

Course Structure
Of
Department of Petroleum Engineering

(For the Batch admitted in 2018 onwards)

**Dibrugarh University Institute of
Engineering and Technology (DUIET)**

Dibrugarh University

Dibrugarh-786004

Course Structure of Department of Petroleum Engineering, DUIET,

Dibrugarh

(For the Batch admitted in 2018 onwards)

3RD SEMESTER

Subject	Code	Credit Structure			Total Credit	Contact hours
		L	T	P		
Mathematics- III	PE-0301	3	1	0	4	4
Mechanical Engineering	PE-0302	3	0	0	3	3
Geology of Petroleum	PE-0303	3	0	0	3	3
Drilling Engineering-I	PE-0304	3	0	0	3	3
Chemistry of Petroleum and Petroleum Refining	PE-0305	3	0	0	3	3
Human Values And Ethics	PE-0306	3	0	0	3	3
Mechanical Engineering Lab	PE-L-0307	0	0	1	1	2
Geology of Petroleum Lab	PE-L-0308	0	0	1	1	2
	Total	18	1	2	21	23

4TH SEMESTER

Subject	Code	Credit Structure			Total Credit	Contact hours
		L	T	P		
Numerical Methods	PE-0401	2	1	0	3	3
Sedimentary & Petroleum Geology	PE-0402	3	0	0	3	3
Production Engineering-I	PE-0403	3	0	0	3	3
Reservoir Engineering-I	PE-0404	2	1	0	3	3
Instrumentation and Control system	PE-0405	3	0	0	3	3
Technical English	PE-0406	2	0	0	2	2
Petroleum Product Testing Lab	PE-L-0407	0	0	1	1	2
Reservoir Engineering Lab	PE-L-0408	0	0	1	1	2
Environment Science (Audit Course)		0	0	0	0	0
Total		15	2	2	19	21

5TH SEMESTER

Subject		Code	Credit Structure			Total Credit	Contact hours
			L	T	P		
Managerial Economics		PE-0501	2	1	0	3	3
Production Engineering-II		PE-0502	2	1	0	3	3
Reservoir Engineering-II		PE-0503	2	1	0	3	3
Reservoir Modeling and Simulation		PE-0504	3	0	0	3	3
Core Elective-I	Drilling Engineering-II	PE-CElv.-0505(1)	2	1	0	3	3
	Well Control Systems	PE-CElv.-0505(2)					
Enhanced Oil Recovery(Open Elective-I)		PE-OElv.-0506	3	0	0	3	3
Core Elective-II	Petrochemicals	PE-CElv.-0507(1)	3	0	0	3	3
	Unit Operations	PE-CElv.-0507(2)					
Production Engineering Lab		PE-L-0508	0	0	1	1	2
Drilling Fluid Lab		PE-L-0509	0	0	1	1	2
Chemistry of Petroleum Lab		PE-L-0510	0	0	1	1	2
Constitution of India(Audit Course)		MC301/MC501	0	0	0	0	0
Total			17	4	3	24	27

6TH SEMESTER

Subject		Code	Credit Structure			Total Credit	Contact hours
			L	T	P		
Management & Accountancy		PE-0601	3	1	0	4	4
Reservoir Engineering aspects of Water flooding (Open Elective-II)		PE-OElv.-0602	3	0	0	3	3
Core Elective-III	Oil and Gas Well Testing	PE-CElv.-0603(1)	3	0	0	3	3
	Well stimulation	PE-CElv.-0603(2)					
Core Elective-IV	Petroleum Exploration-I	PE-CElv.-0604(1)	3	0	0	3	3
	Principles of surveying and remote sensing	PE-CElv.-0604(2)					
Drilling Engineering -III		PE-0605	3	0	0	3	3
Natural Gas Engineering (Open Elective-III)		PE-OElv.-0606	3	1	0	4	4
Transportation and Marketing of Petroleum and Petroleum Products		PE-0607	2	1	0	3	3
EOR Lab		PE-L-0608	0	0	1	1	2
Total			20	3	1	24	25

7TH SEMESTER

Subject		Code	Credit Structure			Total Credit	Contact hours
			L	T	P		
Petroleum Exploration-II (Open Elective-IV)		PE-OElv.-0701	3	0	0	3	3
Core Elective -V	Core Analysis	PE-CElv.-0702(1)	3	0	0	3	3
	Gas Hydrates	PE-CElv.-0702(2)					
Offshore operations		PE-0703	3	1	0	4	4
Petroleum Formation and Evaluation* (Open Elective-V)		PE-OElv.-0704	3	0	0	3	3
Training		PE-0705	3	0	0	3	3
Project-I		PE-0706	4	0	0	4	4
Total			19	1	0	20	20

NOTE: * Petroleum formation and evaluation (PE-OElv.-0704) subject will be taken by guest faculty.

8th SEMESTER

Subject		Code	Credit Structure			Total Credit	Contact hours
			L	T	P		
Energy Scenario in India (Open Elective-VI)		PE-OElv.-0801	3	0	0	3	3
Health, Safety, Security and Environment in Petroleum Industry		PE-0802	4	0	0	4	4
Core Elective -VI	(1) Coal Bed Methane	PE-CElv.-0803(1)	3	0	0	3	3
	(2) Shale Gas	PE-CElv.-0803(2)					
Project-II		PE-0804				4	4
<i>Composite Viva- Voice</i>		PE-0805				2	2
		Total	10	0	0	16	16

NOTE: Experts from industry and reputed institute may be invited time to time to deliver lecture on various courses.

COURSE CONTENT

3RD SEMESTER

SUBJECT: MATHEMATICS-III (PE-0301)

3L-1T-0P:04

Credits

(PDE, Complex Variables and Transform Calculus)

Module 1: Partial Differential Equations

Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, Solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

Module 2: Complex Analysis

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties. Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy-Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour. Evaluation of definite integral involving sine and cosine. Evaluation of certain improper integrals using the Bromwich contour.

Module 3: Transform Calculus

Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials; Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. Fourier transforms, Fourier Integrals. Fourier integral theorem (without proof). Fourier Transform and inverse transform. Fourier Sine & Cosine Transform, inverse transform. Z-transform and Wavelet transforms: properties, methods, inverses and their applications.

Text Books

- [1] B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 36th Edition, 2010.
- [2] H. K. Dass, *Advanced Engineering Mathematics*, S Chand and Company Pvt. Ltd, Reprint 2014.
- [3] M. D. Raisinghania, *Advanced Differential equations*, S Chand and Company Pvt. Ltd

Reference Books

- [1] G.B. Thomas and R.L. Finney, *Calculus and Analytic geometry*, 9th Edition, Pearson, Reprint, 2002.
- [2] Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
- [3] W. E. Boyce and R. C. DiPrima, *Elementary Differential Equations and Boundary Value Problems*, 9th Edition, Wiley India, 2009.
- [4] S. L. Ross, *Differential Equations*, 3rd Edition, Wiley India, 1984.
- [5] E. A. Coddington, *An Introduction to Ordinary Differential Equations*, Prentice Hall India, 1995.
- [6] E. L. Ince, *Ordinary Differential Equations*, Dover Publications, 1958.
- [7] J. W. Brown and R. V. Churchill, *Complex Variables and Applications*, 7th Edition, Mc-Graw Hill, 2004.
- [8] N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, 9th Editions Laxmi Publications, 2014.

Credits**UNIT I****Fundamental Concepts of Thermodynamics:**

Introduction and Definition of thermodynamics System, Macroscopic & microscopic approaches, System, Surrounding and universe, Phase, Concept of continuum, Density, Specific volume, Pressure, temperature. Thermodynamic equilibrium, Thermodynamic Properties, State, Path, Process, Cyclic and non cyclic processes, Reversible and irreversible processes, Quasi static process Energy and its forms, Work and Heat, Enthalpy.

UNIT II**Fundamental Concepts of Thermodynamics and Properties of Steam:**

Zeroth law of thermodynamics, First law of thermodynamics, Processes - flow and non -flow, Control volume, Flow work and non - flow work, Steady flow energy equation, Unsteady flow systems and their analysis. Second law: Limitations of first law of thermodynamics Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator. Statements of second law and their equivalence, Carnot cycle, Carnot theorem, Thermodynamic temperature scale, Clausius inequality. Concept of entropy.

UNIT III**Properties of Steam:**

Properties of steam, Phase transformation process and its graphical representation on P-V, T-V & T-s diagram, Steam Tables, Processes involving steam in closed and open systems. Introduction to I.C. Engines: Two & four stroke Si and C.I. engines. Otto cycle, Diesel cycle, Dual cycle.

UNIT IV**Fluid Mechanics:**

Definition of fluid, types of fluid, Properties of fluids, fluid statics, Forces on fluids, Newton's law of viscosity, pressure depth relationship for compressible and incompressible fluids, Fluid flow: Laminar, Transitional and turbulent flows, fluid flow through a circular tube or pipe: Hagen-Poiseuille equation, Bernoulli's equation, Pressure drop in pipes, Friction Losses in Laminar flow and Turbulent flow, Continuity Equation, Flow measuring devices

for petroleum industries: venturimeter, orifice meter, Rotameter, Pumping of oil and gas, reciprocating pumps and centrifugal pumps, NPSH calculations.

UNIT V

Heat Transfer and Mass Transfer:

Introduction to heat transfer and general concepts of heat transfer by conduction and convection, Conduction: Basic concepts of conduction in solids, liquids, gases, steady state temperature fields and one dimensional conduction without heat generation e.g. through plain walls, cylindrical and spherical surfaces, composite layers, etc. Insulation materials, critical and optimum insulation thickness, Convection: Fundamentals of convection, Basic concepts and definitions, Heat transfer equipment: types of exchangers, viz. double pipe, shell and tube, heat transfer calculation for co-current and counter-flow double pipe heat exchanger: LMTD and overall heat transfer. Condensation of pure vapors, film wise on vertical and horizontal tube.

BOOKS:

1. Holman, J.P.: "Thermodynamics, Tata Mc Graw Hill book Co. NY.
2. Nag, P.K.: Basic and Applied Thermodynamics, Tata McGraw Hill, New Delhi (2009)
3. Rajput, R.K., "Text Book of Fluid Mechanics", S. Chand and Co., New Delhi (1998).
4. Bansal, R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd., New Delhi (2005).
5. Kern, D.Q., "Process Heat Transfer", McGraw Hill Book (1950).
6. Dutta, B.K., "Heat Transfer: Principles and Application", Prentice-Hall of India Pvt. Ltd., New Delhi (2004)
7. Nag, P.K.: Heat and Mass Transfer, McGraw Hill, New Delhi

SUBJECT: GEOLOGY OF PETROLEUM (PE-0303) 3L-0T-0P:03Credits

Mineralogy and Petrology

1. Minerals: General properties; Classification of minerals and properties of common rockforming minerals.
2. Petrology: Rocks; Classification and description of some common rocks.
3. Stratigraphy

4. Principles of stratigraphy; Concepts of palaeontology; Fossils, their mode of preservation and significance as indices of age and climate; Concept of index fossils; Broad stratigraphic subdivisions and associated rock types of important coal belts and oil fields of India.

5. Structural Geology

6. Interpretation of topographic (structural) maps; Attitude of planar and linear structures; Effects of topography on outcrops. Unconformities, folds, faults and joints – their nomenclature, classification and recognition. Forms of igneous intrusions - dyke, sill and batholith. Effects of folds and fractures on strata and their importance in exploration activities.

SUBJECT: DRILLING ENGINEERING –I (PE-0304)

3L-0T-0P:03Credits

1. Well Planning: Introduction to oil well drilling, Drilling planning approaches.
2. Rotary Drilling Method: Rig parts, selection and general layout.
3. Drilling Operations & Practices: Hoisting, Circulation, Rotation, Power system, Well Control System
4. Well tubular: Casing String and Drill String
5. Drill Bits: Classification and design criteria of drag, rotary, roller, diamond and PDC bits, Bit Selection.
6. Coring: Different methods of core drilling.
7. Well Problems and Solutions: Fatigue failure, Pipe sticking, Lost-circulation, Sloughing shale, Swabbing, surge, gas cap drilling.
8. Oil Well Fishing: Fish classification, tools and techniques.
9. Well Head Testing, Hermetical Testing.

SUBJECT: CHEMISTRY OF PETROLEUM AND PETROLEUM REFINING

(PE-0305)

3L-0T-0P:03Credits

PART A: CHEMISTRY OF PETROLEUM (Credit= 1.5)

1. Advance electrochemistry: Reversible and irreversible cells; Fuel cells; Reference electrodes and indicator electrodes; Ion selective electrodes; Application of electrode potentials; Potentiometric titration;
2. Corrosion and corrosion control: Principles of corrosion, methods of corrosion control, cathodic and anodic protection, corrosion inhibitors, Surface coatings, Corrosion Monitoring. Case Studies of Corrosion in Petroleum industry including metals and alloys used in Petroleum Industry.
3. Advanced surface chemistry: Interfacial phenomena; Wetting; Surface tension measurements; Electrokinetic phenomena; Zeta potential and its measurement. Adsorption: Types of adsorption isotherm, Gibb's adsorption equation, BET equation, surface area of adsorbents, Application of Adsorption on the surface of solids, adsorption of high molecular compounds.
4. Analytical techniques: UV-Vis Spectrophotometry, Atomic Absorption Spectrophotometer (AAS), IR Spectroscopy, Liquid and Gas Chromatography and Solvent extraction methods.

Text/Reference Books-

1. A Textbook of Engineering Chemistry- Shashi Chaula
2. Engineering Chemistry-Wiley (India) Publication
3. Organic Spectroscopy- William Kemp

Part -B: PETROLEUM REFINING (Credit= 1.5)

1. Composition of Petroleum: Physical properties of Petroleum. Crude classification, Evaluation of crude oil. Refinery products - specifications, properties, test methods. Additives and their uses.

2. Refinery Equipment Design: Pipe still heater. Distillation column, Heat exchangers and condensers.
3. Petroleum Refining Process: Multi-component distillation. Coking, Cracking, Reforming, alkylation, Isomerisation, Hydro-processes.
4. Specialty Products: Lube Oil Production, Propane De-asphalting, solvent extraction, De-waxing, Hydro-finishing. Wax Production, Carbon black & Petroleum Coke Production.

Text/Reference Books -

1. Modern Petroleum Refining Processes- B. K. Bhaskar Rao
2. Petroleum Refining Engineering- W. L. Nelson
3. Petrochemical Technology Assessment- John Wiley
4. Petrochemicals – B. K. Bhaskar Rao

SUBJECT: HUMAN VALUES AND ETHICS (PE-0306)

3L-0T-0P:03Credits

UNIT I:

Values: Moral and non-moral values, Ethics and Morality. Moral frameworks: Utilitarianism, Rights/Duty Ethics, Virtue Ethics, Normative Ethics and Applied Ethics.

UNIT II:

Science, Technology and Human values: Crisis of values in contemporary context, Need for values in global change, Trans-cultural human values, Technology and Personal and social values, Human centered technology. Problems of Technology transfer. Ethics on IPR.

UNIT III:

Possibility of an ethics for the animate and inanimate: Animal ethics, Bio-ethics, Medical Ethics, Human Gene Therapy: Scientific and Ethical considerations. Cloning.

UNIT IV:

Professional Ethics: Ethical issues in Engineering practice; plagiarism in research/academic, Codes of professional ethics. Conflicts between business demands and professional ideals: Ethics in Corporate Sectors, Managerial Ethics.

UNIT V:

Environmental Ethics: Technological growth and its impact on Environment. Environmental degradation and pollution; Environmental Regulations; Concept of Sustainable Development; Eco friendly technologies; Ethics of the Eco-System.

Textbooks:

1. T. L. Beauchamp. Philosophical Ethics. An Introduction to Moral Philosophy. Georgetown University. McGraw Hill.
2. Peter Singer. Practical Ethics. Cambridge University Press.
3. Mike W. Martin. Ethics in Engineering. McGraw Hill.
4. Michael Bayles. Professional Ethics. Wadsworth.
5. Bruce O. Watkins and Meador Roy. Technology and Human Values: Collision and Solution. AnnArbor Science.
6. Dr. Subir Chowdhury. Blending the best of the East & West. EXCEL
7. Ghosh. Ethics & Mgmt. & Indian Ethos. VIKAS.
8. Pherwani. Business Ethics. EPH
9. Balachandran, Raja & Nair. Ethics, Indian Ethos & Mgmt., Shroff Publishers

SUBJECT: MECHANICAL ENGINEERING LABORATORY (PE-L-0307)

0L-0T-1P:01Credit

1. Single stage air compressor test rig.
2. Refrigeration test rig
3. Four stroke single cylinder petrol engine test rig.
4. Four stroke single cylinder diesel engine test rig.
5. Bernoulli's theorem apparatus.
6. Reynolds apparatus.
7. Losses due to pipe friction.
8. Orifice meter, venturi meter and Rotameter test rig.
9. Reciprocating pump test rig.
10. Separating and throttling calorimeter.
11. Unsteady heat transfer unit.

12. Heat transfer in natural convection.
13. Heat transfer in forced convection.
14. Thermal conductivity of insulating powder.

SUBJECT: GEOLOGY OF PETROLEUM LABORATORY

(PE-L-0308)

0L-0T-1P: 01 Credit

Identify different parts of a Petrological/ Polarising Microscope.

Preparation of thin section.

Examination of minerals in plain polarised light.

Examination of minerals under crossed-nicole.

To draw isopach map.

To draw isolith map of sandstone.

To draw percentage map.

Drawing of geological cross- section.

Drawing of geological section using Arc method.

Triangular plots to analyse the sandstone type.

4TH SEMESTER

SUBJECT: NUMERICAL METHODS (PE-0401)

2L-1T-0P: 03 Credits

Module 1:

Solution of polynomial and transcendental equations - Bisection method, Newton -Raphson method and Regula-Falsi method. Finite differences, Relation between operators.

Module 2:

Interpolation of Unequal intervals-Lagrange's Interpolation formula. Interpolation of Equal intervals-Newton's forward and backward difference formulae. Interpolation with unequal

intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Module 3:

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predictor-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poisson equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Textbooks:

- [1] H. K. Dass, *Advanced Engineering Mathematics*, S Chand and Company Pvt. Ltd, Reprint 2014.
- [2] B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 36th Edition, 2010.

References:

- [1] P. Kandasamy, K. Thilagavathy, K. Gunavathi, *Numerical Methods*, S. Chand and Company, 2nd Edition, Reprint 2012.
- [2] S.S. Sastry, *Introductory Methods of Numerical Analysis*, PHI, 4th Edition, 2005
- [3] Erwin kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.

SUBJECT: SEDIMENTARY AND PETROLEUM GEOLOGY

(PE-0402)

3L-0T-0P: 03Credits

SECTION – A (Sedimentary Geology)

Introduction: Sedimentary processes, Textural properties, Pore morphology and its significance, Sedimentary structures, Important rock groups with special reference to sandstones and carbonates, Reconstruction of sedimentary environment, Tectonics, sedimentation and sequence stratigraphy, Role of sedimentology in petroleum exploration. Elements of basin modeling.

SECTION – B (Petroleum Geology)

1. Physical and chemical characteristics of crude oil, Origin of oil, source rock and maturation.

2. Migration of oil: mechanism, pattern and barriers.
3. Reservoir rocks and cap rocks
4. Entrapment of oil: types and mechanism.
5. Geology of sedimentary basins of India –producing and prospective basins.

SUBJECT: PRODUCTION ENGINEERING –I

(PE-0403)

3L-0T-0P: 03 Credits

1. Characteristics of crude oil and natural gas, classification of crude and its physicochemical properties.
2. Introduction to Productivity Index (PI) & Inflow Performance Relationship (IPR).
3. Well Completion: Importance of Well Completion, Well Completion Equipment, Well Completion Methods.
4. Well Perforation: Introduction, Well Perforating Methods, Perforating Gun Types, Shaped Charge, Type, Size, Depth and Orientation of perforation holes, Shot Density, Standoff, Explosives in perforation, Explosive Train.
5. Well activation: Importance of Well Activation, Well Activation methods viz. Displacement, Compressor Application, Application of Nitrogen, Aerisation, Swabbing etc.
6. Artificial Lift Technology: Basic principles and descriptions of Artificial Lift Methods, Continuous and Intermittent Flow Gas Lift, Design of Gas Lift System, Plunger Lift, Chamber Lift, Sucker Rod Pumping (SRP), Electrical Submersible Pumping (ESP), Hydraulic Pumping (HP).
7. Well Stimulation Techniques: Importance of Well Stimulation, Acid Solutions for Acidizing, Acid Additives, Matrix Acidizing, Fracture Acidizing, Hydraulic Fracturing, Wave Technology, Microbial Stimulation.
8. Introduction to Well Servicing: Objectives and Applications, production problems.

Text Book References:

1. Principles of Oil Well Production- T. E. W. Nind.
2. Applied Petroleum Reservoir Engineering- Craft and Hawkins.
3. The Technology of Artificial Lift Methods, Volume 1- Kermit E. Brown.
4. Petroleum Engineering Handbook-Howard B. Bradley.
5. Oil and Gas Field Development Techniques: Well Completion and Servicing- Denis Perrin, Michel Caron and Georges Gaillot.
6. Production Operations: Well Completions, Workover and Stimulation, Volume 1- Thomas O. Allen and Alan P. Roberts.
7. Production Operations: Well Completions, Workover and Stimulation, Volume 2- Thomas O. Allen and Alan P. Roberts.
8. Dictionary of Petroleum Exploration, Drilling & Production- Norman J, Hyne.

SUBJECT: RESERVOIR ENGINEERING-I

(PE-0404)

2L-1T-0P: 03 Credits

Unit I: Fundamentals of petroleum, petroleum reservoir, reservoir engineering, classification of petroleum reservoir.

Unit II: Reservoir rock properties: porosity, permeability, combination of permeability in parallel and series beds, porosity permeability relationship, effective and relative permeability, fluid saturation and significance, wettability, capillary pressure, surface tension /interfacial tension.

Unit III: Reservoir fluid properties, reservoir fluid sampling, PVT properties, different correlations and laboratory measurements, phase behavior of hydrocarbon system.

Unit IV: Reservoir drive mechanics and recovery factors, generalized MBE, drive indices, performance prediction of depletion, gas-cap, water and combination drive.

Unit V: Reserve estimation: resource & reserve concept, estimation of petroleum reserve, latest reserve classification.

Text/Reference Books -

1. Reservoir Engineering Handbook- Tarek Ahmed
2. Advanced Reservoir Engineering- Tarek Ahmed, Paul D. Mcinney
3. Phase Behavior of Petroleum Reservoir Fluid- Pederson, Chrisgtensen
4. Estimation and Classification of Reserves of Crude oil, Natural Gas & Condensate-

Chapman Corrnquist

5. Fundamental of Reservoir Engineering- L. P. Dake
Applied Petroleum Reservoir Engineering- Craft and Hawkins

SUBJECT:INSTRUMENTATION AND CONTROL SYSTEM

(PE-0405)

3L-0T-0P: 03 Credits

UNIT I

Importance of measuring of Instruments in Process Control, Classification of Instruments, Elements of an Instruments, Static & Dynamic Characterization of Instruments, Errors in measurements & Error Analysis, Selection of instrument for a particular Measurement, transducers.

UNIT II

Measurement of Temperature: Thermocouples, Resistance Thermometer, Expansion Thermometers, Pyrometers.

Measurement of Pressure & Vacuum, Hydrostatic type, Elastic Element type, Electrical Type and other type of instruments like McLeod Gauge, Thermocouple gauge, Knudson Gauge, Ionization Gauge.

UNIT III

Instruments for Measurement of Flow rate & level: Variable Area & variable head flow meters, Volumetric and Mass flow rate meters, Linear velocity measurement systems, Anemometers, Pressure type, Resistance & Capacitance type, Sonic & Ultrasonic, Thermal type Level meters.

UNIT IV

Instruments for Measurement of Viscosity: Redwood, Saybolt, Engler, Cup & Cone type, Rheo & other types of viscometers.

UNIT V

Dynamic modeling of first and second-order process, Interacting and non-interacting processes, Nonlinear and integrating processes, Classification of controllers and control strategy, types of control: P, PI, PD and PID

Books:

1. Eckman, D.P., Industrial Instrumentation, Wiley Eastern Ltd., New York 1990.
2. Jain, R.K., Mechanical and Industrial Measurements, Khanna Publishers.
3. Coughnaowr, D. R., “Process Systems Analysis and Control”, McGraw-Hill, Inc.
4. Stephanopolous, G., “Chemical Process Control”, Prentice-Hall.

SUBJECT: TECHNICAL ENGLISH**(PE-0406)****2L-0T-0P: 02 Credits**

1. Communication skills (What is communication skills? Necessity of skills in the corporate sector, The flows of communication, Barriers of communication, LSRW skills, Verbal and non-verbal communication)
2. Workplace etiquette (Team management, Grooming and dress code, How to address people in the corporate sectors, Mock interviews, Problem solving aptitude and handling conflicts, Management of time in a corporate sector-notes making)
3. Job Interviews (Pre-interview preparation techniques, Resume writing, Practice through mock interviews and group discussions, Problem solving and practicing through potential interview questions)
4. Presentation Skills (How to make an effective power point presentation, Breaking down Laskowski's acronym on 'AUDIENCE' in a presentation, Techniques of organising materials and points in a seminar report, Actual practice of presenting a report and evaluation)
5. Group Discussion (GD)- (Relevance and purpose of group discussion, mechanism of group discussion, Importance of subject knowledge in a GD, Range of topics in a GD and Strategies for an effective GD)
6. Business Writing (How to make business drafts, e-mails by avoiding mistakes in grammar, punctuation, spelling, wordiness and jargons; how to make technical reports and business letters effectively)
7. English Pronunciation and conversation (Role playing, Practicing through GDs and mock

interviews, Reading aloud, Critical reviewing of a current topic orally)

8. Vocabulary Test (Prefixes, Suffixes, Homonyms, Homophones, Synonyms, Antonyms, Words often confused, One word substitution, Foreign terms and expressions, Idioms and phrases, Abbreviations and acronyms)

Reference Books:

1. Effective Technical Communication: M. Ashraf Rizvi; Tata McGraw Hills.
2. Professional Communication Skills: A.K.Jain, Prabir S.R.Bhatia; S.Chand and Co.
3. Communicative English for Engineers and Professionals: Nitin Bhatnagar & Mamta Bhatnagar; Pearson Education ltd.
4. A Communicative Grammar of English: Leech, Geoffrey & Svartvik; Pearson

SUBJECT:PETROLEUM PRODUCT TESTING LABORATORY

(PE-L-0407)

0L-0T-1P: 01Credit

- (i) Determination of ductility of bitumen.
- (ii) Copper strip corrosion experiment
- (iii) Softening point determination of bitumen
- (iv) Specific gravity experiment
- (v) pH, salinity determination
- (vi) Cetane number and octane number of fuel
- (vii) Viscosity of fuel
- (viii) Smoke point of kerosene
- (ix) Flash point and fire point of fuel
- (x) Reid vapor pressure of fuel

SUBJECT:RESERVOIR ENGINEERING LABORATORY

(PE-L-0408)

0L-0T-1P: 01 Credit

1. To prepare the core samples from conventional core/outcrops in desired shape, size and smoothness.
1. To clean the given Core Samples using Soxhlet Apparatus.
2. To clean the given Core Samples using Ultrasonic Cleaner.
3. To determine the dryness fraction of core samples in Humidity Cabinet.
4. To determine the Porosity of given Core Samples using Helium Porosimeter.
5. To determine / estimate the the Gas Permeability and Liquid Permeability/Absolute Permeability using Gas Permeameter.

SUBJECT:ENVIRONMENT SCIENCE

(audit subject)

UNIT-1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- a. Definition, scope and importance. b. Need for public awareness.

UNIT-2

NATURAL RESOURCES

Renewable and non-renewable resources: Natural resources and associated problems.

- a) Forest resources: use and over exploitation, deforestation. Timber- extraction, mining , dams and their effects on forests and tribal people.
- b) Water resources: use and over utilization of surface and ground water, floods, drought , conflicts over water, dams benefits and problems.
- c) Mineral resources: use and exploitation , environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
- e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use

of alternate energy sources.

f) Land resources: land as a resources, land degradation, man- induced landslides, soil erosion and desertification.

*Role of an individual in conservation of natural resources.

*Equitable use of resources for sustainable lifestyles.

UNIT-3

ECOSYSTEMS

a. Concept of an ecosystem. b. Structure and function of an ecosystem. C. Producers, consumers and decomposers. d. Energy flow in the ecosystem. E. Ecological succession. F. Food chains, food web, and ecological pyramids. g. Introduction, types, characteristics features, structure and function of the ecosystem:

a) Forest ecosystem.

b) Grassland ecosystem.

c) Desert ecosystem.

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT-4

BIODIVERSITY AND ITS CONSERVATION

a. Introduction-Definition; genetic, species and ecosystem diversity. B. Biogeographical classification of India. C. Value of biodiversity; consumptive use ,productive use, social, ethical, aesthetic and option values .d. Hot-spots of biodiversity-India. E. Threats to biodiversity; habits loss, poaching of wildlife, man-wild life conflicts. F. Endangered and endemic species. g. Conservation of biodiversity; In-situ Ex-situ conservation of biodiversity.

UNIT-5

ENVIRONMENTAL POLLUTION

A. Defination, causes, effects, and control measures of :

a) Air pollution b) Water pollution c) Soil pollution d) Noise pollution e) Thermal pollution f)

Nuclear hazards

B. Solid waste management:causes, effects ,and control measure of urban and industrial waste- biodegradable and non-biodegradable waste.

C. Role of an individual in prevention of pollution.

D. Disaster management: Floods, earthquake, cyclone and landslides.

UNIT-6

SOCIAL ISSUES AND THE ENVIRONMENT

- a. From Unsustainable to Sustainable development.
- b. Water conservation, rain water harvesting, watershed management.
- c. Resettlement and rehabilitation of people, its problems and concerns.
- d. Environmental ethics.
- e. Climate change, global warming, acid rain ,ozone layer depletion, nuclear accidents and holocaust.
- f. Waste land reclamation.
- g. Consumerism and waste products.
- h. Environmental Legislation.
- i. Public awareness.

UNIT-7

HUMAN POPULATION AND THE ENVIRONMENT

- a. Population growth, variation among nations .
- b. Population explosion-Family welfare programme.
- c. Environment and human health and hygiene (including Sanitation and HIV/AIDS)etc.
- d. Role of Information Technology in Environment and Human Health.

UNIT-8

FIELD WORK

- a. Visit to a local area to document environmental asset-river /forest/grassland/hill/mountain.
- B. visit to a local polluted site-Urban/rural/industrial/agricultural.
- c. Study of common plants, insects, birds and fishes.
- d. study of simple ecosystems-ponds, river, hillslopes, etc.

5TH SEMESTER

SUBJECT:MANAGERIAL ECONOMICS

(PE-0501)

2L-1T-0P: 03

Credits

1. Nature, scope and methods of managerial economics.
2. Managerial Economic Concepts – Incremental concept; Opportunity Cost concept; Equi-marginal concept; discounting concept; Risk & Uncertainty.
3. Law of Diminishing Marginal Utility.
4. Demand Analysis – Meaning & type; Law of Demand – features; Exceptions; Market Demand Schedule & Curve; Elasticity of Demand – Price elasticity, cross elasticity&

- income elasticity.
5. Indifference Curve approach and its properties.
 6. Supply – its law, elasticity & curve.
 7. Types of markets; Pricing under various market conditions – Perfect competition, imperfect competition & monopolistic competition.
 8. Profit & Profit measurement.
 9. Inflation – meaning; Demand-pull, cost-push inflation; Inflationary gap; Causes and steps to control inflation.
 10. National Income – Concepts & methods of measurement; Difficulties in measuring national income.

Text Book References-

1. Managerial Economics by William F. Samuelson and Stephen G. Marks
2. Managerial Economics: Theory, Applications, and Cases by W. Bruce Allen, Keith Weigelt, Neil Doherty and Edwin Mansfield
3. Managerial Economics by Christopher Thomas and S. Charles Maurice

SUBJECT: PRODUCTION ENGINEERING –II

(PE-0502)

2L-1T-0P: 03 Credits

1. Well Performance: Productivity Index (PI), Specific Productivity Index, Inflow Performance Relationship (IPR), Vertical Lift Performance, Bean Performance, Multiphase Flow in tubing and flow lines, Coning, Production Optimization– Nodal System analysis, Production Logging.
2. Sand Control: Sand Control Techniques, use of Screens, Gravel Packing, Formation Sand size analysis, optimum Gravel-Sand Ratio, Gravel Pack Thickness, Gravel Selection, Gravel Packing Fluid, Gravel Placement Techniques, Chemical Method of Sand Control.
3. Oil and Gas Processing: Introduction to Oil & Gas Separation, Flash & Differential Separation, Stage Separation, Fluid Level and Pressure Control System, FWKO, Two Phase Separator, Three Phase Separator; Horizontal, Vertical, Spherical and Centrifugal Separator, Scrubber, Treater, Wash Tank, Design of Oil & Gas Separator,

Safety Feature in separators, Sand Removal, Desalting, Gas Dehydration, Gas Sweetening, formation of Gas Hydrates.

4. Crude Oil Storage Tank: Types & Features of Storage Tanks, Tank Accessories, Tank Batteries, Metering of Oil & Gas, Sampling of Crude Oil, Gauging Equipment and Methods, Vapor Recovery System.

Text Book References:

1. Principles of Oil Well Production- T. E. W. Nind.
2. Introduction to Petroleum Production, Volume I- D. R. Skinner.
3. Introduction to Petroleum Production, Volume-II- D. R. Skinner.
4. Gas-Liquid and Liquid-Liquid Separators- Maurice Stewart and Ken Arnold.
5. Oilfield Processing, Volume Two: Crude Oil- Francis S. Manning and Richard E. Thompson.
6. Petroleum and Gas Field Processing- H. K. Abdel-Aal, Mohamed Aggour and M. A. Fahim.
7. Petroleum Engineering Handbook-Howard B. Bradley.
8. Introduction to Oil and Gas Production, Vocational Training Series- American Petroleum Institute.

SUBJECT: RESERVOIR ENGINEERING-II

(PE-0503)

2L-1T-0P: 03 Credits

Unit I: Flow of Fluids through Porous Media: Darcy's law, assumptions and applications, single and multiphase flow, Types of fluid- compressible fluid, incompressible and slightly compressible fluid; radial and spherical flow, steady state and unsteady state flow.

Unit II: Productivity Index, Injectivity Index, Formation Damage, Skin Effect, GOR, WOR equations, principles of fluid flow for steady state, semi steady state and unsteady state conditions.

Unit III: Water influx in reservoir, different water influx models.

Unit IV: Water and gas coning; Immiscible displacement process, Buckley & Leverett treatment of fractional flow and frontal advance equations.

Unit V: Reservoir Management: Concepts of Reservoir Management and its Application

Text/Reference Books -

1. Reservoir Engineering Handbook- Tarek Ahmed
2. Advanced Reservoir Engineering- Tarek Ahmed, Paul D. Mcinney
3. Fundamental of Reservoir Engineering- L. P. Dake
4. Applied Petroleum Reservoir Engineering- Craft and Hawkins
9. Basics of Reservoir Engineering- R Cosse

SUBJECT: RESERVOIR MODELING AND SIMULATION

(PE-0504)

3L-0T-0P: 03 Credits

Reservoir Modeling:

Introduction to general modeling: Introduction to concept geological modeling. Types of model and designing of various models depending on reservoir complexities, rock properties, fluid properties.

Reservoir Simulation:

1. Overview: Introduction, Historical background, application of simulator, various types of models.
2. Flow Conditions: Single phase flow equations for one, two and three dimension models.
3. Special Concept: Explicit and implicit, grid system, finite difference & finite element method, matrix solution, stability criteria.
4. Data Preparation
5. Resudofunctions
6. Reservoir model Solution Techniques : Implicit Pressure and Explicit Saturation (IMPES)
7. Preview of numerical solution methods: Direct process, iterative process.
8. History Matching : Mechanics and parameters of match
9. Special Concept on Coning and Compositional Models simulation.
10. Optimization using Economic evaluation

11. Introduction to streamline simulation & comparison of conventional/Streamline simulation.

Text Book References-

- 1.Principles of Applied Reservoir Simulation, by John R. Fanchi
- 2.Advanced Petroleum Reservoir Simulation by Rafiq Islam, S.H. Moussavizadegan, Shabbir Mustafiz and Jamal H. Abou-Kassem
- 3.Practical Enhanced Reservoir Engineering: Assisted with Simulation Software by Abdus Satter, Ghulam M. Iqbal and James L. Buchwalter
- 4.Practical Reservoir Simulation by M. R. Carlson
- 5.Modern Reservoir Engineering: A Simulation Approach by Henry B. Crichtlow

SUBJECT: DRILLING ENGINEERING –II

(PE-PE-CEIv.-0505-1)

2L-1T-0P: 03

Credits

A. Drilling Fluids:

1. Overview of Drilling Fluids: Clay chemistry and its application to drilling fluids, Types of clays, hydration, flocculation, aggregation and dispersion.
2. Classification, Types and applications of Drilling Fluids: Water based, oil based, emulsion based, polymer based, Surfactant based, Foam based and Aerated drilling fluids.
3. Drilling Fluid Characteristics: Basic functions, properties, maintenance and treatments of drilling fluids.
4. Drilling fluid calculations.

B. Well Logging:

1. Mud logging.
2. Open hole logs. Indirect Methods: SP and resistivity logs, radioactive logs, acoustic logs (principles, types of tools, limitation and applications).
3. Evaluation of CBL/ VDL, USIT, SFT, RFT.

C. Cements:

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

SUBJECT: WELL CONTROL SYSTEMS

(PE-PE-CEIv.-0505-2)

2L-1T-0P: 03 Credits

1. Basic terms, BHP and leak off test.

Kick, Blow Out, Primary, Secondary & Tertiary Well Control, Bottom Hole pressure, Normal & Abnormal Formation pressure, Causes of abnormal pressure, U tube concept, swab and Surge effects, Equivalent Circulating Density.

2. Kick Indications & Shut-In Procedure

Causes of Kick, Early warning signs, positive kick signs, Shut-in procedures, Type of Influx and behaviour, Gas influx behaviour.

3. Well Killing Methods

Drillers method, wait & weight Method, Volumetric Method, Comparison of methods and calculations, Stripping and Snubbing.

4. Blow Out Preventer Equipment

Annular preventer and packing Elements, Pipe ram, Blind ram and variable Bore ram Preventer, Koomey unit, Choke & kill Manifold, Diverters, Trip tank, Mud gas separator, Vacuum degasser, Pit volume recorder, Mud flow indicators, BOP drill.

SUBJECT: ENHANCED OIL RECOVERY

(PE-OELv.-0506-2)

3L-0T-0P: 03 Credits

Unit I:

Introduction to EOR, Basic principles and mechanism of EOR, Mobility ratio concepts, Screening of EOR process.

Unit II:

Chemical Flooding: Polymer flooding, Surfactant flooding, Caustic flooding; ASP flooding – Principles and applications.

Unit III:

Miscible Flooding: First contact miscibility, Multiple Contact Miscibility- Condensing Gas Drive, Vaporizing Gas Drive, Principles and applications of CO₂ flooding.

Unit IV:

Thermal Recovery Techniques - Steam stimulation, hot water flooding, steam flooding and in-situ combustion process.

Unit V:

Microbial EOR - Principles & Applications.

Text/Reference Books -

1. Principles of Petroleum Reservoir Engineering- Gian Luigi Chierici
2. Enhanced Oil Recovery Textbook Vol-6- Don W. Green G. Paul Willhite
3. The Reservoir Engineering Aspects of Water flooding- Forrest F. Craig, Jr.
4. The Design Engineering Aspects of Water flooding- Stephen C. Rose, John F. Buckwalter and Robert J. Woodhall
5. Improved Recovery, Oil and Gas Production- Nicholas J. Const
6. Improved Oil Recovery by Surfactant and Polymer Flooding- D. O. Shah, R. S. Schechter

SUBJECT:PETROCHEMICALS

(PE-CEIv.-0507-1)

3L-0T-0P: 03 Credits

Unit1:

Petrochemicals

- a. History and growth of petrochemical industry.
- b. Petrochemical industries in India
- c. Trends in Petrochemical Industries
- d. Petrochemicals from Natural Gas : Methane, ethane, propane and butane based Petrochemicals.

Unit-2:

Raw materials

- a. Crude oil and natural gas as raw materials for petrochemical industries, Individual hydrocarbons and Petroleum cuts as feed stock for petrochemical manufacture.
- b. Manufacture of petrochemical feedstock, such as ethylene, propylene, BTX and synthesis gas for manufacture of ammonia and methanol.
- c. Separation process used for purification of product gases of a gas cracker.
- d. Petrochemical Feed Stocks: Aromatics, un-saturates and saturates (linear and cyclic).

Unit-3:

Polymerization

- a. Basic concept of polymer chemistry, the type and structure of the macromolecular products, Physical and mechanical properties of high molecular mass compounds.
- b. Classification of polymers according to the Gas Cracker Products.

Unit-4:

Oxidation

- a. Basic reactions and mechanisms in the oxidation of hydrocarbons.
- b. Process for oxidation of light olefins, production of ethylene oxide, acetaldehyde, acrylonitrile etc.

Unit-5:

Manufacture of petrochemicals

- a. Hydration of Olefins, basic concepts concerning hydration of olefins.
- b. Direct and indirect ways of olefins hydration.
- c. Manufacture of low molecular weight alcohols from olefins.
- d. Processes used in sulfuric acid as a means of obtaining a under molecular weight range of alcohols.

Unit-6:

Processes for Petrochemical Manufacture

- a. Ammonia and methanol synthesis, OXO synthesis.
- b. Manufacture of some important commercial polymer products.

Unit-7:

Petroleum Product safety & Transportation

- a. Product Handling & Safety: Loss Prevention, underground storage, Product Blending.
- b. Transport and distribution, Fire Prevention & safety devices.

Text/Reference Books -

1. Petrochemical Processes- A.Chuvel, G. Lefebure
2. Petrochemicals- Djebbar Tiab, Erle C, Donaldson
3. Petrochemical Technology Assessment- John Wiley
4. Petrochemicals – B. K. Bhaskar Rao

SUBJECT: UNIT OPERATIONS

(PE-CEIV.-0507-2)

3L-0T-0P: 03 Credits

Unit-1:

Definitions and Principles

Physical quantities, Gas constants, Engineering units, Conversion of units, Units and equations, Equation of states (EOS),

Unit-2:

Compressible and incompressible fluid flow

Basics of laminar and turbulent flow, Reynold number, flow of compressible and

incompressible fluid in conduits, laminar flow in pipes, Bernaulis equation, Navier Stoke's equation, turbulent flow in pipes and closed conduits, incompressible fluid flow in closed channels, Compressible fluid flow through variable-area conduits, Adiabatic and isothermal fluid flow, Fluidization, Motion of particles through fluids.

Unit-3:

Transporting and Metering of Fluids

Different fluid moving machinery, Pipes, tubes, fittings and valves, Positive displacement machinery, Centrifugal pumps and compression principles, Hydrostatic equilibrium equation, Barometric equation, Principles of U-Tube Manometer, Inclined manometer, Insertion meter, Full bore meter.

Unit-4:

Heat Transfer in fluid flow

Energy balance, Mode of heat transfer, Steady and Un steady state heat transfer, Rate of heat transfer, Heat transfer by forced convection in laminar/turbulent flow, Heat transfer in transition region between laminar and turbulent flow, Prandtl number, Nusselt number, Overall heat transfer coefficient.

Unit-5:

Gas absorption and adsorption

Principles of gas absorption and adsorption, Equilibria adsorption isotherms, Basic equation for absorption and adsorption, Mass transfer equations, Absorber/adsorber design, Design of Packed tower, Raschig rings, Mass Transfer Correlations, Plate column, Absorption with chemical reactions.

SUBJECT:PRODUCTION ENGINEERING LABORATORY

(PE-L-0508)

0L-0T-1P: 01 Credits

1. To Identify and study of Casing, Float Collar, Casing Shoe, Casing Head Spool, Casing Valve, Gauge Cutter.

2. To Identify and study of Packer, Cross over Sub, Side Pocket Mandrel, Sliding Valve.
3. To Identify and study of Scrapper, Fishing Tool, Shock Sub, Change over Sub, Centralizer, Slick Line, Wire Rope, Piano Wire.
4. To Identify and study of Tubing Hanger, Hanger Flange, Elevator, Sleeve, Ring Seal, Coupling, Dognut.
5. To Identify and study of Bean Housing, Gate Valve, Casing Valve, Standing Valve, Needle Valve, Bean Nozzle, Bean Wrench, Pressure Gauge.

SUBJECT: DRILLING FLUID LABORATORY

(PE-L-0509)

01-01-1P: 01Credits

1. Determination of Density/Specific Gravity of drilling fluid sample.
2. Determination of Funnel Viscosity of drilling fluid.
3. Determination of rheological properties such as plastic viscosity, gel strength etc. of drilling fluid.
4. Determination of filtration /fluid loss of a given drilling fluid.

SUBJECT: CHEMISTRY OF PETROLEUM LAB

(PE-L-0510)

0L-0T-1P: 01Credits

1. To determine the strength of a given CH_3COOH solution by titrating against a standard NaOH solution by conductometric titration.
2. To determine the amount of chloride ions in the given KCl solution by precipitation titration.
3. To determine the strength of an unknown solution of HCl by titrating it with NaOH solution by using pH meter.
4. To determine average molecular weight of polyvinyl acetate by viscosity measurement.
5. To learn the basic principles of UV-visible spectrophotometry and to measure concentration by a UV-visible spectrophotometer.
6. To learn the instrumentation of IR spectroscopy and to analysis IR spectra of three organic molecules.

CONSTITUTION OF INDIA

(AUDIT COURSE)

1. The History of the Making of Indian Constitution.
2. Preamble and the Basic Structures.
3. Fundamental Rights and Duties.
4. Directive Principles of State Policy.
5. Legislature, Executive and Judiciary.
6. Emergency Powers.
7. Special Provisions for Jammu and Kashmir, Nagaland and Other Regions.
8. Amendments.

Text/Reference Books –

1. D D Basu, Introduction to the Constitution of India, 20th Edn., Lexisnexis Butterworths, 2012.
2. Rajeev Bhargava (ed), Ethics and Politics of the Indian Constitution, Oxford University Press, New Delhi, 2008.
3. Granville Austin, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, Oxford, 1966.
4. Zoya Hassan, E. Sridharan and R. Sudarshan (eds), India's Living Constitution: Ideas, Practices, Controversies, Permanent Black, New Delhi, 2002.
5. Subhash C. Kashyap, Our Constitution, National Book Trust, New Delhi, 2011.

6TH SEMESTER

SUBJECT: MANAGEMENT & ACCOUNTANCY

(PE-0601)

3L-1T-1P: 04Credits

1. Nature, scope and methods of managerial economics.
2. Managerial Economic Concepts – Incremental concept; Opportunity Cost concept; Equi-marginal concept; discounting concept; Risk & Uncertainty.
3. Law of Diminishing Marginal Utility.
4. Demand Analysis – Meaning & type; Law of Demand – features; Exceptions; Market Demand Schedule & Curve; Elasticity of Demand – Price elasticity, cross elasticity & income elasticity.
5. Indifference Curve approach and its properties.
6. Supply – its law, elasticity & curve.
7. Types of markets; Pricing under various market conditions – Perfect competition, imperfect competition & monopolistic competition.
8. Profit & Profit measurement.
9. Inflation – meaning; Demand-pull, cost-push inflation; Inflationary gap; Causes and steps to control inflation.
10. National Income – Concepts & methods of measurement; Difficulties in measuring national income.
11. Nature, scope and methods of managerial economics.
12. Managerial Economic Concepts – Incremental concept; Opportunity Cost concept; Equi-marginal concept; discounting concept; Risk & Uncertainty.

13. Law of Diminishing Marginal Utility.
14. Demand Analysis – Meaning & type; Law of Demand – features; Exceptions; Market Demand Schedule & Curve; Elasticity of Demand – Price elasticity, cross elasticity & income elasticity
15. Indifference Curve approach and its properties.
16. Supply – its law, elasticity & curve.
17. Types of markets; Pricing under various market conditions – Perfect competition, imperfect competition & monopolistic competition.
18. Profit & Profit measurement.
19. Inflation – meaning; Demand-pull, cost-push inflation; Inflationary gap; Causes and steps to control inflation.
20. National Income – Concepts & methods of measurement; Difficulties in measuring national income.

Text Book References-

1. Managerial Economics by William F. Samuelson and Stephen G. Marks
2. Managerial Economics: Theory, Applications, and Cases by W. Bruce Allen, Keith Weigelt, Neil Doherty and Edwin Mansfield
3. Managerial Economics by Christopher Thomas and S. Charles Maurice
4. Managerial Economics by William F. Samuelson and Stephen G. Marks
5. Managerial Economics: Theory, Applications, and Cases by W. Bruce Allen, Keith Weigelt, Neil Doherty and Edwin Mansfield
6. Managerial Economics by Christopher Thomas and S. Charles Maurice

SUBJECT: RESERVOIR ENGINEERING ASPECTS OF WATER FLOODING

(PE-OELV-0602)

3L-0T-0P:03Credits

1 Introduction to Water flooding: Formation Energy, Pressure Maintenance, Importance of Water flooding, Optimum Time to Water flood, Effect of Trapped Gas on Water flood Recovery, Factors affecting Water flood Performance, Displacement Efficiency, Sweep Efficiency, Recovery Efficiency, Infill Drilling, Cutler's Law, Reservoir Heterogeneity, Methods used to characterize Vertical Permeability Stratifications, Mobility & Mobility Ratio.

2. Water flood Patterns: Importance of Pattern Water flooding, Types of Flood Patterns.

3. Fractional Flow Curve: Importance of Fractional Flow Equation, Fractional Flow Curve, Types of Fractional Flow Curves, Effects of Wettability, Viscosity, Dip Angle, Capillary Pressure etc. on Fractional Flow Curve.

4. Frontal Advance Equation: Importance of Frontal Advance Equation, Stabilized and Non stabilized Zone, Shock Front, Water Breakthrough, Water Saturation Profile, Oil Recovery Calculation.

5. Injection Water Treatment: Treatment Objectives, Injectivity Problems, Sources of Injection Water, Desired Characteristics of Injection Water, Design consideration for Water Handling and Injection System.

6. Oil & Gas Field Development: Development of Oil & Gas Fields, Rate and Order of drilling well, well spacing & pattern.

Text Book References:

1. Reservoir Engineering Handbook- Tarek Ahmed.
2. The Reservoir Engineering Aspects of Waterflooding- Forrest F. Craig, Jr.
3. The Design Engineering Aspects of Waterflooding- Stephen C. Rose, John F. Buckwalter and Robert J. Woodhall.
4. Waterflooding- James T. Smith and William M. Cobb.

SUBJECT: OIL AND GAS WELL TESTING

(PE-CElv-0603-1 & 2)

3L-0T-0P: 03Credits

Unit I:

Introduction to Oil and Gas Well Testing, Steady State and Unsteady Flow Tests, Diffusivity Equation, its derivation & Solution, Reservoir Pressure Measurements and Significance: Techniques of pressure measurement, Wellbore storage effects, Radius of investigation, Principle of Superposition.

Unit II:

Oil Well Testing: Pressure Transient Tests: Draw-down and Buildup test analysis, Horner's approximation.

Unit III

Gas Well Testing: Flow after flow testing, Isochronal testing, Modified Isochronal testing

Unit IV:

Injection well testing, Multiple well testing, Interference testing, Pulse Testing, Pressure fall-off test in injection wells, Multilayer reservoirs.

Unit V:

Type curves & its uses, well test analysis by use of Type curves, Drill Stem Testing: Equipment, DST chart observation and preliminary interpretation.

Text/Reference Books -

1. Pressure Transient Test- SPE
2. Well Testing- John Lee
3. Pressure Buildup and Flow Tests in Wells – C. S. Matthews and D. G. Russell
4. Advances in Well Test Analysis – Robert C. Earlougher

SUBJECT:PETROLEUM EXPLORATION – I**(PE-CEIv.-0604-1)****3L-0T-0P: 03Credits**

1. Surface indications of subsurface oil and gas accumulations.
2. Oil accumulation parameters.
3. Time of accumulation vis-avis time of oil generation.
4. Geochemical methods of prospecting: Soil geochemical surveys; Source rock characterization and Hydro-geochemistry as a tool for oil exploration.
5. Development Geology

6. Role of plate tectonics in Hydrocarbon accumulation onshore and offshore.
7. Sequence of geological methods of oil exploration.

SUBJECT:PRINCIPLES OF SURVEYING AND REMOTE SENSING

(PE-CElv.-0604-2)

3L-0T-0P: 03Credits

1. Fundamental concepts: Introduction, definitions, surveying, classification of surveying, principles of surveying, errors.
2. Chain Surveying : Different methods, direct measurement, instruments for chaining, ranging out survey lines, chaining , measurement of length with the help of tape, error due to incorrect chain, chaining on uneven or sloping ground, errors in chaining, tape corrections.
3. Compass Traversing: Introduction, bearing and angles, the theory of magnetic compass, classification of compass, magnetic declination, local attraction, errors in compass survey, adjustments of closing errors.
4. Plane Table Surveying : General : Accessories, working operations, methods of plane tabling, two point problem and three point problem, Advantages and Disadvantages of plane table surveying.
5. Levelling: Different methods of levelling, curvature and refraction, reciprocal levelling. Difference of elevation – single observation, reciprocal observation.
6. Contouring: Definition, characteristics of contours. Use of contour maps, direct and indirect methods of contouring.
7. Measurement of area: area bounded by irregular boundaries- Mid ordinate rule, average ordinate rule, trapezoidal rule, Simpson's rule; area by double meridian distances, area by coordinates, planimeter.
8. Measurement of volume: measurement from cross-sections, prismoidal formula, trapezoidal formula, capacity of reservoir.
9. Electromagnetic-distance Measurements: Electromagnetic waves, modulation, types of

EDM, total station.

10. Photographic surveying: Introduction, terrestrial and aerial photograph, horizontal position of a point from terrestrial photograph, horizontal and vertical angles from terrestrial photograph, focal length determination; scale of vertical photograph, computation of length and height from vertical photograph, relief displacement, scale of tilted photograph, tilt distortion, flight planning, stereoscopic vision, parallax in aerial photograph, measurement of parallax.
11. Remote sensing : Electromagnetic energy, electromagnetic spectrum, interaction of electromagnetic energy with matter, remote sensing sensor systems, platforms, ideal and real remote sensing system, data acquisition and interpretation, application of remote sensing, remote sensing in Indi

SUBJECT:DRILLING ENGINEERING –III

(PE-0605)

3L-0T-0P: 03Credits

1. Directional Drilling: Objectives, Types of deflection tools, tool orientation, Directional well profiles.
2. Well Monitoring: Well path deflection & correction. Down the hole surveying methods, Surveying Analysis Methods and Calculations of Three Dimensional well coordinates.
3. Surveying Tools: Single shot and multi shot survey tool, MWD & LWD tools, Telemetry system.
4. Down Hole Motors: Positive displacement motors and Turbo-drills - motor description, Power calculation and applications. Auto-track and verti-track system. Rotary Steerable system, Geo-steering tools.
5. Horizontal Well Drilling: Horizontal well objectives and selection, Different profiles, Drilling techniques etc.
6. Special Methods of Directional Drilling: Extended reach drilling, Multilateral drilling, coil tubing drilling, UBD, MPD.
7. Hole cleaning in high angled wells.
8. Casing Design and Drill String design.
9. Well control methods and well control system, Kick detection.

SUBJECT:NATURAL GAS ENGINEERING

(PE-OEIV.-0606)

3L-1T-0P: 04Credits

1. Gas from condensate and oilfields. Scope of Natural gas industry. Basic thermodynamic and system energy concepts in Natural Gas Engineering.
2. Physical properties of natural gas and hydrocarbon liquids associated with Natural gas. Reservoir aspects of natural gas.
3. Flow of fluids. Compression calculations. Heat Transfer and Mass Transfer principles and applications in Natural Gas Engineering.
4. Gas flow measurement. Process control and instrumentation in natural gas processing plants.
5. Natural Gas Processing. Field separation and oil absorption process. Refrigeration and low temperature processing. Liquefaction Process. Dehydration of Natural Gas sweetening of Natural gas and sulphur recovery. Processing for LPG, LNG, CNG, system.
6. Transmission of Natural Gas. Specifications. Utilization of Natural Gas. Underground storage and conservation of Natural Gas.
7. Unconventional gas: Coal Bed Methane, Natural Gas Hydrate. Insitu Coal Gasification.
8. Conversion of gas to liquid.

Text/Reference Books

1. Natural Gas: A Basic Handbook by J. G. Speight
2. Handbook of Natural Gas Transmission and Processing by Saeid Mokhatab, William A. Poe and James G. Speight
3. Natural Gas Engineering Handbook by Boyun Guo and Ali Ghalambor
4. Advanced Natural Gas Engineering by Michael Economides and Xiuli Wang
5. Standard Handbook of Petroleum and Natural Gas Engineering: Volume 1 & 2, (by William C. Lyons Ph.D. P.E
6. Working Guide to Petroleum and Natural Gas Production Engineering by William C. Lyons.

SUBJECT:TRANSPORTATION AND MARKETING OF PETROLEUM AND PETROLEUM PRODUCTS

(PE-0607)

2L-1T-0P: 03Credits

1. Transportation of petroleum & petroleum products.
2. Basics of pipeline construction, operation and protection.
3. Pump and compressor stations. Instrumentation and control.
4. Metering and measurements of oil and gas.
5. Traffic management, Fire and safety rules.
6. Indian and Global supply scenario of petroleum and petroleum products.
7. Storage of petroleum products in fixed installations. Standards and regulations.
8. Role of International oil companies and OPEC pricing mechanism. Administered and market determined pricing mechanism in India. Conservation of petroleum & its products, Spot and other market control mechanism.

Pipeline engineering

1. Objective and scope of pipeline as a means of fluid transportation with special reference to crude oil/gas/refined products, Economics of Pipeline transportation.
2. Design of Pipeline
3. Theory and different formulae of the flow of fluids in oil/gas pipelines; basic equations for the flow of fluids through pipes; different flow equations for laminar and turbulent flow of compressible and incompressible fluids (Newtonian); Introduction to the flow of Non-Newtonian fluids through pipes; multiphase flow and loop pipelines.
4. Construction of pipelines; materials; general equipment specifications (Pipes, valves and fittings); Pigging, Pigging Technology: pig launcher and receiver, types of pigs.
5. Corrosion protection and control; Design of cathodic protection system, Pipeline automation.

6. Offshore Pipeline: Description of stinger; and Riser, construction of offshore pipeline, Method of underwater welding.
7. Hydrates, wax & scale - formation and prevention. Crude conditioning and use of additives to improve flow conditions.
8. City distribution network of oil/gas. Lease and custody transfer.

Text Book References-

1. Petroleum marketing practices and problems by William H. Day
2. Petroleum Transportation Handbook, By: Harold Sill Bell
3. The economics of petroleum, Author: Joseph Ezekiel Pogue
4. Fundamentals of Pipeline Engineering By Jacques Vincent-Genod
5. Pipeline engineering by Henry Liu
6. Petroleum Engineering Handbook, Vol. 3

SUBJECT: EOR LABORATORY

(PE-L-0608)

0L-0T-1P:01Credits

1. To determine the Interfacial Tension of a given fluid.
2. To determine the Capillary Pressure of a given fluid.
3. To determine the Liquid Permeability of a given fluid in a given core sample.
4. To determine the Relative Permeability of Oil-Water system in a given core sample.
5. To determine the saturation of a given fluid in a given core sample.

7th SEMESTER

SUBJECT: PETROLEUM EXPLORATION – II

(PE-OEIV.-0701)

3L-0T-0P: 03Credits

1. Magnetic Method: The geomagnetic field, Magnetic anomalies. Magnetic survey instrument, Field method of magnetic surveys. Reduction of magnetic data, diurnal and geomagnetic correction. Interpretation of magnetic anomalies. Magnetic response of simple geometric shapes. Application of magnetic survey.
2. Gravity Method: Units of gravity, gravity measuring instruments, gravity survey, gravity anomalies, Gravity data reduction, Drift, Latitude, Elevation, and Free-air correction. Free-air and Bouguer anomalies. Gravity response of simple geometric shapes. Interpretation of gravity anomalies and application of gravity methods.
3. Seismic Methods: Geometry of refracted ray path, planar interface... Methodology of refraction profiling. Field surveys arrangements. Recording instruments and energy source. Application of seismic refraction method, Passive seismic
4. Geometry of reflected ray path, planar interface, single horizontal reflector. Importance of seismic reflection survey over seismic refraction survey technique. Common depth point (CDP) profiling and stacking. 2-D data processing and interpretation of reflection data. Introduction to 3-D data acquisition, processing and interpretation. Applications of seismic method in oil exploration, Concept of 4-D seismic and its application.

SUBJECT: CORE ANALYSIS

(PE-CEIV.-0702-1)

3L-0T-0P: 03Credits

1. Coring Program: Objectives, Coring Tool, Core Types.
2. Core Sampling and Core Preparation: Introduction, Core Cutting, Core Plugging, End Facing, Core Cleaning, Core Drying, Core Preservations.
3. Core Analysis: Importance of Core Analysis, Conventional Core Analysis, Special Core Analysis.
4. Core Flooding: Importance of Core Flooding, Core Flooding methods, determination of Connate Water Saturation, Original Oil In Place (OOIP), Oil Recovery Efficiency,

Residual Oil Saturation, Relative Permeability Curve.

Text Book References:

1. Recommended Practices for Core Analysis: Recommended Practice 40- American Petroleum Institute.
2. Core Analysis- Teknica Petroleum Services Limited.
3. Experimental Reservoir Engineering Laboratory Workbook-O. Torsaeter and M. Abtahi.

SUBJECT:GAS HYDRATE

(PE-CEIv.-0702-1)

3L-0T-0P: 03Credits

1. Introduction to gas hydrates.
2. Formation and properties of gas hydrates.
3. Exploration & Evaluation of Gas Hydrates.
4. Prevention & control of gas hydrates.
5. Gas hydrates accumulation in porous medium.
6. Gas extraction from gas hydrates.
7. Uses and application of gas hydrates.

Text/Reference Books -

1. Growing Interest in Gas Hydrates- Timothy S. Collett, Rick Lewis, Takashi Uchida
2. "Unconventional Gas" Schlumberger--Author: Donna Garbutt
3. Hydrates of Hydrocarbons- Yuri F. Makogon, 2003

SUBJECT:OFFSHORE OPERATIONS

(PE-0703)

3L-1T-0P: 04Credits

UNIT I

Introduction to offshore oil and gas operations. Sea States and Weather: Meteorology, oceanography, ice, sea bed soil. Analyses of Sea environment: Wind, waves and current forces- Characteristics, analysis and force evaluation. Buoyancy and stability, Offshore platforms & their stability, Buoyant force calculation.

UNIT II

Offshore Fixed Platforms: Types, description, operations and installation, Bracing & framing patterns in offshore structures.

Offshore Mobile Units: Types, description and installation. Station keeping methods like conventional mooring & dynamic positioning system.

Offshore Drilling: Difference in drilling from land, from fixed platform, jackup, ships and semi submersibles. Use of conductors and risers. Deep sea drilling.

UNIT III

Offshore Well Completion - Platforms and subsea completions, Deep water applications of subsea technology.

Offshore Production: Oil processing platforms, gas processing platforms, water injection platforms, storage, SPM and SBM, transportation and utilities.

UNIT IV

Deep water technology: Introduction, definition & prospects. Deep water regions, Deep water drilling rig – selection and deployment, Deep water production system, Emerging deep water technologies – special equipment and systems, Remote operation vessels (ROV).

UNIT V

Divers and Safety: Principles of diving use of decompression chambers, life boats. Offshore Environmental Pollution and Remedial Measures, Corrosion in offshore structures and its protection.

BOOKS:

1. Handbook of offshore engineering, S. K. Chakrabarti, Volume 1 & 2, Elsevier, 2005.
2. Handbook of Offshore Oil and Gas Operations, James G. Speight, Gulf Professional Publishing, 2014.
3. Offshore Petroleum Drilling and Production, Sukumar Laik, CRC Press, Taylor & Francis Group,
4. Hydrodynamics of offshore structures, S. K. Chakrabarti, WIT Press.
5. Matrix methods of structural analysis, P. N. Godbole, R. S. Sonparote, S. U. Dhote, PHI Learning Private Limited, 2014.

SUBJECT: PETROLEUM FORMATION AND EVALUATION

(PE-OElv.-0704)

3L-0T-0P: 03Credits

1. Petrophysical measurements to sub-surface engineering.
2. Indirect Methods: SP and resistivity logs, radioactive logs, acoustic logs (principles, types of tools, limitation and applications). Evaluation of CBL/ VDL, USIT, SFT, RFT.
3. Production Logging: Introduction, type of tools, principles, limitations and applications.
4. Special Type of Logging Tools: Casing inspection tools (principles, application and limitation), Formation micro scanner (FMS), DSI, NMR logging principles. Logging in high-angle wells.
5. Log Interpretation and Analysis Techniques.
 - a) Standard log interpretation methods.
 - b) Cross-plotting methods: neutron-density, sonic-density and sonic-neutron etc.
 - c) Clean sand interpretation
 - d) Concepts of invasion – RXO, Tornado charts
 - e) Shaly sand interpretation.

Scope of training: The Students will get an opportunity to know the ongoing R&D activities in different industries, institutes and universities. The Students will explore and gain experience in different branches of biotechnology viz agriculture, food, medicine and pharmaceutical. The Students will develop understanding of biosafety, bioethic, regulatory and compliances. Therefore, the summer training programme will help Students to identify the areas of their interest. Moreover, the Students will know how to write, analyze and compile data, and present the technical/scientific report.

Project:-

The Students will get opportunity to be a part of ongoing QA, QC, Production, and R&D activities in different industries, commercial enterprises and organization. The Students can also join laboratories in research institutes and reputed universities. The Students will explore and gain experience in different sectors of biotechnology viz agriculture, food, medicine and pharmaceutical. The Students will develop understanding of biosafety, bioethic, regulatory and compliances. The Students will acquire skill to write, analyze and compile data, and present the detailed technical/scientific report. At the end of successful project semester training, potentially the Students become employable in the industries/organizations.

Course Learning Outcomes (CLO): The Students will get chance to work in a group and identify engineering problems and formulate / suggest solutions;. Also students will Able to compile generated experimental data or study various cases

8th SEMESTER

SUBJECT: ENERGY SCENARIO IN INDIA

(PE-OEIV.-0801)

3L-0T-0P: 03Credits

1. Introduction to Energy, Primary and Secondary Energy Resources, Commercial and Non-Commercial Energy, Commercial Energy Production, Renewable and Non-Renewable Energy, Importance, limitations to primary sources.
2. Major Primary Energy Sources in India (Coal, Oil, and Natural Gas), nuclear energy, thermal energy, Commercial Energy and Non Commercial Energy, Primary Energy supply and Present Consumption Trend in India.
3. Energy Needs of Growing Economy, Long Term Energy Scenario (Future prospects of Gas Hydrates, CBM & Shale Gas etc in India), Energy Pricing in India.
4. Energy and Environment: Air Pollution, Climate Change, the Greenhouse Effect.
5. Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.
6. Statutory guidelines in Indian Energy Sector: Various statutory bodies of Indian Government involved with the entire energy sector in India such as DGH, OISD.

References:

1. Online Energy Journals/Publications
2. Government Guidelines
3. Published Papers

**SUBJECT: HEALTH, SAFETY, SECURITY & ENVIRONMENT IN PETROLEUM
INDUSTRY**

(PE-0802)

4L-0T-0P:04Credits

Unit-I : Health Hazards in Petroleum Production Refining and Utilization

1. Introduction to national and international safety and environment management.
2. Toxicity, Physiological, Asphyxiation, respiratory and skin effect of Petroleum Hydrocarbons (including mixtures), sour gases (eg Hydrogen sulphide and carbon monoxide etc) with their thresh-hold limits.
3. Effect of corrosive atmosphere and additives during acidizing, sand control and fracturing jobs etc.

Unit –II: Safety System

1. Introduction to API grades and standards related to Petroleum Industry.
2. Hazards analysis, developing a safe process, failure mode analysis, safety analysis (API-14C) safety analysis function evaluation chart (synergic approach).
3. Manual & atmospheric shut down system, blow down systems.
4. Gas detection system
5. Fire detection and suppression systems.
6. Personal protection systems & measures.
7. HSE Policies, standards & specifications
8. Disaster & crisis management.
9. Qualitative and quantitative risk analysis techniques, safety practices in drilling, production and design of installation.
- 10 Safety regulation -mines act, oil mines regulation, petroleum rule, petroleum act, atomic ERB rules, explosive act, explosive rule, occupational health hazards in hydrocarbon industries.

Unit-III: Environment

1. Environment concepts, impact on eco-system, air, water and soil.

2. The impact of drilling & production operations on environment, Environmental transport of petroleum wastes.
3. Offshore environmental studies, offshore oil spill and oil spill control.
4. Oil mines regulations and other environmental legislations.
5. Environmental impact assessment.
6. Waste treatment methods, waste disposal method, remediation of contaminated sites.
7. Air & noise pollution.
8. Biodiversity.

Text/Reference Books -

1. Occupational Safety and Health for Technologists, Engineers, and Managers (7th Edition) (Alternative Etext Formats) by David L. Goetsch
2. Safety and Health for Engineers by Roger L. Brauer and Roger Brauer
3. Elements of Industrial Hazards: Health, Safety, Environment and Loss Prevention by Ratan Tatiya
4. Process Technology: Safety, Health, and Environment by Charles E. Thoma

SUBJECT: COALBED METHANE

(PE-CElv.-0803-1)

3L-0T-0P: 03Credits

1. Introduction & present status of coal bed methane- Global and Indian Scenario
2. Properties of coal bed methane: Generation of coal bed methane gas & its properties, Coal gas origin.
3. Properties of coal: Coal rank, Ultimate & Proximate analyses, Macerals, Cleats, Porosity, Gas desorption etc.
4. Measurement of Coal bed Gas content: Direct methods, Lost gas, Residual gas etc.
5. Sorption of gas on coals: Langmuir's equation, under saturation, sorption isotherms.
6. Overview of Drilling and Production systems of coal bed methane wells, well completion, treatment of produced water and gas etc.
7. Coal well pressure transient tests.

SUBJECT: SHALE GAS/ OIL

(PE-CEIv.-0803-1)

3L-1T-0P:04Credits

1. Global Scenario of shale gas/ Oil production.
2. Nature, origin and distribution of Shale Gas/ Oil.
3. Characterization of Shale for Production of Shale Gas/ Oil.
4. Extraction methods of Shale gas/ Oil: development of current practices.
5. Location and size of production areas: estimated reserves and economics.
6. Environmental issues in shale gas exploration.
7. Markets and Globus impact on energy scenario.
8. Economic factor of shale Gas/ oil production

Course Curriculum of Petroleum Engg. Dept., DUJET, DU