern , Process heat transfer, Tata-McGraw-Hill.
4. Badger and Banchero , Introduction to Chemical Engineering, McGraw-Hill.

PE 319 Industrial Orientation

Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Week	Report writing	V/V	Total Marks
0	0	0	3	6	80	20	100

Aim: To Familiarization of students in Upstream, Midstream and Downstream Hydrocarbon industry.

PE 320 Group Assignment and Presentation

Teaching Scheme					Examination Scheme		
L	**T**	**P**	**C**	**Hrs/Week**	**Report writing**	**V/V**	**Total Marks**
0	**0**	**4**	**2**	**4**	**80**	**20**	**100**

Aim: To train students in developing inter and intra personal skills in professional world.

PE 322 Contracts in Hydrocarbon Industry

Teaching Scheme					Examination Scheme					
L	**T**	**P**	**C**	**Hrs/Week**	**Theory**			**Practical**		**Total Marks**
					MS	**ES**	**IA**	**LW**	**LE/Viva**	
2	**0**	**0**	**2**	**2**	**30**	**60**	**10**	**--**	**--**	**100**

Unit I **Hours: 5**

Historical background of the Oil and Gas trading, , Geopolitical history of Hydrocarbon exploration and trading, Life cycle of Petroleum Project, Fiscal System in hydrocarbon industry, Basic elements of Contracts, Basic terminologies of contract and legal. Basics of Upstream and Downstream regulatory Laws and Policies.

Unit II **Hours: 12**

Contracts in E & P Industry, Classification of contracts, Concession style, Sharing contracts- Production Sharing Contract, Terminologies, Attributes of PSC, Different PSC Models (Indonesian, Indian, Nigerian, Chinese, Equatorial New Guinea, etc). Risk Sharing Contracts, Joint Operating Agreements, JOA attributes, JOA Models, Farm out Agreements, Rig procurement contracts-Design and Fabrication aspects

Unit III **Hours: 5**

Elements of Transportation, Hydrocarbons transport, Contracts related to bougers, ship and pipeline, Tarrif mechanism- national and International, LNG contracts, LNG taxation and charges. Oil Tanker

Unit IV **Hours: 6**

Hydrocarbon trading-Oil trading, Physical and Paper; Crude oil Markets- Spot, Barter, Future and forward. Oil Pricing mechanism, short term and long term, Level playing and swaping. Hydrocarbon Strategic storage, Contract Arbitration and dispute settlement.

Total Hours: 28

Texts and References:

1. Shippey, K. C. (2009) A short course on international Contracts, 4th Ed. World Trace press.
2. Tordo, S (2007) Fiscal System in Hydrocarbons: design issues. The World Bank
3. Ministry of P & G (Goverment of India) Model Production Sharing Contracts
4. Johnston, D (1994) International petroleum fiscal system and Production sharing contracts, Penn Well books.