PE 205 Fluid Flow in Porous Media

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 : Porous Media **Hours: 12**

Homogeneous Fluid, Porous Media, Systematic Packing of spheres, packing of natural materials, compaction of sand and gravel, compaction of clay, Fluid movement in capillary zone, Fluid movement below the water table, occurrence of connate water, migration of connate water, migration and accumulation of gas and well

Unit II : Darcy's law and the measurement of permeability of Porous Media **Hours: 10**

Darcy's law and range of validity of Darcy's law, Measurement of permeability in consolidated and unconsolidated sand, porosity measurements, classical hydrodynamics, generalized form of Darcy's law, equation of motion, boundary and initial conditions, Analogies with other physical problems

Unit III : Steady State Flow of Liquids **Hours: 10**

Radial flow into a well, Unsymmetrical flow into a well, Arbitrary Pressure Distributions over boundaries, Flow from a finite/infinite line source into a well, spherical flow, partially penetrating wells, production capacity, partially penetrating wells in anisotropic sands,

Unit IV : Multiple Fluid System **Hours: 10**

Pressure distribution about an infinite array of wells, model experiments with line floods, effect of barrier in flooding system, conductivity of direct line drive flood, five spot flood, flooding efficiencies, flooding networks, Seven spot flood, Radial system in which density is specified over both boundaries, production decline in a field produced by a water drive with variable field pressures, limiting case of vanishing internal radius, non radial flow, well interference, Green's function

Total hours: 42

Texts and References:

1. Muskat M and Wycoff R D, The flow of homogeneous fluids through porous media.
2. Khillar, K and Fogler, S (1998) Migration of fines in porous media. Kluwer Academic Publication
3. Panfilov, M (2000) Macroscale models of flow through highly heterogeneous porous media Kluwer Academic Publication.
4. Bird, R. B.; Stewart, W. E. & Lightfoot, E. W. (2002) Transport phenomenon, John Willey and Sons.

PE 206T Geo Mechanics & Strength of Materials

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: 7**

Rock Mechanics Tectonic stress field, Pore pressure at depth in sedimentary basin, Basic constitutive laws, Rock failure in compression, tension and shear, Faults and fractures at depth, Compressive and tensile failures in vertical wells, Determination of S3 from mini-fracs and extended leak off tests and constraining the , magnitude of SHmax from well bore failures in vertical wells.

Unit II **Hours: 7**

Well bore failure and stress determination in deviated wells, Stress fields from tectonic plates to reservoirs around world., Well bore stability Critically stressed faults and fluid flow, Effects of Reservoir depletion

Unit III **Hours: 7**

Stress-Strain, Ductile Strength, Hardness, Brittleness, Principle Strain, Elastic constants and relations, Poisson's' ratio, Mechanical properties and tests – Static, Dynamic, Fatigue, Compression test; Thermal stresses – Bars subjected to tension, asymmetric loading, stress calculation of cylindrical vessels,

Unit IV **Hours: 7**

Mechanical properties of materials, Creep strength, Mohr circle, Torsion; Beam bending, Bending of composite beams; Transverse sheer; Combined loadings; Deflection of beams and shafts; Stress in columns; Alloying

Total Hours: 28

Texts and References:

1. Zobak, M. D (2010). Reservoir Geomechanics,
2. Longuemare, P (2001) Geomechanics in reservoir simulation, Technip
3. Nauroy, J. F. (2011) Geomechanis applied to petroleum Engineering., Technip
4. Valentin Popov (2010) Contact Mechanics and Friction: Physical Principles and Applications, Springer
5. R. K. Bansal (1996) A Textbook of Strength of Materials, Laxmi Publications Pvt Ltd.

PE 206P Geo Mechanics & Strength of Materials Laboratory

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

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

Aim: To understand mechanical properties of rocks and its application in upstream hydrocarbon industry.

PE 208T Drilling Fluids & Cementation

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 : Drilling Fluids **Hours: 12**

Basics of drilling fluid, Functions of drilling fluid, Classification of drilling fluids, Properties of drilling fluids, Nature of drilling fluid, Generic drilling fluid system. Drilling fluids equipment related to pressure and separation. Formulations of drilling fluid, separation of drilled solids from drilling fluid, various rheology models of drilling fluids.

Unit II : Mud System **Hours: 10**

Various mud systems like pneumatic drilling fluids; Air, Natural gas and aerated mud as drilling fluids.
Inhibitive and Non-inhibitive drilling fluids, synthetic oil based drilling fluids. Composition, functions and general nature of rotary drilling fluid, drilling fluid and corrosion (also its control). Testing of drilling fluid, Water Based Drilling Fluid Testing procedures, Oil Based Drilling Fluid Testing Procedures. Drilling hazards dependent on mud control, Drilling mud calculations, Field maintenance of mud system. Latest advances and emerging trends in drilling fluid like use of NDDF.

Unit III : Advanced Mud Technology **Hours: 10**

Advanced mud Technology, Safety and Environmental Impact of Drilling fluid., Waste management, classification of drilling waste, approaches of drilling waste minimization.

Unit IV : Cements **Hours: 10**

Cementing, Cements & cement slurry: Objectives of cementing, oil well cements, Classification of cement, Slurry design, Slurry additives, Factors influencing cement slurry design, Cementing equipments.
Cementing Methods: Primary cementing, Stage cementing, Liner cementing, Plugging, Squeeze Cementing techniques in practice. Deep well cementing, Characteristics of good quality cementation. Cementing calculations.

Total Hours: 42

Texts and References:

1. Gray and Darley, Composition and properties of drilling and completion fluids, Gulf Professional publishing.
2. Drilling Fluids processing handbook, ASME, Gulf Professional publishing
3. Carl Gatlin, Petroleum Engineering (Drilling and well completions), Prentice Hall Inc.
4. James Lummas, Drilling fluids optimization, Pennwell Books

PE 208P Drilling Fluids & Cementation Laboratory

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

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

Aim: To understand the characteristics of drilling fluid and cementation.

PE 210 Well Log and Formation Evaluation

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 : Formation Evaluation: **Hours: 5**

Basic Concepts of formation evaluation, Methodology to evaluate wells:

Unit II : Mud log and Drill Coring **Hours: 15**

Weight on bit (WOB), Drill string rotation speed (RPM), Mud pump speed (SPM), Mud pump pressure (SPP), Rate of penetration (ROP), Percentage of gas in air and/or gas composition, Hydrocarbon staining on the cuttings, Lithology and texture of ditch cutting samples, Application and limitations of mud logging, Core analysis – drill core & side wall core analysis, Basics of drill coring Basics of side wall coring – percussion and rotary type Information obtained from cores:, Geological information; Petrophysical information and Advanced Rock Property.

Unit III : Wire line logs (Open hole & Cased hole) **Hours : 15**

Tool physics, measurement principles and data interpretation of the following: Caliper log; Electrical logs – SP and Resistivity logs (conventional, induction and micro devices), Radioactive Logs – Gamma Ray (natural and spectral), Neutron, Density and Elemental capture spectroscopy logs; Sonic Logs including Dipole shear sonic and CBL /VDL logs Advance Logging tools including Casing Inspection tools, Formation micro imaging tool, Nuclear magnetic resonance (NMR) tool, Tough condition logging tool, Ultra sonic imaging tool and Formation testing tools Production logging tool LWD (Logging while drilling) logs: Tool physics, measurement principles and data interpretation, Borehole seismic: Time to depth conversion, Synthetic seismic generation, Gassmann fluid substitution, Investigation of possible AVO effect

Unit IV : Data Integration and Formation Evaluation **Hours : 7**

Integration of Mud data, Core data, Wire line, LWD and Borehole seismic data to understand the geology of the formation with respect to mineralogy, depositional environment, structure, stratigraphy, establishing possible marker horizons, hydrocarbon bearing zones of interest, occurrence of water bearing zones, Type of fluids and lithology, Techniques of Log Interpretation: Log interpretation methods, Cross-plotting methods including neutron density, sonic density & sonic neutron, Clean-sand / shaly-sand formation interpretation and Concept of invasion, Quantitative Formation Evaluation: Lithology, Porosity, Formation water resistivity, Fluid saturation determination, Identification of interesting zones for well testing and hydrocarbon production

Total Hours : 42

Texts and References:

1. Toby Darling, Well log and Formation Evaluation, Gulf drilling Guides
2. Oberto Serra, The interpretation of Logging data , Elsevier Publication
3. Oberto Serra, Fundamentals of well log interpretation, Elsevier, 1984

PE 202 Petroleum Exploration

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 : Fundamentals of Petroleum Exploration **Hours: 12**

Ingredients of Petroleum Exploration, Concept of source, reservoir, migration, trap and seal, Concept of Play, Lead, Prospect and Drillable Prospect, Types of Petroleum Traps-Structural, Stratigraphic and Combinational traps, Primary and Secondary Migration, E&P Life Cycle, Concept of Reserve, Lease and Reservoir, Techniques of Petroleum Exploration, Geochemical, Gravity, Magnetic, Electrical and seismic method of hydrocarbon exploration.

Unit II : Geochemical Analysis **Hours: 10**

Geochemical seep, Classification of seep by Link, Weathering of seeps, a geochemical program for petroleum exploration, Surface Reconnaissance, hydrocarbon Mud Logging, Rock Pyrolysis, Understanding S1, S2, S3,S1/S1+S2, Production Index, Hydrogen Index and Oxygen Index, Processing and interpretation of Geochemical data.

Unit III : Fundamentals of Seismic processing, Interpretation and Attribute **Hours: 10**

Body waves and surface waves, Rayleigh, Love, P and S wave, Seismic acquisition principle, Seismic refraction and reflection surveys, Land and marine sources, Geophone, Hydrophone and Vibroseis survey, Seismic Fold, Signal and Noise, Seismic Processing, SEG D and SEG Y format, CDP/CMP and NMO, DMO, Seismic migration, Base map, Strike Line and Dip Line, 2D and 3D seismic, inline and cross line, 3D fold, time slice and its importance. Horizon and Fault mapping, Seismic impedance and reflection coefficient, convolution and autocorrelation, Fault skeleton preparation, wrench system Structural and Stratigraphic interpretation, Synthetic generation, Time and depth map, VSP survey, Attributes: Amplitude, Frequency and Sweetness, AVO analysis, Classification of sands, Rock solid attributes.

Unit IV : G and M Methods **Hours : 10**

Gravity and magnetic prospecting, Instruments of G&M survey, Gravity and magnetic data correction, Interpretation of G&M anomaly, Correlation of Gravity anomaly with seismic anomaly. SP, Telluric and Magnetotelluric data interpretation, Electrical properties of hydrocarbon, Electrical conductivities, Resistivities of various lithologies, Dielectric constants, land airborne EM, Interpretation and modeling of data, Potential estimation for various buried bodies, Anomaly and well placement based on electrical data.

Basic well logs, GR and SP logs, Shallow, Medium and Deep Resistivity logs, Porosity logs-Sonic, Neutron and Density logs, Importance of log interpretation, qualitative and quantitative Interpretation, Petrophysical evaluation, Correlation of well log with seismic, Preparation of synthetics, proposing drilling locations based on integrated studies.

Total Hours: 42

Texts and References:

1. Supriya Mohan Sengupta, Introduction to Sedimentology, A.A.Balkema publication.
2. Mamdough, R. Gadallah, Reservoir Seismology, Pennwell Books, Pennwell Publishing Company, Tusa, Oklahoma.
3. Telford, W M, Geldart, L.P., Sheriff, R.E. and Keys, D.E., Applied Geophysics, Oxford and IBH Publishing Co Pvt Ltd.
4. Milson, J. J and ErikSen (2011) Field Geophysics, John Wiley and Sons

ESH 115T Gandhian Thoughts

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

Unit I

Life and Basic Works of Mahatma Gandhi, Sarvodaya**,**

Unit II

Truth and Non – Violence, Gandhian Approach to Science, Technology and Development

Unit III

The Constructive work and Human Liberation, Satyagraha and Peace Making

Unit IV

Gandhian way of Management and Trusteeship, Gandhian Futurology, Gandhian Life Style, Contemporaries of Mahatma Gandhi

Text and Reference Books

1. Gandhi, M. K**.** My experiments with truth
2. Hingorani, A. T and Hingorani, G. A. (1985) The Encyclopaedia of Gandhian Thoughts
3. Gupta, A. A. Gandhian Thoughts