

**17BPE401 - Production Engineering-II**

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	25	50	25	--	--	100

**Unit I** **Hours : 12**

**Production Enhancement**

**Introduction:** An overview of various production enhancement techniques, Well Analysis and Remedial Measures, Low Productivity – Stimulation, Excessive Production of unwanted fluid, Water Control, Sand Control, Production Optimization.

**Stimulation:** Concept of Formation damage, Type & description of stimulation techniques to mitigate formation damage problem and address issues of low productivity, Design of matrix acidization and acid fracturing. Design of hydraulic fracturing, Multistage fracturing.

**Excessive Production of unwanted fluid:** Reasons for excessive production of oil & gas, Causes and hazards of excessive sand production. Industry practices to contain their production. Application of Coil tubing Unit as new generation work over rig for well activation & well repair.

**Unit II** **Hours : 8**

**Production optimization**

Monitoring, Design & optimization of two major lift techniques: SRP & Gas lift system.

**Unit III** **Hours : 14**

**Deep water Production system**

**Introduction:** Deep water facts & figures, Deep water technology aspect, Conceptual development planning, Deep water JIP, Fast track development strategy, Indian scenario

**Sub-Sea Production System -** Floating Production Platform-Mooring & Anchoring, Flow assurance in deep sea, New Technologies.

**Unit IV** **Hours : 5**

**Offshore Safety and fire protection**

Safety aspects:-Process safety, Life extension, Well integrity, Rig interferences. Human factors and safety, ERR Process. Navigation aids, Fire protection system

**Total Hours : 39**

**Texts and References:**

1. Dr. Guo Boyun, Computer Aided Petroleum Production Engineering
2. H Dale Begg, Production Optimization , OGCI Publication, Tulsa.
3. Deep water Petroleum Exploration & Production-By Willium Leffler, Richard Pattardozi, Gordon Sterling
4. Floating Production System- By N.K. Mitra.

**17BPE402 - Integrated Reservoir Management**

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	25	50	25	--	--	100

**Unit I** **Hours : 7**

**Reservoir Management Concept & Process**

Definition, history & fundamentals of reservoir management, synergic team approach; Integration of geosciences and engineering for reservoir development, development plans, surveillance & monitoring, Evaluation, Revision of plans & strategies.

**Unit II** **Hours : 12**

**Reservoir Data & Model& Performance Analysis**

Reservoir Data types: Geosciences, seismic & engineering, Data validation & Integration, Application for Reservoir Model building, Reservoir Performance analysis by various methods: Volumetric, decline curve, material balance & simulation.

**Unit III** **Hours : 12**

**Reservoir Management, Development Plans, EOR Concepts & Techno economic Evaluation**

Developmental plans for newly developed and matured fields, Differentiation in cases of oil, gas and condensate reservoirs, Importance of improved recovery processes in development plans and their screening criteria. Scenarios for development plans & Economic evaluation. Risk, uncertainties & economic optimization.

**Unit IV** **Hours : 8**

**Reservoir Case Studies & Conclusions**

Reservoir Management case studies for various types of fields from both onshore and offshore, Importance of IRM. Current challenges and areas of further work.

**Total Hours : 39**

**Texts and References:**

1. Integrated Petroleum Reservoir Management- A team approach: Abdus Satter & Ganesh C. Thakur; Penwell Publishing Company, Tulsa, Oklahoma.
2. Development of oil and gas fields: Dr. Sant Kumar; Allied Printers, Dehra Dun, 248001, India.

**17BPE403 - Natural Gas Processing and LNG**

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>25</b>	<b>50</b>	<b>25</b>	<b>-</b>	<b>-</b>	<b>100</b>

**Unit I** **Hours : 10**

Introduction- Defining Gas processing, Historical background, General processes concerning gas Processing : Water and Hydro Carbon Liquid Separation, Dehydration, H<sub>2</sub> S Removal and elemental Sulfur extraction, Carbon Di Oxide ( CO<sub>2</sub> ) removal, Mercury Removal. Gas processing for pipeline transportation (Corrosion protection, limits for water , H<sub>2</sub>S and CO<sub>2</sub> contents).

**Unit II** **Hours : 10**

Introduction to Refrigeration/ Cryogenic Process for separation / processing of Gases : Refrigeration Cycle, Cascade refrigeration processes ( Multiple pure component system and Mixed Refrigeration system), Turbo Expander and System, Advanced Refrigeration system

**Unit III** **Hours : 10**

Extraction of components in Natural gas and /or liquids : Helium Extraction, Nitrogen Removal, Propane and Butane (LPG) Extraction, Ethane Extraction, NGL component extraction from NGL liquids by Fractionation process, NGL Extraction from Gas Mix, Introduction to use of natural gas liquid (NGL), its components for manufacture of value added products. :C<sub>2</sub>, C<sub>3</sub> and C<sub>4</sub>

**Unit IV** **Hours : 9**

Gas processing for LNG Production (limits of Water, CO<sub>2</sub>, H<sub>2</sub>S and Mercury contents etc.), LNG Production process, LNG Storage, LNG Transportation & Regasification

**Total Hours : 39**

**Texts and References:**

Gas Production Engineering by Sanjay Kumar

Handbook of Natural Gas Transmission and Processing by Saeid Mokhatab, William A Poe and James G. Speight

**17BPE404 - City Gas Distribution**

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	25	50	25	--	--	100

**Unit I** **Hours : 10**

**Introduction**

Natural Gas: Fuel for Future (Properties of Natural Gas); Energy Resources for CGD; Update on Gas Discoveries; Demand-Supply Gap; History of CGD in India; Pre and Post PNGRB Era; LNG and CGD business

**Gas Retailing Business:** Introducing Gas Retailing; Terminology used in CGD; Various components of CGD Network; CGD Business Segments; CGD Projects – Status in India; CGD Companies in India; Role of CNG and PNG in Gas Distribution; CGD Economics

**Unit II** **Hours: 10**

**Regulatory Framework and Standards for City Gas Distribution:** Petroleum and Natural Gas Regulatory Board (PNGRB) era; Purpose, role and functions of PNGRB; Challenges faced by PNGRB; Technical Standards including T4S.

**Gas Value Chain:** Gas Transmission and Distribution System; City Gate Station (CGS); Gas Filtration and Pressure reduction skids; Odorizing unit; Common pressure reduction station (CPRS)/District Regulation Station (DRS); Metering system; Pipeline for CGD network; Steel and PE Pipelines; CNG infrastructure: Mother Station, Online Station, Daughter Station, Daughter Booster Station; SCADA System

**Unit III** **Hours : 10**

**Operation and Maintenance**

Annual O&M Plan; Steel Pipeline O&M (Cathodic Protection); Maintenance planning.

**QHSE:** CNG Safety; Emergency Response Plan; Disaster Management Plan; Quality assurance concepts; Inspection and Surveillance; Risk Assessment in CGD Business.

**Unit IV** **Hours : 09**

**Business Scenario**

CGD Business Scenario – India and Abroad; Profile of Major Players; Gas Pricing in CGD; Customer Service Issues in CGD Business; Innovations in CGD; Accelerators and Retarders of CGD business; Case Studies – India and Abroad

**Total Hours:39**

**Texts and References:**

1. City Gas in India(BS Negi)
2. Natural Gas (AK Jain)
3. City Gas Distribution in India: Demystifying the Opportunity, Growth and Investment Potential (Infra line Energy)

**17BPE408 - Enhanced Oil Recovery**

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	25	50	25	--	--	100

**Unit I** **Hours : 5**

**Introduction to EOR processes**

Definition, Difference of IOR and EOR, Target oil resource for EOR, General Classification. Description and potential of different EOR processes.

**Unit II** **Hours : 5**

Microscopic and macroscopic displacement of fluids in a reservoir, Displacement efficiency in different system – linear, areal, volumetric, Definition and discussion of mobility ratio and mobility control processes for different types of fluids

**Unit III** **Hours : 10**

**Candidates for EOR processes and Selection Criteria**

Miscible/Immiscible displacement processes - water flooding, gas injection, micro-emulsion flooding  
 Chemical Flooding - polymer flooding, Surfactant flooding, Micellar flooding related methods  
 Thermal recovery processes- in situ combustion, hot-water injection, steam flooding, SAGD  
 Microbial EOR.

**Selection criteria for EOR:** Determination of residual oil (well test, reservoir performance, core analysis, cased /open hole logs, single well tracer), Laboratory studies, Field pilot test and evaluation, Techno economic feasibility, Full scale implementation, Monitoring and review

**Unit IV** **Hours : 6**

**Global Scenario of EOR and Some Case Studies**

Field scale implementation and their performance of various EOR schemes of local and global context.

**Total Hours : 26**

**Texts and References:**

- Enhanced Oil Recovery, I –Fundamentals and analyses – E. C. Donaldson, G. V. Chilingarian, T. F. Yen (Edited) – Elsevier Science Publishers B. V. – 1985.
- Enhanced Oil Recovery, II –Processes and operations – E. C. Donaldson, G. V. Chilingarian, T. F. Yen (Edited) – Elsevier Science Publishers B. V. – 1989.
- Modern Chemical Enhanced Oil Recovery: Theory and Practice-James J. Sheng, Gulf Professional Publishing, Elsevier.
- Enhanced Oil Recovery – D. W. Green, G. P. Willhite – SPE Textbook Series Vol. 6 -1998.

**17BPE409 - Petroleum Management**

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	25	50	25	--	--	100

**Unit I** **Hours : 06**

**Petroleum management strategies**

Petroleum strategy, Industrial relation and labor law, Project management, legal aspects of business, management control system, business ethics, entrepreneurship, energy laws.

**Unit II** **Hours : 06**

**Energy and Infrastructure**

Energy Economics, Business of Petroleum, Energy Trade and Risk management, Infrastructure for Marketing of Oil and Gas, Storage and products, Information system in energy value chain, supply chain and logistics management.

**Unit III** **Hours : 08**

**Oil Marketing**

Consumer Behavior, Service Marketing, Strategic Brand Management, Marketing communication, Digital marketing, Retail management, Sales and Distribution management

**Unit IV** **Hours : 06**

**Finance Management**

Investment Analysis and Portfolio Management, Oil and Gas projects financing, Derivative and Risk Management, Venture Capital and Private Equity.

**Total Hours : 26**

**Texts and References:**

1. The Global oil and Gas industries; Management, Strategy and Finance, 2011, Penn well Corporation Oklahoma USA, By- Andrew ink pen and Michael H. Moffett.
2. Oil Property Evaluation, By Robert S. Thompson

**17BPE410 - Petrochemical Engineering**

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	25	50	25	0	0	100

**Unit I** **Hours : 5**

Definition of Petrochemicals – petrochemical industries and products – feed stock for petrochemicals – Separation of Aromatics: Azeotropic separation of Toluene, Separation of Styrene, Extraction process, Crystallisation process – Air separation (Making Oxygen and Nitrogen).

**Unit II** **Hours : 7**

Production of methanol via synthesis gas – production of formaldehyde from methanol – production of Methylamines - production of chloromethane – trichloroethylene – perchloroethylene – Ethylene dichloride production – Vinyl chloride via ethylene dichloride pyrolysis and acetylene HCl reaction. Ethylene Oxide by air oxidation of ethylene. Butadiene via dehydrogenation of butane – butadiene from butane by oxydehydrogenation process – butadiene from ethanol – hydro dealkylation process.

**Unit III** **Hours : 7**

Types of Polymerization, methods and mechanism. Properties, applications and production technologies of the following commodity polymers –Polyethylene, LLDPE, HDPE, polypropylene, polystyrene, PVC, polyesters, nylons, acrylic fibers, etc. production of phenol formaldehyde resin, epoxy resin, production principle of ABS plastic, polycarbonates, etc. manufacturing techniques of butyl rubber, SBR, isoprene rubber.

**Unit IV** **Hours : 7**

**Petroleum Aromatics:** BTX Production, Naptha reforming, Paraxylene from Naptha  
**Benzene derivatives:** Phenol, Aniline, Benzoic acid , Styrene, Maleic anhydride.  
**Toluene derivatives:** Caprolactum, DMT, Terephalic acid, Phthalic anhydride,  
**Xylene derivatives:** Cumene, Naphthalene

**Total Hours : 26**

**Texts and References:**

1. Waddams, A.L., ‘Chemicals from Petroleum’, 4th edition, Gulf Publishing Company, London, 1980.
2. Lewis F. Hatch & S Matar, From Hydrocarbon to Petrochemicals
3. B.K. Bhaskara Rao, A Text on Petrochemicals, 2/e, Khanna Publishers, Delhi, 1998.
4. Mall, I.D., “Petrochemical Process Technology”, Macmillan India Limited, Delhi, 2007.
5. F.A. Lowenheim and M. K. Moran; Industrial Chemicals, John Wiley & Son Inc.,USA

**17BPE411 - Flow Assurance**

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	25	50	25	-	-	100

**Unit I** **Hours : 6**

Definition of Flow assurance, Typical Production System, Criteria of flow assurance, Resistances to the flow, Various issues encountered for flow assurance in the industry, Importance of velocity profiles, temperature profiles and concentration profiles in prediction flow assurance issues. Importance of Pressure drop calculations in flow assurance industry

**Unit II** **Hours : 8**

Definition of Slugging, Terminology used in slugging, Flow Pattern Maps and its utilization, Definition and criteria for terrain slugging and severe slugging, Remedies of slugging, terrain slugging and severe slugging, Liquid Loading definition, symptoms of liquid loading, Models used to predict liquid loading, Mitigation of Liquid Loadings

**Unit III** **Hours : 6**

Wax Deposition definition, Wax deposition Criteria, Models used to predict Wax deposition remedies and mitigation techniques for wax deposition , Definition of Gas Hydrates, Criteria for formation of Gas hydrates, Models utilized for prediction of gas hydrates, remedies and mitigation techniques of gas hydrates

**Unit IV** **Hours : 6**

Scale Deposition definition, Scale deposition Criteria, Models used to predict Scale deposition remedies and mitigation techniques for Scale deposition , Definition of Asphaltenes, Criteria for formation of Asphaltenes, Models utilized for prediction of Asphaltenes, remedies and mitigation techniques of Asphaltenes.

**Total Hours : 26**

**Texts and References:**

1. Mechanistic Modeling of Gas-Liquid Two-Phase Flow in Pipes. Ovdia Shoham: 2006: 408 pp.; Softcover: ISBN: 978-1-55563-107-9: Society of Petroleum Engineers
2. Organic Deposits in Oil and Gas production, Wayne Frenier, Murtuza Ziauddin, Ramachandran Venkatesan, 2010, Softcover: ISBN: 978-1-55563-291-5, Society of Petroleum Engineers
3. Formation, Removal, and Inhibition of Inorganic Scale in the Oilfield Environment,, Wayne Frenier, Murtuza Ziauddin, 2008, Softcover: ISBN: 978-1-61399-279-1, Society of Petroleum Engineers