

PE 324 Surface Production Engineering

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

Hours: 12

Separation: Classification of separators, Components of separator, Types of separator, Liquid level control and relative advantages/disadvantages of different type of separators.

Unit II

Hours: 10

Dehydration & Desalting of Oil, De-emulsification and Desalting process. Measurement- metering of Oil, Gas, Effluent Treatment

Unit III

Hours: 10

Storage of Oil and Gas: Storage tank for Oil, storage of LPG, Underground storage.

Unit IV

Hours: 10

Transportation & Metering: Gathering, Collector and Trunk pipeline system, Pipeline design (Friction Factor and flow type, Steady state liquid / Gas / Multiphase flow, Economic pipe diameter, Allowable pressure drop and velocity). Flow improver (Pour point depression and Drag reducer, heat treatment) and pigging in pipe lines.

Total Hours: 42

Texts and References:

1. Arnold Ken and Stewart Maurice, Surface Production Operations Vol-I and II.
2. Chillangarian G V, Surface Operations in Petroleum Production.
3. Huges J R and Swindles, Storage and Handling of Petroleum Liquids.
4. Alex Marks, Petroleum Storage Principles.

PE 325 Well Test Analysis and EOR										
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 : Well Test Analysis										Hours: 12
Principles of fluid flow for steady state, semi steady state & non steady state conditions. Diffusivity equation derivation & Constant Terminal Rate Solution, Drill Stem Testing: Equipment, DST Chart observation, analysis & interpretation										
Unit II										Hours: 10
Pressure Transient Tests: Pressure Build-up / Draw-down tests, RLT (Reservoir Limit Test) etc. for both oil and gas. Advanced Pressure Transient Analysis, Gas Well tests: Flow after flow, isochronal, modified isochronal tests. Other tests: Interference and pulse tests, Pressure Fall Off test in Injection wells. Multi rate tests, pulse test, Average reservoir pressure. PBU / PDD in Horizontal wells, Type Curves & their uses										
Unit III : EOR and Water Injection										Hours: 10
Introduction to EOR, Reservoir Engineering aspects of enhanced recovery methods, Water Flooding concepts – well spacing for fluid injection. Buckley Leverett Principle for immiscible flooding & Mobility Ratio Concepts.										
Unit IV : Other EOR Techniques										Hours: 10
Polymer Flooding, Surfactant flooding, Caustic flooding, ASP – Principles and applications. Miscible Flooding: Principles and applications of CO2 flooding, Dry & Enriched gas flooding. Inert Gas Flooding, WAG flooding, Thermal processes in EOR.										
										Total Hours: 42
Texts and References:										
<ol style="list-style-type: none"> 1. John Lee, Well Test Analysis. 2. R.C. Earlougher, Modern Well Test Analysis. 3. Mathews and Russel, Well Testing 										

PE 326 Petroleum Engineering Laboratory										
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: Theory courses which are taught will be practiced in the laboratory.										

PE 327 Seminar

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

Aim: To improve the presentation and inter-personal skill of the students

PE 331 Advanced Drilling

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	30	60	10			100

Unit I

Hours: 4

Directional Drilling Technology, Objectives of Directional Drilling. Tools for deflection & orientation. Directional well profiles and well path – deflection & corrections Motor Types: PD motors and Turbo-drills; their description, power calculations and applications

Unit II

Hours: 12

Horizontal Well Drilling, Introduction of Horizontal well drilling: Objectives & selection, Drilling techniques and different well profiles, Special mud requirements and their characteristics. Measurements While Drilling: Objectives of MWD / LWD their tools, telemetry system and data interpretation Well Surveying: Objectives & methods. Surveying analysis & calculations for well coordinates Directional drilling problems & their remedies Auto and Verti-track systems: Rotary steerable motors and geo-steering tools.

Unit III

Hours: 6

Directional, Horizontal & Multilateral Well Economics: Slant Hole Drilling: Objectives & selections of rig etc., Well profiles & applications.

Unit IV

Hours: 6

Special Drilling Methods: Aerated / under balanced / overbalanced / HP-HT / plasma / electrical / top-drive / re-entry / extended reach / jet / multilateral / slim-hole and coil tubing drilling methods.

Total Hours: 28

Texts and References:

1. Bourgoyne , Adam T. Jr., Martin E. Chenevert, Keith K. Millheim and F.S. Young Jr., Richardson, TX (1991) Applied Drilling Engineering, Society of Petroleum Engineers.
2. Watson, D., Terry Brittenham and Preston Moore (2002) Advanced Well Control Manual., SPE Textbook Series, 2002
3. Joshi, S. D. (1991) Horizontal Well Technology, Penn Well Publishing.
4. Adam, N. J. (1980) Well control Problems and Solutions. Petroleum Publishing Company
5. Lummus, J. L. and Azar, J. J. (2007) Drilling fluids optimization, Pennwell Books
6. Lapeyrouse, N. J. (2002) Formulas and Calculation for Drilling, Gulf Professional Publishing.

MA 301T Advanced Numerical Methods										
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 : Numerical solution of Algebraic & Transcendental equations										Hours:10
Introduction, Descarte's Sign rule, Bisection Method, Method of false position, Secant method, Iteration method, Extended method of iteration, Newton-Raphson method, it's applications, Solution of nonlinear simultaneous equations, Newton-Raphson method for multiple roots, Horner's method, Lin-Bairstow's method or Method for Complex Root, Graeffe's root squaring method, Comparison of various methods.										
Unit II : Finite Differences										Hours:10
Introduction, Finite differences, Operators: Forward Difference, Backward Difference, Central Difference, Shift Operator, Averaging Operator. Relation between operators, Factorial Notation, Synthetic Division, and Missing term Technique. Interpolation: Newton Gregory Forward Interpolation Formula, Newton Gregory Backward Interpolation Formula, Gauss's Forward and Backward Interpolation Formula, Stirling's Central Difference Formula, Lagrange's Interpolation Formula for unevenly spaced Formula, Inverse Interpolation, Divided Differences, Properties of Divided Differences, Newton's Divided Difference Formula, Relation between Divided Differences and Ordinary Differences.										
Unit III : Numerical Differentiation										Hours:15
Introduction, Formulae for Derivatives ; Numerical integration : Introduction, Newton-Cotes's Quadrature Formula, Trapezoidal rule, Simpson's one-third rule, Simpson's Three-Eighth rule, Weddle's rule, Romberg's method, Double Integration. Solution of Simultaneous Algebraic Equations: Direct methods, Iterative methods: Gauss-Jacobi's method, Gauss-Seidal method, Relaxation method. Numerical Solution of Ordinary Differential Equation: Taylor's method, Euler's method, Rung- Kutta method, Modified Euler's method, Predictor Corrector method: Adam's method & Milne's method. Numerical Solution of Partial Differential Equation: Difference Quotients, Graphical representation, Classification of PDE's of 2 nd order, Elliptic equations, Solutions of Laplace equation by Liebmann's iteration method, Poisson's equation, Parabolic equation(One dimension heat equation), Bender-Schmidt method Crank- Nicholson method.										
Unit IV : Introduction to Finite Elements Methods										Hours: 7
Introduction to Finite Element Methods, Functionals, Base Functions. Methods of Approximation: The Rayleigh-Ritz Method, The Galerkin Method. The FEM for one dimensional problems and applications to two dimensional problems.										
Total Hours: 42										
Texts and References:										
<ol style="list-style-type: none"> 1. Numerical Methods in Engineering and Science with Programs in C & C++ by B.S. Grewal, Khanna Publisher. 2. Introductory Methods for Numerical Analysis by S.S. Sastry, Fourth edition, Prentice Hall of India. 3. Numerical Methods for Scientific and Engineering Computation by M.K. Jain, S.R.K. Iyenger and R.K. Jain, 5th edition, New Age International . 4. An introduction to Finite Element Method By J N Reddy, Mc Graw Hill. 5. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyenger, 3rd edition, Narosa . 6. Numerical Methods for Engineers by S C Chapra , Raymond P. Canale, Tata McGraw Hill Pub. Co. Ltd. 										

PE 345 Prime Movers, Pumps and Compressors

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	30	60	10	--	--	100

Unit I : Reciprocating Engines

Hours: 7

Two & four stroke engines, engine cycles and their comparisons. Natural Aspirated and Supercharged engines. Carburetion and Fuel Injection systems including MPFI system Supercharging & Turbo Charging, Engine cooling and lubrication. Engine testing and performance Emission and control mechanism,

Unit II : Gas Turbine Engines

Hours: 7

Fundamentals (Bayton cycle and Regeneration cycle) Combined cycle & waste heat recovery etc. Single and multi-shaft turbines Effects of intake compressor speed and air contamination

Unit III : Pumps

Hours: 7

Pumps classification & types Advantages & disadvantages, Basic principles – head, HP, Net Positive Suction Head (NPSH), Selection criteria, Centrifugal multiple pump and stage installations and their characteristics. Pumping stations (series & parallel installations).Types of seal systems etc. Reciprocating pumps Pulsation dampening system, Various codes & standards

Unit IV : Compressors

Hours: 7

Types, Advantages & disadvantages, Centrifugal Compressors, Specifying a compressor, Determination of HP & No of stages, Surge control & stonewalling, Reciprocating compressors, Components, Capacity control devices, Cooling & lubricating systems, API Specs; 11P & 618, Environmental Aspects:, Air pollution

Total Hours: 28

Texts and References:

1. Boyce, M. P. (2012) Gas turbine engineering Handbook, Elsevier
2. American Petroleum Institute (1995) Positive displacement pumps-resciprocating
3. Girdhar, P (2008) Performance evaluation of pumps and compressors, Lulu. com

PE 346 Petroleum Equipment Design

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	30	60	10	--	--	100

Unit I

Hours: 8

Casing program, casing and tubing design, principles of cementing, completion added skin, well perforating, hydraulic fracturing. Drill bit design, roller cone bits, pdc drill bits, nomenclature and IADC codes for drill bits. BHA (Bottom hole assembly). ESP(Electrical submersible pumps). SRP(Sucker rod pumping) unit design.

Unit II

Hours: 7

Design of Surface Facilities -Design of production and processing equipment, including separation problems, treating, and transmission systems, Capstone design

Unit III

Hours: 6

Oil desalting-horizontal and spherical electrical dehydrators- Natural Gas Dehydration-Horton sphere- Natural Gas Sweetening. Crude & Condensate Stabilization-design of stabilizer- Oil and Gas Treatment. Treating Equipment.

Unit IV

Hours: 7

Refinery Equipment Design-atmospheric distillation column Design and construction of on/ offshore pipelines, Fields Problems in pipeline, Hydrates, scaling & wax etc and their mitigation..

Total Hours: 28

Texts and References:

1. Petroleum Exploration Hand Book by Moody, G.B.
2. Wellsite Geological Techniques for petroleum Exploration by Sahay.B et al
3. Standard Hand Book of Petroleum & Natural Gas Engineering” – 2nd Edition 2005-William
4. C.Lyons & Gary J.Plisga-Gulf professional publishing comp (Elsevier).