

## COURSE STRUCTURE FOR B.TECH. Fourth Year

SEMESTER VIII			B.TECH. Fourth year										
Sr. No	Course Code	Course Name	Teaching Scheme					Exam Scheme					Total Marks
			L	T	P	C	Hrs/wk	Theory			Practical		
								MS	ES	IA	LW	LE/Viva	
1	PE-409 T	Safety Health and Environment	3	0	0	6	3	30	60	10	--	--	100
	PE-409P		0	0	2	1	2	--	--	--	25	25	50
2	PE- 422	Pipeline Engineering	2	1	0	5	4	30	60	10	--	--	100
3	PE- 410	Regulatory and Policy Issues in Hydrocarbon Sector	3	0	0	6	3	30	60	10	--	--	100
4	PE XXX	Elective-2	2	0	0	4	2	30	60	10	--	--	100
5	PE-419	Management in Hydrocarbon Industry	3	0	0	6	3	30	60	10	--	--	100
6	PE 412	Major Industrial Project Work	0	6	4	8	10	--	--	--	80	20	100
7	PE 426	Grand Viva	0	0	8	4	8	--	--	--	80	20	100
<b>Total</b>			<b>13</b>	<b>7</b>	<b>14</b>	<b>38</b>	<b>35</b>						<b>750</b>

MS = Mid Semester, ES = End Semester;

IA = Internal assessment (like quiz, assignments etc)

LW = Laboratory work; LE = Laboratory Exam

Elective-2: PEXXX-Petroleum Production Engineering

PEXXX-Unconventional Energy Resources

PE 410 Regulatory and policy issues in hydrocarbon sector										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	--	6	3	30	60	10	--	--	100
<p><b>Unit – 1: Petroleum Policy and laws</b> <span style="float: right;"><b>Hours: 12</b></span>  Constitution, Petroleum Laws and regulations, E&amp;P business regime – concession, joint ventures, service contract, production sharing contract</p> <p><b>Unit – 2: Policy Mechanism</b> <span style="float: right;"><b>Hours: 10</b></span>  PMO, MOPNG, Planning Commission, upstream regulator: DGH, Downstream; Gas regulator, Public sector undertaking: ONGC, OIL, GAIL, GSPC, Private Sector: Reliance, Jubliant, Videocon, ESSAR; Foreign Sector: BG, ENI, CAIRN, NIKO, Petroleum Regulatory Board Bill, 2002, regulation benefits, role as arbitrator, resource exploitation – approach.</p> <p><b>Unit -3: Legal Framework</b> <span style="float: right;"><b>Hours: 10</b></span>  Constitution of India 1950, Oil Field Act – Regulation and Development (1948), The petroleum and National Gas rules Act (1959), Territorial waters, Continental Shelf and exclusive Economic Zones Act(1976), Income Tax Act (1961), customs Act (1962), Foreign Exchange Management Act(1999), Environmental Protection Act(1986), Arbitration and Conciliation Act(1996)</p> <p><b>Unit – 4: Legal Terminologies</b> <span style="float: right;"><b>Hours: 10</b></span>  Title Transfer, Despite resolution, Force Majeure, Form in/Farm out, Share acquisition, Swaps, Licensing/ bidding, Policy making, revenue management, Audit, optimal hydrocarbon utilization, technical advisory, OISD – safety monitoring, technical advisory, OISD – Safety monitoring, PNGRB – Downstream regulation issues.</p> <p style="text-align: right;"><b>Total Hours : 42</b></p> <p><b>Text Books and References</b></p> <ol style="list-style-type: none"> <li>1. Petroleum and natural Gas regulatory Board Act 2006</li> <li>1. Various Regulations notified by PNGRB on Authorization, Designing Construction and safety of Pipelines and CGD</li> <li>2. Government policy on FDI in Oil &amp; Gas retail Sector</li> <li>3. Government Policy on Natural gas Pipeline, Petroleum Products Pipelines</li> </ol>										

PE 421T Safety, Health and Environment										
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
<p><b>Unit I</b> <span style="float: right;"><b>Hours: 12</b></span></p> <p>Physical Hazards Noise, Heat, Vibration, Illumination, Radiation, extreme climatic conditions etc, Chemical Hazards Hydrogen sulfide gas, Hydrocarbons, Ammonia, Chlorine, Formaldehyde, Hydrochloric Acid, Methanol, Sulphur, Sulphuric acid, Sodium Hydroxide, etc. Biological Hazards, Psychological Hazards, Ergonomic Hazards, Injuries, Burns etc Prevention &amp; Remedial controls of Occupational Hazards In Oil &amp; Gas Industry for each type of Hazards Engineering Control, Administrative Control, Medical Control, Use of Personal Protective Equipment (PPE) Understanding Fire: Fire triangle/tetrahedron, Stages of development of fire Flammability, Concept of flash / Fire point, volatility, Flammable Limits, Fire Detection; Fire signature, Smoke, Heat, Flame, Combustible Gas Detection Fire Prevention, Fire suppression , Process Safety: Safety Analysis Table, Safety Analysis Checklist &amp; SAFE Chart( ref API 14 C)</p> <p><b>Unit II : Hazard &amp; Risk Analysis,</b> <span style="float: right;"><b>Hours: 12</b></span></p> <p>Risk Matrix, HAZID, HAZOP, QRA (API 14 J, OISD) , Safe Work Practices : PTW, MOC, SIMOPS etc (ref API RP 75,OISD, OMR) , Electrical Safety;, Classification of Hazardous locations, use of electricity I Hazardous area ( Ref IER, OISD, OMR, API RP 500 &amp; 14 F) Accident Investigations: Study of major accidents like Piper Alpha, Flixborough, Bhopal etc., Investigation techniques Emergency Response planning Audits &amp; Inspection. Audit methodology, protocol, typical check lists for Drilling rigs, Work over activities, logging, etc (ref OISD Standards)</p> <p><b>Unit III : HSE Management System:</b> <span style="float: right;"><b>Hours: 6</b></span></p> <p>OISD, API RP 75, ISO 14000, ISO 9000, OSHAS 18000 Standards</p> <p><b>Unit IV : Environment</b> <span style="float: right;"><b>Hours: 12</b></span></p> <p><b>Environment Concepts:</b> Effect on eco-system; Air, Water, &amp; Soil of HC"s. Impact of Exploration &amp; Exploitation of Hydrocarbon on Environment Environmental studies (Off shore &amp; On Shore) - Environmental Impact Assessment Oil Spills Control and their management. State, Government of India and international Maritime Environmental Rules &amp; Regulations. Drilling / Oil Storage / Effluent water / waste (solid &amp; sludge) treatments their disposal and remediation of soil etc.</p> <p><b>Upstream safety :</b> Implementing Agency OISD(for on-land blocks)0 directorate of Mine Safety(for Off Shore Blocks),Safety in Rig operation; Safety in Exploration and Production.</p> <p><b>Downstream Safety:</b> Implementing Agency PNGRB; Safety Regulations(Technical Standard, Specification and Safety Standards T4S), Emergencies, Mutual Aida; Emergency Response and Disaster Management Plan ERDMP)</p> <p style="text-align: right;"><b>Total Hours: 42</b></p>										
<p><b>Texts and References:</b></p> <p>1. Less, F. P., Loss Prevention in the Process Industries, 2nd ed., Butterworth Heinemann, UK.</p>										

2. Peavy, H. S., Rowe, D. R. and Tchobanoglous, G., Environmental Engineering, McGraw Hill, New York.
3. Sanders, R. E., Chemical Process Safety, Butterworth Heinemann, UK, Year.
4. NFPA, API 14 G & OISD Standards.
5. Marchell, V. and Ruchemann, S., Fundamentals of Process Safety, Institution of Chemical Engineers, Warwickshire, UK.

PE 421P Safety, Health and Environment Laboratory							
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Week	LW	LE/Viva	Total
0	0	2	1	2	25	25	50
<p><b>Aim:</b> To get exposure on day- to-day Safety, Health and Environmental activities of various segments of hydrocarbon industries.</p>							

PE 422 Pipeline Engineering										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	5	3	30	60	10	--	--	100
<b>Unit – 1: Introduction</b>					<b>Hours: 12</b>					
Introduction to Pipelines, Responsibilities of pipeline engineers and designers, scope of pipeline, inputs and outputs, process diagram (PFD, PNID), course and standards, oil and gas terminology, types of platforms, pipeline elements, pipeline materials, material takeoff for onshore and offshore pipelines										
<b>Unit – 2: Pipeline Drawings</b>					<b>Hours: 10</b>					
Field layouts, alignment sheet, riser and spool, GAD'S, crossing details, trench details, anode details, monel sheathing										
<b>Unit – 3: Pipeline Specification</b>					<b>Hours: 10</b>					
Pipeline valve thickness calculations, cathodic protection, valves specifications & specialties, pipeline supports, clamps, configuration of equipments, pipeline installation methods, on bottom stability, free span calculations										
<b>Unit – 4: Stress Calculation</b>					<b>Hours: 10</b>					
Pipe stress Requirements, fatigue failure, stress intensification factor, code compliance, pipe support span calculations, piping design for leading types (sustain load – pressure, weight, expansion loads, hanger design, occasional loads), piping configuration, loops – types and sizing, cold spring, underground pipe, flange leak analysis, thrust force calculations, code compliances										
<b>Total Hours: 42</b>										
<b>Text books and Reference</b>										
<ol style="list-style-type: none"> <li>1. Alkazraji Duraid, (2008) A quick guide to pipeline engineering Woodhead Publishing Limited</li> <li>2. Vincent, Jecques (2010) Fundamentals of Pipeline Engineering, Gulf Publishing</li> <li>3. Antaki, G. A. (2003) Piping and Pipeline Engineering , Marcell Dekker.</li> </ol>										

**PE 419 Management in Hydrocarbon Industry**

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 (10 Hrs)**

Personnel Function: Scope and Organization; Wage and Salary Administration; Recruitment, Selection, Induction, Promotion, Transfer and Separation. Industrial Relations: Concept and importance; Trade Unions: Their growth and role, Problem of Multiplicity of Trade Unions; Industrial Dispute: Definition, Prevention and Settlement. Various legislations regarding labour issues: Wage & Bonus, social security, industrial relations. Workers participation in Management. Conflict Resolution & Employee Discipline. Welfare schemes for Employees and its Importance in the Changed Scenario.

**Unit 2 (8 Hrs)**

Introduction to accounting; Accounting equation; Preparation of financial statements & Analysis; Accounts for Joint Stock Companies; Introduction to International Accounting standards; GAAP; Annual reports; Cash flow reporting; Cost concepts: Absorption & Marginal Costing, CVP Analysis, Standard Costing and Variance analysis.

**Unit 3 (12 Hrs)**

Supply Chain Management – genesis, definitions and basic structure; Value Chain concept; Relevant issues in supply chain; Strategy formulation; Product type- Supply Chain Matrix; Strategic sourcing and management of supply, Suppliers evaluation and development, Outsourcing strategy. Logistic Management – functions and basic issues, Indian Scenario; Areas of logistical decision making, Design of transportation network; Warehousing; Introduction to e-commerce; Performance measurement of Supply Chain Management.

**Unit 4 (12 Hrs)**

Introduction to Operations Management; Production Systems, Capacity Planning, Forecasting Models, Facilities Management; Operations Planning and Control – Job Shop scheduling and Aggregate Planning; Line Balancing, Production scheduling and sequencing.

**Text Books and references**

- 1) David Jacob (2012) Optimal supply chain management in oil, gas and power generation, Penn Well Pub. Company
- 2) Barry Richards (1993) Management of International oil operation, Penn Well Publishing Company.
- 3) Wright, C. J and Gallum, R. A (2008) Fundamentals of Oil and gas accounting, Penn Well Pub. Company

PE 412 Major industrial project work							
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Week	Report writing	V/V	Total
0	6	4	8	10	80	20	100
<p><b>Aim:</b> To address specific industry and research related problems.</p> <p><b>Unit 1:</b> Experimentation and data analysis and Synthesis</p> <p><b>Unit 2:</b> Outcome, discussion and conclusion</p> <p><b>Unit 3:</b> Report Writing, Presentation and Viva-Voce</p> <p><b>Text Books &amp; Recommended Software:</b></p> <ol style="list-style-type: none"> <li>1. Kothari, C. R. (2008) Research Methodology: Methods and techniques,</li> <li>2. Murray, R (2002) How to write a thesis, McGrawal Hill Publication</li> <li>3. Recent ENDNOTE Software for referencing</li> <li>4. JABREF for Referencing.</li> </ol>							

PE 426 Grand Viva-Voce										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	8	4	8				80	20	100
<p><b>Aim:</b> to evaluate the students at the end of their four year studies.</p>										

PE XXX Unconventional Energy Resources (Elective)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	4	2	30	60	10	--	--	100
<p><b>Unit-1</b> <span style="float: right;"><b>6Hrs.</b></span>  Introduction- Energy resources; Conventional Energy Resources; Un-Conventional Energy Resources; Difference between Conventional and un Conventional, HC resources, Conventional Energy Resources (Simple introduction) (a). Crude Oil (b). Natural Gas (c) Coal</p> <p><b>Unit-2</b> <span style="float: right;"><b>12Hrs.</b></span>  Unconventional Energy Resources: CBM formation; Resource potential mapping status of CBM bidding round; Current CBM Production; Future prospects; Players in India; Global Scenario, CMM- formation; Resource potential mapping; methods for assessing the potential; Award procedure for CMM block in India ; status of CMM; Current CMM Production; Future prospects; Players in India; Global Scenario, Shale Gas- Introducing Shale Gas; Shale Rock formation; History of Shale Gas; US success Story; Replication possibilities US experience in India; Shale gas Global Potential ; Shale Gas initiatives in Europe and Asia; Shale Gas Potential in India; major Shale Plats in India; Shale Gas a game changer; Status of Regulatory regime in India for shale gas.</p> <p><b>Unit-3</b> <span style="float: right;"><b>6Hrs.</b></span>  Gas hydrates. Indian and Global Scenario. Gas Hydrates formation and production. Prevention methods for gas hydrate formation in gas flow pipelines.  Estimation of Unconventional Energy Resources Methods of estimation, Indian scenario' potential of various unconventional sources,</p> <p><b>Unit-4</b> <span style="float: right;"><b>4Hrs.</b></span>  Detail study of CBM and Shale Gas Exploration, Technology, Land and water requirement, Environmental issues, Global Experience- US, Europe, China, Australia and India</p> <p style="text-align: right;"><b>Total: 28 hrs</b></p> <p><b>Text Book and References</b></p> <ol style="list-style-type: none"> <li>1. Zou, C et al (2013) Unconventional Petroleum Geology, Elsevier</li> <li>2. Max, M. D. (2003) Natural Gas Hydrate in Oceanic and Permafrost Environments, Kluwer Academic Publication</li> <li>3. Nash, K. M. (2010) Shale gas Development, Nova Science Publishers, Incorporated</li> <li>4. Rogers, R. (1994) Coal bed methane: principles and Practices, PTR Prentice Hall</li> </ol>										



PE XXX Petroleum Production Engineering (Elective)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	4	2	30	60	10	--	--	100
<p><b>Unit - 1:</b> <span style="float: right;"><b>Hours: 6</b></span>  <b>Petroleum Production Engineering Fundamentals</b> Petroleum Production System- Role of Production Engineer, Well Completion, Well tests and Well test analysis</p> <p><b>Unit – 2:</b> <span style="float: right;"><b>Hours: 7</b></span>  <b>Production testing:</b> 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.</p> <p><b>Unit – 3:</b> <span style="float: right;"><b>Hours: 8</b></span>  <b>Artificial Lift Methods:</b> Overview of artificial lift technology, Criteria for selection of artificial lift system, Reservoir performance, Artificial lift screening , Sucker Rod Pump (SRP), Gas Lift System,</p> <p><b>Unit – 4:</b> <span style="float: right;"><b>Hours: 7</b></span>  <b>Production Enhancement:</b> 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</p> <p><b>Texts and References:</b></p> <ol style="list-style-type: none"> <li>1. Dr. Guo Boyun , Computer Aided Petroleum Production Engineering</li> <li>2. H Dale Begg , Production Optimization , OGCI Publication,tulsa.</li> <li>3. Kermit Brown, Technology of artificial lift method –. Vol 2a ,2b.Penwell publishing company, Tulsa.</li> </ol>										