COURSE STRUCTURE FOR B.TECH. Third Year

SEMESTER V			B.TECH. Third year										
Sr. No	Course Code	Course Name	Teaching Scheme					Exam Scheme					
			L	T	P	C	Hrs/wk	Theory			Practical		Total Marks
								MS	ES	IA	LW	LE/Viva	
1	PE-315	Assessment of Petroleum Reserves	3	0	0	6	3	30	60	10	--	--	100
2	PE-316	Natural Gas Engineering	3	1	0	7	4	30	60	10	--	--	100
3	PE-317T	Petroleum Production Engineering	3	0	0	6	3	30	60	10	--	--	100
	PE-317P		0	0	2	1	2	--	--	--	25	25	50
4	PE-318	Reservoir Engineering	3	1	0	7	4	30	60	10	--	--	100
5	CH-306	Transport Phenomena	3	1	0	7	4	30	60	10	--	--	100
6	PE-319	Industrial Orientation	0	0	6	3	6	--	--	--	80	20	100
7	PE-320	Group Assignment and Presentation	0	0	4	2	4	--	--	--	80	20	100
		Total	**15**	**3**	**12**	**39**	**30**						**750**

MS = Mid Semester, ES = End Semester; IA = Internal assessment (like quiz, assignments etc) LW = Laboratory work; LE = Exam

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	6	3	30	60	10	--	--	100

Unit - 1 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 – 2 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 -3 Reporting System Hours: 10

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

Unit - 4 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					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	7	4	30	60	10	--	--	100

Unit - 1: Introduction **Hours: 12**

Composition, properties, fields & reserves in India and energy scenario; major NG producing industries of India and their contribution to Indian economy; techniques of utilization

Unit - 2: 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 - 3: Transportation of NG: **Hours: 10**

Compression calculations; gas stations & transmission; city gas distribution system; gas flow measurement; compressor sizing

Unit – 4: Marketin, retailing and gas trading: **Hours: 10**

CBM, NG hydrates & in-situ coal gasification, conversion of gas to liquid (GTL)

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					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	6	3	30	60	10	--	--	100

Unit - 1: Petroleum Production Engineering Fundamentals: Hours: 12

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

Unit – 2: 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 – 3: 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 – 4: 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					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
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					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	--	7	4	30	60	10	--	--	100

Unit – 1: **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 – 2: 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.

Unit – 3: Reserve Estimation **Hours: 10**

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

Unit – 4: 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.

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 Transport Phenomenon										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	--	7	4	30	60	10	--	--	100

Unit – 1: 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 vapours

Unit – 2: 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 – 3: 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 4:- **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
0	0	0	3	0	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
0	0	4	2	3	80	20	100
Aim: To train students in developing inter and intra personal skills in professional world.							